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The NBS tables of chemical thermodynamic properties

Selected values for inorganic and C_1 and C_2 organic substances in SI units

Donald D. Wagman, William H. Evans, Vivian B. Parker, Richard H. Schumm, Iva Halow, Sylvia M. Bailey, Kenneth L. Churney, and Ralph L. Nuttall

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David R. Lide, Jr., Editor

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Foreword

The *Journal of Physical and Chemical Reference Data* is published jointly by the American Institute of Physics and the American Chemical Society for the National Bureau of Standards. Its objective is to provide critically evaluated physical and chemical property data, fully documented as to the criteria used for evaluation. One of the principal sources of material for the journal is the National Standard Reference Data System (NSRDS), a program coordinated by the NBS for the purpose of promoting the compilation and critical evaluation of property data.

The Regular issues of the *Journal of Physical and Chemical Reference Data* are published quarterly and contain compilations and critical data reviews of moderate length. Longer monographs, volumes of collected tables, and other material unsuited to a periodical format are published separately as *Supplements* to the *Journal*. This compilation, "The NBS Tables of Chemical Thermodynamic Properties," is presented as Supplement No. 2 to Volume 11 of the *Journal of Physical and Chemical Reference Data*.

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National Bureau of Standards, Washington, DC 20234

Recommended values are provided for chemical thermodynamic properties of inorganic substances and for organic substances usually containing only one or two carbon atoms. Where available, values are given for the enthalpy of formation, Gibbs energy of formation, entropy, and heat capacity at 298.15 K (25°C), the enthalpy difference between 298.15 and 0 K and the enthalpy of formation at 0 K. All values are given in SI units and are for a standard state pressure of 100 000 pascal. This volume is a new collective edition of "Selected Values of Chemical Thermodynamic Properties," which was issued serially as National Bureau of Standards Technical Notes 270–1 (1965) to 270–8 (1981). Values are given for properties of gaseous, liquid and crystalline substances, for solutions in water, and for mixed aqueous and organic solutions. Values are not given for alloys or other solid solutions, fused salts or for substances of undefined composition. Compounds of the transuranium elements are not included.

Key words: chemical thermodynamics; enthalpy; entropy; Gibbs energy; inorganic chemistry; thermochemistry; evaluated data.

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[1]No table for this element is included.

1. Introduction

The purpose of presenting these tables of evaluated data is to provide scientists and engineers with reliable values of chemical thermodynamic properties of the elements and their compounds from which they can calculate equilibrium constants and changes in enthalpies, entropies and heat capacities for processes. The tables contain values, where known, of the enthalpy of formation and Gibbs energy of formation, entropy and heat capacity at 298.15 K (25°C), the enthalpy difference between 298.15 K and 0 K, and the enthalpy of formation at 0 K, for inorganic substances and for organic substances containing one or two carbon atoms. In some instances such as complexes with organic ligands and metal–organic compounds, data are given for substances in which each organic ligand contains one or two carbon atoms.

No values are given in these tables for metal alloys or other solid solutions, fused salts, or for substances of undefined chemical composition. Nor are values given for the properties of compounds of the transuranic elements (Np to Lr). Values for the transuranics are being prepared for the International Atomic Energy Agency by a group with which the National Bureau of Standards (NBS) is cooperating. Values based on the work of that group and consistent with the present tables will be published later.

This volume is a new edition of NBS Technical Note 270, "Selected Values of Chemical Thermodynamic Properties," [1][2] which was issued in eight parts starting in 1965. The values there were in calorie units (1 calorie = 4.184 J) and for a standard state pressure of one atmosphere (101 325Pa). Here the data are given in SI units, joules, and for a standard state pressure of 100 000 Pa, which has recently been recommended by the International Union of Pure and Applied Chemistry. Since publication of the last section of the Technical Note there have also been some changes and additions. These are listed in Appendices, and have been incorporated in the tables.

This volume (and NBS Technical Note 270) supersede NBS Circular 500 [2]. The values in this volume are the result of a comprehensive evaluation of all available data as of the dates shown in the headings of the individual tables. The present tables contain a completely consistent set of values of properties. *When the value for a change in a property for a process is calculated, all data should, by preference, be taken from these tables in order to avoid inconsistencies.* The values reported in NBS Circular 500 Series I [2] should not be mixed indiscriminately with those presented here because the former differ importantly for some key compounds. These differences are due primarily to newer data and reinterpretation of older work. Nor should the present data be combined, without careful reworking, with other current tables, such as the CODATA Key Values for Thermodynamics [3], the JANAF Thermochemical Tables [4] or Thermal Constants of Substances [5]. How other tables can be used with ours is discussed in section 4.

[2]Figures in brackets indicate literature references.

The documentation for this work is being prepared and will be published separately. In the interim, information about particular selections may be obtained by writing to the Director, Chemical Thermodynamics Data Center, National Bureau of Standards, Washington, DC 20234.

In this introductory material, following a short historical background (sec. 2), several topics are addressed that should be of interest to the user of the tables and students of data evaluation. These include: (a) discussion of the general principles and important techniques used in the work (sec. 3), (b) discussion of expected accuracies of chemical thermodynamic data, including those calculated from these tables (sec. 4), (c) definitions, symbols, conventions, and important auxiliary data (sec. 5), (d) discussion of the problem of converting data from calorie units at 1 atmosphere to SI units (and back) and the effect of the change in the standard state pressure on $\Delta_f G^\circ$ and S° (sec. 6), and (e) guides to the use of the tables (sec. 7 and 9). Symbols used, conventions, and conversion factors are summarized in tables I through V of this introduction. Entry to the tables of selected values may be made via the table of contents, the sequence diagram (fig. 1) or the alphabetical index of the elements.

2. Evolution of These Tables of Chemical Thermodynamic Properties

Comprehensive thermodynamic tables are taken for granted today. They are the result of one hundred years of development in measurement and in data evaluation. In this section the growth of data evaluation activities at NBS in the area of chemical thermodynamics is described. Emphasis is on inorganic chemistry.

When physical chemistry grew into a recognized discipline its practitioners began to accumulate large quantities of information of thermodynamic importance. The need for a logical system of collecting and correlating the available data became important. Notable among early attempts are those by Berthelot [6] and the summaries for groups of compounds by Lewis and Randall [7].

The first self-consistent set of tables of enthalpies of formation and solution at 18°C and enthalpies of transition [8] was prepared by F. Russell Bichowsky, U.S. Naval Research Laboratory, for the International Critical Tables, edited by Edward W. Washburn, NBS. Bichowsky's tables listed approximately 3,700 inorganic and small organic substances and were based on some 12,000 measurements extracted from 1,113 articles. Each of these measurements was abstracted onto a 3x5 inch card; the set is the nucleus of the NBS master file of thermochemical measurements. The International Critical Tables also included a table of Gibbs energies of formation and related quantities [9], but the values were not always consistent with Bichowsky's selections.

2.1. Thermochemical Tables at NBS

Bichowsky's data bank was systematically updated and used in the preparation of "The Thermochemistry of the Chemical Substances" by Bichowsky and Frederick D.

Rossini [10]. That volume provided enthalpies of formation at 18°C and enthalpies of phase transition for approximately 6,000 inorganic and C_1–C_2 compounds. The total number of selected values was 6,600; the measurements were described and compared in the text. The data bank consisted of approximately 22,000 measurements based on 3,750 references.

Until 1940 the preparation of tables and the maintenance of the data bank were part-time activities. Then a formal program was started at NBS under the leadership of Rossini. An important decision was made that future tables should also include enthalpy differences $[H°(T)–H°(0)]$, Gibbs energies of formation, entropies and heat capacities at 25°C. Tables restricted to enthalpies of formation and transition excluded significant and useful data. When the volume "Selected Values of Chemical Thermodynamic Properties," NBS Circular 500 [2], was published in 1952, each line entry in the thermochemical part on the formation properties (Series I), contained values for not only $\Delta_f H°$, but also $\Delta_f G°$, log K_f, $S°$, and $C_p°$ (all at 298.15 K), and $\Delta_f H°(0)$ if data were available. The phase transition properties (in Series II) were T, P, ΔH, ΔS, and ΔC_p for vaporization, fusion and solid-state transitions. There were now 7,000 substances covered in Series I and 3,850 in Series II (transitions). Fifteen thousand property values based on 8,500 references were reported. The data bank had expanded to 50,000 items. The tables were documented by reference citations only.

With this expansion of the tables, the user was provided with data useful for the prediction of equilibrium constants at or near 298.15 K. Also substances could be included for which there were no enthalpy measurements and values could be predicted for properties that had not been studied.

The expansion also put data evaluation on a firmer basis. Equilibrium data could be compared with calorimetric experiments. More correlations between properties and structure could be developed. Data evaluation became both more complex and more reliable.

The evaluation process used in developing all of these tables was a non-automated, sequential approach of making selections for one compound at a time. Relationships among the values for properties of compounds were built up, networks of data were examined, and the values were adjusted until an optimum set was obtained. This manual, sequential approach has dominated thermochemical data evaluation; it is still being used today. Only within the past decade has a computer-based simultaneous solution approach become important.

NBS Circular 500 was reprinted in 1961. It is still cited as a source of chemical thermodynamic data. But starting in 1965 it has gradually been replaced by NBS Technical Note 270 [1], which has the same scope as the thermochemical section (Series I) of NBS Circular 500. Technical Note 270 has been issued in eight parts over the past 16 years. It (and the present volume) list 26,000 values for the chemical thermodynamic properties of 14,300 substances, counting separately the same compound in different phases and at different concentrations. Enthalpies of formation at 298.15 K dominate with 12,800 entries, with 4,400 values for Gibbs energies and 3,600 for entropies. We estimate that 60,000 references were used in the development of the tables, and that these produced 180,000 cards in our index to thermodynamic measurements. The present volume collects all of the selections published in Technical Note 270 and presents them in SI units.

2.2. Other Tables

The activities described above are only one part of an expanding, worldwide effort to provide science and technology with reliable thermodynamic data. Both general and very specific tables have been produced by many authors. Herington [11] has listed many of them along with the vast number of texts in the field. Both the "Combustion Fundamentals for Waste Incineration" handbook [12] and Armstrong and Goldberg [13] have provided annotated bibliographies. Gurvich et al. [14] have commented critically on most current tables. We mention here only a few large sets of tables that are similar to ours or complement them.

The JANAF Thermochemical Tables [4] were started in 1958 to support research on rocket propellants. They were issued in loose-leaf form until 1971 when the second edition was published as part of the National Standard Reference Data System. Three supplements have since been published in the Journal of Physical and Chemical Reference Data (cited with ref. 4) and a fourth is in press. The tables list nearly 1,500 species and give $C_p°$, $S°$, $[G-H°(298.15\text{ K})]/T$, $H°-H°(298.15)$, $\Delta_f H°$, $\Delta_f G°$, and log K_f for each of them over the range 0 to 6000 K (where possible). Each table is documented by a page of descriptive text, data and references. Their thermal functions have often been used in our work.

A similar table of thermal functions for minerals was published by Robie, Hemingway and Fisher [15] and is currently being expanded.

Two comprehensive sets of tables of evaluated data have been prepared and published by the Institute of High Temperatures, Academy of Science of the USSR, Moscow. The first, "Thermal Constants of Substances" [5] parallels NBS Technical Note 270 but also includes transition properties; since 1965 ten volumes have appeared. In these tables, as in NBS Technical Note 270, self-consistency has been maintained. Although there have been extensive discussions between the groups preparing tables at NBS and IHT, the different interpretations and selection of data have led to different values for many compounds. For this reason it is not advisable to use values from the two sets of tables in the same calculation. The second, "Thermodynamic Properties of Individual Substances," is a collection of evaluated thermodynamic properties as a function of temperature; it is similar to the JANAF Tables. It was first issued in 1958 [16] as "Thermodynamic Properties of the Products of Combustion," and revised in 1962 under the present title [17]. A third edition of this work is in progress; three volumes have been issued [14] and one more is expected.

During the past two decades methods for evaluating data have changed. It became practical to use digital computers to solve the large sets of linear algebraic equations which arise in chemical thermodynamics. Computers also became essential elements in the reduction of data from experimental measurements and in the continuing activity of collecting and filing the data upon which the present tables are based. How the evaluation process itself has changed under the impact of the computer is discussed in the next section.

3. Evaluation of Chemical Thermodynamic Data

3.1. Purpose of Data Evaluation

Often values for the properties of a substance can be determined from each of several different sets of measurements. Rarely do these values agree. The disagreement can be large. A choice must be made in establishing the "best" value to be used. This choice often can be made by a careful reexamination of the available data. Occasionally it cannot be made until further experiments are carried out.

Values for chemical thermodynamic properties data are tabulated by convention as enthalpies of formation, Gibbs energies of formation, and entropies, all for the standard state. The purpose of using this convention is to make it possible, and easy, to calculate the properties for *any* process for which reactants and products are listed in the tables, not only those processes that have been studied.

The tabulated values are chosen so that, when combined appropriately, they will reproduce the more reliable measurements. We assume that if reliable measurements can be reproduced well, the values calculated for properties for other processes will also be reliable and that, ideally, these calculated values are independent of the procedures used in the evaluation.

3.2. Types of Data Used in the Evaluations

Experimental data and theoretical models of many types are used in the evaluation of chemical thermodynamic data. The principal types are:

(a) For the determination of enthalpies of formation:
  1) Calorimetrically measured enthalpies of reaction, fusion, vaporization, sublimation, transition, solution, and dilution;
  2) Temperature variation of equilibrium constants;
  3) Spectroscopically determined dissociation energies;
  4) Calculations from Gibbs energies and entropies.

(b) For the determination of Gibbs energies of formation:
  1) Vapor pressures, solubilities, chemical equilibrium constants and electromotive force data;
  2) Calculations from enthalpies and entropies.

(c) For the determination of entropies:
  1) Heat capacities and enthalpies as a function of temperature;
  2) Statistical mechanical calculations using molecular structure and energy levels;
  3) Temperature variation of equilibrium constants;
  4) Calculations from enthalpies and Gibbs energies.

In the interpretation of various types of experiments other kinds of data can be needed: PVT data, mixing properties, phase diagrams, transition temperatures, crystal structures, densities, and critical parameters. In addition, correlations of thermodynamic properties with molecular structure and with various properties are useful in assessing the reasonableness of isolated data points.

3.3. The Data Evaluation Process

There are two major stages in the process of evaluating chemical thermodynamic data. The first is an examination of each paper in order to establish what was measured, what value or values were obtained (converted to consistent units), and what the reliability of each of the values is. The second stage is a solution of the data network, either by hand or by machine. This involves the examination of the consistency of results from different studies, selection of the apparently most reliable value, and calculation of the properties that are to be tabulated. Reliability of experimental method, adequate characterization of chemicals, knowledge of the process occuring, and consistency of results are emphasized throughout.

In sections 3.4 and 3.5 below, we discuss some of the important methods for determining the tabulated properties. The subject can be divided, for this purpose, into methods for S°, C_p° and $H^\circ - H^\circ(0)$, and methods for the formation properties, $\Delta_f H^\circ$ and $\Delta_f G^\circ$. These discussions emphasize how individual measurements are treated. Then the interconnected nature of chemical thermodynamics measurements — the network of data — is discussed in sections. 3.6 and 3.7. The two principal methods for solving the networks are described and contrasted. These are the non–automated sequential and the computer–aided solution of simultaneous equations.

3.4. Methods Used for Calculation of Heat Capacity, Entropy, and Enthalpy

a. Condensed Phases

(a) *Heat capacities.* These are obtained from three types of measurements. Low–temperature heat capacities are measured directly (calorimetrically). Above 400 K, C_p's are either measured directly or derived from enthalpy difference measurements (receiving or "drop" calorimetry). Less frequently C_p is derived from measurements on chemical reactions or physical processes as a function of temperature.

(b) *Entropies and enthalpies for condensed phases at 298.15 K.* These are obtained by numerical integration of C_p over the experimental temperature range.

$$S^\circ(298.15\ \mathrm{K}) - S^\circ(T_1) = \int_{T_1}^{298.15\ \mathrm{K}} C_p^\circ \mathrm{d}\ln T + \sum \Delta_{trs}H^\circ/T_{trs}$$

and

$$H^\circ(298.15\text{ K}) - H^\circ(T_1) = \int_{T1}^{298.15\text{ K}} C_p^\circ \text{dTT} + \sum \Delta_{\text{trs}} H^\circ$$

combined with an extrapolation to $T = 0$. (T_1 is the lowest temperature at which measurements were made, and the rightmost term in each equation covers phase transitions.)[3] The problems and methods are discussed in many texts, e.g. [18]. When it is advisable to reintegrate the data we usually use a cubic spline fit and extrapolate using either a T^3 dependence or Debye and Einstein functions.

Complications can arise if anomalous heat effects, such as magnetic order–disorder transitions appear at very low temperatures and are not recognized or if random orientation of certain groups (such as H_2O in hydrates) persists as the temperature approaches 0 K. Then an unknown "residual" or "zero point" entropy may remain in the crystal. A correction can be (and often is) made for it if there is another path for obtaining the entropy, as, for example, from the gas or from equilibrium studies. Even then the result may be only a call for new measurements.

In these calculations contributions to the entropy by nuclear spins and isotopic mixing are ignored.

b. Gaseous Species

For most species in the ideal gaseous state $S^\circ(T)$, $H^\circ(T)$—$H^\circ(0)$ and $C_p^\circ(T)$ have been calculated using statistical mechanical methods, as discussed in [19]. (In a few cases S° for a gas has been obtained from that of the condensed phase and vaporization data). The statistical procedures are discussed below.

For monatomic species the electronic contributions to the partition function were obtained by summation over the electronic energy levels.

For diatomic molecules, the rotational and vibrational constants were used in a nonrigid rotator–anharmonic oscillator formulation based upon the Mayer and Mayer [20] treatment.

The calculations for polyatomic molecules were usually made only in the rigid rotator–harmonic oscillator approximation. For a few molecules for which data on anharmonic, stretching, and rotation–vibration interactions were available, the calculations were extended to include these effects.

Internal rotation contributions were approximated by the method of Pitzer and Gwinn [21].

The calculations were made for the usual isotopic composition; where data were available only for a specific isotopic species, they were corrected to the accepted isotopic mixture [22]. This occurred primarily for spectroscopic constants of molecular species. When the data were reported for specific species such as $^1H^{35}Cl$ and $^1H^{37}Cl$, these data were corrected to refer to the hypothetical species, such as $^1H^{35.454}Cl$ and used in the statistical calculations. In a few cases, calculations were also made for each isotopic species and the resulting thermal functions combined according to the mole fractions of the species; the results are the same as those from the average calculation. Isotopic mixing contributions have been excluded from the entropy. The effects of nuclear spin have been excluded except for calculations for H_2 and D_2. For them corrections were applied to the values calculated for the equilibrium ortho–para mixture to remove the standard nuclear spin contributions. This makes values for hydrogen– and deuterium– containing species compatible with those for other species in the tables.

In recent years the availability of large computers has made it possible to use very effective direct summation methods and more effective representations of energy levels. We have used such methods for a few compounds in which features are present such as multiplet ground states, low dissociation energies, or large rotational effects. For molecules for which these features are absent, these methods and the simpler approximations give results at 298.15 K agreeing within the uncertainty of the molecular data.

Values for heat capacities, entropies, and enthalpy differences are often much more accurate than are enthalpies and Gibbs energies of reaction. In the solution of measurement networks involving both $\Delta_r H^\circ$ and $\Delta_r G^\circ$ (see later), S° and $H^\circ - H^\circ(0)$ often are considered fixed quantities, i.e. not subject to adjustment.

3.5. Methods Used for Calculating Gibbs Energy of Formation and Enthalpy of Formation

a. Enthalpy Changes

(a) *Direct determination of enthalpy changes.* Most standard enthalpies of formation, $\Delta_f H^\circ$, are derived from measured enthalpies of reaction by:

$$\Delta_r H^\circ = \Sigma_j n_j \Delta_f H_j^\circ - \Sigma_i n_i \Delta_f H_i^\circ \quad (1)$$

where $\Delta_r H^\circ$ is the measured value, corrected to standard conditions, i and j specify reactants and products, respectively, and n_i, n_j are the amounts of each substance in the chemical reaction.

When, for example the process

$$\text{Mn(cr)} + 2\text{HCl(aq)} = \text{MnCl}_2\text{(cr)} + \text{H}_2\text{(g)} \quad (2)$$

is treated by the sequential evaluation procedure (described later) the expression of equation 1 as

$$\Delta_r H^\circ = \Delta_f H^\circ(\text{MnCl}_2, \text{cr}) + \Delta_f H^\circ(\text{H}_2, \text{g}) - 2\Delta_f H^\circ(\text{HCl, aq}) - \Delta_f H^\circ(\text{Mn, cr})$$

allows the calculation of $\Delta_f H^\circ(\text{MnCl}_2, \text{cr})$ since both $\Delta_f H^\circ(\text{H}_2, \text{g})$ and $\Delta_f H^\circ(\text{Mn, cr})$ are zero by definition and $\Delta_f H^\circ(\text{HCl, aq})$ would have been selected in earlier evaluations.

Most of the calorimetric measurements used in obtaining enthalpies of formation are of a few general types:

[3] Notational conventions are summarized in table I.

(a) Direct chemical reactions

$C(cr, graphite) + O_2(g) = CO_2(g)$

$CO(g) + 0.5\ O_2(g) = CO_2(g)$

$C_2H_5OH(l) + 3\ O_2(g) = 2\ CO_2(g) + 3\ H_2O(l)$

$U(cr) + 3\ F_2(g) = UF_6(g)$

$B_2H_6(g) = 2\ B(am) + 3\ H_2(g)$

(b) Dissolution of substance with chemical reaction

$Cl_2(g) + H_2O(l) + [400\ H_2O] = HCl(400\ H_2O) + HClO(400\ H_2O)$

$Na_2O(cr) + H_2O(l) + [200\ H_2O] = 2\ NaOH(100\ H_2O)$

$Mn(cr) + 2HCl(in\ HCl + 50\ H_2O) = MnCl_2(in\ HCl + 50\ H_2O) + H_2(g)$

(c) Simple dissolution of a substance

$KCl(cr) + [100\ H_2O] = KCl(100\ H_2O)$

$MnCl_2(cr) + [HCl\ in\ 50\ H_2O] = MnCl_2(HCl\ in\ 50\ H_2O)$

(d) Dilution

$H_2SO_4(100\ H_2O) + [100\ H_2O] = H_2SO_4(200\ H_2O)$

(e) Chemical reaction in solution

$(2\ KMnO_4 + 200\ H_2O) + (10\ FeSO_4 + 8\ H_2SO_4 + 1000\ H_2O) = (K_2SO_4 + 5\ Fe_2(SO_4)_3 + 2\ MnSO_4 + 1208\ H_2O)$

f) Mixing of solutions

$K_2SO_4(200\ H_2O) + 2NaCl(100\ H_2O) = (K_2SO_4 + 2\ NaCl + 400\ H_2O)$

In the evaluation of the data several reactions may be combined algebraically to eliminate ill-defined mixtures. Thus two reactions of type (f) can be combined to eliminate the product mixtures:

$$K_2SO_4(200\ H_2O) + 2\ NaCl(100\ H_2O) = (K_2SO_4 + 2\ NaCl + 400\ H_2O), \quad (3)$$

$$Na_2SO_4(200\ H_2O) + 2\ KCl(100\ H_2O) = (Na_2SO_4 + 2KCl + 400\ H_2O) \quad (4)$$

yield

$$K_2SO_4(200\ H_2O) + 2\ NaCl(100\ H_2O) = Na_2SO_4(200\ H_2O) + 2KCl(100\ H_2O)$$

$$\Delta_rH = \Delta_rH(3) - \Delta_rH(4)$$

Here the assumption is made that the mixtures formed in the two systems (3) and (4), consisting of K^+, Na^+, Cl^-, and SO_4^{2-}, are the same. (This assumption cannot be made in cases in which kinetics controls speciation in solution.)

Other types of calorimetric measurements are used in the evaluation, but less frequently. These include measurement of enthalpies of phase change – fusion, transition and vaporization – and of polymerization, hydrolysis and ionization in solution.

The reactions actually measured usually do not conform to standard conditions. Adjustments will be necessary for temperature, departure from exact stoichiometry, impurities, dilution, incomplete reaction, etc. These adjustments may or may not have been made by the author. Furthermore, it may be necessary to correct the author's values for atomic masses, physical constants, energy units, revised stoichiometry, and, on occasion, for apparent errors.

(b) *Indirect Determination of Enthalpy Changes.* Values of Δ_rH° can be derived from the temperature variation of equilibrium constants. The equilibrium properties measured may be equilibrium constants for chemical reactions, cell potentials or vapor pressures. Two methods are used: the "second law method," which does not require thermal functions involving entropy, and the "third law method" which does.

Second law method. An equilibrium measurement at one temperature leads to the corresponding $\Delta_rG^\circ(T)$. Several equilibrium measurements at more than one temperature also leads to Δ_rH° or Δ_rS°, as for example from

$$\Delta_rH^\circ(T_1) = -RT(\partial \ln K_p/\partial(1/T))_p$$

where T_1, is the temperature at which the derivative is evaluated [23]. The Δ_rH°(298.15 K) can be calculated if Δ_rC_p or $\Delta_r[H(T)-H(298.15\ K)]$ is known or can be estimated. Many measurements over a large temperature range are needed for this method to be reliable. The principal advantage of this method, for simple processes such as vaporization, is that an absolute measurement of pressure is not required. By the same token the method is less sensitive to calibration errors than that described below.

Third law method. Given values for the function, $[G(T)-H(298.15\ K)]/T$ for each substance in a reaction, Δ_rH is derived from each individual K_p by

$$\Delta_rH^\circ(298.15\ K) = -RT\ln K_p - T\cdot\Delta_r\left[\frac{G(T)-H(298.15\ K)}{T}\right]$$

Constancy among the values derived for the Δ_rH°'s is an indication of a combination of experimental reliability and of the correctness of the term in brackets which was calculated separately. Various schemes for applying this method (and the second law method as well) implicitly weight the data points differently [24].

The third law method often is preferred. It can be used when there are too few points to permit accurate determination of a slope (needed in the second method), and can yield a precise value of ΔH when there are many points. It does require, however, an absolute calibration of the pressure scale (and any other measures of concentration).

An agreement between the two methods is often taken as an indication of the absence of serious systematic errors.

b. Gibbs Energy Changes

Most values of $\Delta_f G^\circ$ are obtained from enthalpies and entropies:

$$\Delta_f G^\circ = \Delta_f H^\circ - T\Delta S^\circ$$

Some values of $\Delta_f G°$ are obtained from $\Delta_r G°$ by a method analogous to that used for enthalpies of reactions:

$$\Delta_r G° = \Sigma_j \Delta_f G_j° - \Sigma_i \Delta_f G_i°$$

The most common sources of $\Delta_r G°$ are equilibrium measurements such as vapor pressures, solubility, and the equilibrium constants of chemical reactions. The basic relationships are:

$\Delta_r G°$ = $-RT \ln K$ for a chemical or physical system at equilibrium,
= $-nFE°$ for a reversible electrochemical cell [at zero current drain].

The symbol F is the Faraday constant, $E°$ is the standard electromotive force and K is the equilibrium constant.

The aqueous solubilities of salts are often used for obtaining $\Delta_r G°$ for the process:

$$M_aX_b{\cdot}nH_2O(cr) = M_aX_b(aq,\ \text{std. state},\ m=1) + n{\cdot}H_2O(l)$$

for which

$$K(\text{solubility}) = f(\text{activities})$$
$$-\Delta_r G°/RT = \ln K = \ln[a(M_aX_b)\, a(H_2O)^n]$$
$$= \ln[a^a b^b (m_s\gamma_\pm)^{(a+b)}] + n \ln a(H_2O)$$

with

$$-\ln a(H_2O) = (a+b)\ m_s\phi_w/n_w$$

In these equations the activities, a, are those in the saturated solution and M_aX_b is assumed to be fully dissociated to cations and anions. Other terms are m_s, the molality of the saturated solution, n_w (=1000/M_w), the number of moles of water associated with m_s moles of solute, $\gamma_\pm$, the mean ionic activity coefficient of the solute at saturation, and ϕ_w, the practical osmotic coefficient of the water in the saturated solution. The derived $\Delta_r G°$ is for the process where the ionic products are in their standard states, i.e., in the hypothetical ideal solution at unit mean ionic molality and at the standard state pressure.

Standard electrode potentials in cells without liquid junction can yield the $\Delta_r G°$ of the cell reaction. For example, in the cell

$$\underset{p°}{\text{Pt, } H_2(g°)}\,|\,\underset{m}{HCl(aq)}\,|\,\underset{p°}{Cl_2(g°)}\text{, Pt}$$

this reaction occurs

$$0.5\ H_2(g) + 0.5\ Cl_2(g) = HCl(m)$$

and its potential is related to the Gibbs energy by

$$\Delta_r G = -\ nFE.$$

In this example the reaction forms HCl in a solution of HCl at molality m from the elements in their standard states. The Gibbs energy change, $\Delta_r G$, is therefore the partial molar Gibbs energy of formation of HCl(m). $\Delta_r G$ is also the chemical potential because the reaction takes place at constant pressure, and temperature.

The standard potential, however, is not measured directly but must be obtained by a series of measurements at very low concentrations, extrapolated to infinite dilution (where activities are proportional to concentrations),

$$E° = \lim_{m\to 0}(E - RT \ln \alpha)$$

where α represents a quotient of molalities. The extrapolation can be made with the aid of the Debye–Hückel theory (to calculate activities in very dilute solution). Alternatively, $E°$ can be obtained from measurements at higher concentrations if the activity coefficients are known for all components.

The treatment required for cells with liquid junctions is described in monographs on electrolyte solutions [25, 26]. In all work with cell potentials care must be taken to determine the conventions used by the author [27].

Phase diagrams also yield thermochemical data, both ΔG and ΔH. At times these data compete with other types of measurements, but often the diagrams are only suitable for showing trends. We have made extensive use of one component phase diagrams, but have used two and three component phase diagrams infrequently.

c. Interrelationships

The $\Delta_f H°$, $\Delta_f G°$, and $S°$ obtained for a substance as a result of the calculations outlined above are not independent. They are related by

$$\Delta_f G° = \Delta_f H° - T\Delta_f S°$$

This expression has been used above to calculate values for properties that have not been measured; it is the only relationship linking the three main classes of measurements listed in section 3.2.

When data are available for all three, it is almost invariably the case that this relationship is not satisfied exactly, due to experimental error, and an adjustment must be made. That phase of data evaluation is discussed below.

3.6. Structure of Chemical Thermodynamic Networks

The second stage of data evaluation in chemical thermodynamics is the intercomparison of individual measurements and the combination of them to obtain the properties that are tabulated. The tactics used are strongly influenced by the amount of data to be considered and the extent to which measurements are interconnected.

All thermochemical measurements are relative, yielding the value for a change in a property of the system as a process occurs. Each measurement can be expressed as an algebraic difference equation involving the formation properties of the compounds:

$$Rb_2O(cr) + H_2O(l) = 2RbOH(aq)$$
$$\Delta_r H^\circ = -338 \pm 3 \text{ kJ mol}^{-1}$$
$$\Delta_r H^\circ = 2\cdot\Delta_f H(RbOH) - \Delta_f H^\circ(Rb_2O) - \Delta_f H^\circ(H_2O)$$

where each $\Delta_f H$ represents the enthalpy of formation of the substance from the elements in its formula. Similar equations relating the measured changes in Gibbs energies to Gibbs energies of formation or for entropies of reaction may also be written.

It is convenient at this point to restrict our attention to thermochemical measurements at 298.15 K. Measurements at other temperatures will be assumed to have been reduced to this reference temperature.

Two features become apparent when a large number of thermochemical measurements is examined. First, there is usually a very limited number of replicate measurements for any particular reaction, and second, there are many reactions that share the same reactants or products; that is, many reactions involve common oxidants, mineral acids, etc. This means that almost all thermochemical measurements are linked together in a mammoth network. This very large network can be treated by subdividing it and solving pieces of it in sequence.

The sequence used here follows the thermochemical "standard order of arrangement," (fig. 1). First the compounds of oxygen alone are treated, then those of hydrogen and oxygen, next the "inert gases", then the compounds of the halogens with themselves, oxygen, hydrogen and the "inert gases", and so on across the periodic table. This general plan has been modified to allow early evaluation of some common reagents and other substances that appear extensively in thermochemical measurements. When values of the properties of the compounds of an element are set, they become fixed, auxiliary data for later evaluations. Thus, when compounds of barium (table 96) are treated, the properties of all compounds in tables 1 through 95 (oxygen through strontium) are used as auxiliary data. This assures that each table will be consistent with all others. This procedure also reduces each measurement to a difference equation involving only compounds of the element being studied.

When networks of processes involving compounds of only one element as variables i.e., processes that have been reduced as described above, are examined, several characteristics stand out. First, the results of many different types of measurements, differing in reliability, are to be combined. Different techniques and different classes of properties are involved. Second, when the measurements are reduced to mathematical form with all of the auxiliary values specified, almost all have the following simple forms:

$$Y_i + b_i = ax$$
$$Y_i + b_i = a_1x_1 - a_2x_2$$
$$Y_i + b_i = a_1x_1 \pm a_2x_2 - a_3x_3$$

with the third case being relatively uncommon. In these equations the Y's are the observables for the processes, the x's are the properties of the compounds, e.g., $\Delta_f G$'s, the a's are stoichiometric coefficients, and the b's are known values for auxiliary data.

Third, a network, although containing 10 to 500 variables, is linked loosely together. Each variable appears in only a small percentage of the equations. Fourth, as described earlier, thermodynamic laws place constraints upon the solution in the form of interrelations between variables.

A small network for measurements on several barium compounds is shown in figure 2. It has been extracted from a

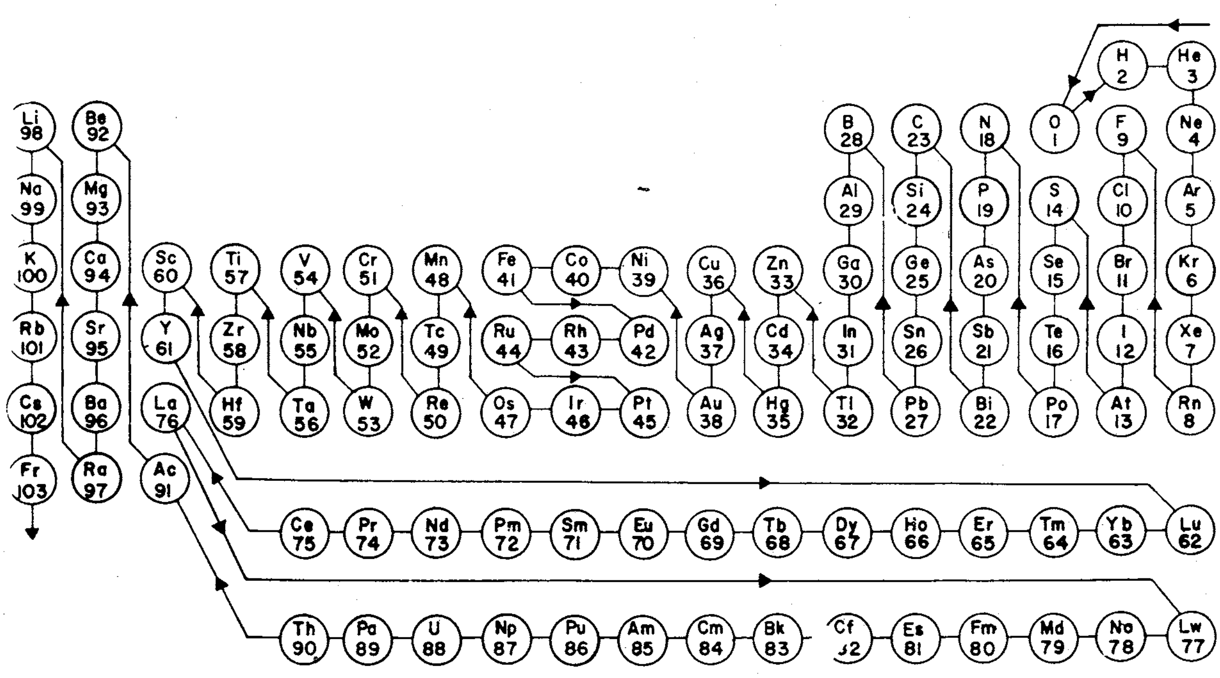

FIGURE 1. Standard order of arrangement of the elements and compounds based on the periodic classification of the elements.

much larger set. The mathematical problem is simple: solve accurately an over-determined set of linear algebraic equations.

3.7. Solution of Over-Determined Networks of Chemical Thermodynamic Data

As described earlier two types of methods have been used to date: a sequential procedure and a simultaneous solution of the entire network. Both are able to satisfy the following criteria for a reasonable solution for $\Delta_f H°$, $\Delta_f G°$, and $S°$ of interrelated compounds:

(a) The values selected must reproduce well those measurements considered to be reliable.

(b) The values selected must be as consistent as possible with all other values in the tables and should be in reasonable accord with the properties of similar substances or with physicochemical correlations.

(c) A consistent set of auxiliary data should be used throughout the entire set of tables. These auxiliary data include both the values for physical constants and the properties of substances common in thermodynamic measurements.

If these criteria are satisfied, our presumption is that the individual values of $\Delta_f H°$, $\Delta_f G°$, and $S°$ may be combined to predict the "best" values of the change in enthalpy, Gibbs energy, or entropy for any process, measured or not.

a. Sequential Method of Evaluation

This technique was used for evaluation of properties of compounds of almost all of the elements considered in this volume. Figure 2, a network for enthalpies of barium compounds, will be used to illustrate this method. The starting point is the element in its reference phase, Ba(cr). There are measurement pathways that lead directly to BaO(cr), $BaCl_2$(cr), $BaCl_2$(aq) and BaH_2(cr). The enthalpies of formation of these four compounds can be calculated directly. Then three others are accessible: BaO_2(cr), $Ba(OH)_2$(cr) and $Ba(NO_3)_2$(aq). Finally, $BaCO_3$(cr) can be treated. This is a typical sequence within the compounds of an element: first, those for which formation properties can be determined directly; second, those compounds directly dependent upon the first set and so on. (The sequence of evaluation among the compounds in a network does not usually follow the sequence in which the elements are treated (sec. 3.6 and fig. 1: Standard Order of Arrangement). Instead, it is controlled by the structure of the local measurement network.)

There may be, at each step in the evaluation of a network, several pathways leading to the next compound. Each such path may lead to a different result because of the effect of errors.

When such discrepancies are noted, decisions have to be made as to how to resolve them. Should a weighted average be taken? Should a measurement or even a pathway be rejected? Is it possible that the problem is not that of erroneous measurements but of a poor value selected in an earlier step or in the auxiliary data?

In such a case, the evaluator must retrace his steps, find the suspect value and modify that selection and all the subsequent values dependent upon it. Measurements that originally appeared to be reliable become suspect and are downgraded if they are highly inconsistent with values arrived at from other paths in the overdetermined set. The set of values for key compounds is built up carefully, taking care to reproduce well the measurements on which it is based. Because of these various factors, this manual sequential method is, in reality, iterative.

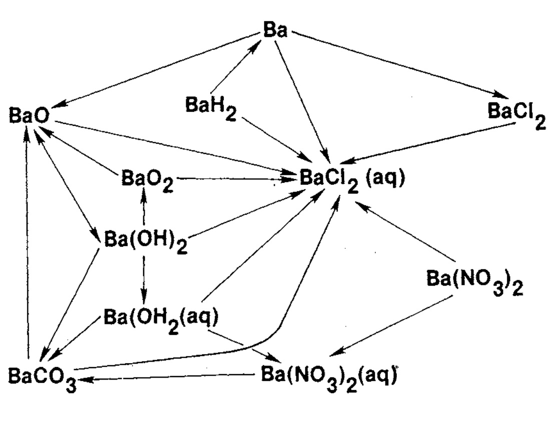

FIGURE 2. Thermochemical data network.

b. Computer-Assisted Simultaneous Solutions

This technique has been used in the evaluation of properties of the compounds of Li and Th, and for some of the evaluations of compounds of U, Na, K, Rb and Cs. It consists of a computer solution of the linear algebra problem posed by the thermochemical network of data. Formation properties of all the compounds in the network are determined simultaneously.

The machine procedures overcome many of the difficulties in making iterative, sequential solutions. Solutions can be repeated, with major and minor variations, to test hypotheses. Systematic analyses of the networks and statistical indications of goodness of fit are provided. Furthermore the procedures can handle large amounts of data efficiently; we have solved networks with more than 1,200 processes in the course of this work. The method does not provide the final answer; it is an aid to the data analyst who must make the final choice of the selected values.

The method now being used for solving networks is a two-stage procedure that has been designed to take into account the two features of the data emphasized by data analysts: reliability and consistency with other measurements [28]. In the first stage an unweighted least sums (linear programming) solution is made. It finds the most consistent set of measurements. The second stage is a weighted least-squares solution with the weights based on a combination of pre-assigned uncertainties and residuals from the first stage. The method gives results similar to those from the sequential method.

Several trials may be necessary because the solution of the network is the first point in the evaluation process at which a quantitative intercomparison of measurements is made. Some earlier decisions about weighting data items may require reexamination.

The prime importance, however, of the simultaneous, computer based method is the facility it offers for the rapid incorporation of new measurements into the body of evaluated thermodynamic data. This makes it a very important aspect of modern data evaluation and is a major reason why the method has been introduced [29, 30].

4. Accuracy of Tabulated Data

4.1. Internal Consistency of the Tables.

The values tabulated for any given substance are consistent with those of all other substances in the tables so that an appropriate combination of them may be used to obtain the value for a property of a chemical reaction or physical process. The various aspects of internal consistency are specified below.

a. Subsidiary and Auxiliary Quantities Used

All of the values given in these tables have been calculated from data given in the original articles, using consistent values for all subsidiary and auxiliary quantities. The original data were corrected to a temperature of 298.15 K and, where possible, for differences in energy units, molecular weights, temperature scales, etc. Thus we have sought to maintain a uniform scale of energies for all substances in the tables.

b. Physical and Thermodynamic Relationships for the Tabulated Properties of a Substance

Three relationships hold throughout the tables.

(1) The quantities $\Delta_f H°$, $\Delta_f G°$, and $S°$ at 298.15 K satisfy, within the implied uncertainty, the relation

$$\Delta_f G° = \Delta_f H° - T\Delta_f S°$$

where $\Delta_f S°$ is to be calculated from tabulated values of $S°$ for a neutral substance and its constituent elements. See section 5.8 for the special case of aqueous ions.

In a few specific cases, the G–H–S relation has been relaxed as explained in the next subsection.

(2) Enthalpies satisfy the relationship:

$$\begin{aligned}\Delta_f H°(298.15\text{ K}) = {} & \Delta_f H°(0\text{ K}) \\ & + [H°(298.15\text{ K}) - H°(0\text{ K})]\text{ (subs.)} \\ & -\Sigma\nu_i[H_i°(298.15\text{ K}) - H_i°(0\text{ K})]\text{ (el.)}\end{aligned}$$

where ν_i is the stoichiometric coefficient for an element i in the equation for formation of the compound.

(3) A value for a thermodynamic property of an ionized substance in solution in the standard state is the sum of the values for the constituent ions.

c. Effect of New Data on Values Selected Earlier

In an evaluation as comprehensive and lengthy as that leading to this volume, in which the elements and their compounds are treated sequentially, values previously selected are considered fixed and are then treated as auxiliary data in subsequent calculations. This maintains the internal consistency necessary to retrieve the experimental data (within the expected uncertainty) and to predict the thermochemical properties of processes not directly measured.

Newer measurements on some species have become available after their property values were fixed and used in subsequent calculations. It is not possible to incorporate all of these newer measurements into the tables without a detailed analysis of the effect of the changes on interrelated selections. Unless great care is used, relatively significant errors in the calculated values of $\Delta_f H°$, $\Delta_f G°$, or $\Delta S°$ for specific processes may result from the introduction of such data. The user is advised not to make these substitutions. They can be made only after careful examination of the measurement network. As an example, when the enthalpy of formation of $Al_2O_3 \cdot 3H_2O$, gibbsite, was changed recently, 45 other values had to be adjusted to maintain optimum relationships.

The danger is that "improving" one value for a property of one substance may distort calculated values for chemical processes. There may be compounds of the same element or distantly related substances for which the value in question was used as an auxiliary datum. (Under very limited conditions changes can be made; see sec. 4.3.)

We have handled new data in three ways. First, in some cases changes can be and have been made where values for only a limited number of compounds were affected. Examples of these are the ClO_3^- and BrO_3^- aqueous ions, for which new values have been introduced, as well as new values for substances dependent on them. (For change of values from those published earlier see the appendices to this volume and that of NBS Technical Note 270–8.)

Second, in other cases, as for aqueous F^-, I^- and S^{2-}, for which new data indicate significantly different values of $\Delta_f H°$ [3], such changes cannot be readily made, since these ions are "key substances" involved in many sets of reactions throughout the tables. A major revision of many values would be required. For example, many substances whose properties are determined by calorimetric reactions in which these ions form or disappear would be affected.

Although this problem is intractable, its importance to the user of these tables should not be overemphasized. Differences between values are more important than the absolute numbers. Most differences before and after a revision of the type discussed here will remain almost the same.

Third, in a limited number of cases, a partial solution has been adopted. The G–H–S relationship has been relaxed, so that $T\Delta_f S°$[cr] does not equal $\Delta_f H°$[cr] – $\Delta_f G°$[cr] within the expected uncertainty. They are designated in the tables by the statement:

"G–H–S constraint has been relaxed; see Introduction" These instances are limited to some of the alkali metal salts of I^-, SO_4^{-2}, HSO_4^-, CO_3^{-2} and HCO_3^-. Newer "third law" evaluations of entropies for salts and for entropies of solution have led to significantly different values of the entropies of these ions from those reported in NBS Technical Note 270–3 and used throughout these tables.

For these cases, in order to retain the basic principle that the values in the tables should yield "best" values for thermodynamic processes, we have selected values of $\Delta_f H^\circ$ and $\Delta_f G^\circ$ for the crystalline alkali metal salts such that the "best" values of ΔH° and ΔG° for the standard solution process are maintained. On the other hand the values of S° for the salts are selected from measurements independent of the solution process and are "best" values for the "thermal" entropies of the compounds. As a result, values of $\Delta_{sol}H^\circ$ and $\Delta_{sol}G^\circ$ for the process

$$MX(cr) + [aq] = MX(aq, \text{ std. state, } m=1)$$

calculated from tabulated values are reliable. However, $\Delta_{sol}S^\circ$ should be calculated from

$$\Delta_{sol}S^\circ = (\Delta_{sol}G^\circ - \Delta_{sol}H^\circ)/T,$$

instead of from tabulated entropies. In contrast, $\Delta_f S^\circ$ of the crystalline salt should be calculated from its S° and those of the elements, not from $\Delta_f G^\circ$ and $\Delta_f H^\circ$. The property values of the aqueous electrolyte in the standard state are not affected by these procedures; they are equal to the sum of the values of the properties of its constituent ions.

4.2. Uncertainties

The uncertainty in any value in the tables depends on the inaccuracies of all the determinations in the total chain of reactions used to establish the value. Individual links in the chain may have substantially smaller inaccuracies.

"Inaccuracy" is used here in the same sense as it is applied to an individual study [31]: the estimated total likely error including contributions from both random and systematic errors. In this work we rely upon evaluation of methods and intercomparison of results from several laboratories to estimate the inaccuracy. (The terms uncertainty and inaccuracy are used interchangeably in this discussion.)

Certain rules have been followed with respect to significant figures to indicate these inaccuracies:

(a) Values are tabulated in general so that the overall uncertainty lies between 8 and 80 units of the last (right-most) digit. This overall inaccuracy is given on a scale analogous to two standard deviations for imprecision.

(b) In certain cases values are given to a sufficient number of digits so that the experimental data from which they are derived may be recovered with an accuracy equal to that of the original quantities.

The first rule means that the last digit is, for the most part, a guide to rounding after a calculation. The significant figures shown for $\Delta_f H^\circ$ and $\Delta_f G^\circ$ are appropriate only for the formation process (or its reverse, decomposition to the elements).

The second rule means that the number of significant figures for any one value in the tables need not represent the absolute accuracy of that value. (The absolute inaccuracy may be greater.) This rule is applied most noticeably for solutions of definite composition in water, e.g., NaCl in 400 H_2O, where extra digits make possible recovery of enthalpies of solution and dilution. All digits are to be used in this case. The inaccuracy estimate is to be based, however, on the value with the least number of significant figures among the values listed for the particular compound in the same range of dilutions.

This same procedure has been used to relate hydrates to their anhydrous salts and to treat other processes determined by accurate solution calorimetry.

Similarly, values of $\Delta_f H^\circ(0\text{ K})$ and $\Delta_f H^\circ(298.15\text{ K})$ may be given to different numbers of significant figures. In this instance the quantity with the lesser number of figures is used to determine the inaccuracy estimate. The larger number of figures is used for the other quantity to retain the significance of the temperature correction term based on accurate values of $H^\circ(298.15\text{ K})–H^\circ(0\text{ K})$.

The cases described in the preceding paragraphs illustrate the general situation: the inaccuracy to be assigned to a value by a user of these tables depends upon the process for which a calculation is being made.

For example, the $\Delta_f H$'s of two related compounds often are highly correlated, e.g., a hydrate and its anhydrous salt. This is because there are only a few measurements and often only one measurement path connecting them. On such an occasion it may be better to use the inaccuracy of only one of them in a calculation.

Another example is the reaction in which there is an excess of a reactant and its concentration changes only slightly:

$$Ag_2O(cr) + (100\ HCl + 5000\ H_2O) = 2AgCl(cr) + (98\ HCl + 5001\ H_2O).$$

The effect of the dilution must be taken into account in the enthalpy of reaction, as must the disappearance of HCl, but the inaccuracy in the properties of the excess HCl solutions on both sides of the equation should be ignored.

Uncertainty limits for $\Delta_r H^\circ$ and $\Delta_r G^\circ$ that are calculated as the square root of the sum of the squares of the individual inaccuracies often will lead to gross overestimates of the inaccuracy of the value for the reaction.

4.3. Use of Other Data with These Tables

There are two distinct cases: (1) extension of the tables by using other, non–overlapping data with those published here, and (2) replacement of data items in the tables. The problems associated with replacement are discussed in section 4.1.c. Here we give procedures for the use of thermal functions and phase transition data from other sources and for temporary addition and replacement of property values. When used in the manner described below these new values will not destroy the consistency of the existing data.

All data that are combined with these tables must be in the same units and apply at the same standard state pressure.

a. Extension to Other Temperatures

For property values for a compound at other than 298.15 K use can be made of the thermal functions $S°$, $C_p°$, $H°(T)–H°(298.15\ K)$, and $-[G°(T)–H°(298.15\ K)]/T$ for the compounds and the elements from other compilations of critically evaluated data.

If the values of $S°$ and $C_p°$ at 298.15 K and $H°(298.15\ K)–H°(0\ K)$ for all components in the formation reaction agree (within the stated uncertainty) with those in this volume, the thermal functions can be used directly to obtain values for $\Delta_f H°(T)$ and $\Delta_f G°(T)$ consistent with this volume.

If $S°$ and $C_p°$ at 298.15 K and $H°(298.15\ K)–H°(0\ K)$ at 298.15 K for a component do not agree with values tabulated here, adjustments must be made in the thermal functions to obtain a set consistent with this volume. The principle is to combine the data from this volume (at 298.15 K) with the difference in the thermal functions $X(T) - X(298.15\ K)$, where X is $S°$ or $H°$.

$$S°(T)_{NBS} = S°(298.15\ K)_{NBS} + [S°(T)–S°(298.15\ K)]_{TF}$$

$$[H°(T) - H°(0\ K]_{NBS} = [H°(298.15\ K)–H°(0\ K)]_{NBS} + [H°(T)–H°(298.15\ K)]_{TF}$$

where TF refers to the source of the thermal functions and NBS to data compatible with or from this volume.

Substitution of these expressions into the identity

$$G = H - T{\cdot}S$$

leads to

$$\left[-\left(\frac{G°(T) - H°(298.15\ K)}{T}\right)\right]_{NBS} = \left[-\left(\frac{G°(T) - H°(298.15\ K)}{T}\right)\right]_{TF} + S(298.15\ K)_{NBS} - S°(298.15\ K)_{TF}$$

and

$$\left[-\left(\frac{G°(T) - H°(0\ K)}{T}\right)\right]_{NBS} = \left[-\left(\frac{G°(T) - H°(0\ K)}{T}\right)\right]_{TF} + \left[\frac{H°(298.15\ K) - H°(0\ K)}{T} - S°(298.15\ K)\right]_{TF} - \left[\frac{H°(298.15\ K) - H°(0\ K)}{T} - S°(298.15\ K)\right]_{NBS}$$

b. Properties at Phase Transitions

Many tables of high temperature thermal functions include phase transition data. Such phase transition properties have been used together with thermal functions to obtain some of our values for $\Delta_f H°$, $\Delta_f G°$, and $S°$ at 298.15 K. These evaluated phase transition properties, however, are not highly coupled with our selections; hence values for these properties taken from another compilation will in general be compatible with the values given here for the formation properties at 298.15 K.

c. Addition of Values Now Absent from These Tables

This subsection is concerned with the introduction of new, non–overlapping data. Replacement is not considered here. The principal concern is with $\Delta_f H°$, $\Delta_f G°$, and $S°$, at 298.15 K, for the addition of which specific rules are given. Values for the properties, $C_p°(298.15\ K)$ and $H°(298.15\ K)–H°(0\ K)$, may be added, if missing, the only precaution to be taken being to select reliable data.

The procedure to be used in adding a value for $\Delta_f H°$, $\Delta_f G°$ or $S°$ is different depending upon whether the source of the data is a new set of measurements for which $\Delta_r H°$, $\Delta_r G°$, $\Delta_r S°$ or $S°$ is available, or is a value for a formation property from another compilation of critically evaluated data.

Conversion procedure. If the source is a measurement, the value for the property of the compound is to be calculated from that of the measurement using auxiliary data from this volume. (Entropies from low temperature calorimetric measurements or statistical calculations may be used directly – no auxiliary data are needed.) If the measurement is at a temperature different from 298.15 K the value should first be reduced to 298.15 K using thermal functions obtained according to section 4.3.a.

If the datum to be added is a value for a formation property from another compilation there are two steps to the procedure. First, select a hypothetical feasible thermochemical process in which the substance appears and calculate $\Delta_r H$, $\Delta_r G$, or $\Delta_r S$ using auxiliary data from the other compilation. Then recalculate the formation property from the value for this process data using auxiliary data from this volume. This procedure is essentially a translation from one set of auxiliary data to another. This does not mean, however, that the new value is a high quality evaluated datum, since the original path to the value is not known.

Processes to be given priority for use in this translation are ones that connect the substance to "key" compounds, that is to compounds that occur in many thermochemical measurements. Particularly useful are: solution of an electrolyte in water, formation of a mixed oxide from simpler ones (and analogs with silicates, oxyhalides, etc.), vaporization and double decomposition reactions. In selecting data to be converted, priority should be given to those based on experiment and high priority should be given to using entropies derived from low temperature heat capacities or statistical calculations (for gases). (Reactions involving the element itself should be avoided; reference states may differ and formation properties reflect most strongly the differences between compilations.)

There are several slightly different applications of these procedures. They depend on which data are present here and in the other source and how many items are to be added.

If no data are tabulated here, two of the three properties $\Delta_f H^\circ$, $\Delta_f G^\circ$, and S° may be added. The third is to be calculated from the other two using the relationship $\Delta_f G^\circ = \Delta_f H^\circ - T\Delta_f S^\circ$. If a value of one of the three properties is given here *one* new property may be introduced and then the third one calculated from the other two. *The value in the present volume should not be changed* unless the criteria in section 4.3.d are met. This general procedure assures thermodynamic consistency.

Similar procedures should be used for adding values for members of the interrelated set

$$\Delta_f H^\circ(298.15\ \mathrm{K}),\ \Delta_f H^\circ(0\ \mathrm{K})$$

and

$$H^\circ(298.15\ \mathrm{K}) - H^\circ(0\ \mathrm{K}).$$

d. Replacement of Values in These Tables with New Ones

The reader has been warned against changing values in these tables; the problems that can arise have been discussed in section 4.1.c. Nevertheless, there are conditions, stringent ones, under which a temporary replacement can be made of a value for a formation property or an entropy without upsetting the consistency of these tables.

The procedures are described below. They require a careful study of the thermochemical literature and an understanding of the possible data networks. If a major change is contemplated, the reader is advised to consult with the authors.

The substances for which changes can be considered are those whose properties are based on isolated measurements or on single measurement pathways connected at one point to a network (sec. 3.6 and 3.7). There are many such substances in these tables. They may account for over half of the values reported here. They do not, however, include the common classes of compounds: oxides, hydrides, hydroxides, halides, nitrates, sulfates, carbonates, aqueous ions and the elements. In general changes are excluded for all properties which can be determined by more than one measurement pathway. Those properties are embedded in overdetermined networks (sec. 3.6).

The procedures to be applied when considering a change are:

(a) Determine what thermochemical measurements have been made that involve the property of substance A that is to be changed.

(b) If these measurements relate the property of A to those of others via only one measurement path, then the property of A may be changed.

In applying this procedure, three points should be considered. (1) All thermochemical measurements involving the substance should be examined, not only those that could have been used in selecting the present value, since that value may have been used by us as an auxiliary datum in a subsequent evaluation. (This information is not given in this volume; it will become available in the documentation planned for these tables. In the meantime a search of the chemical thermodynamic literature will be required.) (2) The value for the formation property should be calculated from that of a process, preferably a thermochemically measurable one, as described in section 4.3.c. (3) If $\Delta_f H^\circ$, $\Delta_f G^\circ$, and S° are all given for the substance, measurements on all of these must be considered when applying this rule. Unless one of them has been calculated from the others, it will be impractical to apply this rule. Also, thermodynamic consistency must be reestablished among the new values.

5. Symbols, Units, and Definitions

5.1. Physical States

The physical state of each substance is indicated in the tables in the column headed "State" as crystalline solid (cr), liquid (l), vitreous or glassy (vit), amorphous (am), or gaseous (g). For solutions, the physical state is that normal for the indicated solvent at 298.15 K (almost always liquid). Notations for solutions are given in section 5.8. Isomeric substances or various crystalline modifications of a given substance are designated by a number following the letter designation as cr, cr2, cr3 or g and g2. These are arbitrary designations They do not imply an order of stability.

5.2. Definition of Symbols

The symbols used here follow the IUPAC recommendations [32] wherever possible. They are listed in table I. The reader is advised that there are a few ad hoc symbols, particularly for properties of solutions. They were adopted when it proved difficult to use the recommended symbolism in our automated table preparation system.

5.3. Unit of Energy and Fundamental Constants

All of the energy values given in these tables are expressed in terms of the joule. Values reported in the literature in other units were, during the course of the evaluation, converted to thermochemical calories and selections made. Now, for publication, these selections have been converted to joules. The conversion factors for units of molecular energy used here are given in table V at the end of the introduction. See also section 6 for information on conversions of data from calories at a pressure of one atmosphere to joules at the standard state pressure of 0.1 MPa (1 bar).

The following values of the fundamental physical constants, or combinations of them, have been used in this work and in preparing table V: These values for the constants are consistent with those recommended in the 1960's by the National Academy of Sciences–National Research Council [33].

R = molar gas constant	= 8.3143(12)	J mol^{-1} K^{-1}
	= 1.98717(29)	cal_{th} mol^{-1} K^{-1}
N_A = Avogadro number	= 6.02252(28) × 10^{23}	elementary entities per mole
c = speed of light in vacuum	= 2.997925(3) × 10^{8}	m s^{-1}
h = Planck constant	= 6.6256(5) × 10^{-34}	J s
e = elementary charge	= 1.60210(7) × 10^{-19}	C or J V^{-1}
F = Faraday constant = $N_A e$	= 96487.0(16)	C mol^{-1} or J V^{-1} mol^{-1}
	= 23060.9(4)	cal_{th} V^{-1} mol^{-1}
c_2 = second radiation constant (where $k = R/N_A$) = hc/k	= 0.0143879(19)	m K
0 °C	= 273.15 K exactly	
1 cal_{th}	= 4.184 J exactly	
1 atm	= 0.101325 MPa exactly	

The numbers in parenthesis are the estimated error limits, based on three standard deviations. They apply to the last (right most) digit shown. (The values for F, N_A and e in this set are not consistent to the last digit shown in each of their values.)

Slightly different values for the fundamental constants were recommended by CODATA in 1973 [34] on the basis of more recent measurements. These changes and those that may be made in the near future [35] have virtually no effect on the data presented here. Some of the statistically calculated entropies of gases would be affected by the fractional change in R between 1963 and 1973 (–1.2 × 10^{-5}). Other changes in property values due to changes in the fundamental constants are less than the implied uncertainties in the thermodynamic quantities.

5.4. Atomic Masses

The molar masses listed in the tables of chemical thermodynamic properties were calculated using the relative atomic masses in table II. They are the values used in the evaluation of the data.

The molar masses are shown uniformly to four decimal places. However, some of those digits may not be significant because some atomic masses are known to fewer than four decimal places. The values for molar masses are for the usual isotopic composition.

The tabulated relative atomic masses do not match a single published atomic mass scale. Many of them are from the 1961 table [36], with a few values rounded. Those for the actinides and the alkali metals are from the 1971 table [37].

Changes that have been made in values assigned to relative atomic masses between the 1961 and the 1979 scales [38] have virtually no effect on the data presented here. In considering the effect of such changes each measurement must be considered separately. Although the amount of reaction is often determined by weighing the substance of interest, this is not always true: the enthalpy of combustion of a hydrocarbon may be based on the mass of CO_2 formed and thus be independent of changes in the atomic mass of hydrogen. Also, the more interconnected the network of data the less likely that changes in atomic masses will shift values of thermodynamic properties. Finally, the impact of a change in one value upon the others in the table must be considered.

The magnitude of possible changes can be calculated easily for a measurement. (In general, only data of the highest accuracy would be affected.) The value for the property should be multiplied by the ratio of the new to the old mass of the substance actually weighed. For a change to be considered at all it should be a sizeable fraction of the implied inaccuracy in the data. This test eliminates many potential cases.

Those chemical elements whose compounds are most likely to be affected are listed below together with the absolute and fractional changes.

Differences between 1979 relative atomic masses and those in table II

Element	Absolute change	Fractional change × 10^4
B	0.001	0.9
Ir	0.02	1.0
Mg	–0.007	–2.9
Ni	–0.02	–3.4
Pa	0.02	0.9
S	–0.004	–1.2
Ti	–0.02	–4.2
Zn	0.01	1.5

Lithium is a special case. Lithium salts now available have had their isotopic ratios artifically changed; measurements reported in recent years must be examined carefully to determine if the amount of reaction reported depends upon the mass of a lithium compound. If so, the isotopic composition of the lithium must be taken into consideration.

The following unstable elements show equally large changes to those tabulated, but these would not affect the present tables: Bk, Cf, Cm, Es, Fm, Md, No, Pu, Am, Pm, and Tc. Smaller changes (between 1 part in 10^5 and 1 part in 10^4) have occurred for Ba, Br, Cd, C, H, Pb, Lu, H, K, Re, Sm, Si, Ag, and Tl. It is unlikely that any of these changes will have an impact on chemical thermodynamic data.

Continual changes in values assigned to atomic masses make it very important that experimenters report what substance was weighed. Unless such information is presented, their result may be assigned a larger inaccuracy than it may deserve.

5.5. Standard States: Conditions at which the Tabulated Values Apply

All values of thermodynamic properties tabulated here apply at $T = 298.15$ K or $T = 0$ K, as indicated, for one mole of the substance as shown by its formula, in the state of aggregation indicated, and at the standard state (indicated by the superscript ° on the thermodynamic property symbol). Values are frequently given for the properties of solutions of compositions other than standard. Standard states used here are defined below.

For a pure solid the standard thermodynamic properties are for the pure substance in the solid phase under a pressure of 0.1 MPa (1 bar).

For a pure liquid the standard thermodynamic properties are for the pure substance in the liquid phase under a pressure of 0.1 MPa (1 bar).

For a gaseous substance the standard thermodynamic properties are for the pure substance at a pressure of 0.1 MPa (1 bar) and in a (hypothetical) state in which it exhibits ideal gas behavior. Its heat capacity and enthalpy are those of the real gas extrapolated to zero pressure.

Standard state conventions for solution are defined in section 5.8. Various conventions that apply to the tabulated data are explained in the next few sections. All conventions and definitions of states are summarized in table III.

Slightly different values for S° and $\Delta_f G^\circ$ than those tabulated here would apply for some substances at a standard state pressure of 1 atmosphere (101 325 Pa). Usually the difference is less than the inaccuracy in the tabulated values. It does not affect changes in values of $\Delta_r G^\circ$ and $\Delta_r S^\circ$ for processes to any noticeable extent, except where the number of moles for gas changes during the process. The matter is discussed in section 6.

5.6. Reference Phases for the Elements

The reference phase for an element at any temperature is that state of aggregation selected for use as a base point in thermodynamic calculations. The reference phase at 298.15 K for each element except phosphorus has been chosen to be the phase that is thermodynamically stable at that temperature and 0.1 MPa. For phosphorus the reference phase is the crystalline white form; the more stable phases have not been well characterized thermochemically. At 0 K the reference state is the ideal gas for an element that is gaseous at 298.15 K. For an element that is solid or liquid at 298.15 K, the reference state at 0 K is the stable crystalline phase. The exceptions are white phosphorus and white tin which remain the reference phases at 0 K. The crystalline reference phases at 0 K are assumed to be perfectly ordered and to represent the lowest energy state, unless otherwise indicated in the tables. The reference phases are indicated in the tables by the fact that the values of $\Delta_f H^\circ$ and $\Delta_f G^\circ$ at both temperatures are exactly zero. The term "standard reference state" is used later in the text. When applied to an element it means the reference phase at the standard state condition.

5.7. Conventions Regarding the Properties of Pure Substances

A tabulated value of $\Delta_f H^\circ$ (or $\Delta_f G^\circ$) represents the change in that thermodynamic quantity when one mole of the substance in its standard state is formed isothermally at the indicated temperature from the appropriate amounts of the elements, each in its standard reference state.

The value of $[H^\circ(298.15\ \mathrm{K})-H^\circ(0\ \mathrm{K})]$ represents the difference in enthalpy for the given substance between 298.15 K and 0 K. If the indicated phase at 298.15 K is the gas, the corresponding phase at 0 K is the hypothetical ideal gas; if the phase at 298.15 K is solid or liquid, the corresponding phase at 0 K is the thermodynamically stable perfectly ordered crystalline solid, unless otherwise specifically indicated. If values for allotropic forms of the same substance are given at 298.15 K, then $H^\circ-H^\circ(0)$ is referred to each of the forms separately at 0 K and not to the more stable one. See, for example $KAlSi_3O_6$ (sanidine and microcline).

The quantity S° is the change in entropy between 0 K and 298.15 K for one mole of a substance. If the substance at 298.15 K is a crystal, its standard state at 0 K is the perfectly ordered thermodynamically stable crystal. If the substance at 298.15 K is a liquid, its standard state at 0 K is the perfectly ordered crystal of the thermodynamically stable phase. If the phase of the substance at 298.15 K is a gas, its standard state at 0 K is the hypothetical ideal gas. These distinctions preserve the conventions used for other properties, but are not numerically significant because, conventionally, $S^\circ(0\ \mathrm{K, cr}) = S^\circ(0\ \mathrm{K, ideal\ gas}) = 0$. Exceptions to these rules are indicated in comments in the tables.

This tabulated entropy is sometimes called the virtual or "thermal" entropy. It includes all contributions that might change in a chemical reaction in which the substance is a reactant or product: effects due to state of aggregation, electronic degeneracy and energy level spacing, molecular mixing in racemic mixtures, etc. It does not include contributions that would not change: contributions from atomic isotope mixing and nuclear spins. (See, however, sec. 3.4.b for the special case of H_2 and D_2). Where data have been available only for a particular isotope, they have been corrected when possible to the normal isotopic composition.

Gaseous ions. Values for the enthalpies of formation of gaseous ions are almost invariably calculated from ionization or appearance potentials that are applicable at (or have been corrected to) 0 K. The enthalpies are calculated using reactions such as

$$\begin{array}{lllll} M(g) & \rightarrow M^+(g) & + e^-(g) & & T = 298.15\ K \\ \downarrow & \uparrow & \uparrow & & \\ M(g) & \rightarrow M^+(g) & + e^-(g) & & T = 0\ K \end{array}$$

which lead to the relationships

$$\Delta_f H^\circ M^+,g,\ 0\ K) = \Delta_r H^\circ(0\ K) + \Delta_f H^\circ(M,\ g,\ 0\ K)$$
$$\Delta_f H^\circ(M^+,\ g,\ 298.15\ K) = \Delta_r H^\circ(0\ K) + \Delta[H^\circ(298.15\ K) - H^\circ(0)] + \Delta_f H(M,\ g,\ 298.15\ K)$$

where

$$\Delta[H^\circ(298.15\ K) - H^\circ(0)] = [H^\circ(298.15\ K) - H^\circ(0)](M^+,\ g) - [H^\circ(298.15\ K) - H^\circ(0)](M,g) + [H^\circ(298.15\ K) - H^\circ(0)](e^-,g).$$

The conventions used here are:

(a) The electron is treated classically and is in thermal motion.

$$[H^\circ(298.15\ K) - H^\circ(0)](e^-,g) = 6.197\ J\ mol^{-1},$$
$$\Delta_f H^\circ(0) = 0,\ \Delta_f H^\circ(298.15\ K) = 0.$$

(b) Enthalpy differences for the molecules (here M(g) and M^+(g) are calculated statistically from energy level data.

(c) If there is no entry in the tables for

$$[H^\circ(298.15\ K)\ -\ H^\circ\text{-}H^\circ(0)]$$

its enthalpy difference is assumed to be the same as that of the next lowest ion for the purpose of calculating $\Delta_f H^\circ$.

(d) Sufficient digits are retained in values for $\Delta_f H^\circ$ of ions to make it possible to retrieve an accurate value of the ionization potential.

The conventions used by other compilations can differ from these. The JANAF Thermochemical [4] Tables use conventions (1) and (2). Rosenstock et al. [39] do not include $[H^\circ(298.15\ K) - H^\circ(0)](e^-,g)$, that is, they use the "stationary electron" convention. See reference [40] for a discussion.

5.8. Conventions Regarding Solutions

a. Composition

For all dissolved substances the composition of the solvent is indicated following the chemical formula of the solute. In most instances the amount (number of moles) of solvent associated with one mole of solute is stated explicitly, e.g., "in 200 H_2O." In some cases the concentration of the solute cannot be specified. For aqueous solutions this is indicated in the State column by "aq" (aqueous, unspecified). For non–aqueous and mixed solutions the designation is "u" following the formula of the solvent. Such solutions may be assumed to be "dilute."

b. Standard States

Solvents. The standard thermodynamic properties for the solvent, which may be a mixture, apply to the substance at unit mole fraction under a pressure of 0.1 MPa (1 bar). In the equation

$$G_1 - G_1^\circ = RT\ \ln\ a_1,\ a_1/x_1 \rightarrow 1\ \text{as}\ x_1 \rightarrow 1$$

where G_1 is the partial molar Gibbs energy of the solvent, G_1° is its value in the standard state, a_1 is the activity and x_1 is the mole fraction. The standard partial molar enthalpy, heat capacity, Gibbs energy and entropy of the solvent in the standard state are the same as those of the pure material.

Solutes, general. The standard thermodynamic properties for solutes apply to the substances in hypothetical ideal solutions at unit mole fraction (when composition is measured on the mole fraction scale) or at unit molality. Here

$$G_2 - G_2^\circ = RT\ \ln\ a_2,$$

and either

$$a_2/x_2 \rightarrow 1\ \text{as}\ x_2 \rightarrow 0,\ \text{or}\ a_2/m_2 \rightarrow 1\ \text{as}\ m_2 \rightarrow 0.$$

In the hypothetical ideal solution, $a_2 = x_2$ or $a_2 = m_2$, depending on the composition scale. These definitions mean that the properties of solutes in their standard state are derived from the same solution used for defining the properties of the solvent. The convention that takes the pure substance as the standard state for each component of a binary solution is not used in these tables. The values tabulated for the properties of a solute in its standard state are the partial molar properties. For $\Delta_f H^\circ$ and C_p° these are the same as those of the real solution extrapolated to infinite dilution with the speciation assumed for the solute. Partial molar Gibbs energies and entropies, however, are composition dependent. Their standard values are not those of the infinitely dilute solution and change with composition scale.

Values for $\Delta_f H$ of solutes for compositions other than the hypothetical standard state are for the apparent molar properties.

Electrolytes. The standard state for an electrolyte in aqueous solution is the hypothetical ideal solution at unit mean ionic molality (unit activity) containing the ions of which it is assumed to be composed at infinite dilution. This state is indicated in the State column by "ai". In previous tables it was designated as "std. state, m = 1" or, in NBS Technical Note 270–8 by "a".

Mean ionic molality is defined for the strong electrolyte R_aX_b as

$$m_\pm = (m_R{}^a \cdot m_X{}^b)^{1/(a+b)} = m(a^a b^b)^{1/(a+b)}$$

where m, is the molality of the neutral species R_aX_b. For many salts and for the common strong acids and bases the ions assumed to be present are those present in the infinitely dilute solution: $Na_2SO_4 = 2Na^+ + SO_4^{2-}$, $H_3PO_4 = 3H^+ + PO_4^{3-}$. For others, particularly salts of intermediate ions of polybasic acids, the principal constituent ions are assumed to be the only ones present: $NaHSO_4 \rightarrow Na^+ + HSO_4^-$, not $Na^+ + H^+ + SO_4^{2-}$. Where the assumed composition may not be readily apparent, it is indicated in the description, as for K_2HASO_4: "from $HASO_4^{2-}$". For weak electrolytes values are frequently given for properties in the ionized and un-ionized (not dissociated) standard states. For the former, the notation "ai" is used, and for the latter, "ao".

Non-electrolytes. For an undissociated solute in aqueous solution the standard state is the ideal solution at unit molality. This is indicated in the "State" column by the designation "ao". Previously this was designed as "undissoc., std. state, $m = 1$," except in NBS Technical Note 270-8 where the present notation was used.

Non-aqueous and mixed solutions. The standard state for the solute may be either the ideal solution at unit mole fraction of solute or at unit molality. These standard states are designated by adding "x" or "s", respectively, to the formula of the solvent, e.g., $I_2(CCl_4$:x). This convention was used in NBS Technical Note 270-8, while in earlier parts these states were described as "std. state, $x_2 = 1$" or "std. state, $m = 1$."

c. Properties

The value of $\Delta_f H°$ for a solute in its standard state is equal to the apparent molar enthalpy of formation of the substance in the infinitely dilute solution, since the enthalpy of dilution of an ideal solution is zero. For an electrolyte, only the ions *of which it is assumed to be composed* are considered to be present in this solution. Where appropriate, corrections have been made for hydrolysis and further ionization.

At infinite dilution the partial molar enthalpy is equal to the apparent molar quantity. At concentrations other than the infinitely dilute and the standard state the tabulated value of $\Delta_f H$ represents the apparent enthalpy of the reaction of formation of the *real* solution from the elements comprising the solute, each in its standard state, *and from the appropriate number of moles of solvent.* In this representation the value of $\Delta_f H$ for the solvent is not required. A typical formation reaction is

$$Na(cr) + 1/2\ Cl_2(g) + [100\ H_2O(l)] \rightarrow NaCl(100\ H_2O).$$

The experimental value for an enthalpy of dilution may be calculated as the difference between the values of $\Delta_f H°$ for the two pertinent concentrations. At finite concentrations the partial molar enthalpy of formation differs from the apparent enthalpy. In some instances the partial molar enthalpy of formation is given in the tables. In this case the concentration designation is preceded by "D", and this value *cannot be combined* with others to get $\Delta_{dil}H$.

Ions in solution. Values for the thermodynamic properties of both neutral electrolytes and their constituent ions are given in the tables. Those for the ions are always for the undissociated ions in the standard state, not for their dissociation products (if any) at infinite dilution. The state designation is "ao", indicating that the property applies to the ion, not to any further ionization products. The properties are based on the convention that $\Delta_f H°$, $\Delta_f G°$, $S°$, and $C_p°$ for H^+(ao) are zero. This convention holds for the standard state pressure adopted here (0.1MPa) and also holds for the standard pressure of 1 atm. It follows that the properties of the neutral strong electrolyte in aqueous solution in the standard state are equal to the sum of these values for the appropriate number of ions assumed to consitute the molecule of the given electrolyte. The formation processes for ions in solution are defined in terms of oxidation-reduction processes, e.g.

$$M + nH^+(ao) \rightarrow M^{n+}(ao) + (n/2)H_2(g)$$
$$X + (n/2)H_2(g) \rightarrow X^{n-}(ao) + nH^+(ao)$$

which are easily extendable to polyatomic species. These are also the processes that are implied when a "half cell potential" is calculated from $\Delta_f G°$ for an ion. By adopting the above convention with respect to H^+(ao), it follows that for an individual ionic species the *G-H-S* relation becomes

$$\Delta_f G° = \Delta_f H° - T(S°(\text{ion}) - \Sigma S°(\text{elem.}) + (n/2)S°(H_2,\ g))$$

with n = the algebraic value of the ionic charge. The entropy of hydrogen gas changes, and the entropies of the elements may change with standard state pressure, thus affecting $E°$. For neutral electrolytes and gaseous ions the normal consistency relation holds.

d. Variant Formulas for the Same Aqueous Substance

Some species in aqueous solution are listed with two or more formulas that differ only by the number of molecules of water contained in them. Usually these formulas are not next to each other in the tables. Often these multiple forms are thermodynamically equivalent and are listed in these conventional forms for the convenience of the user.

Examples:
SO_2 and H_2SO_3
NH_3 and NH_4OH
PH_3 and PH_4OH
AsO_2^- and $H_2AsO_3^-$
$HAsO_2$ and H_3AsO_3
CO_2 and H_2CO_3
H_2SiO_3, H_4SiO_4 and $H_2(Si(OH)_6)$
$HPbO_2^-$ and $Pb(OH)_3^-$
BO_2^- and $B(OH)_4^-$
AlO_2^- and $Al(OH)_4^-$
FeO_2^{2-} and $Fe(OH)_4^{2-}$
$HFeO_2^-$ and $Fe(OH)_3^-$
MoO_3 and H_2MoO_4
VO_3^- and $H_2VO_4^-$

The properties of each pair are connected by the formal chemical relationship

$$A(aq) + nH_2O(l) = A \cdot nH_2O(aq),$$

for which

$$\Delta_r H^\circ = \Delta_r G^\circ = \Delta_r S^\circ = 0.$$

Pairs of substances in solution that differ in composition by an integral number of water molecules should always be tested against this rule. When it holds for all tabulated properties, within the implied uncertainty, no attempt should be made to calculate an enthalpy change, an equilibrium constant, or entropy change for a process containing both of them.

6. Conversion of Property Values from Calorie Units at One Atmosphere to Joule Units at 100 000 Pascals

The values given in this publication were taken from a master data file developed for NBS Technical Note 270 [1]. For the data in this file the standard state pressure is one atmosphere (101 325 Pa) and the unit of energy is the thermochemical calorie (4.184 J). For this book we have changed the standard state pressure to 0.1 MPa (1 bar), recently recommended by IUPAC [32], and the energy unit to the joule. The values from the master data file have been converted as described below. This information is provided not only to make clear the correspondence between this book and NBS Technical Note 270 but also to assist the reader in making comparisons with other tables.

6.1. Conversion for Change in Pressure

The following expressions define the effect of pressure on the properties of all substances:

$$\begin{aligned} (\partial H/\partial p)_T &= V - T(\partial V/\partial T)_p = V(1-\alpha T) \\ (\partial C_p/\partial p)_T &= -T(\partial^2 V/\partial T^2) \\ (\partial S/\partial p)_T &= -V\alpha = -(\partial V/\partial T)_p \\ (\partial G/\partial p)_T &= V \\ \alpha &\equiv (1/V)(\partial V/\partial T)_p \end{aligned} \tag{1}$$

For the small pressure change here, the pressure coefficients may be taken as constants for condensed phases. There are no cases in this book for which the pressure coefficients for condensed phases are large enough to affect the tabulated values. (Typical values of α for solids are 10^{-5} to $2 \times 10^{-4} K^{-1}$ and $V < 10^{-3} m^3 \cdot mol^{-1}$.) For ideal gases, $V = RT/p$ and $\alpha = R/pV = 1/T$. The pressure coefficients for gases are large enough to affect high-accuracy data. In practice the only properties tabulated here that are affected are S° (for gases) and $\Delta_f G^\circ$ for some substances.

a. Conversion Equations

The conversion equations used here for the change in standard state pressure are listed below together with some that apply to thermal functions. Superscript ° and * denote values at one bar and one atm, respectively. These equations apply to the small change in pressure from 1 atm to 1 bar. The procedures explained below are summarized in table IV.

For all substances, exactly for ideal gases and within the limit of experimental inaccuracy for all other phases:

$$\begin{aligned} \Delta_f H^\circ(T) - \Delta_f H^*(T) &= 0 \\ [H^\circ(T) - H^\circ(T_1)] - [H^*(T) - H^*(T_1)] &= 0 \\ C_p^\circ(T) - C_p^*(T) &= 0 \end{aligned} \tag{2}$$

where T_1 is a reference temperature.

For condensed phases, within the limit of experimental inaccuracy:

$$\begin{aligned} S^\circ(T) - S^*(T) &= 0 \\ G^\circ(T) - G^*(T) &= 0 \end{aligned} \tag{3}$$

For substances that are gaseous:

$$\begin{aligned} S^\circ(T) - S^*(T) &= R \ln p^*/p^\circ \\ &= R \ln (1.01325/1) \\ &= 0.1094 \text{ J (mol K)}^{-1} \end{aligned} \tag{4}$$

For substances that are gaseous at T but may not be gaseous at T_1,

$$-[G^\circ(T) - H^\circ(T_1)]/T + [G^*(T) - H^*(T_1)]/T = R \ln p^*/p^\circ \text{ as for } S. \tag{5}$$

$$[G^\circ(T) - G^\circ(T_1)] - [G^*(T) - G^*(T_1)] = -R(T - T_j) \ln p^*/p^\circ \tag{6}$$

where $T > T_j \geqslant T_1$ and T_j is the temperature at which the function begins to apply to the ideal gas, normally the boiling point at 0.1 MPa. This last function occurs in the one tabulated as "G" (quotes added here) by Barin and Knacke [41]: "G^*" $= \Delta_f H^*(298.15 \text{ K}) + G^*(T) - H^*(298.15 \text{ K})$, and can be retrieved by taking the difference "$G(T)$" – "G(298.15 K)".

For a process

$$\begin{aligned} \Delta_r S^\circ &= \Delta_r S^* + [R \ln (p^*/p^\circ)] \cdot \delta \\ &= \Delta_r S^* + (0.1094) \cdot \delta \text{ J mol}^{-1} K^{-1} \end{aligned} \tag{7}$$

where δ is the net increase in moles of gas in the process. Similarly, the change in Gibbs energy in a process between the two standard state pressures is

$$\begin{aligned} \Delta_r G^\circ &= \Delta_r G^* - [RT \ln (p^*/p^\circ)] \cdot \delta \\ &= \Delta_r G^* - (0.03263) \cdot \delta \text{ kJ mol}^{-1} \text{ at } 298.15 \text{ K} \end{aligned} \tag{8}$$

This equation applies to the Gibbs energies of formation tabulated here

$$\Delta_f G^\circ = \Delta_f G^* - (0.03263) \cdot \delta \text{ kJ mol}^{-1} \text{ at } 298.15 \text{ K} \tag{9}$$

where δ now is the net increase in moles of gas in the formation reaction.

The change in cell potentials with change in standard state pressure follows from the expression for Gibbs energy changes.

$$\begin{aligned} E^\circ - E^* &= -(\Delta_r G^\circ - \Delta_r G^*)/nF \\ &= [RT \ln (p^*/p^\circ)](\delta/nF) \qquad (10) \\ &= 0.3382(\delta/n)\text{mV at } 298.15\text{ K}. \end{aligned}$$

The most important case is the electrode potential (or half cell potential) on the hydrogen electrode scale. The changes in potential with pressure for an electrode potential conventionally written as

$$e^- + Ag^+(ao) \rightarrow Ag(cr)$$

should be calculated from the balanced reaction that includes the hydrogen electrode

$$0.5H_2(g) + Ag^+(ao) \rightarrow Ag(cr) + H^+(ao).$$

Here $\delta = -0.5$. Three other examples show both δ and the size of the change.

	δ	$E^\circ - E^*$
		mV
$Cu(cr) + 2H^+(ao) \rightarrow Cu^{2+}(ao) + H_2(g)$	1	0.17
$Mn(cr) + 2O_2(g) + 0.5H_2(g) \rightarrow MnO_4^-(ao)$	-2.5	-0.12
$0.5N_2(g) + 1.5H_2(g) + H^+(ao) \rightarrow NH_4^+(ao)$	-2	-0.23.

b. Effect on Property Values for Processes

Only $\Delta_r G^\circ$ and $\Delta_r S^\circ$ and properties derived from them are affected. There is essentially no change for a condensed phase reaction. When the number of moles of gas changes in a process there will be an effect, which can be noticeable if the data are accurate. The cell potentials based on the examples at the end of the preceding section are a case in point. So are vapor–liquid equilibria.

But the most noticeable effect is on the boiling point, T_B, which is not tabulated here. Thermodynamically, this is taken as the temperature at which $\Delta G^\circ = 0$. Assuming Trouton's Rule to hold, $\Delta_{vap}H/T^\circ = 21$ cal mol^{-1} K^{-1}, the change in boiling point between 101.325 kPa and 100 kPa is $\ln(T_2/T_1) \approx -0.0013$. This is $\Delta T = -0.4$ K at 300 K and -4 K at 3000 K. The temperature at which the vapor pressure of water is 100 kPa is 99.6 °C[4]. Procedures given in handbooks for the correction of boiling temperatures to standard pressure may also be applied to this problem.

It will be necessary for some time to distinguish between baric and atmospheric boiling temperatures.

6.2. Conversion of Values in Calories to Joules

For the energy units the defined conversion factor of 4.184 J/cal was used. Conversion equations for entropies and $\Delta_f G^\circ$ are listed in table IV for several combinations of units and pressures.

[4]We are indebted to a reviewer of this paper for the discussion of the use of Trouton's Rule to estimate changes in T_B.

6.3. Significant Figures and Rounding

The rule used here to control significant figures after conversion is an adaptation of that in section 4.4.1.1 of the American Society for Testing and Materials "Metric Practice Guide" [42]. The rule for rounding is identical to the rule in section 4.4 of the 1974 edition of the same guide [43].

a. Rule for Significant Figures

(a) If the most significant digit in the converted quantity is less than the most significant digit in the original, one more digit is retained in the converted quantity than is present in the original. Otherwise the same number of digits is used.

(b) The number of significant digits derived above is decreased, if necessary, to allow no more than three decimal places (0.001). (Special limitation for these tables.)

For conversion from calories to joules the effect of this rule is to retain the same number of decimal places.

b. Rounding

Write the quantity that is to be rounded in the form $N.R \times 10^K$ where K is an integer and R is the fractional portion to be discarded in the rounding process.

If $0.R < 0.5$, then no change is made in N
If $0.R > 0.5$, then one unit is added to N
If $0.R = 0.5$ exactly, then one unit is added to N if N is odd, no change is made if N is even.

The significant figure and rounding rules may increase the number of significant digits in a quantity, but only by one per cycle in a sequence of conversions, e.g, joules → calories → joules → calories, etc.

7. Arrangement of Material in the Tables

7.1. Contents of a Line of Data in the Tables

There are seven columns. The first contains the formula, description (if needed), state of aggregation and molar mass of the substance. The remaining six columns contain values for the chemical thermodynamic properties of one mole of that substance, to the extent that there are reliable data.

The formula for the substance is written in the conventional manner, often in a semistructural form. Some substances are written as a combination of others, as $KCl{\cdot}ZnSO_4$, $Na_2SO_4{\cdot}10H_2O$ and $CaCl_2{\cdot}6NH_3$. These formulae are conventional. They do not imply anything concerning the structure of the substance.

For solutions and mixtures the state of aggregation is given by stating the number of moles of the solvent, which may itself be a mixture, associated with one mole of the substance, as "KCNS in 3000 H_2O"

7.2. Position of a Substance in the Tables

Each chemical formula has a unique location in the tables. Its position is defined by the algorithm given below in detail. Briefly, a substance will be found in the table for the element contained in it that has the highest number in the "Standard Order of Arrangement", figure 1. The same principle of latest position (highest sequence number) holds within a table: Oxides precede hydrides which precede hydroxides which precede fluorides and so on.

This arrangement is used in NBS Technical Note 270 [1], NBS Circular 500 [2] and Bichowsky and Rossini's tables [10]. It is also used in the Bulletin of Chemical Thermodynamics [44] and by the Thermodynamics Research Center, Texas A & M University. It was adopted by the American Petroleum Institute Project 44 and by the National Research Council Office of Critical Tables for its "Consolidated Index to Selected Property Values [45]." A similar arrangement has been adopted by the U.S.S.R. State Service for Standard and Reference Data.

In this system the elements in the long form of the periodic table are assigned consecutive numbers starting with oxygen (1), hydrogen (2), the "inert" gases (3–8) and then proceeding by groups from right to left across the table. These "sequence numbers" are displayed in figure 1. An alphabetical list of elements showing these sequence numbers is given at the end of the volume.

Tables of selected values are also numbered using this system. That is, the table number of first appearance of an element is the sequence number of that element.

7.3. Rules for Locating a Compound in the Tables

a. Table in which a Substance Appears

A substance is listed in the table of that constituent element which has the highest sequence number. That is, NaCl is listed in table 99 (Na) not table 10 (Cl).

A table for a particular element contains compounds between that element and elements having lower sequence numbers. That is, table 99 for sodium contains compounds from Na, Na^+, NaO to NaLiClI, but not CsNaClI.

b. Ordering within a Table

Within a table the substances are arranged primarily by the principle of latest position by considering the sequence numbers of the other elements in each compound. Example: Na, NaO, NaH, NaOH, NaI, $NaIO_3$, Na_2SO_4, $NaHSO_4$, NaN_3, $NaI{\cdot}4.5NH_3$, $NaHCO_3$. This arrangement is independent of the way the formulae are written.

There are a few exceptions. First, hydrates are listed immediately after solutions of their anhydrous salts. Second, dimers, etc., may be near their monomers. Third, the table of organic compounds (number 23) is subdivided first by number of carbon atoms and then each part is arranged using the standard order. That is, there is a sub-table of C_1 compounds, then one of C_2 compounds.

c. Identical Sequence Numbers

Two compounds having the same set of sequence numbers are ordered by (1) writing their elements in order by sequence number high to low, left to right, and then (2) putting first that compound with the first lower number of atoms (reading from left to right). Example: Na_2SO_3, Na_2SO_4, $Na_2S_2O_3$, $Na_2S_2O_5$. Sets of entries for isomers are kept separate and are ordered arbitrarily. Ions follow neutral species, with positive ions before negative ions.

d. Multiple Entries for a Substance

The sequence is determined by the state of aggregation:

- crystal
- amorphous
- liquid
- vitreous (glassy)
- gas
- aqueous, standard state
- aqueous solutions of uncertain concentration
- aqueous solutions of known concentrations, the more concentrated first
- solutions in aqueous solutions containing acids, bases and salts as part of the solvent
- solutions in solvents other than water and in mixtures of water and other solvents

This detailed ordering may be modified to simplify a particular case, but no substance is moved far from the position indicated by these ordering rules.

8. Chronology, Sources of Data, and Documentation

8.1. Chronology

The tables in this book have been prepared over a period of eighteen years. The year during which each table was completed is shown in the table heading. The reader should assume that only measurements published before the year shown have been used, although there have been some adjustments using newer data. Also, we have on occasion had access to data prior to publication.

8.2. Sources of Data

The data used in the evaluations have been obtained from many sources:

(a) Original research papers published in archival journals. Both journals and pertinent sections of Chemical Abstracts have been searched. Data have been extracted from the articles for all of the types of measurements listed in section 3.2. Not only obvious thermodynamic measurements but also physical property determinations made in the course of synthetic and analytical work are collected and used. This search and abstracting system is supplemented by examination of references in articles and research reports. An index to the material abstracted is published each year in the Bulletin of Chemical Thermodynamics [44].

(b) Private communications from research workers in chemical thermodynamics, and allied fields.

(c) Material prepared by other data evaluators. An adequate critical evaluation made elsewhere for a class of data needed for our work is often used unless it has been superseded by new data. Occasionally it has been necessary to adjust these evaluated data to the energy and atomic mass scales used here, and to change the auxiliary thermochemical data used with them.

A few of the thermodynamic data sources used extensively in preparing this work are the JANAF Thermochemical Tables [4], tables of thermodynamic properties of the elements and alloys by Hultgren and coworkers [46, 47], the works of Kelley [48, 49], and of Kelley and King [50], and the tables of thermodynamic properties produced at the Institute for High Temperatures, Academy of Sciences of the USSR, Moscow [14, 17].

The reader should assume that versions of these tables used by us were those available at the dates of preparation shown in our tables. Both the JANAF group and Hultgren and coworkers, however, provided us with tables well in advance of publication.

Many of the sources of evaluated data on solutions, on atomic and molecular properties, crystal structure, phase diagrams, molten salts, etc., that have been used in this work are listed in the 1979 Bulletin of Chemical Thermodynamics [44, p. 499]. It must be pointed out that some very important tables of reference data listed there were published during the course of our work and could be used only in the later tables. Data for gaseous ions have been supplied by the NBS Atomic Energy Levels Data Center and by the NBS Ion Kinetics and Energetics Data Center.

8.3. Documentation

Separate reports are being prepared about the selection of the values in this book. They will list the measurements considered and those used, show how well the selected values reproduce the measurements, indicate corrections that were made, identify auxiliary data that were used, and give the bibliographic citation for each measurement. These reports are expected not only to document this book but also to provide a set of evaluated process data that can be used in future evaluations without repetition of all of the analysis we have had to make. One such report has been prepared as an experiment, on the compounds of thorium [51].

Pending publication of these reports, information about the selection of values for specific compounds may be obtained by writing to the Director, Chemical Thermodynamics Data Center, Room A158, Chemistry Building, National Bureau of Standards, Washington, DC 20234.

9. Examples of Calculations Using These Tables

To compute the change in a thermodynamic property for a balanced chemical or physical process: Add together the tabulated values of the property for the substances present in the final state and then subtract from them the sum of the values of the property for the substances present in the initial state, each value being properly multiplied by the appropriate stoichiometric coefficient. The rule holds for all changes in extensive thermodynamic properties during chemical reactions, phase transitions, solution and dilution processes, ionization in solution, ionization in the gas phase, and so on. (Statement from reference 8, modified).

Examples are given below. The data provided in these tables apply when all substances, reactants and products, are present under standard conditions. The subject of applied thermodynamic calculations is treated in most physical chemistry texts. A useful summary is given in the JANAF Tables [4].

9.1. Properties of a Chemical Reaction at 298.15 K

	CaO(cr)	+ H_2O(l)	= $Ca(OH)_2$(cr)
$\Delta_f H°$/kJ mol^{-1}	−635.09	−285.830	−986.09
$\Delta_f G°$/kJ mol^{-1}	−604.03	−237.129	−898.49
$S°$/J mol^{-1} K^{-1}	39.75	69.91	83.39
$C_p°$/J mol^{-1} K^{-1}	42.80	75.291	87.49

Whence $\Delta_r H°/\mathrm{kJ\ mol^{-1}} = -986.09 - (-635.09 - 285.830) = -65.17$

and similarly

$$\Delta_r G°/\mathrm{kJ\ mol^{-1}} = -57.33$$
$$\Delta_r S°/\mathrm{J\ mol^{-1}\ K^{-1}} = -26.27$$
$$\Delta_r C_p°/\mathrm{J\ mol^{-1}\ K^{-1}} = -30.60$$

All of these changes are the same at 0.1MPa and at 1 atm; there being no change in the number of moles of gas in the process.

Each of the values carries an implied inaccuracy of 8 to 80 in the rightmost place. The properties of water are known more accurately than those of the calcium compounds so the inaccuracies contributed by water may be ignored in estimating the overall inaccuracy. Because the calcium compounds are closely related, the inaccuracy of only one of them is used.

9.2. Properties of a Chemical Reaction as a Function of Temperature

Over a short temperature range (about 100 K) when no phase changes occur the $\Delta_r C_p°$ usually can be assumed to be constant. Then several simple formulae can be used. A much shorter range must be used for reactions in solution; their ΔC_p's change rapidly with temperatures.

a. Temperature Variation of Enthalpy

$$(\partial \Delta_r H^\circ / \partial T)_p = \Delta_r C_p^\circ$$

$$\Delta_r H_2^\circ - \Delta_r H_1^\circ = \int_{T1}^{T2} \Delta_r C_p^\circ dT \approx \Delta_r C_p^\circ(T_1) \cdot \Delta T$$

Here and in the rest of this section subscripts 1 and 2 refer to T_1 and T_2.

Using the example above

$$\Delta_r H^\circ(350\ K)/kJ\ mol^{-1} \approx -65.17 + (-30.60 \times 10^{-3}) \times 51.85 \approx -66.76.$$

Note the change in units for $\Delta_r C_p$(joules to kilojoules) and the small effect that $\Delta C_p \cdot \Delta T$ has on ΔH for this reaction. In general, the smaller ΔC_p is, the larger the temperature range in which this approximation may be used. An alternative procedure is to use values of $H^\circ(T) - H^\circ(298.15\ K)$ from other tables to calculate the change in $\Delta_r H$

$$\Delta_r H^\circ(T) - \Delta_r H^\circ(298.15\ K) = \Delta_r[H^\circ(T) - H^\circ(298.15\ K)].$$

b. Temperature Variations of Entropy

$$(\partial \Delta S^\circ / \partial T)_p = \Delta_r C_p^\circ / T$$

$$\Delta_r S_2^\circ - \Delta_r S_1^\circ = \int_{T1}^{T2} \Delta_r C_p^\circ \, d \ln T \approx \Delta_r C_{p1} \cdot \ln[T_2/T_1]$$

Using the example above

$$\Delta_r S^\circ(350\ K)/J\ mol^{-1} = -26.27 + (-30.60) \cdot \ln(350/298.15) = -26.27 - 4.906 = -31.18.$$

c. Temperature Variation of Gibbs Energy

If the changes in $\Delta_r H^\circ$ and $\Delta_r S^\circ$ have been calculated as in the preceding two sections, simple substitution into

$$\Delta G^\circ = \Delta H^\circ - T\Delta S^\circ$$

is sufficient:

$$\Delta_r G^\circ(350)/kJ\ mol^{-1} = -66.76 - 350 \cdot (-31.18 \times 10^{-3}) = -55.85.$$

Alternatively, from

$$(\partial(\Delta_r G^\circ/T)/\partial T)_p = -\Delta_r H^\circ / T^2$$

we can derive

$$(\Delta_r G_2^\circ - \Delta_r H_1^\circ)/T_2 \approx -\Delta_r S_1^\circ - T_1 \cdot \Delta_r C_{p1}^\circ [1/T_2 - 1/T_1 + (1/T_1)\ln(T_2/T_1)] - \Delta C_{p1}^\circ \cdot \ln(T_2/T_1).$$

(The function on the left hand side of this equation is frequently tabulated for individual species.) Using data from the example in section 9.1,

$$((\Delta_r G^\circ(350) - \Delta_r H^\circ(298.15))/350)/J\ mol^{-1}\ K^{-1} = 26.27 - 298.15\ (-30.60) \cdot (1/350 - 1/298.15) - (-30.60)\ln(350/298.15) = 26.27 - 4.533 + 4.906 = 26.64$$

$$\Delta_r G^\circ(350)/kJ\ mol^{-1} = -65.17 + 350 \cdot 26.64 \cdot 10^{-3} = -55.85.$$

9.3. Enthalpy of Solution

$$CaCl_2(cr) + (400\ H_2O) \rightarrow CaCl_2(400\ H_2O)$$

$$\Delta_{sol} H(298.15\ K) = \Delta_f H(CaCl_2, 400\ H_2O) - \Delta_f H^\circ(CaCl_2,\ cr)$$

which is, using data from the tables

$$\Delta_{sol} H^\circ(298.15\ K)/kJ\ mol^{-1} = -874.983 - (-795.8) = -79.18.$$

(If the product had been $CaCl_2(450\ H_2O)$, for which no value is tabulated, interpolation would have been required.)

The likely uncertainty for this process should be estimated by noting that for all dilutions of $CaCl_2$ in water at least two decimal places are given, and that they must have been determined by a combination of solution and dilution experiments, involving $CaCl_2$(cr). Thus the uncertainty in the latter, which must reflect the chain of measurements from Ca(cr) should be discounted. Two decimal places in the value and estimated uncertainty of 0.1 kJ mol^{-1} appear to be reasonable.

Note that the value for $\Delta_f H^\circ$ for the water in which the calcium chloride is dissolved is not used, because liquid water is neither formed nor destroyed in the process. This procedure is valid because the apparent molar enthalpy is tabulated, not the partial molar enthalpy.

For solution of a hydrate where liquid water is formed, the process is

$$CaCl_2 \cdot 6H_2O(cr) + [394H_2O] \rightarrow CaCl_2(400H_2O) + 6H_2O(l)$$

$$\Delta_{sol} H^\circ = \Delta_f H^\circ(CaCl_2,\ 400H_2O) + 6\Delta_f H^\circ(H_2O,\ l) - \Delta_f H^\circ(CaCl_2 \cdot 6H_2O,\ cr)$$

and

$$\Delta_{sol} H^\circ(298.15\ K)/kJ\ mol^{-1} = -874.983 - 6 \cdot 285.830 - (-2607.9) = 17.94.$$

An estimated uncertainty of 0.1 kJ mol^{-1} appears reasonable.

9.4. Enthalpy of Dilution

The molar integral enthalpy of dilution is obtained from the difference between two tabulated values

$$CaCl_2(10\ H_2O) + (1990\ H_2O) \rightarrow CaCl_2(2000\ H_2O)$$

$$\Delta_{dil} H(298.15)/kJ\ mol^{-1} = -875.891 - (-862.74) = -13.151$$

Dilution experiments are among the most precise and the tables give values with sufficient number of figures to enable enthalpies of dilution to be reconstructed accurately. Therefore, all figures are retained. A reasonable uncertainty is 0.008 to 0.08 kJ mol^{-1}.

9.5. Gibbs Energy, Equilibrium Constants, and Vapor Pressure

The example is a decomposition reaction, but the same procedure applies to any sublimation or vaporization.

	$Na_2SO_4 \cdot 10\ H_2O(cr) \rightarrow$	$Na_2SO_4(cr)$	$+\ 10\ H_2O(g)$
$\Delta_f G°/kJ\ mol^{-1}$:	−3646.85	−1270.16	−228.572

$$\Delta_r G°/kJ\ mol^{-1} = -1270.16 - 2285.72 + 3646.85 = 90.98$$

$\Delta_r G° = -RT \ln K \approx -RT \ln (p(H_2O)/p°)^{10} = 90.98$ kJ mol^{-1} from which $\ln(p/p°) = -3.670$ and $p(H_2O) = 2.55$ kPa. A more accurate calculation would require the use of an equation of state for water as a real gas.

The properties of the two salts limit the accuracy of this calculation, those of water being very well known. Because the properties of easily dissolved hydrates are almost invariably strongly correlated with those of the anhydrous substance when both are studied by solution calorimetry, the uncertainty in $\Delta_r G°$ is taken as 0.08 to 0.80 kJ.

The Gibbs energy change in this process will be different at 1 atmosphere than for 0.1 MPa as given above, because of the change in the number of moles of gas. Using a formula given in table IV, $\Delta_r G$(298.15K, 1 atm) = 91.11 kJ mol^{-1}. The equilibrium constant will also change. So will $\Delta_r S$.

9.6. Gibbs Energy and Cell Potentials

	Cd(cr) +	Zn^{2+}(ao) →	Cd^{2+}(ao) +	Zn(cr)
$\Delta_f G°$kJ mol^{-1}	0	−147.06	−77.612	0

$$\Delta_r G° = -n F E°$$

$$\Delta_r G°(298.15)/kJ\ mol^{-1} = -77.612 + 0 - (-147.06 + 0) = 69.45$$

$$E°/V = -69.45 \cdot 1000/(2 \cdot 96487) = -0.360$$

where $n = 2$ and $F = 96487$ C·mol^{-1}.

The uncertainty is limited by the value for the $\Delta_f G°$ of Zn^{2+}. An uncertainty of 0.08 to 0.80 kJ is assigned. Because values for ions are usually well established, an upper limit of 0.40 kJ mol^{-1} or 0.002 V may be reasonable. The Gibbs energy change for this process will be the same at 1 atmosphere as at 0.1 MPa, above.

9.7. Other Processes

These are shown only in terms of the chemical reactions and applicable formulae:

Ionization of a weak acid

$$CH_3COOH(ao) = H^+(ao) + CH_3COO^-(ao)$$

(CH_3COOH(ao) represents the undissociated acid, while CH_3COOH(ai) would mean the ionized molecule).

$$\Delta_r G° = -RT \ln K$$
$$K = a(H^+) \cdot a(CH_3COO^-)/a(CH_3COOH)$$

where a is the activity. Values for ΔG and K will be the same as above at 1 atm, there being no change in the number of moles of gas.

Ion pair formation

$$Mg^{2+}(ao) + IO_3^-(ao) = MgIO_3^+(ao)$$

The calculation is the same as for ionization of a weak acid.

Henry's law constant for the solubility of a gas

$$SO_2(ao) = SO_2(g)$$
$$\Delta_r G° = -RT \ln K = -RT \ln [p(SO_2)/a(SO_2(ao))]$$

which applies at low concentrations where the solution is becoming ideal. Note that the equilibrium constant refers to the dissolved, un-ionized SO_2, not the total (analytical) SO_2 in solution. The Gibbs energy change for this process will be more positive by 32.63 J mol^{-1} at 1 atmosphere than at 0.1MPa. (see sec. 6 and table IV).

Cell potentials at different pressures

Examples showing the change in cell potentials and electrode potentials with change of pressure between 1 atm and 0.1 MPa are given in section 6.1.a.

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We are indebted to the members of the Chemical Thermodynamics Data Center who have helped us in this work. Those who prepared NBS Circular 500 and carried out special projects in the 1950's developed extensive files of data and records of evaluations upon which we have built. During the entire period of preparation of this book we have been ably supported by colleagues who have searched the literature, abstracted data, retrieved information for us, and built our master index to thermodynamic measurements. These activities have been well planned and managed by Rachel M. Dudley, Joyce J. Grimes and Eugene S. Domalski. The principal abstractors have been Thomas L. Jobe, Jr., and formerly, Rachel M. Dudley and Kay Nelson. Many others have contributed for limited periods of time. To all of them we express our appreciation.

In recent years our procedures have been automated extensively. Blanton C. Duncan designed and together with David Garvin implemented the system used to store our data extracts (General Purpose Scientific Document Code) [52]. This was developed further and maintained by Robert McClennon, Keith Draxl, and one of us (W.H.E.). It was extended for use with phototypesetting by Carla Messina and Robert C. Thompson and used by them to print this book.

Two computer-based systems have been used by us for solving large networks of thermochemical data. The first was suggested by D.R. Stull and implemented by A. Syverud [29], both at Dow Chemical Company, Midland, Michigan. The system now in use was designed and implemented by J.B. Pedley, University of Sussex, Brighton, England for the "CATCH" Tables [53] and the "Sussex-NPL Computer Analyzed Thermochemical Data" [54] on organic compounds. The system was extended and adapted for our use by him and David Garvin in a cooperative program between the University of Sussex and NBS.

Participation in two collaborative evaluation projects has given us access to new data, insights about the chemistry and has pinpointed the need for new measurements. The groups responsible for these activities are the CODATA Task Group on Key Values for Thermodynamics and the group preparing "The Chemical Thermodynamics of the Actinide Elements and Compounds" for the International Atomic Energy Agency [55]. L.V. Gurvich, V.A. Medvedev, and other members of the thermodynamic tables group at the Institute for High Temperatures of the Academy of Science, Moscow, USSR, have exchanged information with us and discussed data evaluation problems in detail. This cooperation continues under a bilateral science exchange agreement.

B.R. Staples and R.N. Goldberg of the NBS Electrolyte Data Center have assisted in the evaluation of activities of solutions. Professor R.D. Freeman has advised us on terminology, symbols, definitions of properties, and the conversion of data to the new standard pressure. Many experts at NBS have interpreted the work of their disciplines for us in ways that made it easy for us to use. We are particularly indebted to Dr. Sharon G. Lias for help with the properties of gaseous molecular ions and Dr. Wm. C. Martin for advice on ionization potentials of atoms. Their work is the basis for Appendices 2 and 3. The advice and guidance of Edward J. Prosen and George T. Armstrong during the course of this work is gratefully acknowledged.

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Thermodynamicists throughout the world have discussed their work in detail, provided data in advance of publication and have made experiments in response to our requests. We have profited by their expert analyses, their careful measurements and their criticism. As a result these tables have been extended and improved, and some of the inevitable errors have been eliminated. We are deeply indebted to them.

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TABLE I. Symbols used in the tables and the text

	Properties and their units		
p	pressure, Pa (or bar)	C_p	molar heat capacity at constant pressure, $(\partial H/\partial T)_p$, J mol^{-1} K^{-1}
V	molar volume, L mol^{-1}	R	gas constant, J mol^{-1} K^{-1}
T	temperature, K	p°	standard state pressure = 0.1 MPa (1 bar)
H	molar enthalpy, kJ mol^{-1} (heat content)	m	molality, moles (of solute) per kilogram (of solvent)
G	molar Gibbs energy, kJ mol^{-1}	x	mole fraction
S	molar entropy, J mol^{-1} K^{-1}		
	Physical states (phases)		
cr	crystalline solid		
l	liquid		
g	gaseous		
am	amorphous solid		
vit	vitreous (glassy) liquid		
aq	aqueous solution, concentration not specified		
ai	aqueous solution, ionized substance standard, $m_\pm = 1$ mol/kg		
ao	aqueous solution, un–ionized substance, standard state, $m = 1$ mol/kg, or an ion for which here no further ionization is considered		
	Miscellaneous		
In symbols for properties:			
Δ	change (final minus initial)		
°	standard state (superscript)		
dil	dilution (subscript)		
f	formation (subscript)		
r	reaction (subscript)		
sol	solution (subscript)		
trs	transition (subscript)		
	Designation of isomers and crystalline forms		
	A numeral is appended to the physical state designation, e.g., cr2, cr3, g2, g3. The number may be appended to the solvent. A more general designation is i2, i3, etc.		
	In descriptions of systems		
nH_2O	moles of water associated with one mole of substance, as "in 100 H_2O".		
:x	standard state, mole fraction = 1, non–aqueous and mixed solutions (suffix in description of the state, as in $I_2(CCl_4$:x).		
:s	standard state, molality = 1, non–aqueous and mixed suffix as in $I_2(CCl_4$:s).		
D:	partial molar property (prefix in description of the state as "in HCl(D:100H_2O)").		
:u	non-aqueous, mixed or multicomponent aqueous solutions, concentration not specified.		

TABLE II. Relative atomic masses[a] used in calculating molar masses

Element	Order No.	Relative Atomic Mass	Element	Order No.	Relative Atomic Mass	Element	Order No.	Relative Atomic Mass
O	1	15.9994	Cu	36	63.54	Sm	71	150.35
H[b]	2	1.0080	Ag	37	107.870	Pm	72	146.915
He	3	4.0026	Au	38	196.967	Nd	73	144.24
Ne	4	20.183	Ni	39	58.71	Pr	74	140.907
Ar	5	39.948	Co	40	58.9332	Ce	75	140.12
Kr	6	83.80	Fe	41	55.847	La	76	138.91
Xe	7	131.30	Pd	42	106.4	Lw	77	257.
Rn	8	222.	Rh	43	102.905	No	78	255.
F	9	18.9984	Ru	44	101.07	Md	79	258.10
Cl	10	35.453	Pt	45	195.09	Fm	80	257.10
Br	11	79.909	Ir	46	192.2	Es	81	254.09
I	12	126.9044	Os	47	190.2	Cf	82	251.08
At	13	210.	Mn	48	54.9380	Bk	83	249.075
S	14	32.064	Tc	49	98.906	Cm	84	247.07
Se	15	78.96	Re	50	186.2	Am	85	241.06
Te	16	127.60	Cr	51	51.996	Pu	86	239.05
Po	17	210.	Mo	52	95.94	Np	87	237.05
N	18	14.0067	W	53	183.85	U	88	238.029
P	19	30.9738	V	54	50.942	Pa	89	231.0359
As	20	74.9216	Nb	55	92.9060	Th	90	232.0381
Sb	21	121.75	Ta	56	180.948	Ac	91	227.028
Bi	22	208.980	Ti	57	47.90	Be	92	9.0122
C	23	12.0112	Zr	58	91.22	Mg	93	24.312
Si	24	28.086	Hf	59	178.49	Ca	94	40.08
Ge	25	72.59	Sc	60	44.956	Sr	95	87.62
Sn	26	118.69	Y	61	88.905	Ba	96	137.34
Pb	27	207.19	Lu	62	174.97	Ra	97	226.025
B	28	10.811	Yb	63	173.04	Li	98	6.941
Al	29	26.9815	Tm	64	168.934	Na	99	22.9898
Ga	30	69.72	Er	65	167.26	K	100	39.102
In	31	114.82	Ho	66	164.930	Rb	101	85.4678
Tl	32	204.37	Dy	67	162.50	Cs	102	132.9054
Zn	33	65.37	Tb	68	158.924	Fr	103	223.
Cd	34	112.40	Gd	69	157.25			
Hg	35	200.59	Eu	70	151.96			

See section 5.4 for sources of the data.

[a]The ratio of the average mass of an atom of the element to 1/12 of the mass of an atom of nuclide ^{12}C.

[b]D: 2.0141, T: 3.016

TABLE III. Summary of conventions, reference phases and standard states

Reference Phases for the Elements

Element	At 298.15 K	At 0 K
H_2, He, Ne, Ar, Kr, Xe,	Ideal gas	Ideal gas
Rn, F_2, Cl_2, O_2, N_2, electron		
Br_2, Hg	Liquid	Perfectly ordered crystal of stable phase
All others	Crystal	Same as above

Note: White (not red) phosphorus and white tin are the reference phases at both temperatures. $\Delta_f H^\circ$ and $\Delta_f G^\circ = 0$ for all elements in their reference phases. The classical statistical mechanical value is assumed for H°–H°(0) for the electron in the calculation of $\Delta_f H^\circ$ for the gaseous ions.

Standard states for pure substances

State of aggregation at 298.15 K	Standard states at 0.1 MPa (1 bar)	
	at 298.15 K	at 0 K
Gaseous (g)	Ideal gas	Ideal gas
Liquid (l)	Liquid	Perfectly ordered crystal of stable phase
Crystalline solid (cr)	Crystalline solid	Perfectly ordered crystal (see Sec. 5.7)
Amorphous solid (am)	Amorphous solid	Perfectly ordered crystal of stable phase
Vitreous or glassy (vit)	Vitreous	Perfectly ordered crystal of stable phase

Standard states at 298.15 K for solutions

Substance	Standard state at 0.1 MPa (1 bar)
(a) solvent (all solutions)	Pure substance, $x_1 = 1$
(b) solutes in aqueous, mixed and non–aqueous solutions	
Non–electrolyte or not dissociated	Hypothetical ideal solution, $m = 1$ mol/kg *or* Hypothetical ideal solution, $x_2 = 1$
Electrolyte (ionized)	Hypothetical ideal solution, $m_\pm = 1$ mol/kg

NOTE: $\Delta_f H^\circ$, $\Delta_f G^\circ$, S°, and $C_p^\circ = 0$ for H^+(ao)

TABLE IV. Conversion factors for entropies and Gibbs energies between standard states

A. Conversions for entropies of gases[a]

TO CONVERT FROM:		S°(g,0.1 MPa) / J/(mol K)	S^*(g,1 atm) / cal/(mol K)	$S^\dagger$(g, 1 atm) / J/(mol K)
TO:				
S°(g, 0.1 MPa) / J/(mol K)	=	X°	$4.184(X^* + 0.02616)$	$X^\dagger + 0.1094$
$S^\dagger$(g, 1 atm) / J/(mol K)	=	$X^\circ - 0.1094$	$4.184\ X^*$	$X^\dagger$
S(g, 0.1 MPa) / cal/(mol K)	=	$X^\circ/4.184$	$X^* + 0.02616$	$(X^\dagger + 0.1094)/4.184$
S^*(g, 1 atm) / cal/(mol K)	=	$(X^\circ - 0.1094)/4.184$	X^*	$X^\dagger/4.184$

B. Conversion factors for Gibbs energies of formation at 298.15 K[a]
(δ is the increase in the number of moles of gas upon formation of the compound from the elements)

TO CONVERT FROM:		$\Delta_f G^\circ$(0.1 MPa) / J/mol	$\Delta_f G^*$(1 atm) / cal/mol	$\Delta_f G^\dagger$(1 atm) / J/mol
TO:				
$\Delta_f G^\circ$(0.1 MPa) / J/mol	=	X°	$4.184(X^* - 7.799 \cdot \delta)$	$X^\dagger - 32.63 \cdot \delta$
$\Delta_f G^\dagger$(1 atm) / J/mol	=	$X^\circ + 32.63 \cdot \delta$	$4.184 X^*$	$X^\dagger$
$\Delta_f G$(0.1 MPa) / cal/mol	=	$X^\circ/4.184$	$X^* - 7.799 \cdot \delta$	$(X^\dagger - 32.63 \cdot \delta)/4.184$
$\Delta_f G^*$(1 atm) / cal/mol	=	$(X^\circ + 32.63 \cdot \delta)/4.184$	X^*	$X^\dagger/4.184$

[a]The symbols X°, X^*, and $X^\dagger$ represent the dimensionless quantities at the heads of the columns in which they appear.

See section 6 for discussion.

TABLE V. Conversion factors for units of molecular energy[a]

	J/mol	cal/mol	cm³ atm/mol	cm³ bar/mol	kWh/mol	Btu/lb-mol	cm⁻¹/molecule	eV/molecule
1 J/mol	= 1	2.390 057 × 10⁻¹	9.869 23	10. exactly	2.777 77.. × 10⁻⁷	0.429 923	8.359 42 × 10⁻²	1.036 41 × 10⁻⁵
1 cal/mol (thermochemical)	= 4.184 exactly	1	41.292 9	41.84 exactly	1.162 222.. × 10⁻⁶	1.798 796	3.497 58 × 10⁻¹	4.336 34 × 10⁻⁵
1 cm³ atm/mol	= 0.101 325 exactly	2.421 73 × 10⁻²	1	1.013 25 exactly	2.814 58 × 10⁻⁸	4.356 19 × 10⁻²	8.470 18 × 10⁻³	1.050 14 × 10⁻⁶
1 cm³ bar/mol	= 0.1 exactly	2.390 057 × 10⁻²	0.986 923	1	2.777 77.. × 10⁻⁸	4.299 23 × 10⁻²	8.359 42 × 10⁻³	1.036 41 × 10⁻⁶
1 kWh/mol	= 3.6 × 10⁶ exactly	860 421.	3.552 92 × 10⁷	3.6 × 10⁷ exactly	1	1.547 721 × 10⁶	300 939.	37.310 7
1 Btu/lb-mol (I.T.)	= 2.326 exactly	5.559 27 × 10⁻¹	22.955 8	23.26 exactly	6.461 11 × 10⁻⁷	1	1.944 40 × 10⁻¹	2.410 69 × 10⁻⁵
1 cm⁻¹/molecule	= 11.962 6	2.859 12	118.061	119.626	3.322 93 × 10⁻⁶	5.142 97	1	1.239 81 × 10⁻⁴
1 eV/molecule	= 96 487.0 (=F)	23 060.9	952 253.	9.648 70 × 10⁵	2.680 19 × 10⁻²	41 482.0	8 065.73[b] (=0.01 e/hc)	1

[a]Example of use of the table: To convert kWh/mol to J/mol multiply by 3.6 × 10⁶.

The underlined numbers were used to derive the other conversion factors in this table by applying the relationships

$$n_{ij} = n_{ik} \cdot n_{kj} = n_{ik}/n_{jk} \text{ and } n_{ij} \cdot n_{ji} = 1$$

where n_{ij} is the number in the i'th row and j'th column and n_{ik}, n_{kj} and n_{jk} are underlined numbers or ones previously derived from them. Only the final result in a sequence of calculations is rounded. The table is based on the 1963 adjustment of the fundamental physical constants [33]. See also section 5.3.

[b]This number, from [33], is not consistent, to the least significant digit shown, with the underlined numbers in rows 7 and 8.

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Table 1:O — **OXYGEN** (Prepared 1963) — Table 1:O

Substance Formula and Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H_0^\circ$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H_0^\circ$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
O	g	15.9994	246.785	249.170	231.731	6.724	161.055	21.912
O^+	g	15.9994	1560.716	1568.770	—	6.197	—	—
O^{2+}	g	15.9994	4949.00	4964.94	—	7.883	—	—
O^{3+}	g	15.9994	10249.46	10271.01	—	7.293	—	—
O^{4+}	g	15.9994	17718.70	17745.35	—	6.197	—	—
O^{5+}	g	15.9994	28708.18	28741.03	—	6.197	—	—
O^{6+}	g	15.9994	42034.6	42073.5	—	6.197	—	—
O^{7+}	g	15.9994	113365.	113412.	—	6.197	—	—
O^{8+}	g	15.9994	197443.	197493.	—	6.197	—	—
O^-	g	15.9994	105.44	101.63	—	—	—	—
O_2	g	31.9988	0	0	0	8.680	205.138	29.355
	ao	31.9988	—	-11.7	16.4	—	110.9	—
O_2^+	g	31.9988	1164.70	1171.52	—	9.309	—	—
O_3	g	47.9982	145.35	142.7	163.2	10.350	238.93	39.20
	ao	47.9982	—	125.9	174.1	—	146.	—

Table 2:H — **HYDROGEN** (Prepared 1963) — Table 2:H

Substance Formula and Description		State	Molar mass g mol⁻¹	0 K $\Delta_f H_0^\circ$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H_0^\circ$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
H		g	1.0080	216.003	217.965	203.247	6.197	114.713	20.784
H^+		g	1.0080	1528.043	1536.202	—	6.197	—	—
H^-		g	1.0080	143.22	138.99	—	6.197	—	—
H^+		ao	1.0080	—	0	0	—	0	0
D		g	2.0141	219.760	221.673	206.506	6.197	123.349	20.786
H_2		g	2.0160	0	0	0	8.468	130.684	28.824
		ao	2.0160	—	-4.2	17.6	—	57.7	—
H_2^+		g	2.0160	1488.42	1494.65	—	—	—	—
D_2		g	4.0282	0	0	0	8.560	144.960	29.196
HD		g	3.0221	0.331	0.318	-1.464	8.505	143.801	29.196
OH		g	17.0074	38.70	38.95	34.23	8.816	183.745	29.886
OH^+		g	17.0074	1283.2	1289.5	—	8.602	—	—
OH^-		g	17.0074	-137.7	-143.5	—	8.606	—	—
		ao	17.0074	—	-229.994	-157.244	—	-10.75	-148.5
OD		g	18.0135	36.48	36.86	32.47	8.999	189.733	29.874
HO_2		g	33.0068	13.4	10.5	22.6	10.00	229.0	34.89
HO_2^+		g	33.0068	1138.	1134.	—	—	—	—
HO_2^-		ao	33.0068	—	-160.33	-67.3	—	23.8	—
H_2O		cr	18.0154	-286.315	—	—	—	—	—
H_2O		l	18.0154	—	-285.830	-237.129	13.293	69.91	75.291
		g	18.0154	-238.915	-241.818	-228.572	9.902	188.825	33.577
H_2O^+		g	18.0154	978.26	981.57	—	—	—	—
D_2O		l	20.0276	—	-294.600	-243.439	—	75.94	84.35
		g	20.0276	-246.249	-249.199	-234.535	9.958	198.339	34.27
HDO		l	19.0215	—	-289.888	-241.857	—	79.29	—
		g	19.0215	-242.367	-245.300	-233.112	9.925	199.511	33.81
H_2O_2		l	34.0148	—	-187.78	-120.35	—	109.6	89.1
		g	34.0148	-130.04	-136.31	-105.57	10.853	232.7	43.1
		ao	34.0148	—	-191.17	-134.03	—	143.9	—
H_2O_2	in 0.1 H_2O		34.0148	—	-188.134	—	—	—	—
	in 0.5 H_2O		34.0148	—	-189.108	—	—	—	—
	in 1.0 H_2O		34.0148	—	-189.807	—	—	—	—
	in 2.0 H_2O		34.0148	—	-190.456	—	—	—	—
	in 3.0 H_2O		34.0148	—	-190.728	—	—	—	—
H_2O_2	in 4.0 H_2O		34.0148	—	-190.874	—	—	—	—
	in 5.0 H_2O		34.0148	—	-190.949	—	—	—	—
	in 10 H_2O		34.0148	—	-191.083	—	—	—	—
	in 15 H_2O		34.0148	—	-191.129	—	—	—	—
	in 20 H_2O		34.0148	—	-191.146	—	—	—	—
H_2O_2	in 50 H_2O		34.0148	—	-191.154	—	—	—	—
	in ∞ H_2O		34.0148	—	-191.17	—	—	—	—
$H_2O_2^+$		g	34.0148	887.0	887.0	—	—	—	—

Table 3:**He** **HELIUM** (Prepared 1963) Table 3:**He**

Substance Formula and Description	State	Molar mass g mol^{-1}	0 K $\Delta_f H_0^\circ$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H_0^\circ$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
He	g	4.0026	0	0	0	6.197	126.150	20.786
	ao	4.0026	—	-1.7	19.7	—	54.4	—
He^+	g	4.0026	2372.303	2378.499	—	6.197	—	—

Table 4:Ne NEON (Prepared 1964) Table 4:Ne

Substance Formula and Description	State	Molar mass g mol^{-1}	0 K $\Delta_f H^\circ_0$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H^\circ_0$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
Ne	g	20.1830	0	0	0	6.197	146.328	20.786
	ao	20.1830	—	-4.6	19.3	—	66.1	—
Ne^{+}	g	20.1830	2080.645	2086.950	—	6.305	—	—
Ne^{2+}	g	20.1830	6032.99	6045.50	—	6.335	—	—
Ne^{3+}	g	20.1830	12155.4	12174.2	—	6.197	—	—
Ne^{4+}	g	20.1830	21527.	21556.	—	7.820	—	—
Ne^{5+}	g	20.1830	33706.	33740.	—	6.197	—	—

Table 5:**Ar** | **ARGON** (Prepared 1964) | Table 5:**Ar**

Substance Formula and Description	State	Molar mass g mol^{-1}	0 K $\Delta_f H_0^\circ$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H_0^\circ$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
Ar	g	39.9480	0	0	0	6.197	154.843	20.786
	ao	39.9480	—	-12.1	16.4	—	59.4	—
Ar^{+}	g	39.9480	1520.558	1526.762	—	6.205	—	—
Ar^{2+}	g	39.9480	4186.38	4198.81	—	6.238	—	—
Ar^{3+}	g	39.9480	8117.4	8135.8	—	6.197	—	—
Ar^{4+}	g	39.9480	13888.0	13913.1	—	6.832	—	—
Ar^{5+}	g	39.9480	21125.	21158.	—	6.197	—	—
Ar^{6+}	g	39.9480	29907.	29945.	—	6.197	—	—
Ar^{7+}	g	39.9480	41903.	41949.	—	6.197	—	—

Table 6:**Kr** **KRYPTON** (Prepared 1964) Table 6:**Kr**

Substance Formula and Description	State	Molar mass g mol^{-1}	0 K $\Delta_f H_0^\circ$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H_0^\circ$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
Kr	g	83.8000	0	0	0	6.197	164.082	20.786
	ao	83.8000	—	–15.5	15.1	—	61.5	—
Kr^+	g	83.8000	1350.746	1356.942	—	6.197	—	—
Kr^{2+}	g	83.8000	3701.12	3713.51	—	6.197	—	—
Kr^{3+}	g	83.8000	7266.4	7284.8	—	6.197	—	—

Table 7:**Xe** — **XENON** (Prepared 1964) — Table 7:**Xe**

Substance Formula and Description	State	Molar mass g mol^{-1}	0 K $\Delta_f H^\circ_0$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H^\circ_0$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
Xe	g	131.3000	0	0	0	6.197	169.683	20.786
	ao	131.3000	—	-17.6	13.4	—	65.7	—
Xe^{+}	g	131.3000	1170.344	1176.541	—	6.197	—	—
Xe^{2+}	g	131.3000	3216.7	3229.2	—	6.197	—	—
Xe^{3+}	g	131.3000	6316.2	6335.0	—	6.197	—	—

Table 8:Rn RADON (Prepared 1964) Table 8:Rn

Substance Formula and Description	State	Molar mass g mol⁻¹	0 K: $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar): $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
Rn	g	222.0000	0	0	0	6.197	176.21	20.786
Rn^+	g	222.0000	1037.063	1043.259	—	6.197	—	—

Table 9:F — **FLUORINE** (Prepared 1963) — Table 9:F

Substance Formula	Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H_0^\circ$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H_0^\circ$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
F		g	18.9984	76.90	78.99	61.91	6.519	158.754	22.744
F^+		g	18.9984	1757.95	1766.44	—	6.711	—	—
F^{2+}		g	18.9984	5132.09	5146.24	—	6.197	—	—
F^{3+}		g	18.9984	11182.6	11204.8	—	8.222	—	—
F^{4+}		g	18.9984	19590.3	19617.5	—	6.661	—	—
F^{5+}		g	18.9984	30613.1	30645.7	—	6.197	—	—
F^{6+}		g	18.9984	45777.1	45816.1	—	6.197	—	—
F^{7+}		g	18.9984	63644.9	63690.1	—	6.197	—	—
F^{8+}		g	18.9984	155682.	155737.	—	—	—	—
F^-		g	18.9984	–250.96	–255.39	—	6.197	—	—
F^-		ao	18.9984	—	–332.63	–278.79	—	–13.8	–106.7
F_2		g	37.9968	0	0	0	8.820	202.78	31.30
F_2^+		g	37.9968	1513.48	1519.67	—	—	—	—
FO		g	34.9978	108.78	109.	105.	8.79	216.8	30.5
F_2O		g	53.9962	26.78	24.7	41.9	10.895	247.43	43.30
F_2O^+		g	53.9962	1293.7	1297.9	—	—	—	—
F_2O_2		g	69.9956	—	18.0	—	—	—	—
F_2O_3		g	85.9950	—	15.9	—	—	—	—
HF	x denotes undetermined zero point entropy	l	20.0064	—	–299.78	—	—	75.40+x	—
		g	20.0064	–271.077	–271.1	–273.2	8.598	173.779	29.133
HF		ai	20.0064	—	–332.63	–278.79	—	–13.8	–106.7
		ao	20.0064	—	–320.08	–296.82	—	88.7	—
	in 2.0 H_2O		20.0064	—	–317.11	—	—	—	—
	in 3.0 H_2O		20.0064	—	–317.90	—	—	—	—
	in 4.0 H_2O		20.0064	—	–318.40	—	—	—	—
HF	in 5.0 H_2O		20.0064	—	–318.674	—	—	—	—
	in 10 H_2O		20.0064	—	–318.967	—	—	—	—
	in 15 H_2O		20.0064	—	–319.126	—	—	—	—
	in 25 H_2O		20.0064	—	–319.206	—	—	—	—
	in 30 H_2O		20.0064	—	–319.239	—	—	—	—
HF	in 40 H_2O		20.0064	—	–319.273	—	—	—	—
	in 50 H_2O		20.0064	—	–319.306	—	—	—	—
	in 75 H_2O		20.0064	—	–319.377	—	—	—	—
	in 100 H_2O		20.0064	—	–319.407	—	—	—	—
	in 200 H_2O		20.0064	—	–319.482	—	—	—	—
HF	in 300 H_2O		20.0064	—	–319.549	—	—	—	—
	in 400 H_2O		20.0064	—	–319.670	—	—	—	—
	in 500 H_2O		20.0064	—	–319.754	—	—	—	—
	in 600 H_2O		20.0064	—	–319.838	—	—	—	—
	in 700 H_2O		20.0064	—	–319.921	—	—	—	—
HF	in 800 H_2O		20.0064	—	–320.013	—	—	—	—
	in 900 H_2O		20.0064	—	–320.122	—	—	—	—
	in 1 000 H_2O		20.0064	—	–320.206	—	—	—	—
	in 2 000 H_2O		20.0064	—	–321.33	—	—	—	—
	in 3 000 H_2O		20.0064	—	–321.96	—	—	—	—
HF	in 4 000 H_2O		20.0064	—	–322.38	—	—	—	—
	in 5 000 H_2O		20.0064	—	–322.75	—	—	—	—
	in 7 000 H_2O		20.0064	—	–323.21	—	—	—	—
	in 10 000 H_2O		20.0064	—	–323.72	—	—	—	—

Table 9:F **FLUORINE** (Prepared 1963) — Continued Table 9:F

Substance Formula and Description		State	Molar mass g mol⁻¹	0 K $\Delta_f H_0^\circ$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H_0^\circ$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
HF	in 20 000 H_2O		20.0064	—	-325.10	—	—	—	—
	in ∞ H_2O		20.0064	—	-332.63	—	—	—	—
HF_2^-		ao	39.0048	—	-649.94	-578.08	—	92.5	—
XeF_4		cr	207.2936	—	-261.5	—	—	—	—

Table 10:**Cl** — **CHLORINE** (Prepared 1963) — Table 10:**Cl**

Substance Formula	Description	State	Molar mass g mol^{-1}	0 K $\Delta_fH^\circ_0$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) Δ_fH° kJ mol^{-1}	Δ_fG° kJ mol^{-1}	$H^\circ-H^\circ_0$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
Cl		g	35.4530	120.00	121.679	105.680	6.272	165.198	21.840
Cl^+		g	35.4530	1371.18	1379.17	—	6.385	—	—
Cl^{2+}		g	35.4530	3668.9	3682.8	—	6.197	—	—
Cl^{3+}		g	35.4530	7491.0	7512.4	—	7.573	—	—
Cl^{4+}		g	35.4530	12649.5	12675.8	—	6.226	—	—
Cl^{5+}		g	35.4530	19192.	19225.	—	6.197	—	—
Cl^{6+}		g	35.4530	28556.	28598.	—	6.197	—	—
Cl^{7+}		g	35.4530	39572.	39618.	—	6.197	—	—
Cl^{8+}		g	35.4530	73178.	73228.	—	6.197	—	—
Cl^-		g	35.4530	-228.61	-233.13	—	—	—	—
Cl^-		ao	35.4530	—	-167.159	-131.228	—	56.5	-136.4
Cl_2		g	70.9060	0	0	0	9.176	223.066	33.907
		ao	70.9060	—	-23.4	6.94	—	121.	—
	in CCl_4:x		70.9060	—	-18.58	4.59	—	145.2	—
Cl_2^+		g	70.9060	1107.9	1114.2	—	—	—	—
Cl_2^{2+}		g	70.9060	3146.	3159.	—	—	—	—
Cl_3^-		ao	106.3590	—	—	-120.4	—	—	—
ClO		g	51.4524	101.92	101.84	98.11	8.845	226.63	31.46
ClO^-		ao	51.4524	—	-107.1	-36.8	—	42.	—
ClO_2		g	67.4518	104.98	102.5	120.5	10.795	256.84	41.97
ClOO	chlorine peroxy	g2	67.4518	90.8	89.1	105.0	11.63	263.7	46.0
ClO_2		ao	67.4518	—	74.9	120.1	—	164.8	—
ClO_2^-		ao	67.4518	—	-66.5	17.2	—	101.3	—
ClO_3		g	83.4512	—	155.	—	—	—	—
ClO_3^-		ao	83.4512	—	-103.97	-7.95	—	162.3	—
ClO_4^-		ao	99.4506	—	-129.33	-8.52	—	182.0	—
Cl_2O		g	86.9054	82.47	80.3	97.9	11.376	266.21	45.40
	in CCl_4:x		86.9054	—	52.80	96.20	—	179.9	—
Cl_2O_7		l	182.9018	—	238.1	—	—	—	—
		g	182.9018	—	272.0	—	—	—	—
HCl		g	36.4610	-92.132	-92.307	-95.299	8.644	186.908	29.12
		ai	36.4610	—	-167.159	-131.228	—	56.5	-136.4
	in 1.0 H_2O		36.4610	—	-121.55	—	—	—	—
	in 1.5 H_2O		36.4610	—	-132.67	—	—	—	—
	in 2.0 H_2O		36.4610	—	-140.96	—	—	—	—
HCl	in 2.5 H_2O		36.4610	—	-145.48	—	—	—	—
	in 3.0 H_2O		36.4610	—	-148.49	—	—	—	—
	in 4.0 H_2O		36.4610	—	-152.917	—	—	—	—
	in 4.5 H_2O		36.4610	—	-154.503	—	—	—	—
	in 5.0 H_2O		36.4610	—	-155.774	—	—	—	—
HCl	in 6.0 H_2O		36.4610	—	-157.682	—	—	—	—
	in 8.0 H_2O		36.4610	—	-160.005	—	—	—	—
	in 10 H_2O		36.4610	—	-161.318	—	—	—	—
	in 12 H_2O		36.4610	—	-162.180	—	—	—	—
	in 15 H_2O		36.4610	—	-163.025	—	—	—	—
HCl	in 20 H_2O		36.4610	—	-163.845	—	—	—	—
	in 25 H_2O		36.4610	—	-164.339	—	—	—	—
	in 30 H_2O		36.4610	—	-164.670	—	—	—	—
	in 40 H_2O		36.4610	—	-165.096	—	—	—	—
	in 50 H_2O		36.4610	—	-165.356	—	—	—	—

Table 10:Cl **CHLORINE** (Prepared 1963) — Continued Table 10:Cl

Substance Formula	Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
HCl	in 75 H_2O		36.4610	—	-165.724	—	—	—	—
	in 100 H_2O		36.4610	—	-165.925	—	—	—	—
	in 150 H_2O		36.4610	—	-166.147	—	—	—	—
	in 200 H_2O		36.4610	—	-166.272	—	—	—	—
	in 300 H_2O		36.4610	—	-166.423	—	—	—	—
HCl	in 400 H_2O		36.4610	—	-166.506	—	—	—	—
	in 500 H_2O		36.4610	—	-166.573	—	—	—	—
	in 600 H_2O		36.4610	—	-166.619	—	—	—	—
	in 700 H_2O		36.4610	—	-166.657	—	—	—	—
	in 800 H_2O		36.4610	—	-166.686	—	—	—	—
HCl	in 900 H_2O		36.4610	—	-166.711	—	—	—	—
	in 1 000 H_2O		36.4610	—	-166.732	—	—	—	—
	in 1 500 H_2O		36.4610	—	-166.804	—	—	—	—
	in 2 000 H_2O		36.4610	—	-166.850	—	—	—	—
	in 3 000 H_2O		36.4610	—	-166.908	—	—	—	—
HCl	in 4 000 H_2O		36.4610	—	-166.933	—	—	—	—
	in 5 000 H_2O		36.4610	—	-166.963	—	—	—	—
	in 7 000 H_2O		36.4610	—	-166.992	—	—	—	—
	in 10 000 H_2O		36.4610	—	-167.017	—	—	—	—
	in 20 000 H_2O		36.4610	—	-167.055	—	—	—	—
HCl	in 50 000 H_2O		36.4610	—	-167.092	—	—	—	—
	in 100 000 H_2O		36.4610	—	-167.117	—	—	—	—
	in ∞ H_2O		36.4610	—	-167.159	—	—	—	—
	in $CHCl_3$:x		36.4610	—	-105.0	-85.7	—	112.1	—
	in CCl_4:x		36.4610	—	-103.3	-84.9	—	115.1	—
HCl^+		g	36.4610	1137.2	1143.1	—	—	—	—
HClO		g	52.4604	-75.73	-78.7	-66.1	10.209	236.67	37.15
		ao	52.4604	—	-120.9	-79.9	—	142.	—
	in 6.0 H_2O		52.4604	—	-118.91	—	—	—	—
	in 7.0 H_2O		52.4604	—	-119.16	—	—	—	—
HClO	in 8.0 H_2O		52.4604	—	-119.41	—	—	—	—
	in 10 H_2O		52.4604	—	-119.75	—	—	—	—
	in 12 H_2O		52.4604	—	-119.91	—	—	—	—
	in 15 H_2O		52.4604	—	-120.16	—	—	—	—
	in 20 H_2O		52.4604	—	-120.37	—	—	—	—
HClO	in 25 H_2O		52.4604	—	-120.5	—	—	—	—
	in 30 H_2O		52.4604	—	-120.58	—	—	—	—
	in 40 H_2O		52.4604	—	-120.71	—	—	—	—
	in 50 H_2O		52.4604	—	-120.79	—	—	—	—
	in 75 H_2O		52.4604	—	-120.88	—	—	—	—
HClO	in 100 H_2O		52.4604	—	-120.92	—	—	—	—
	in 200 H_2O		52.4604	—	-121.00	—	—	—	—
	in 300 H_2O		52.4604	—	-121.00	—	—	—	—
	in 500 H_2O		52.4604	—	-121.00	—	—	—	—
	in 1 000 H_2O		52.4604	—	-121.04	—	—	—	—
$HClO_2$		ao	68.4598	—	-51.9	5.9	—	188.3	—
$HClO_3$		ai	84.4592	—	-103.97	-7.95	—	162.3	—
$HClO_4$		l	100.4586	—	-40.58	—	—	—	—
		ai	100.4586	—	-129.33	-8.52	—	182.0	—
	in 2.0 H_2O		100.4586	—	-106.27	—	—	—	—

Table 10:**Cl** **CHLORINE** (Prepared 1963) — Continued Table 10:**Cl**

Substance Formula	Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
$HClO_4$	in 2.5 H_2O		100.4586	—	-112.55	—	—	—	—
	in 3.0 H_2O		100.4586	—	-117.24	—	—	—	—
	in 4.0 H_2O		100.4586	—	-122.72	—	—	—	—
	in 4.5 H_2O		100.4586	—	-124.52	—	—	—	—
	in 5.0 H_2O		100.4586	—	-126.23	—	—	—	—
$HClO_4$	in 6.0 H_2O		100.4586	—	-127.82	—	—	—	—
	in 8.0 H_2O		100.4586	—	-129.29	—	—	—	—
	in 10 H_2O		100.4586	—	-129.79	—	—	—	—
	in 12 H_2O		100.4586	—	-130.00	—	—	—	—
	in 15 H_2O		100.4586	—	-130.12	—	—	—	—
$HClO_4$	in 20 H_2O		100.4586	—	-130.04	—	—	—	—
	in 25 H_2O		100.4586	—	-129.96	—	—	—	—
	in 30 H_2O		100.4586	—	-129.87	—	—	—	—
	in 40 H_2O		100.4586	—	-129.66	—	—	—	—
	in 50 H_2O		100.4586	—	-129.54	—	—	—	—
$HClO_4$	in 75 H_2O		100.4586	—	-129.33	—	—	—	—
	in 100 H_2O		100.4586	—	-129.24	—	—	—	—
	in 200 H_2O		100.4586	—	-129.08	—	—	—	—
	in 500 H_2O		100.4586	—	-129.03	—	—	—	—
	in 1 000 H_2O		100.4586	—	-129.03	—	—	—	—
$HClO_4$	in 3 000 H_2O		100.4586	—	-129.08	—	—	—	—
	in 7 000 H_2O		100.4586	—	-129.12	—	—	—	—
	in 10 000 H_2O		100.4586	—	-129.16	—	—	—	—
	in 20 000 H_2O		100.4586	—	-129.20	—	—	—	—
	in 100 000 H_2O		100.4586	—	-129.24	—	—	—	—
$HClO_4$	in ∞ H_2O		100.4586	—	-129.33	—	—	—	—
$HClO_4{\cdot}H_2O$		cr	118.4740	—	-382.21	—	—	—	—
$HClO_4{\cdot}2H_2O$		l	136.4894	—	-677.98	—	—	—	—
ClF		g	54.4514	-54.4	-54.48	-55.94	8.899	217.89	32.05
ClF_3		l	92.4482	—	-189.5	—	—	—	—
ClF_3		g	92.4482	-159.0	-163.2	-123.0	13.648	281.61	63.85
ClF_3^+		g	92.4482	1061.5	1063.6	—	—	—	—
$(ClF_3)_2$		g	184.8964	—	-339.3	-237.1	—	490.	—
ClO_3F		g	102.4496	-15.1	-23.8	48.2	13.301	278.97	64.94
$ClF_3{\cdot}HF$		g	112.4546	—	-450.6	-384.0	—	360.	—

Table 11:**Br** **BROMINE** (Prepared 1964) Table 11:**Br**

Substance Formula	Description	State	Molar mass	0 K	298.15 K (25°C) and 0.1 MPa (1 bar)				
				$\Delta_f H^\circ_0$	$\Delta_f H^\circ$	$\Delta_f G^\circ$	$H^\circ - H^\circ_0$	S°	C_p
			g mol^{-1}	kJ mol^{-1}	kJ mol^{-1}			J mol^{-1} K^{-1}	
Br		g	79.9090	117.943	111.884	82.396	6.197	175.022	20.786
Br^+		g	79.9090	1257.794	1257.932	—	6.197	—	—
Br^{2+}		g	79.9090	3361.4	3367.7	—	6.197	—	—
Br^{3+}		g	79.9090	6824.	6837.	—	6.197	—	—
Br^{4+}		g	79.9090	11389.	11410.	—	6.197	—	—
Br^{5+}		g	79.9090	17150.	17175.	—	6.197	—	—
Br^-		g	79.9090	-206.82	-219.07	—	6.197	—	—
		ao	79.9090	—	-121.55	-103.96	—	82.4	-141.8
Br_2		cr	159.8180	0	—	—	—	—	—
		l	159.8180	—	0	0	24.514	152.231	75.689
Br_2		g	159.8180	45.702	30.907	3.110	9.719	245.463	36.02
		ao	159.8180	—	-2.59	3.93	—	130.5	—
	in CCl_4:x		159.8180	—	2.97	1.51	—	157.3	—
	in CH_3COOH:u in acetic acid		159.8180	—	-1.05	—	—	—	—
	in CS_2:u		159.8180	—	0.04	—	—	—	—
Br_2	in $CHCl_3$:u		159.8180	—	2.72	—	—	—	—
	in C_7F_{16}:x in n-perfluoroheptane		159.8180	—	16.3	-7.5	—	231.8	—
Br_2^+		g	159.8180	1064.4	1056.0	—	—	—	—
Br_3^-		ao	239.7270	—	-130.42	-107.05	—	215.5	—
Br_5^-		ao	399.5450	—	-142.3	-103.7	—	316.7	—
BrO		g	95.9084	133.5	125.77	108.22	8.91	237.55	32.09
BrO^-		ao	95.9084	—	-94.1	-33.4	—	42.	—
BrO_2		cr	111.9078	—	48.5	—	—	—	—
BrO_3^-		ao	127.9072	—	-67.07	18.60	—	161.71	—
BrO_4^-		ao	143.9066	—	13.0	118.1	—	199.6	—
HBr		g	80.9170	-28.560	-36.40	-53.45	8.648	198.695	29.142
		ai	80.9170	—	-121.55	-103.96	—	82.4	-141.8
	in 1.0 H_2O		80.9170	—	-72.72	—	—	—	—
	in 1.5 H_2O		80.9170	—	-85.86	—	—	—	—
	in 2.0 H_2O		80.9170	—	-93.72	—	—	—	—
HBr	in 2.5 H_2O		80.9170	—	-99.37	—	—	—	—
	in 3.0 H_2O		80.9170	—	-103.26	—	—	—	—
	in 4.0 H_2O		80.9170	—	-108.621	—	—	—	—
	in 4.5 H_2O		80.9170	—	-110.437	—	—	—	—
	in 5.0 H_2O		80.9170	—	-111.738	—	—	—	—
HBr	in 6.0 H_2O		80.9170	—	-113.583	—	—	—	—
	in 8.0 H_2O		80.9170	—	-115.683	—	—	—	—
	in 10 H_2O		80.9170	—	-116.955	—	—	—	—
	in 12 H_2O		80.9170	—	-117.734	—	—	—	—
	in 15 H_2O		80.9170	—	-118.436	—	—	—	—
HBr	in 20 H_2O		80.9170	—	-119.077	—	—	—	—
	in 25 H_2O		80.9170	—	-119.411	—	—	—	—
	in 30 H_2O		80.9170	—	-119.641	—	—	—	—
	in 40 H_2O		80.9170	—	-119.959	—	—	—	—
	in 50 H_2O		80.9170	—	-120.160	—	—	—	—
HBr	in 75 H_2O		80.9170	—	-120.416	—	—	—	—
	in 100 H_2O		80.9170	—	-120.562	—	—	—	—
	in 150 H_2O		80.9170	—	-120.721	—	—	—	—

Table 11:**Br** **BROMINE** (Prepared 1964) — Continued Table 11:**Br**

Substance Formula	Description	State	Molar mass g mol^{-1}	0 K $\Delta_f H^\circ_0$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H^\circ_0$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
HBr	in 200 H_2O		80.9170	—	-120.809	—	—	—	—
	in 300 H_2O		80.9170	—	-120.918	—	—	—	—
	in 400 H_2O		80.9170	—	-120.980	—	—	—	—
	in 500 H_2O		80.9170	—	-121.026	—	—	—	—
	in 600 H_2O		80.9170	—	-121.064	—	—	—	—
HBr	in 700 H_2O		80.9170	—	-121.093	—	—	—	—
	in 800 H_2O		80.9170	—	-121.118	—	—	—	—
	in 900 H_2O		80.9170	—	-121.139	—	—	—	—
	in 1 000 H_2O		80.9170	—	-121.160	—	—	—	—
	in 1 500 H_2O		80.9170	—	-121.223	—	—	—	—
HBr	in 2 000 H_2O		80.9170	—	-121.261	—	—	—	—
	in 3 000 H_2O		80.9170	—	-121.311	—	—	—	—
	in 4 000 H_2O		80.9170	—	-121.340	—	—	—	—
	in 5 000 H_2O		80.9170	—	-121.361	—	—	—	—
	in 7 000 H_2O		80.9170	—	-121.390	—	—	—	—
HBr	in 10 000 H_2O		80.9170	—	-121.415	—	—	—	—
	in 20 000 H_2O		80.9170	—	-121.453	—	—	—	—
	in 50 000 H_2O		80.9170	—	-121.491	—	—	—	—
	in 100 000 H_2O		80.9170	—	-121.508	—	—	—	—
	in ∞ H_2O		80.9170	—	-121.55	—	—	—	—
HBr	in C_4H_{10}:x in n–butane		80.9170	—	-49.4	-44.8	—	126.4	—
	in C_6H_6:x		80.9170	—	-54.0	-46.8	—	117.6	—
	in C_6H_{14}:x in n–hexane		80.9170	—	-47.7	-45.6	—	134.3	—
	in C_8H_{18}:x in n–octane		80.9170	—	-47.7	-46.0	—	136.0	—
	in $CHCl_3$:x		80.9170	—	-50.2	-46.0	—	127.2	—
HBr	in $C_{10}H_{22}$:x in n–decane		80.9170	—	-47.3	-46.4	—	138.1	—
	in CCl_4:x		80.9170	—	-49.8	-45.6	—	127.2	—
HBr^+		g	80.9170	1096.6	1095.0	—	—	—	—
HBrO		ao	96.9164	—	-113.0	-82.4	—	142.	—
$HBrO_3$		ai	128.9152	—	-67.07	18.60	—	161.71	—
$HBrO_3$	in 400 H_2O		128.9152	—	-66.86	—	—	—	—
$HBrO_4$		ai	144.9146	—	13.0	118.1	—	199.6	—
BrF		g	98.9074	-86.2	-93.85	-109.18	9.021	228.97	32.97
BrF_3		l	136.9042	—	-300.8	-240.5	—	178.2	124.60
		g	136.9042	-244.39	-255.60	-229.43	14.293	292.53	66.61
BrF_5		l	174.9010	—	-458.6	-351.8	—	225.1	—
		g	174.9010	-413.17	-428.9	-350.6	18.627	320.19	99.62
BrCl		g	115.3620	22.09	14.64	-0.98	9.393	240.10	34.98
	in CCl_4:u		115.3620	—	-6.473	—	—	—	—
$BrCl^+$		g	115.3620	1088.	1088.	—	—	—	—
Br_2Cl^-		ao	195.2710	—	-170.3	-128.4	—	188.7	—

Table 12:I | **IODINE** (Prepared 1964) | Table 12:I

Substance Formula	and Description	State	Molar mass g mol^{-1}	0 K $\Delta_f H_0^\circ$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H_0^\circ$	S° J mol^{-1} K^{-1}	C_p
I		g	126.9044	107.240	106.838	70.250	6.197	180.791	20.786
I^+		g	126.9044	1115.626	1121.421	—	6.197	—	—
I^{2+}		g	126.9044	2961.48	2973.49	—	6.197	—	—
I^-		g	126.9044	-188.	-197.	—	—	—	—
		ao	126.9044	—	-55.19	-51.57	—	111.3	-142.3
I_2		cr	253.8088	0	0	0	13.196	116.135	54.438
		g	253.8088	65.517	62.438	19.327	10.117	260.69	36.90
		ao	253.8088	—	22.6	16.40	—	137.2	—
	in C_6H_6:x		253.8088	—	18.0	7.1	—	152.7	—
	in C_6H_{12}:x in cyclohexane		253.8088	—	24.3	11.7	—	158.2	—
I_2	in CCl_4:s		253.8088	—	25.1	11.13	—	163.2	—
	in CCl_2FCClF_2:x		253.8088	—	30.5	15.1	—	168.2	—
	in $CHBr_3$:x		253.8088	—	22.2	6.7	—	168.6	—
	in CH_3OH:u		253.8088	—	8.8	—	—	—	—
	in $C_4H_8O_2$:u2 in 1,4–dioxane		253.8088	—	7.5	—	—	—	—
I_2	in C_2H_5OH:u		253.8088	—	7.1	—	—	—	—
	in CH_3COOCH_3:u in methyl acetate		253.8088	—	10.0	—	—	—	—
	in $(C_2H_5)_2O$:u		253.8088	—	7.5	—	—	—	—
	in CS_2:u		253.8088	—	21.8	—	—	—	—
	in C_5H_5N:u in pyridine		253.8088	—	16.7	—	—	—	—
I_2	in $CH_3COOC_2H_5$:u in ethyl acetate		253.8088	—	13.0	—	—	—	—
	in $C_6H_5CH_3$:u		253.8088	—	15.9	—	—	—	—
	in C_6H_5Cl:u		253.8088	—	20.1	—	—	—	—
	in $CF_3C_6F_{11}$:x in perfluoromethylcyclohexane		253.8088	—	39.7	20.9	—	179.5	—
	in $CHCl_3$:u		253.8088	—	22.2	—	—	—	—
I_2	in $C_6H_5NO_2$:u		253.8088	—	7.1	—	—	—	—
	in $C_6H_5COOCH_3$:u in methyl benzoate		253.8088	—	16.3	—	—	—	—
	in C_7F_{16}:x in perfluoroheptane		253.8088	—	43.1	21.3	—	189.1	—
I_2^+		g	253.8088	964.4	967.3	—	—	—	—
I_3^-		ao	380.7132	—	-51.5	-51.4	—	239.3	—
IO		g	142.9038	177.0	175.06	149.77	9.008	245.50	32.89
IO^-		ao	142.9038	—	-107.5	-38.5	—	-5.4	—
IO_3^-		ao	174.9026	—	-221.3	-128.0	—	118.4	—
IO_4^-		ao	190.9020	—	-151.5	-58.5	—	222.	—
I_2O^{2-}		ao	269.8082	—	—	-82.4	—	—	—
I_2O_5		cr	333.8058	—	-158.07	—	—	—	—
HI		g	127.9124	28.660	26.48	1.70	8.657	206.594	29.158
		ai	127.9124	—	-55.19	-51.57	—	111.3	-142.3
	in 3.0 H_2O		127.9124	—	-35.82	—	—	—	—
	in 4.0 H_2O		127.9124	—	-42.80	—	—	—	—
HI	in 4.5 H_2O		127.9124	—	-44.89	—	—	—	—
	in 5.0 H_2O		127.9124	—	-46.40	—	—	—	—
	in 6.0 H_2O		127.9124	—	-48.367	—	—	—	—
	in 8.0 H_2O		127.9124	—	-50.522	—	—	—	—

Table 12:I — IODINE (Prepared 1964) — Continued — Table 12:I

Substance	Formula and Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
HI	in 10 H_2O		127.9124	—	-51.610	—	—	—	—
	in 12 H_2O		127.9124	—	-52.258	—	—	—	—
	in 15 H_2O		127.9124	—	-52.944	—	—	—	—
	in 20 H_2O		127.9124	—	-53.530	—	—	—	—
	in 25 H_2O		127.9124	—	-53.781	—	—	—	—
HI	in 30 H_2O		127.9124	—	-53.928	—	—	—	—
	in 40 H_2O		127.9124	—	-54.099	—	—	—	—
	in 50 H_2O		127.9124	—	-54.208	—	—	—	—
	in 75 H_2O		127.9124	—	-54.375	—	—	—	—
	in 100 H_2O		127.9124	—	-54.451	—	—	—	—
HI	in 200 H_2O		127.9124	—	-54.601	—	—	—	—
	in 300 H_2O		127.9124	—	-54.664	—	—	—	—
	in 400 H_2O		127.9124	—	-54.702	—	—	—	—
	in 500 H_2O		127.9124	—	-54.735	—	—	—	—
	in 600 H_2O		127.9124	—	-54.760	—	—	—	—
HI	in 800 H_2O		127.9124	—	-54.802	—	—	—	—
	in 1 000 H_2O		127.9124	—	-54.836	—	—	—	—
	in 2 000 H_2O		127.9124	—	-54.923	—	—	—	—
	in 3 000 H_2O		127.9124	—	-54.969	—	—	—	—
	in 4 000 H_2O		127.9124	—	-54.994	—	—	—	—
HI	in 5 000 H_2O		127.9124	—	-55.015	—	—	—	—
	in 7 000 H_2O		127.9124	—	-55.045	—	—	—	—
	in 10 000 H_2O		127.9124	—	-55.066	—	—	—	—
	in 20 000 H_2O		127.9124	—	-55.103	—	—	—	—
	in 50 000 H_2O		127.9124	—	-55.137	—	—	—	—
HI	in 100 000 H_2O		127.9124	—	-55.149	—	—	—	—
	in ∞ H_2O		127.9124	—	-55.19	—	—	—	—
HI^+		g	127.9124	1030.77	1034.79	—	—	—	—
HIO		ao	143.9118	—	-138.1	-99.1	—	95.4	—
HIO_3		cr	175.9106	—	-230.1	—	—	—	—
HIO_3		ao	175.9106	—	-211.3	-132.6	—	166.9	—
	in 100 H_2O		175.9106	—	-216.3	—	—	—	—
	in 200 H_2O		175.9106	—	-216.7	—	—	—	—
	in 400 H_2O		175.9106	—	-217.6	—	—	—	—
	in 800 H_2O		175.9106	—	-218.4	—	—	—	—
H_2OI^+		ao	144.9198	—	—	-106.7	—	—	—
$H_3IO_6^{2-}$		ao	225.9248	—	-756.0	—	—	—	—
$H_4IO_6^-$		ao	226.9328	—	-759.4	—	—	—	—
H_5IO_6		ao	227.9408	—	-759.4	—	—	—	—
	in 2 000 H_2O		227.9408	—	-757.7	—	—	—	—
I_2OH^-		ao	270.8162	—	—	-230.1	—	—	—
$I_2O_5 \cdot HIO_3$		cr	509.7164	—	-385.8	—	—	—	—
IF		g	145.9028	-93.72	-95.65	-118.51	9.096	236.17	33.43
IF^+		g	145.9028	923.4	927.6	—	—	—	—
IF_5		l	221.8964	—	-864.8	—	—	—	—
IF_5		g	221.8964	-812.91	-822.49	-751.73	19.100	327.7	99.2
IF_5^+		g	221.8964	436.0	432.6	—	—	—	—
IF_7		g	259.8932	-930.5	-943.9	-818.3	24.066	346.5	136.4
ICl	α form	cr	162.3574	—	-35.1	—	—	—	—
		l	162.3574	—	-23.89	-13.58	—	135.1	—

Table 12:I — **IODINE** (Prepared 1964) — Continued — Table 12:I

Substance Formula and Description		State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
ICl		g	162.3574	19.41	17.78	-5.46	9.548	247.551	35.56
		ao	162.3574	—	—	-17.1	—	—	—
	in CCl_4:x		162.3574	—	-13.8	-8.8	—	152.7	—
ICl^+		g	162.3574	992.9	997.5	—	—	—	—
ICl_2^-		ao	197.8104	—	—	-161.0	—	—	—
ICl_3		cr	233.2634	—	-89.5	-22.29	—	167.4	—
I_2Cl^-		ao	289.2618	—	-137.7	-116.3	—	221.3	—
IBr		cr	206.8134	—	-10.5	—	—	—	—
		g	206.8134	49.79	40.84	3.69	9.904	258.773	36.44
		ao	206.8134	—	—	-4.2	—	—	—
IBr	in CCl_4:x		206.8134	—	6.78	-1.7	—	163.	—
IBr^+		g	206.8134	994.41	991.65	—	—	—	—
IBr_2^-		ao	286.7224	—	—	-123.0	—	—	—
BrI_2^-		ao	333.7178	—	-128.0	-110.0	—	197.5	—
$HBrI_2$	from BrI_2^-	ai	334.7258	—	-128.0	-110.0	—	197.5	—
$IBrCl^-$		ao	242.2664	—	—	-146.4	—	—	—

Table 13:**At** **ASTATINE** (Prepared 1964) Table 13:**At**

Substance Formula and Description	State	Molar mass g mol^{-1}	0 K $\Delta_f H_0^\circ$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H_0^\circ$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
At	cr	210.0000	0	0	0	—	—	—

Table 14:S **SULFUR** (Prepared 1964) Table 14:S

Substance Formula and Description		State	Molar mass g mol⁻¹	0 K $\Delta_f H_0^\circ$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H_0^\circ$	S° J mol⁻¹ K⁻¹	C_p
S	rhombic	cr	32.0640	0	0	0	4.410	31.80	22.64
	monoclinic	cr2	32.0640	—	0.33	—	—	—	—
		g	32.0640	276.6	278.805	238.250	6.657	167.821	23.673
	in 2 CS_2		32.0640	—	1.682	—	—	—	—
	in 6 CS_2		32.0640	—	1.695	—	—	—	—
S	in $(C_2H_5)_2O$:u		32.0640	—	6.3	—	—	—	—
	in C_6H_6:u		32.0640	—	2.89	—	—	—	—
	in $CHCl_3$:u		32.0640	—	2.93	—	—	—	—
	in CCl_4:u		32.0640	—	2.59	—	—	—	—
S^+		g	32.0640	1276.133	1284.111	—	6.197	—	—
S^{2+}		g	32.0640	3527.5	3543.4	—	8.042	—	—
S^{3+}		g	32.0640	6887.7	6908.2	—	6.422	—	—
S^{4+}		g	32.0640	11452.0	11478.8	—	6.197	—	—
S^{5+}		g	32.0640	18464.	18497.	—	6.197	—	—
S^{6+}		g	32.0640	26958.	26995.	—	6.197	—	—
S^{7+}		g	32.0640	54061.	54107.	—	6.197	—	—
S^{8+}		g	32.0640	85730.	85780.	—	6.197	—	—
S^{9+}		g	32.0640	122307.	122365.	—	6.197	—	—
S^-		g	32.0640	75.	71.	—	—	—	—
S^{2-}		ao	32.0640	—	33.1	85.8	—	-14.6	—
S_2		g	64.1280	128.227	128.37	79.30	8.958	228.18	32.47
S_2^+		g	64.1280	1031.4	1037.6	—	—	—	—
S_2^{2-}		ao	64.1280	—	30.1	79.5	—	28.5	—
S_3		g	96.1920	—	132.6	—	—	—	—
S_3^+		g	96.1920	—	1072.8	—	—	—	—
S_3^{2-}		ao	96.1920	—	25.9	73.7	—	66.1	—
S_4		g	128.2560	—	136.8	—	—	—	—
S_4^+		g	128.2560	—	1133.4	—	—	—	—
S_4^{2-}		ao	128.2560	—	23.0	69.1	—	103.3	—
S_5		g	160.3200	—	123.8	—	—	—	—
S_5^+		g	160.3200	—	959.8	—	—	—	—
S_5^{2-}		ao	160.3200	—	21.3	65.7	—	140.6	—
S_6		g	192.3840	—	102.5	—	—	—	—
S_6^+		g	192.3840	—	977.0	—	—	—	—
S_7		g	224.4480	—	113.4	—	—	—	—
S_7^+		g	224.4480	—	956.0	—	—	—	—
S_8		g	256.5120	106.06	102.30	49.63	31.510	430.98	156.44
S_8^+		g	256.5120	978.2	980.7	—	—	—	—
SO		g	48.0634	6.3	6.259	-19.853	8.732	221.95	30.17
SO^+		g	48.0634	1001.6	1007.5	—	—	—	—
SO_2		l	64.0628	—	-320.5	—	—	—	—
		g	64.0628	-294.286	-296.830	-300.194	10.548	248.22	39.87
		ao	64.0628	—	-322.980	-300.676	—	161.9	—
	in 100 H_2O		64.0628	—	-326.578	—	—	—	—
	in 150 H_2O		64.0628	—	-327.298	—	—	—	—
SO_2	in 200 H_2O		64.0628	—	-327.837	—	—	—	—
	in 250 H_2O		64.0628	—	-328.268	—	—	—	—
	in 300 H_2O		64.0628	—	-328.641	—	—	—	—
	in 400 H_2O		64.0628	—	-329.243	—	—	—	—
	in 500 H_2O		64.0628	—	-329.745	—	—	—	—

Table 14:S SULFUR (Prepared 1964) — Continued Table 14:S

Substance Formula	Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H_0^\circ$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H_0^\circ$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
SO_2	in 750 H_2O		64.0628	—	-330.687	—	—	—	—
	in 1 000 H_2O		64.0628	—	-331.377	—	—	—	—
	in 1 500 H_2O		64.0628	—	-332.465	—	—	—	—
	in 2 000 H_2O		64.0628	—	-333.222	—	—	—	—
	in 2 500 H_2O		64.0628	—	-333.783	—	—	—	—
SO_2	in 3 000 H_2O		64.0628	—	-334.264	—	—	—	—
	in 3 500 H_2O		64.0628	—	-334.674	—	—	—	—
	in 4 000 H_2O		64.0628	—	-335.005	—	—	—	—
	in 5 000 H_2O		64.0628	—	-335.594	—	—	—	—
	in 7 500 H_2O		64.0628	—	-336.574	—	—	—	—
SO_2	in 10 000 H_2O		64.0628	—	-337.163	—	—	—	—
	in $C_6H_5N(CH_3)_2$:u in dimethylaniline		64.0628	—	-339.7	—	—	—	—
SO_2^+		g	64.0628	896.2	900.0	—	—	—	—
SO_3	I, β	cr	80.0622	—	-454.51	-374.21	—	70.7	—
		l	80.0622	—	-441.04	-373.75	—	113.8	—
SO_3		g	80.0622	-389.99	-395.72	-371.06	11.698	256.76	50.67
SO_3^{2-}		ao	80.0622	—	-635.5	-486.5	—	-29.	—
SO_4^{2-}		ao	96.0616	—	-909.27	-744.53	—	20.1	-293.
$S_2O_3^{2-}$		ao	112.1262	—	-648.5	-522.5	—	67.	—
$S_2O_4^{2-}$		ao	128.1256	—	-753.5	-600.3	—	92.	—
$S_2O_6^{2-}$		aq	160.1244	—	-1198.3	—	—	—	—
$S_2O_7^{2-}$		aq	176.1238	—	-1401.2	—	—	—	—
$S_2O_8^{2-}$		ao	192.1232	—	-1344.7	-1114.9	—	244.3	—
$S_3O_6^{2-}$		aq	192.1884	—	-1199.6	—	—	—	—
$S_4O_6^{2-}$		ao	224.2524	—	-1224.2	-1040.4	—	257.3	-67.8
$S_5O_6^{2-}$		aq	256.3164	—	-1236.4	—	—	—	—
HS		g	33.0720	142.	142.67	113.29	9.083	195.67	32.30
HS^-		ao	33.0720	—	-17.6	12.08	—	62.8	—
HS^+		g	33.0720	1144.7	1151.4	—	—	—	—
H_2S		g	34.0800	-17.707	-20.63	-33.56	9.954	205.79	34.23
H_2S		ao	34.0800	—	-39.7	-27.83	—	121.	—
H_2S^+		g	34.0800	991.6	995.0	—	—	—	—
H_2S_2		l	66.1440	—	-18.12	—	—	—	84.1
		g	66.1440	—	15.52	—	—	—	51.5
H_2S_3		l	98.2080	—	-14.94	—	—	—	—
H_2S_3		g	98.2080	—	30.50	—	—	—	—
H_2S_4		l	130.2720	—	-12.51	—	—	—	—
		g	130.2720	—	44.22	—	—	—	—
H_2S_5		l	162.3360	—	-10.42	—	—	—	—
		g	162.3360	—	57.91	—	—	—	—
H_2S_6		l	194.4000	—	-8.33	—	—	—	—
HSO_3^-		ao	81.0702	—	-626.22	-527.73	—	139.7	—
HSO_4^-		ao	97.0696	—	-887.34	-755.91	—	131.8	-84.
H_2SO_3		ao	82.0782	—	-608.81	-537.81	—	232.2	—
	equivalent to SO_2(ao) + H_2O(l) in 100 H_2O		82.0782	—	-612.408	—	—	—	—
H_2SO_3	in 150 H_2O		82.0782	—	-613.128	—	—	—	—
	in 200 H_2O		82.0782	—	-613.667	—	—	—	—
	in 250 H_2O		82.0782	—	-614.098	—	—	—	—

Table 14:S **SULFUR** (Prepared 1964) — Continued Table 14:S

Substance Formula	Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
H_2SO_3	in 300 H_2O		82.0782	—	-614.471	—	—	—	—
	in 400 H_2O		82.0782	—	-615.073	—	—	—	—
	in 500 H_2O		82.0782	—	-615.575	—	—	—	—
	in 750 H_2O		82.0782	—	-616.517	—	—	—	—
	in 1 000 H_2O		82.0782	—	-617.207	—	—	—	—
H_2SO_3	in 1 500 H_2O		82.0782	—	-618.295	—	—	—	—
	in 2 000 H_2O		82.0782	—	-619.052	—	—	—	—
	in 2 500 H_2O		82.0782	—	-619.613	—	—	—	—
	in 3 000 H_2O		82.0782	—	-620.094	—	—	—	—
	in 3 500 H_2O		82.0782	—	-620.504	—	—	—	—
H_2SO_3	in 4 000 H_2O		82.0782	—	-620.834	—	—	—	—
	in 5 000 H_2O		82.0782	—	-621.424	—	—	—	—
	in 7 500 H_2O		82.0782	—	-622.403	—	—	—	—
	in 10 000 H_2O		82.0782	—	-622.993	—	—	—	—
H_2SO_4		cr	98.0776	-811.985	—	—	—	—	—
H_2SO_4		l	98.0776	—	-813.989	-690.003	28.234	156.904	138.91
		ai	98.0776	—	-909.27	-744.53	—	20.1	-293.
	in 1.0 H_2O		98.0776	—	-841.791	—	—	—	—
	in 1.5 H_2O		98.0776	—	-849.888	—	—	—	—
	in 2.0 H_2O		98.0776	—	-855.440	—	—	—	—
H_2SO_4	in 2.5 H_2O		98.0776	—	-859.611	—	—	—	—
	in 3.0 H_2O		98.0776	—	-862.912	—	—	—	—
	in 3.5 H_2O		98.0776	—	-865.611	—	—	—	—
	in 4.0 H_2O		98.0776	—	-867.879	—	—	—	—
	in 4.5 H_2O		98.0776	—	-869.808	—	—	—	—
H_2SO_4	in 5.0 H_2O		98.0776	—	-871.477	—	—	—	—
	in 5.5 H_2O		98.0776	—	-872.937	—	—	—	—
	in 6.0 H_2O		98.0776	—	-874.222	—	—	—	—
	in 7.0 H_2O		98.0776	—	-876.372	—	—	—	—
	in 8.0 H_2O		98.0776	—	-878.075	—	—	—	—
H_2SO_4	in 9.0 H_2O		98.0776	—	-879.435	—	—	—	—
	in 10 H_2O		98.0776	—	-880.527	—	—	—	—
	in 12 H_2O		98.0776	—	-882.134	—	—	—	—
	in 15 H_2O		98.0776	—	-883.623	—	—	—	—
	in 20 H_2O		98.0776	—	-884.916	—	—	—	—
H_2SO_4	in 25 H_2O		98.0776	—	-885.585	—	—	—	—
	in 30 H_2O		98.0776	—	-885.983	—	—	—	—
	in 40 H_2O		98.0776	—	-886.460	—	—	—	—
	in 50 H_2O		98.0776	—	-886.774	—	—	—	—
	in 75 H_2O		98.0776	—	-887.292	—	—	—	—
H_2SO_4	in 100 H_2O		98.0776	—	-887.636	—	—	—	—
	in 115 H_2O		98.0776	—	-887.811	—	—	—	—
	in 150 H_2O		98.0776	—	-888.188	—	—	—	—
	in 200 H_2O		98.0776	—	-888.627	—	—	—	—
	in 300 H_2O		98.0776	—	-889.372	—	—	—	—
H_2SO_4	in 400 H_2O		98.0776	—	-889.974	—	—	—	—
	in 500 H_2O		98.0776	—	-890.493	—	—	—	—
	in 600 H_2O		98.0776	—	-890.983	—	—	—	—
	in 700 H_2O		98.0776	—	-891.359	—	—	—	—
	in 800 H_2O		98.0776	—	-891.728	—	—	—	—

Table 14:S SULFUR (Prepared 1964) — Continued Table 14:S

Substance Formula	Description	State	Molar mass g mol^{-1}	0 K: $\Delta_f H^\circ_0$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar): $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H^\circ_0$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
H_2SO_4	in 900 H_2O		98.0776	—	−892.050	—	—	—	—
	in 1 000 H_2O		98.0776	—	−892.343	—	—	—	—
	in 1 500 H_2O		98.0776	—	−893.522	—	—	—	—
	in 2 000 H_2O		98.0776	—	−894.476	—	—	—	—
	in 3 000 H_2O		98.0776	—	−895.941	—	—	—	—
H_2SO_4	in 4 000 H_2O		98.0776	—	−897.112	—	—	—	—
	in 5 000 H_2O		98.0776	—	−897.970	—	—	—	—
	in 7 000 H_2O		98.0776	—	−899.330	—	—	—	—
	in 10 000 H_2O		98.0776	—	−900.752	—	—	—	—
	in 15 000 H_2O		98.0776	—	−902.342	—	—	—	—
H_2SO_4	in 20 000 H_2O		98.0776	—	−903.326	—	—	—	—
	in 30 000 H_2O		98.0776	—	−904.715	—	—	—	—
	in 50 000 H_2O		98.0776	—	−906.024	—	—	—	—
	in 70 000 H_2O		98.0776	—	−906.698	—	—	—	—
	in 100 000 H_2O		98.0776	—	−907.321	—	—	—	—
H_2SO_4	in 150 000 H_2O		98.0776	—	−907.807	—	—	—	—
	in 200 000 H_2O		98.0776	—	−908.104	—	—	—	—
	in 300 000 H_2O		98.0776	—	−908.430	—	—	—	—
	in 500 000 H_2O		98.0776	—	−908.719	—	—	—	—
	in 700 000 H_2O		98.0776	—	−908.853	—	—	—	—
H_2SO_4	in 1 000 000 H_2O		98.0776	—	−908.957	—	—	—	—
	in 2 000 000 H_2O		98.0776	—	−909.087	—	—	—	—
	in ∞ H_2O		98.0776	—	−909.27	—	—	—	—
	in 5 $(CH_3)_2SO_4$ in dimethyl sulfate		98.0776	—	−824.25	—	—	—	—
	in 10 $(CH_3)_2SO_4$		98.0776	—	−826.13	—	—	—	—
H_2SO_4	in 15 $(CH_3)_2SO_4$		98.0776	—	−826.76	—	—	—	—
	in 20 $(CH_3)_2SO_4$		98.0776	—	−827.60	—	—	—	—
	in 25 $(CH_3)_2SO_4$		98.0776	—	−828.01	—	—	—	—
	in 10 C_2H_5OH		98.0776	—	−876.76	—	—	—	—
	in 15 C_2H_5OH		98.0776	—	−879.90	—	—	—	—
H_2SO_4	in 20 C_2H_5OH		98.0776	—	−882.61	—	—	—	—
	in 25 C_2H_5OH		98.0776	—	−884.29	—	—	—	—
	in 49 C_2H_5OH		98.0776	—	−887.22	—	—	—	—
	in 5 $C_6H_5NO_2$		98.0776	—	−819.02	—	—	—	—
	in 10 $C_6H_5NO_2$		98.0776	—	−820.27	—	—	—	—
H_2SO_4	in 15 $C_6H_5NO_2$		98.0776	—	−821.11	—	—	—	—
	in 20 $C_6H_5NO_2$		98.0776	—	−821.86	—	—	—	—
	in 25 $C_6H_5NO_2$		98.0776	—	−822.37	—	—	—	—
	in 49 $C_6H_5NO_2$		98.0776	—	−823.58	—	—	—	—
	in 5 $(C_2H_5)_2O$		98.0776	—	−861.61	—	—	—	—
H_2SO_4	in 10 $(C_2H_5)_2O$		98.0776	—	−866.72	—	—	—	—
	in 15 $(C_2H_5)_2O$		98.0776	—	−870.90	—	—	—	—
	in 20 $(C_2H_5)_2O$		98.0776	—	−874.08	—	—	—	—
	in 25 $(C_2H_5)_2O$		98.0776	—	−876.59	—	—	—	—
	in CH_2ClCH_2Cl:u in 1,2–dichloroethane		98.0776	—	−795.8	—	—	—	—
$H_2SO_4{\cdot}H_2O$		l	116.0930	—	−1127.621	−950.383	—	211.54	214.85
$H_2SO_4{\cdot}2H_2O$		l	134.1084	—	−147.100	−1199.650	—	276.40	260.83
$H_2SO_4{\cdot}3H_2O$		l	152.1238	—	−1720.402	−1443.980	—	345.39	318.95

Table 14:S **SULFUR** (Prepared 1964) — Continued Table 14:S

Substance Formula and Description		State	Molar mass g mol^{-1}	0 K $\Delta_f H^\circ_0$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H^\circ_0$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
$H_2SO_4 \cdot 4H_2O$		l	170.1392	—	-2011.199	-1685.863	—	414.59	382.21
$H_2SO_4 \cdot 6.5H_2O$		l	215.1777	—	-2733.256	-2285.734	—	587.89	570.28
$HS_2O_4^-$		ao	129.1336	—	—	-614.5	—	—	—
$H_2S_2O_4$		ao	130.1416	—	—	-616.6	—	—	—
$H_2S_2O_6$		aq	162.1404	—	-1198.3	—	—	—	—
$H_2S_2O_7$		cr	178.1398	—	-1273.6	—	—	—	113.
$H_2S_2O_8$		ai	194.1392	—	-1344.7	-1114.9	—	244.3	—
SF_4		g	108.0576	-767.3	-774.9	-731.3	14.569	292.03	73.01
SF_6		g	146.0544	-1195.4	-1209.	-1105.3	16.970	291.82	97.28
		ai	146.0544	—	-1225.9	-1084.8	—	166.5	—
SO_3F^-		ao	99.0606	—	-871.5	—	—	—	—
SOF_2		g	86.0602	—	—	—	12.539	278.68	56.82
SO_2F_2		g	102.0596	—	—	—	13.560	284.04	66.02
$HF \cdot SO_2$		g	84.0692	—	-582.4	—	—	—	—
HSO_3F		l	100.0686	—	-795.0	—	—	—	—
HSO_3F		ai	100.0686	—	-871.5	—	—	—	—
SCl_2		l	102.9700	—	-50.	—	—	—	—
		g	102.9700	—	-19.7	—	—	—	—
S_2Cl_2		l	135.0340	—	-59.4	—	—	—	—
		g	135.0340	-17.49	-18.4	-31.8	17.079	331.5	73.6
S_3Cl_2		l	167.0980	—	-51.9	—	—	—	—
S_4Cl_2		l	199.1620	—	-42.7	—	—	—	—
S_5Cl_2		l	231.2260	—	-36.8	—	—	—	—
$SOCl_2$		l	118.9694	—	-245.6	—	—	—	121.
		g	118.9694	-209.49	-212.5	-198.3	14.891	309.77	66.5
$SOCl_2$	in C_6H_6:u		118.9694	—	-249.8	—	—	—	—
SO_2Cl_2		l	134.9688	—	-394.1	—	—	—	134.
		g	134.9688	-357.73	-364.0	-320.0	16.004	311.94	77.0
	in C_6H_6:u		134.9688	—	-394.1	—	—	—	—
$S_2O_5Cl_2$		l	215.0310	—	-705.8	—	—	—	234.
$S_2O_5Cl_2$		g	215.0310	—	-641.0	—	—	—	—
$SO_2 \cdot HCl$		g	100.5238	—	-403.8	—	—	—	—
HSO_3Cl		l	116.5232	—	-601.2	—	—	—	—
SF_5Cl		l	162.5090	—	-1065.7	—	—	—	—
		g	162.5090	-1035.46	-1048.1	-949.3	18.393	319.18	104.2
S_2Br_2		l	223.9460	—	-13.	—	—	—	—
$SOBr_2$		l	207.8814	—	-168.6	—	—	—	—
		g	207.8814	-102.47	-123.0	-136.8	12.719	332.95	69.71

Table 15:Se — **SELENIUM** (Prepared 1964) — Table 15:Se

Substance Formula	Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H_0^\circ$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H_0^\circ$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
Se	hexagonal, black	cr	78.9600	0	0	0	5.519	42.442	25.363
	monoclinic, red	cr2	78.9600	—	6.7	—	—	—	—
		vit	78.9600	—	5.0	—	—	—	—
		g	78.9600	226.40	227.07	187.03	6.199	176.72	20.820
Se^+		g	78.9600	1167.34	1174.20	—	6.197	—	—
Se^{2-}		ao	78.9600	—	—	129.3	—	—	—
Se^{2+}		g	78.9600	3211.6	3224.6	—	6.197	—	—
Se^{3+}		g	78.9600	6185.2	6204.5	—	6.197	—	—
Se^{4+}		g	78.9600	10328.6	10354.1	—	6.197	—	—
Se^{5+}		g	78.9600	16920.	16949.	—	6.197	—	—
Se_2		g	157.9200	147.53	146.0	96.2	9.519	252.0	35.40
Se_6		g	473.7600	—	164.0	—	—	—	—
SeO		g	94.9594	54.4	53.35	26.80	8.820	234.0	31.25
SeO_2		cr	110.9588	—	-225.35	—	—	—	—
		aq	110.9588	—	-221.63	—	—	—	—
SeO_3		cr	126.9582	—	-166.9	—	—	—	—
SeO_3^{2-}		ao	126.9582	—	-509.2	-369.8	—	13.	—
SeO_4^{2-}		ao	142.9576	—	-599.1	-441.3	—	54.0	—
Se_2O_5		cr	237.9170	—	-408.4	—	—	—	—
HSe^-		ao	79.9680	—	15.9	44.0	—	79.	—
H_2Se		g	80.9760	33.68	29.7	15.9	10.004	219.02	34.73
		ao	80.9760	—	19.2	22.2	—	163.6	—
$HSeO_3^-$		ao	127.9662	—	-514.55	-411.46	—	135.1	—
$HSeO_4^-$		ao	143.9656	—	-581.6	-452.2	—	149.4	—
H_2SeO_3		cr	128.9742	—	-524.46	—	—	—	—
H_2SeO_3		ao	128.9742	—	-507.48	-426.14	—	207.9	—
		aq	128.9742	—	-507.27	—	—	—	—
H_2SeO_4		cr	144.9736	—	-530.1	—	—	—	—
	in 7.85 H_2O		144.9736	—	-562.3	—	—	—	—
	in 500 H_2O		144.9736	—	-586.2	—	—	—	—
H_2SeO_4	in 1 200 H_2O		144.9736	—	-587.0	—	—	—	—
$H_2SeO_4 \cdot H_2O$		cr	162.9890	—	-840.6	—	—	—	—
		l	162.9890	—	-820.5	—	—	—	—
SeF_6		g	192.9504	-1105.0	-1117.	-1017.	19.832	313.87	110.5
$SeCl_2$		g	149.8660	—	-31.8	—	—	—	—
$SeCl_4$		cr	220.7720	—	-183.3	—	—	—	—
Se_2Cl_2		l	228.8260	—	-82.4	—	—	—	—
		g	228.8260	—	17.	—	—	—	—
$SeOCl_2$		g	165.8654	—	-25.	—	—	—	—
$Se(OH)_3ClO_4$		cr	229.4328	—	-616.7	—	—	—	—
$SeBr_2$		g	238.7780	—	-21.	—	—	—	—
Se_2Br_2		g	317.7380	—	29.	—	—	—	—
$SeO_2 \cdot SO_3$		cr	191.0210	—	-689.1	—	—	—	—

Table 16:Te **TELLURIUM** (Prepared 1964) Table 16:Te

Substance Formula and Description		State	Molar mass g mol^{-1}	0 K $\Delta_f H_0^\circ$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H_0^\circ$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
Te		cr	127.6000	0	0	0	6.121	49.71	25.73
		am	127.6000	—	11.3	—	—	—	—
		g	127.6000	197.	196.73	157.08	6.197	182.74	20.786
Te^{+}		g	127.6000	1065.92	1072.19	—	6.197	—	—
Te^{2+}		g	127.6000	2862.	2874.	—	6.197	—	—
Te^{3+}		g	127.6000	5561.	5577.	—	6.197	—	—
Te^{4+}		g	127.6000	9171.	9196.	—	6.197	—	—
Te^{5+}		g	127.6000	14841.	14870.	—	6.197	—	—
Te^{6+}		g	127.6000	21661.	21698.	—	6.197	—	—
Te_2		g	255.2000	170.50	168.2	118.0	9.954	268.14	36.74
$Te_2{}^{+}$		g	255.2000	947.3	951.0	—	—	—	—
TeO		g	143.5994	67.	65.3	38.5	8.757	241.5	30.08
TeO_2		cr	159.5988	—	-322.6	-270.3	—	79.5	—
$TeO_3{}^{2-}$		aq	175.5982	—	-544.8	—	—	—	—
H_2Te		g	129.6160	—	99.6	—	—	—	—
H_2Te^{+}		g	129.6160	—	987.47	—	—	—	—
H_2TeO_3		ai	177.6142	—	—	-476.1	—	—	—
H_2TeO_4	in 100 H_2O		193.6136	—	-711.	—	—	—	—
$Te(OH)_3{}^{+}$		ao	178.6222	—	-608.4	-496.1	—	111.7	—
$H_4TeO_6{}^{2-}$		ao	227.6284	—	-1222.1	—	—	—	—
$H_5TeO_6{}^{-}$		ao	228.6364	—	-1261.5	—	—	—	—
H_6TeO_6		cr	229.6444	—	-1298.7	—	—	—	—
		aq	229.6444	—	-1284.	—	—	—	—
TeF_6		g	241.5904	—	-1318.	—	—	—	—
$TeCl_4$		cr	269.4120	—	-326.4	—	—	—	138.5
$TeBr_4$		cr	447.2360	—	-190.4	—	—	—	—
$(TeO_2)_2\cdot SO_3$		cr	399.2598	—	-1317.5	—	—	—	—
TeSe		g	206.5600	160.7	159.0	108.8	—	265.8	—

Table 17:**Po** — **POLONIUM** (Prepared 1965) — Table 17:**Po**

Substance Formula and Description	State	Molar mass g mol^{-1}	0 K $\Delta_f H_0^\circ$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H_0^\circ$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
Po	cr	210.0000	0	0	0	—	—	—
Po^{2+}	ao	210.0000	—	—	71.	—	—	—
Po^{4+}	ao	210.0000	—	—	293.	—	—	—
$Po(OH)_2^{4+}$	ao	244.0148	—	—	-473.	—	—	—
$Po(OH)_4$	cr	278.0296	—	—	-544.	—	—	—
$PoCl_6^{2-}$	ao	422.7180	—	—	-577.	—	—	—
PoS	cr	242.0640	—	—	-4.	—	—	—

NITROGEN (Prepared 1964) Table 18:N

Table 18:N

Substance Formula	and Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
N		g	14.0067	470.842	472.704	455.563	6.197	153.298	20.786
N^+		g	14.0067	1873.156	1882.139	—	7.121	—	—
N^{2+}		g	14.0067	4729.221	4744.443	—	7.163	—	—
N^{3+}		g	14.0067	9307.345	9327.793	—	6.197	—	—
N^{4+}		g	14.0067	16782.338	16808.986	—	6.197	—	—
N^{5+}		g	14.0067	26227.224	26260.068	—	6.197	—	—
N^{6+}		g	14.0067	79493.61	79532.65	—	6.197	—	—
N^{7+}		g	14.0067	143853.0	143898.2	—	6.197	—	—
N_2		g	28.0134	0	0	0	8.669	191.61	29.125
N_2^+		g	28.0134	1503.378	1509.575	—	—	—	—
N_3^+		g	42.0201	1628.	1632.6	—	—	—	—
N_3^-		g	42.0201	188.	180.7	—	—	—	—
	azide	ao	42.0201	—	275.14	348.2	—	107.9	—
NO		g	30.0061	89.75	90.25	86.55	9.192	210.761	29.844
NO^+		g	30.0061	983.637	989.826	—	8.669	—	—
NO_2		g	46.0055	35.98	33.18	51.31	10.201	240.06	37.20
NO_2^+		g	46.0055	964.0	967.8	—	—	—	—
NO_2^-		ao	46.0055	—	-104.6	-32.2	—	123.0	-97.5
NO_3^-	nitrate	ao	62.0049	—	-205.0	-108.74	—	146.4	-86.6
	peroxynitrite	aq2	62.0049	—	-44.8	—	—	—	—
N_2O		g	44.0128	85.500	82.05	104.20	9.556	219.85	38.45
		aq	44.0128	—	56.1	—	—	—	—
N_2O^+		g	44.0128	1329.59	1332.35	—	—	—	—
$N_2O_2^{2-}$	hyponitrite ion	aq	60.0122	—	-17.2	—	—	—	—
N_2O_3		l	76.0116	—	50.29	—	—	—	—
N_2O_3		g	76.0116	90.492	83.72	139.46	14.920	312.28	65.61
N_2O_4		l	92.0110	—	-19.50	97.54	—	209.2	142.7
		g	92.0110	18.79	9.16	97.89	16.393	304.29	77.28
N_2O_5		cr	108.0104	—	-43.1	113.9	—	178.2	143.1
		g	108.0104	23.8	11.3	115.1	17.728	355.7	84.5
NH		g	15.0147	351.	351.5	345.6	8.602	181.23	29.192
NH_2		g	16.0227	187.78	184.9	194.6	9.937	195.00	33.85
NH_2^+		g	16.0227	1266.5	1269.8	—	—	—	—
NH_3		g	17.0307	-39.08	-46.11	-16.45	9.991	192.45	35.06
		ao	17.0307	—	-80.29	-26.50	—	111.3	—
NH_3	in 1.0 H_2O		17.0307	—	-75.358	—	—	—	—
	in 2.0 H_2O		17.0307	—	-77.655	—	—	—	—
	in 5.0 H_2O		17.0307	—	-79.266	—	—	—	—
	in 10 H_2O		17.0307	—	-79.806	—	—	—	—
	in 20 H_2O		17.0307	—	-80.019	—	—	—	—
NH_3	in 50 H_2O		17.0307	—	-80.149	—	—	—	—
	in 100 H_2O		17.0307	—	-80.195	—	—	—	—
	in 500 H_2O		17.0307	—	-80.220	—	—	—	—
	in 1 000 H_2O		17.0307	—	-80.211	—	—	—	—
	in 5 000 H_2O		17.0307	—	-80.140	—	—	—	—
NH_3	in 10 000 H_2O		17.0307	—	-80.082	—	—	—	—
	in 50 000 H_2O		17.0307	—	-79.856	—	—	—	—
	in 100 000 H_2O		17.0307	—	-79.693	—	—	—	—
	in $(C_2H_5)_2O$:u		17.0307	—	-16.7	—	—	—	—
NH_3^+		g	17.0307	940.1	939.43	—	—	—	—

Table 18:N NITROGEN (Prepared 1964) — Continued Table 18:N

Substance Formula and Description		State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
NH_4^+		ao	18.0387	—	-132.51	-79.31	—	113.4	79.9
N_2H_4		l	32.0454	—	50.63	149.34	—	121.21	98.87
		g	32.0454	109.54	95.40	159.35	11.477	238.47	49.58
		ao	32.0454	—	34.31	128.1	—	138.	—
$N_2H_5^+$		ao	33.0534	—	-7.5	82.5	—	151.	70.3
HN_3		l	43.0281	—	264.0	327.3	—	140.6	—
		g	43.0281	300.49	294.1	328.1	10.874	238.97	43.68
		ao	43.0281	—	260.08	321.8	—	146.0	—
HN_3^+		g	43.0281	1336.75	1336.62	—	—	—	—
NH_4N_3		cr	60.0588	—	115.5	274.2	—	112.5	—
NH_4N_3	from N_3^-	ai	60.0588	—	142.7	268.7	—	221.3	—
HNO_2	cis	g	47.0135	-71.63	-77.99	-42.94	10.912	248.76	44.77
	trans	g2	47.0135	-73.97	-80.12	-45.24	11.096	249.22	46.07
	cis–trans mixture, equil.	g3	47.0135	—	-79.5	-46.0	—	254.1	45.6
		ao	47.0135	—	-119.2	-50.6	—	135.6	—
HNO_3		l	63.0129	—	-174.10	-80.71	—	155.60	109.87
		g	63.0129	-125.27	-135.06	-74.72	11.778	266.38	53.35
		ai	63.0129	—	-207.36	-111.25	—	146.4	-86.6
	in 1.0 H_2O		63.0129	—	-187.631	—	—	—	—
	in 2.0 H_2O		63.0129	—	-194.556	—	—	—	—
HNO_3	in 3.0 H_2O		63.0129	—	-198.568	—	—	—	—
	in 4.0 H_2O		63.0129	—	-201.104	—	—	—	—
	in 5.0 H_2O		63.0129	—	-202.765	—	—	—	—
	in 7.0 H_2O		63.0129	—	-204.593	—	—	—	—
	in 10 H_2O		63.0129	—	-205.819	—	—	—	—
HNO_3	in 15 H_2O		63.0129	—	-206.510	—	—	—	—
	in 25 H_2O		63.0129	—	-206.815	—	—	—	—
	in 50 H_2O		63.0129	—	-206.853	—	—	—	—
	in 100 H_2O		63.0129	—	-206.857	—	—	—	—
	in 500 H_2O		63.0129	—	-206.974	—	—	—	—
HNO_3	in 1 000 H_2O		63.0129	—	-207.041	—	—	—	—
	in 2 000 H_2O		63.0129	—	-207.112	—	—	—	—
	in 5 000 H_2O		63.0129	—	-207.183	—	—	—	—
	in 10 000 H_2O		63.0129	—	-207.229	—	—	—	—
	in 50 000 H_2O		63.0129	—	-207.296	—	—	—	—
HNO_3	in ∞ H_2O		63.0129	—	-207.36	—	—	—	—
$HNO_3 \cdot H_2O$		l	81.0283	—	-473.46	-328.77	—	216.90	182.46
$HNO_3 \cdot 3H_2O$		l	117.0591	—	-1056.04	-811.09	—	346.98	325.14
NH_2OH		cr	33.0301	—	-114.2	—	—	—	—
		aq	33.0301	—	-98.3	—	—	—	—
$NH_2OH_2^+$		aq	34.0381	—	-137.2	—	—	—	—
NH_4OH		l	35.0461	—	-361.20	-254.02	—	165.56	154.89
	from NH_4^+	ai	35.0461	—	-362.50	-236.53	—	102.5	-68.6
	equivalent to NH_3(ao) + H_2O(l)	ao	35.0461	—	-366.121	-263.65	—	181.2	—
	in 1.0 H_2O		35.0461	—	-363.485	—	—	—	—
NH_4OH	in 1.5 H_2O		35.0461	—	-364.000	—	—	—	—
	in 2.0 H_2O		35.0461	—	-364.334	—	—	—	—
	in 2.5 H_2O		35.0461	—	-364.585	—	—	—	—

Table 18:N — NITROGEN (Prepared 1964) — Continued — Table 18:N

Substance Formula	Substance Description	State	Molar mass g mol^{-1}	0 K: $\Delta_f H^\circ_0$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar): $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H^\circ_0$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
NH_4OH	in 3.0 H_2O		35.0461	—	-364.795	—	—	—	—
	in 3.5 H_2O		35.0461	—	-364.962	—	—	—	—
	in 4.0 H_2O		35.0461	—	-365.096	—	—	—	—
	in 4.5 H_2O		35.0461	—	-365.205	—	—	—	—
	in 5.0 H_2O		35.0461	—	-365.292	—	—	—	—
NH_4OH	in 6.0 H_2O		35.0461	—	-365.422	—	—	—	—
	in 8.0 H_2O		35.0461	—	-365.585	—	—	—	—
	in 10 H_2O		35.0461	—	-365.665	—	—	—	—
	in 12 H_2O		35.0461	—	-365.732	—	—	—	—
	in 15 H_2O		35.0461	—	-365.795	—	—	—	—
NH_4OH	in 20 H_2O		35.0461	—	-365.862	—	—	—	—
	in 25 H_2O		35.0461	—	-365.908	—	—	—	—
	in 30 H_2O		35.0461	—	-365.924	—	—	—	—
	in 40 H_2O		35.0461	—	-365.974	—	—	—	—
	in 50 H_2O		35.0461	—	-365.991	—	—	—	—
NH_4OH	in 75 H_2O		35.0461	—	-366.016	—	—	—	—
	in 100 H_2O		35.0461	—	-366.029	—	—	—	—
	in 200 H_2O		35.0461	—	-366.041	—	—	—	—
	in 400 H_2O		35.0461	—	-366.054	—	—	—	—
	in 500 H_2O		35.0461	—	-366.050	—	—	—	—
NH_4OH	in 1 000 H_2O		35.0461	—	-366.041	—	—	—	—
	in 2 000 H_2O		35.0461	—	-366.020	—	—	—	—
	in 3 000 H_2O		35.0461	—	-366.008	—	—	—	—
	in 4 000 H_2O		35.0461	—	-365.987	—	—	—	—
	in 5 000 H_2O		35.0461	—	-365.970	—	—	—	—
NH_4OH	in 7 000 H_2O		35.0461	—	-365.949	—	—	—	—
	in 10 000 H_2O		35.0461	—	-365.912	—	—	—	—
	in 20 000 H_2O		35.0461	—	-365.849	—	—	—	—
	in 50 000 H_2O		35.0461	—	-365.686	—	—	—	—
	in 100 000 H_2O		35.0461	—	-365.523	—	—	—	—
NH_4OH	in ∞ H_2O		35.0461	—	-362.50	—	—	—	—
NH_4HO_2	from HO_2^-	ai	51.0455	—	-292.84	-146.7	—	137.2	—
$HN_2O_2^-$	hyponitrite	aq	61.0202	—	-51.9	—	—	—	—
NH_2NO_2	nitramide	cr	62.0282	—	-89.5	—	—	—	—
$H_2N_2O_2$	hyponitrous acid	aq2	62.0282	—	-64.4	—	—	—	—
NH_4NO_2		cr	64.0442	—	-256.5	—	—	—	—
	from NO_2^-	ai	64.0442	—	-237.2	-111.6	—	236.4	-17.6
NH_4ONO_2	ammonium peroxynitrite	aq2	80.0436	—	-177.4	—	—	—	—
NH_4NO_3	ammonium nitrate	cr	80.0436	—	-365.56	-183.87	—	151.08	139.3
		ai	80.0436	—	-339.87	-190.56	—	259.8	-6.7
NH_4NO_3	in 3.0 H_2O		80.0436	—	-349.301	—	—	—	—
	in 3.5 H_2O		80.0436	—	-348.611	—	—	—	—
	in 4.0 H_2O		80.0436	—	-348.184	—	—	—	—
	in 4.5 H_2O		80.0436	—	-347.816	—	—	—	—
	in 5.0 H_2O		80.0436	—	-347.481	—	—	—	—
NH_4NO_3	in 6.0 H_2O		80.0436	—	-346.875	—	—	—	—
	in 7.0 H_2O		80.0436	—	-346.331	—	—	—	—
	in 8.0 H_2O		80.0436	—	-345.849	—	—	—	—
	in 10 H_2O		80.0436	—	-345.054	—	—	—	—
	in 12 H_2O		80.0436	—	-344.494	—	—	—	—

Table 18:N **NITROGEN** (Prepared 1964) — Continued Table 18:N

Substance Formula	Description	State	Molar mass g mol^{-1}	0 K: $\Delta_f H^\circ_0$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar): $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H^\circ_0$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
NH_4NO_3	in 15 H_2O		80.0436	—	-343.423	—	—	—	—
	in 20 H_2O		80.0436	—	-343.088	—	—	—	—
	in 25 H_2O		80.0436	—	-342.527	—	—	—	—
	in 30 H_2O		80.0436	—	-342.105	—	—	—	—
	in 40 H_2O		80.0436	—	-341.523	—	—	—	—
NH_4NO_3	in 50 H_2O		80.0436	—	-341.155	—	—	—	—
	in 75 H_2O		80.0436	—	-340.628	—	—	—	—
	in 100 H_2O		80.0436	—	-340.327	—	—	—	—
	in 150 H_2O		80.0436	—	-340.017	—	—	—	—
	in 200 H_2O		80.0436	—	-339.875	—	—	—	—
NH_4NO_3	in 300 H_2O		80.0436	—	-339.753	—	—	—	—
	in 400 H_2O		80.0436	—	-339.695	—	—	—	—
	in 500 H_2O		80.0436	—	-339.670	—	—	—	—
	in 600 H_2O		80.0436	—	-339.653	—	—	—	—
	in 800 H_2O		80.0436	—	-339.645	—	—	—	—
NH_4NO_3	in 1 000 H_2O		80.0436	—	-339.645	—	—	—	—
	in 2 000 H_2O		80.0436	—	-339.665	—	—	—	—
	in 3 000 H_2O		80.0436	—	-339.686	—	—	—	—
	in 4 000 H_2O		80.0436	—	-339.703	—	—	—	—
	in 5 000 H_2O		80.0436	—	-339.716	—	—	—	—
NH_4NO_3	in 7 000 H_2O		80.0436	—	-339.732	—	—	—	—
	in 10 000 H_2O		80.0436	—	-339.749	—	—	—	—
	in 20 000 H_2O		80.0436	—	-339.774	—	—	—	—
	in 50 000 H_2O		80.0436	—	-339.808	—	—	—	—
	in 100 000 H_2O		80.0436	—	-339.824	—	—	—	—
NH_4NO_3	in ∞ H_2O		80.0436	—	-339.87	—	—	—	—
$NH_2OH{\cdot}HNO_3$		cr	96.0430	—	-366.5	—	—	—	—
		aq	96.0430	—	-344.8	—	—	—	—
N_2H_5OH		l	50.0608	—	-242.71	—	—	—	—
		g	50.0608	—	-205.0	-79.0	—	264.	—
N_2H_5OH		ao	50.0608	—	-251.50	-109.1	—	207.9	73.2
	in 75 H_2O		50.0608	—	-251.412	—	—	—	—
	in 100 H_2O		50.0608	—	-251.437	—	—	—	—
	in 150 H_2O		50.0608	—	-251.463	—	—	—	—
	in 200 H_2O		50.0608	—	-251.479	—	—	—	—
N_2H_5OH	in 500 H_2O		50.0608	—	-251.488	—	—	—	—
$(NH_4)_2O$		l	52.0768	—	-430.70	-266.93	—	267.52	247.19
$NH_4HN_2O_2$	from hyponitrite	aq	79.0589	—	-184.5	—	—	—	—
$N_2H_5NO_3$		cr	95.0583	—	-251.58	—	—	—	—
	from $N_2H_5^+$	ai	95.0583	—	-215.10	-28.73	—	297.	—
$(NH_4)_2N_2O_2$		aq	96.0896	—	-282.0	—	—	—	—
NF_2		g	52.0035	45.69	43.1	57.8	10.573	249.94	41.00
NF_2^+		g	52.0035	1166.9	1170.3	—	—	—	—
NF_3		g	71.0019	-118.95	-124.7	-83.2	11.828	260.73	53.1
N_2F_2	cis, active	g	66.0102	—	69.5	—	—	—	—
N_2F_2	trans	g2	66.0102	—	82.0	—	—	—	—
N_2F_4		g	104.0070	3.68	-7.1	81.2	15.523	301.19	79.1
NOF		g	49.0045	-64.14	-66.5	-51.0	10.698	248.10	41.34
NO_2F		g	65.0039	—	—	—	11.527	260.4	49.8
NH_4F		cr	37.0371	-449.40	-463.96	-348.68	11.109	71.96	65.27

Substance Formula	Description	State	Molar mass	0 K	298.15 K (25°C) and 0.1 MPa (1 bar)				
			g mol⁻¹	$\Delta_f H^\circ_0$ kJ mol⁻¹	$\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
NH_4F		ai	37.0371	—	-465.14	-358.09	—	99.6	-26.8
NF_2H		g	53.0115	—	—	—	10.803	252.82	43.39
NH_4HF_2		cr	57.0435	-786.34	-802.9	-650.9	17.753	115.52	106.69
	from HF_2^-	ai	57.0435	—	-782.45	-657.39	—	205.9	—
	in 4.54 H_2O, saturated		57.0435	—	-781.6	—	—	—	—
NH_4HF_2	in 600 H_2O		57.0435	—	-782.8	—	—	—	—
$NH_4H_3F_4$		l	97.0563	—	-1409.2	—	—	—	—
NCl_3		l	120.3657	—	230.	—	—	—	—
	in CCl_4:u		120.3657	—	230.1	—	—	—	—
NOCl		g	65.4591	53.60	51.71	66.08	11.364	261.69	44.69
NOCl		ao	65.4591	—	—	67.16	—	—	—
NO_2Cl		g	81.4585	17.95	12.6	54.4	12.196	272.15	53.18
$NOClO_4$		cr	129.4567	—	-154.4	—	—	—	—
NO_2ClO_4		cr	145.4561	—	36.4	—	—	—	—
NH_4Cl		cr	53.4917	—	-314.43	-202.87	—	94.6	84.1
NH_4Cl		ai	53.4917	—	-299.66	-210.52	—	169.9	-56.5
	in 8.0 H_2O		53.4917	—	-299.533	—	—	—	—
	in 10 H_2O		53.4917	—	-299.436	—	—	—	—
	in 12 H_2O		53.4917	—	-299.369	—	—	—	—
	in 15 H_2O		53.4917	—	-299.286	—	—	—	—
NH_4Cl	in 20 H_2O		53.4917	—	-299.206	—	—	—	—
	in 25 H_2O		53.4917	—	-299.156	—	—	—	—
	in 30 H_2O		53.4917	—	-299.123	—	—	—	—
	in 40 H_2O		53.4917	—	-299.097	—	—	—	—
	in 50 H_2O		53.4917	—	-299.089	—	—	—	—
NH_4Cl	in 100 H_2O		53.4917	—	-299.102	—	—	—	—
	in 150 H_2O		53.4917	—	-299.139	—	—	—	—
	in 200 H_2O		53.4917	—	-299.169	—	—	—	—
	in 300 H_2O		53.4917	—	-299.219	—	—	—	—
	in 400 H_2O		53.4917	—	-299.248	—	—	—	—
NH_4Cl	in 500 H_2O		53.4917	—	-299.273	—	—	—	—
	in 600 H_2O		53.4917	—	-299.294	—	—	—	—
	in 700 H_2O		53.4917	—	-299.315	—	—	—	—
	in 800 H_2O		53.4917	—	-299.328	—	—	—	—
	in 900 H_2O		53.4917	—	-299.340	—	—	—	—
NH_4Cl	in 1 000 H_2O		53.4917	—	-299.353	—	—	—	—
	in 1 500 H_2O		53.4917	—	-299.394	—	—	—	—
	in 2 000 H_2O		53.4917	—	-299.420	—	—	—	—
	in 3 000 H_2O		53.4917	—	-299.457	—	—	—	—
	in 4 000 H_2O		53.4917	—	-299.474	—	—	—	—
NH_4Cl	in 5 000 H_2O		53.4917	—	-299.491	—	—	—	—
	in 7 000 H_2O		53.4917	—	-299.516	—	—	—	—
	in 10 000 H_2O		53.4917	—	-299.537	—	—	—	—
	in 20 000 H_2O		53.4917	—	-299.566	—	—	—	—
	in 50 000 H_2O		53.4917	—	-299.599	—	—	—	—
NH_4Cl	in 100 000 H_2O		53.4917	—	-299.616	—	—	—	—
	in ∞ H_2O		53.4917	—	-299.66	—	—	—	—
NH_4Cl_3	from Cl_3^-	ai	124.3977	—	—	-199.9	—	—	—
N_2H_5Cl		cr	68.5064	—	-196.6	—	—	—	—
	from $N_2H_5^+$	ai	68.5064	—	-174.9	-48.8	—	207.1	-66.1

Table 18:N — NITROGEN (Prepared 1964) — Continued — Table 18:N

Substance Formula	Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
N_2H_5Cl	in 50 H_2O		68.5064	—	-175.176	—	—	—	—
	in 75 H_2O		68.5064	—	-175.038	—	—	—	—
	in 100 H_2O		68.5064	—	-174.983	—	—	—	—
	in 200 H_2O		68.5064	—	-174.920	—	—	—	—
	in 500 H_2O		68.5064	—	-174.900	—	—	—	—
N_2H_5Cl	in ∞ H_2O		68.5064	—	-174.9	—	—	—	—
$N_2H_5Cl{\cdot}HCl$		cr	104.9674	—	-367.4	—	—	—	—
$NH_2OH{\cdot}HCl$		cr	69.4911	—	-317.6	—	—	—	92.9
NH_4ClO		ai2	69.4911	—	-239.7	-116.2	—	155.	—
$NH_2OH{\cdot}HCl$		aq	69.4911	—	-303.8	—	—	—	—
NH_4ClO_2		ai	85.4905	—	-199.2	-62.2	—	214.6	—
NH_4ClO_3		ai	101.4899	—	-236.48	-87.26	—	275.7	—
NH_4ClO_4		cr	117.4893	—	-295.31	-88.75	—	186.2	—
		ai	117.4893	—	-261.83	-87.83	—	295.4	—
$N_2H_5ClO_4$		cr	132.5040	—	-176.6	—	—	—	—
$N_2H_5ClO_4$	from $N_2H_5^+$	ai	132.5040	—	-136.8	73.8	—	333.5	—
	in 50 H_2O		132.5040	—	-141.315	—	—	—	—
	in 100 H_2O		132.5040	—	-139.453	—	—	—	—
	in 200 H_2O		132.5040	—	-138.290	—	—	—	—
	in 300 H_2O		132.5040	—	-137.905	—	—	—	—
$N_2H_5ClO_4$	in 500 H_2O		132.5040	—	-137.570	—	—	—	—
	in 1 000 H_2O		132.5040	—	-137.298	—	—	—	—
	in ∞ H_2O		132.5040	—	-136.8	—	—	—	—
$N_2H_5ClO_4{\cdot}0.5H_2O$		cr	141.5117	—	-327.11	—	—	—	—
NOBr		g	109.9151	91.46	82.17	82.42	11.652	273.66	45.48
NH_4Br		cr	97.9477	—	-270.83	-175.2	—	113.	96.
		ai	97.9477	—	-254.05	-183.26	—	195.8	-61.9
	in 100 H_2O		97.9477	—	-253.609	—	—	—	—
	in 150 H_2O		97.9477	—	-253.613	—	—	—	—
	in 200 H_2O		97.9477	—	-253.634	—	—	—	—
NH_4Br	in 300 H_2O		97.9477	—	-253.655	—	—	—	—
	in 400 H_2O		97.9477	—	-253.676	—	—	—	—
	in 500 H_2O		97.9477	—	-253.693	—	—	—	—
	in 600 H_2O		97.9477	—	-253.718	—	—	—	—
	in 700 H_2O		97.9477	—	-253.734	—	—	—	—
NH_4Br	in 800 H_2O		97.9477	—	-253.743	—	—	—	—
	in 1 000 H_2O		97.9477	—	-253.760	—	—	—	—
	in 1 500 H_2O		97.9477	—	-253.797	—	—	—	—
	in 2 000 H_2O		97.9477	—	-253.822	—	—	—	—
	in 3 000 H_2O		97.9477	—	-253.860	—	—	—	—
NH_4Br	in 4 000 H_2O		97.9477	—	-253.873	—	—	—	—
	in 5 000 H_2O		97.9477	—	-253.889	—	—	—	—
	in 7 000 H_2O		97.9477	—	-253.914	—	—	—	—
	in 10 000 H_2O		97.9477	—	-253.931	—	—	—	—
	in 20 000 H_2O		97.9477	—	-253.960	—	—	—	—
NH_4Br	in 50 000 H_2O		97.9477	—	-253.994	—	—	—	—
	in 100 000 H_2O		97.9477	—	-254.011	—	—	—	—
	in ∞ H_2O		97.9477	—	-254.05	—	—	—	—
NH_4Br_3		cr	257.7657	—	-282.4	-188.6	—	272.	—
	from Br_3^-	ai	257.7657	—	-262.92	-186.36	—	328.9	—

Table 18:N NITROGEN (Prepared 1964) — Continued Table 18:N

Substance Formula	Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
NH_4Br_5	from Br_5^-	ai	417.5837	—	-274.9	-183.2	—	430.1	—
N_2H_5Br		cr	112.9624	—	-155.6	—	—	—	—
	from $N_2H_5^+$	ai	112.9624	—	-128.9	-21.6	—	233.0	-71.5
	in 50 H_2O		112.9624	—	-129.746	—	—	—	—
	in 100 H_2O		112.9624	—	-129.223	—	—	—	—
N_2H_5Br	in 200 H_2O		112.9624	—	-128.972	—	—	—	—
	in 500 H_2O		112.9624	—	-128.905	—	—	—	—
	in 1 000 H_2O		112.9624	—	-128.888	—	—	—	—
	in ∞ H_2O		112.9624	—	-128.9	—	—	—	—
$NH_4Br{\cdot}1.5NH_3$		cr	123.4937	—	-392.9	-196.5	—	213.	—
$N_2H_5Br{\cdot}HBr$		cr	193.8794	—	-271.1	—	—	—	—
$N_2H_5Br{\cdot}HBr{\cdot}2H_2O$		cr	229.9102	—	-864.4	—	—	—	—
NH_4BrO		ai	113.9471	—	-226.8	-112.9	—	155.	—
NH_4BrO_3		ai	145.9459	—	-199.58	-60.70	—	275.10	—
NH_4Br_2Cl	from Br_2Cl^-	ai	213.3097	—	-302.9	-207.8	—	302.1	—
NH_4I		cr	144.9431	—	-201.42	-112.5	—	117.	—
		ai	144.9431	—	-187.69	-130.88	—	224.7	-62.3
	in 100 H_2O		144.9431	—	-187.376	—	—	—	—
	in 150 H_2O		144.9431	—	-187.368	—	—	—	—
	in 200 H_2O		144.9431	—	-187.360	—	—	—	—
NH_4I	in 300 H_2O		144.9431	—	-187.339	—	—	—	—
	in 400 H_2O		144.9431	—	-187.351	—	—	—	—
	in 500 H_2O		144.9431	—	-187.360	—	—	—	—
	in 600 H_2O		144.9431	—	-187.385	—	—	—	—
	in 800 H_2O		144.9431	—	-187.393	—	—	—	—
NH_4I	in 1 000 H_2O		144.9431	—	-187.410	—	—	—	—
	in 1 500 H_2O		144.9431	—	-187.447	—	—	—	—
	in 2 000 H_2O		144.9431	—	-187.472	—	—	—	—
	in 4 000 H_2O		144.9431	—	-187.519	—	—	—	—
	in 5 000 H_2O		144.9431	—	-187.535	—	—	—	—
NH_4I	in 7 000 H_2O		144.9431	—	-187.560	—	—	—	—
	in 10 000 H_2O		144.9431	—	-187.577	—	—	—	—
	in 20 000 H_2O		144.9431	—	-187.606	—	—	—	—
	in 50 000 H_2O		144.9431	—	-187.640	—	—	—	—
	in 100 000 H_2O		144.9431	—	-187.652	—	—	—	—
NH_4I	in ∞ H_2O		144.9431	—	-187.69	—	—	—	—
NH_4I_3		cr	398.7519	—	-207.9	-119.6	—	234.7	—
	from I_3^-	ai	398.7519	—	-184.1	-130.9	—	352.7	—
$NH_4I{\cdot}NH_3$		cr	161.9738	—	-288.7	-131.6	—	180.3	—
NH_3NI_3		cr	411.7506	—	154.4	—	—	—	—
$NH_4I{\cdot}2NH_3$		cr	179.0045	—	-374.9	-146.2	—	232.2	—
NH_4IO		ai	160.9425	—	-240.2	-117.9	—	107.9	—
NH_4IO_3		cr	192.9413	—	-385.8	—	—	—	—
		ai	192.9413	—	-354.0	-207.4	—	231.8	—
NH_4IO_4		aq	208.9407	—	-284.1	—	—	—	—
$NH_4H_4IO_6$		aq	244.9715	—	-892.0	—	—	—	—
NH_4I_2OH	from I_2OH^-	ai	288.8549	—	—	-309.5	—	—	—
$(NH_4)_2H_3IO_6$	from $H_3IO_6^{2-}$	aq	262.0022	—	-1020.9	—	—	—	—
$(NH_4)_2I_2O$	from I_2O^{2-}	ai	305.8856	—	—	-240.8	—	—	—
NH_4ICl_2		cr	215.8491	—	—	-232.1	—	—	—

Table 18:N — NITROGEN (Prepared 1964) — Continued — Table 18:N

Substance Formula	Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H_0^\circ$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H_0^\circ$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
NH_4ICl_2	from ICl_2^-	ai	215.8491	—	—	-240.5	—	—	—
NH_4ICl_4		cr	286.7551	—	—	-247.5	—	—	—
NH_4I_2Cl	from I_2Cl^-	ai	307.3005	—	-270.3	-195.7	—	334.7	—
NH_4IBr_2		cr	304.7611	—	-296.2	-196.1	—	231.8	—
	from IBr_2^-	ai	304.7611	—	—	-202.4	—	—	—
NH_4BrI_2	from I_2Br^-	ai	351.7565	—	-260.7	-189.5	—	310.9	—
NH_4IBrCl		cr	260.3051	—	—	-217.5	—	—	—
	from $IBrCl^-$	ai	260.3051	—	—	-225.8	—	—	—
N_4S_4		cr	184.2828	—	535.6	—	—	—	—
$N_2O_3(SO_3)_2$		cr	236.1360	—	-1059.	—	—	—	—
	nitrosyl pyrosulfate, nitrosyl sulfuric anhydride								
NH_4HS		cr	51.1107	—	-156.9	-50.5	—	97.5	—
	from HS^-	ai	51.1107	—	-150.2	-67.22	—	176.1	—
	in 200 H_2O		51.1107	—	-145.6	—	—	—	—
S_7NH		cr	239.4627	—	-282.0	—	—	—	—
$(NH_4)_2S$		ai	68.1414	—	-231.8	-72.6	—	212.1	—
$(NH_4)_2S_2$		ai	100.2054	—	-234.7	-78.9	—	255.2	—
$(NH_4)_2S_3$		ai	132.2694	—	-238.9	-84.8	—	292.9	—
$(NH_4)_2S_4$		cr	164.3334	—	-272.8	—	—	—	—
		ai	164.3334	—	-241.8	-89.4	—	330.1	—
$(NH_4)_2S_5$		cr	196.3974	—	-274.5	—	—	—	—
$(NH_4)_2S_5$		ai	196.3974	—	-243.5	-92.7	—	367.4	—
$(NH_4)_2S_8$		cr	292.5894	—	-276.1	—	—	—	—
H_2NSO_3H	sulphamic acid	cr	97.0929	—	-674.9	—	—	—	—
		aq	97.0929	—	-654.0	—	—	—	—
NH_4HSO_3		cr	99.1089	—	-768.6	—	—	—	—
NH_4HSO_3	from HSO_3^-	ai	99.1089	—	-758.73	-607.04	—	253.1	—
	in 300 H_2O		99.1089	—	-758.6	—	—	—	—
NH_4HSO_4		cr	115.1083	—	-1026.96	—	—	—	—
	from HSO_4^-	ai	115.1083	—	-1019.85	-835.21	—	245.2	-3.8
	in 200 H_2O		115.1083	—	-1027.80	—	—	—	—
$NH_2OH{\cdot}H_2SO_4$		aq	131.1077	—	-1032.2	—	—	—	—
$NH_4HS_2O_4$	from $HS_2O_4^-$	ai	147.1723	—	—	-694.0	—	—	—
$SO_2(NH_2)_2$	sulphamide	cr	96.1082	—	-541.0	—	—	—	—
$(NH_4)_2SO_3$		cr	116.1396	—	-885.3	—	—	—	—
		ai	116.1396	—	-900.4	-645.0	—	197.5	—
$(NH_4)_2SO_3$	in 400 H_2O		116.1396	—	-882.8	—	—	—	—
$(NH_4)_2SO_3{\cdot}H_2O$		cr	134.1550	—	-1187.4	—	—	—	—
$(NH_4)_2SO_4$		cr	132.1390	—	-1180.85	-901.67	—	220.1	187.49
		ai	132.1390	—	-1174.28	-903.14	—	246.9	-133.1
	in 10 H_2O		132.1390	—	-1174.53	—	—	—	—
$(NH_4)_2SO_4$	in 30 H_2O		132.1390	—	-1173.95	—	—	—	—
	in 50 H_2O		132.1390	—	-1173.65	—	—	—	—
	in 100 H_2O		132.1390	—	-1173.223	—	—	—	—
	in 200 H_2O		132.1390	—	-1172.863	—	—	—	—
	in 400 H_2O		132.1390	—	-1172.57	—	—	—	—
$(NH_4)_2SO_4$	in 500 H_2O		132.1390	—	-1172.532	—	—	—	—
	in 1 000 H_2O		132.1390	—	-1172.428	—	—	—	—
	in 2 000 H_2O		132.1390	—	-1172.428	—	—	—	—
	in ∞ H_2O		132.1390	—	-1174.28	—	—	—	—

Table 18:N NITROGEN (Prepared 1964) — Continued Table 18:N

Substance Formula and Description	State	Molar mass g mol^{-1}	0 K $\Delta_f H^\circ_0$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H^\circ_0$	S° J mol^{-1} K^{-1}	C_p
$(NH_2OH)_2 \cdot H_2SO_4$	aq	164.1378	—	-1177.0	—	—	—	—
$(NH_4)_2S_2O_3$	aq	148.2036	—	-917.1	—	—	—	—
$(NH_4)_2S_2O_4$	ai	164.2030	—	-1018.4	-758.7	—	318.	—
$(NH_4)_2S_2O_6$	aq	196.2018	—	-1463.1	—	—	—	—
$(NH_4)_2S_2O_7$	aq	212.2012	—	-1666.1	—	—	—	—
$(NH_4)_2S_2O_8$	cr	228.2006	—	-1648.1	—	—	—	—
	ai	228.2006	—	-1610.0	-1273.3	—	471.1	—
$(NH_4)_2S_3O_6$	aq	228.2658	—	-1464.4	—	—	—	—
$(NH_4)_2S_4O_6$	aq	260.3298	—	-1489.17	—	—	—	—
$(NH_4)_2S_5O_6$	aq	292.3938	—	-1501.2	—	—	—	—
$(N_2H_5)_2SO_4$	cr	162.1684	—	-959.0	—	—	—	—
	ai	162.1684	—	-924.7	-579.6	—	322.	-151.
$(N_2H_5)_2SO_4 \cdot H_2O$	cr	180.1838	—	-1218.8	—	—	—	—
$(NH_4)_2SO_4 \cdot 3NH_3$	cr	183.2311	—	-1429.7	-935.5	—	374.5	—
NSF	g	65.0691	—	—	—	11.205	259.81	44.14
NSF_3	g	103.0659	—	—	—	14.523	286.63	71.88
NH_4SO_3F from SO_3F^-	ai	117.0993	—	-1004.2	—	—	—	—
$NH_4I \cdot 3SO_2$	cr	337.1315	—	-1210.0	-999.4	—	419.7	—
NSe	cr	92.9667	—	177.0	—	—	—	—
NH_4HSe	cr	98.0067	—	-133.1	-23.3	—	96.7	—
NH_4HSe from HSe^-	ai	98.0067	—	-116.7	-35.5	—	192.	—
	aq	98.0067	—	-118.0	—	—	—	—
$(NH_4)_2Se$	ai	115.0374	—	—	-29.1	—	—	—
NH_4HSeO_3 from $HSeO_3^-$	ai	146.0049	—	-647.06	-490.76	—	248.5	—
NH_4HSeO_4 from $HSeO_4^-$	ai	162.0043	—	-714.2	-531.6	—	262.8	—
$(NH_4)_2SeO_3$	ai	163.0356	—	-774.0	-528.2	—	238.	—
$(NH_4)_2SeO_4$	cr	179.0350	—	-874.5	—	—	—	—
	ai	179.0350	—	-864.0	-599.8	—	280.7	—
NH_4HTe	cr	146.6467	—	1.3	—	—	—	—
$NH_4H_5TeO_6$	aq	246.6751	—	-1394.1	—	—	—	—
$(NH_4)_2TeO_3$	aq	211.6756	—	-809.6	—	—	—	—
$(NH_4)_2H_4TeO_6$ from $H_4TeO_6^{2-}$	aq	263.7058	—	-1487.0	—	—	—	—
$(NH_4)_2PoCl_6$ from $PoCl_6^{2-}$	ai	458.7954	—	—	-736.	—	—	—

Table 19:P — **PHOSPHORUS** (Prepared 1964) — Table 19:P

Substance Formula	Description	State	Molar mass g mol^{-1}	0 K: $\Delta_f H_0^\circ$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar): $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H_0^\circ$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
P	white	cr	30.9738	0	0	0	5.360	41.09	23.840
	red, triclinic	cr2	30.9738	–15.82	–17.6	–12.1	3.607	22.80	21.21
	black	cr3	30.9738	—	–39.3	—	—	—	—
	red	am	30.9738	—	–7.5	—	—	—	—
		g	30.9738	314.	314.64	278.25	6.197	163.193	20.786
P	in CS_2:u		30.9738	—	2.1	—	—	—	—
P^+		g	30.9738	1325.57	1334.57	—	8.150	—	—
P^{2+}		g	30.9738	3228.8	3243.0	—	6.991	—	—
P^{3+}		g	30.9738	6140.4	6160.1	—	6.197	—	—
P^{4+}		g	30.9738	11096.8	11122.3	—	6.197	—	—
P^{5+}		g	30.9738	17370.7	17402.5	—	6.197	—	—
P^{6+}		g	30.9738	38639.	38677.	—	6.197	—	—
P^{7+}		g	30.9738	64036.	64078.	—	6.197	—	—
P^{8+}		g	30.9738	93889.	93939.	—	6.197	—	—
P_2		g	61.9476	146.19	144.3	103.7	8.895	218.129	32.05
P_2^+		g	61.9476	1075.	1084.	—	—	—	—
P_4		g	123.8952	66.23	58.91	24.44	14.134	279.98	67.15
P_4^+		g	123.8952	942.2	941.4	—	—	—	—
PO		g	46.9732	–28.0	–28.5	–51.9	9.393	222.78	31.76
PO_2		g	62.9726	–276.6	–279.9	–281.6	10.50	252.11	39.54
PO_3^-		aq	78.9720	—	–977.0	—	—	—	—
PO_4^{3-}		ao	94.9714	—	–1277.4	–1018.7	—	–222.	—
$P_2O_7^{4-}$		ao	173.9434	—	–2271.1	–1919.0	—	–117.	—
P_4O_6		cr	219.8916	—	–1640.1	—	—	—	—
P_4O_{10}	hexagonal	cr	283.8892	–2953.15	–2984.0	–2697.7	33.962	228.86	211.71
P_4O_{10}		am	283.8892	—	–3042.	—	—	—	—
PH_3		g	33.9978	13.39	5.4	13.4	10.125	210.23	37.11
		ao	33.9978	—	–9.50	25.36	—	120.1	—
PH_3^+		g	33.9978	974.5	972.8	—	—	—	—
PH_4^+		ao	35.0058	—	—	92.1	—	—	—
P_2H_4		l	65.9796	—	–5.0	—	—	—	—
		g	65.9796	—	20.9	—	—	—	—
HPO_3		cr	79.9800	—	–948.5	—	—	—	—
		aq	79.9800	—	–977.0	—	—	—	—
HPO_3^{2-}		aq	79.9800	—	–969.0	—	—	—	—
HPO_4^{2-}		ao	95.9794	—	–1292.14	–1089.15	—	–33.5	—
$H_2PO_2^-$		aq	64.9886	—	–613.8	—	—	—	—
$H_2PO_3^-$		aq	80.9880	—	–969.4	—	—	—	—
$H_2PO_4^-$		ao	96.9874	—	–1296.29	–1130.28	—	90.4	—
H_3PO_2		cr	65.9966	—	–604.6	—	—	—	—
H_3PO_2		l	65.9966	—	–595.4	—	—	—	—
	in 50 H_2O		65.9966	—	–600.8	—	—	—	—
	in 100 H_2O		65.9966	—	–602.5	—	—	—	—
	in 200 H_2O		65.9966	—	–604.2	—	—	—	—
	in 400 H_2O		65.9966	—	–605.4	—	—	—	—
H_3PO_3		cr	81.9960	—	–964.4	—	—	—	—
		aq	81.9960	—	–964.8	—	—	—	—
H_3PO_4		cr	97.9954	–1260.60	–1279.0	–1119.1	16.983	110.50	106.06
		l	97.9954	—	–1266.9	—	—	—	—
		ai	97.9954	—	–1277.4	–1018.7	—	–222.	—

Table 19:P **PHOSPHORUS** (Prepared 1964) — Continued Table 19:P

Substance Formula and Description		State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$	S° J mol⁻¹ K⁻¹	C_p
H_3PO_4		ao	97.9954	—	-1288.34	-1142.54	—	158.2	—
	in 0.5 H_2O		97.9954	—	-1271.77	—	—	—	—
	in 0.628 H_2O		97.9954	—	-1272.61	—	—	—	—
	in 0.75 H_2O		97.9954	—	-1273.40	—	—	—	—
	in 1.0 H_2O		97.9954	—	-1274.82	—	—	—	—
H_3PO_4	in 1.5 H_2O		97.9954	—	-1277.21	—	—	—	—
	in 2.0 H_2O		97.9954	—	-1278.63	—	—	—	—
	in 2.5 H_2O		97.9954	—	-1280.22	—	—	—	—
	in 3.0 H_2O		97.9954	—	-1281.27	—	—	—	—
	in 3.5 H_2O		97.9954	—	-1282.10	—	—	—	—
H_3PO_4	in 4.0 H_2O		97.9954	—	-1282.81	—	—	—	—
	in 4.5 H_2O		97.9954	—	-1283.44	—	—	—	—
	in 5.0 H_2O		97.9954	—	-1283.94	—	—	—	—
	in 5.5 H_2O		97.9954	—	-1284.36	—	—	—	—
	in 6.0 H_2O		97.9954	—	-1284.70	—	—	—	—
H_3PO_4	in 7.0 H_2O		97.9954	—	-1285.32	—	—	—	—
	in 8.0 H_2O		97.9954	—	-1285.79	—	—	—	—
	in 9.0 H_2O		97.9954	—	-1286.16	—	—	—	—
	in 10 H_2O		97.9954	—	-1286.50	—	—	—	—
	in 12 H_2O		97.9954	—	-1286.973	—	—	—	—
H_3PO_4	in 15 H_2O		97.9954	—	-1287.480	—	—	—	—
	in 18 H_2O		97.9954	—	-1287.806	—	—	—	—
	in 20 H_2O		97.9954	—	-1287.965	—	—	—	—
	in 25 H_2O		97.9954	—	-1288.283	—	—	—	—
	in 30 H_2O		97.9954	—	-1288.484	—	—	—	—
H_3PO_4	in 40 H_2O		97.9954	—	-1288.806	—	—	—	—
	in 50 H_2O		97.9954	—	-1288.952	—	—	—	—
	in 75 H_2O		97.9954	—	-1289.249	—	—	—	—
	in 100 H_2O		97.9954	—	-1289.408	—	—	—	—
	in 150 H_2O		97.9954	—	-1289.664	—	—	—	—
H_3PO_4	in 200 H_2O		97.9954	—	-1289.827	—	—	—	—
	in 250 H_2O		97.9954	—	-1289.936	—	—	—	—
	in 300 H_2O		97.9954	—	-1290.036	—	—	—	—
	in 350 H_2O		97.9954	—	-1290.14	—	—	—	—
	in 400 H_2O		97.9954	—	-1290.212	—	—	—	—
H_3PO_4	in 500 H_2O		97.9954	—	-1290.358	—	—	—	—
	in 750 H_2O		97.9954	—	-1290.651	—	—	—	—
	in 1 000 H_2O		97.9954	—	-1290.898	—	—	—	—
	in 1 500 H_2O		97.9954	—	-1291.274	—	—	—	—
	in 2 000 H_2O		97.9954	—	-1291.584	—	—	—	—
H_3PO_4	in 2 500 H_2O		97.9954	—	-1291.860	—	—	—	—
	in 3 000 H_2O		97.9954	—	-1292.094	—	—	—	—
	in 4 000 H_2O		97.9954	—	-1292.567	—	—	—	—
	in 5 000 H_2O		97.9954	—	-1292.781	—	—	—	—
	in 10 000 H_2O		97.9954	—	-1293.680	—	—	—	—
$H_3PO_4 \cdot 0.5H_2O$		cr	107.0031	-1409.544	-1431.3	-1242.1	20.020	129.16	126.02
$H_3PO_4 \cdot H_2O$		cr	116.0108	—	-1568.83	—	—	—	—
PH_4OH	equivalent to PH_3(ao) + H_2O(l)	ao	52.0132	—	-295.35	-211.78	—	190.0	—
$HP_2O_7^{3-}$		ao	174.9514	—	-2274.8	-1972.2	—	46.	—

Table 19:P PHOSPHORUS (Prepared 1964) — Continued Table 19:P

Substance Formula and Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
$H_2P_2O_7^{2-}$	ao	175.9594	—	-2278.6	-2010.2	—	163.	—
$H_3P_2O_7^-$	ao	176.9674	—	-2276.5	-2023.2	—	213.	—
$H_4P_2O_5$	aq	145.9766	—	-1646.8	—	—	—	—
$H_4P_2O_7$	cr	177.9754	—	-2241.0	—	—	—	—
supercooled	l	177.9754	—	-2231.7	—	—	—	—
$H_4P_2O_7$	ao	177.9754	—	-2268.6	-2032.0	—	268.	—
in 150 H_2O		177.9754	—	-2271.9	—	—	—	—
$H_4P_2O_7 \cdot 1.5H_2O$	cr	204.9985	—	-2681.5	—	—	—	—
	l	204.9985	—	-2666.5	—	—	—	—
PF	g	49.9722	—	—	—	8.858	224.96	31.63
PF_3	g	87.9690	-913.16	-918.8	-897.5	12.937	273.24	58.70
PF_5	g	125.9658	—	-1595.8	—	—	—	—
PO_3F^{2-}	ao	97.9704	—	—	-1174.8	—	—	—
POF_3	g	103.9684	-1202.44	-1211.3	-1162.7	14.096	285.08	68.66
HPO_3F^-	ao	98.9784	—	—	-1198.2	—	—	—
H_2PO_3F	ao	99.9864	—	—	-1202.8	—	—	—
PCl_3	l	137.3328	—	-319.7	-272.3	—	217.1	—
	g	137.3328	-283.88	-287.0	-267.8	15.970	311.78	71.84
PCl_3^+	g	137.3328	672.4	675.3	—	—	—	—
PCl_5	cr	208.2388	—	-443.5	—	—	—	—
PCl_5	g	208.2388	-369.57	-374.9	-305.0	23.008	364.58	112.80
$POCl_3$	cr	153.3322	-610.07	—	—	—	—	—
	l	153.3322	—	-597.1	-520.8	36.484	222.46	138.78
	g	153.3322	-552.92	-558.48	-512.93	17.878	325.46	84.94
in $CHCl_3$:u		153.3322	—	-600.8	—	—	—	—
PH_4Cl	cr	70.4588	—	-145.2	—	—	—	—
$H_3PO_4 \cdot HClO_4$	cr	198.4540	—	-1361.1	—	—	—	—
PBr_3	l	270.7008	—	-184.5	-175.7	—	240.2	—
	g	270.7008	-114.93	-139.3	-162.8	17.740	348.09	75.98
in CS_2:u		270.7008	—	-179.9	—	—	—	—
PBr_5	cr	430.5188	—	-269.9	—	—	—	—
$POBr_3$	cr	286.7002	—	-458.6	—	—	—	—
	g	286.7002	—	—	—	19.849	359.81	89.87
PH_4Br	cr	114.9148	—	-127.6	-47.6	—	110.0	—
PI_3	cr	411.6870	—	-45.6	—	—	—	—
PI_3	g	411.6870	—	—	—	19.004	374.37	78.37
in CS_2:u		411.6870	—	-31.8	—	—	—	—
PH_4I	cr	161.9102	—	-69.9	0.9	—	123.0	109.6
P_2S_3	cr	158.1396	—	-80.3	—	—	—	—
$PSCl_3$	g	169.3968	—	—	—	18.920	336.80	89.50
$PSBr_3$	cr	302.7648	—	—	—	—	231.0	—
	g	302.7648	—	—	—	—	372.78	94.93
PN	cr	44.9805	—	-63.	—	—	—	—
	g	44.9805	110.9	109.87	87.72	8.703	211.19	29.71
P_3N_5	cr	162.9549	—	-298.7	—	—	—	151.
NH_4PO_3	aq	97.0107	—	-1109.6	—	—	—	—
$NH_4H_2PO_2$	cr	83.0273	—	-753.1	—	—	—	—
in 100 H_2O		83.0273	—	-744.75	—	—	—	—
in 200 H_2O		83.0273	—	-745.42	—	—	—	—
in 300 H_2O		83.0273	—	-745.67	—	—	—	—

Table 19:P **PHOSPHORUS** (Prepared 1964) — Continued Table 19:P

Substance Formula and Description		State	Molar mass g mol⁻¹	0 K $\Delta_f H_0^\circ$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H_0^\circ$	S° J mol⁻¹ K⁻¹	C_p
$NH_4H_2PO_2$	in 400 H_2O		83.0273	—	-745.92	—	—	—	—
	in 800 H_2O		83.0273	—	-746.09	—	—	—	—
	in 1 000 H_2O		83.0273	—	-746.17	—	—	—	—
	in 1 400 H_2O		83.0273	—	-746.34	—	—	—	—
	in 1 600 H_2O		83.0273	—	-746.38	—	—	—	—
$NH_4H_2PO_2$	in ∞ H_2O		83.0273	—	-746.4	—	—	—	—
$NH_4H_2PO_3$		aq	99.0267	—	-1102.1	—	—	—	—
$NH_4H_2PO_4$		cr	115.0261	—	-1445.07	-1210.38	—	151.96	142.26
	from $H_2PO_4^-$	ai	115.0261	—	-1428.79	-1209.58	—	203.8	—
	in 15 H_2O		115.0261	—	-1429.242	—	—	—	—
$NH_4H_2PO_4$	in 20 H_2O		115.0261	—	-1429.233	—	—	—	—
	in 25 H_2O		115.0261	—	-1429.208	—	—	—	—
	in 40 H_2O		115.0261	—	-1429.120	—	—	—	—
	in 50 H_2O		115.0261	—	-1429.058	—	—	—	—
	in 75 H_2O		115.0261	—	-1428.999	—	—	—	—
$NH_4H_2PO_4$	in 100 H_2O		115.0261	—	-1428.953	—	—	—	—
	in 200 H_2O		115.0261	—	-1428.882	—	—	—	—
	in 500 H_2O		115.0261	—	-1428.832	—	—	—	—
	in 1 000 H_2O		115.0261	—	-1428.815	—	—	—	—
	in 5 000 H_2O		115.0261	—	-1428.798	—	—	—	—
$NH_4H_2PO_4$	in ∞ H_2O		115.0261	—	-1428.79	—	—	—	—
$(NH_4)_2HPO_3$		aq	116.0574	—	-1233.9	—	—	—	—
$(NH_4)_2HPO_4$		cr	132.0568	—	-1566.91	—	—	—	188.
	from HPO_4^{2-}	ai	132.0568	—	-1557.16	-1247.76	—	193.3	—
	in 11 H_2O		132.0568	—	-1549.54	—	—	—	—
$(NH_4)_2HPO_4$	in 15 H_2O		132.0568	—	-1549.75	—	—	—	—
	in 20 H_2O		132.0568	—	-1550.09	—	—	—	—
	in 25 H_2O		132.0568	—	-1550.42	—	—	—	—
	in 30 H_2O		132.0568	—	-1550.67	—	—	—	—
	in 50 H_2O		132.0568	—	-1551.64	—	—	—	—
$(NH_4)_2HPO_4$	in 75 H_2O		132.0568	—	-1552.26	—	—	—	—
	in 100 H_2O		132.0568	—	-1553.18	—	—	—	—
	in 200 H_2O		132.0568	—	-1553.48	—	—	—	—
	in 300 H_2O		132.0568	—	-1553.73	—	—	—	—
	in 500 H_2O		132.0568	—	-1553.9	—	—	—	—
$(NH_4)_2HPO_4$	in 1 000 H_2O		132.0568	—	-1554.10	—	—	—	—
$(NH_4)_3PO_4$		cr	149.0875	—	-1671.9	—	—	—	—
		ai	149.0875	—	-1674.9	-1256.6	—	117.	—
	in 600 H_2O		149.0875	—	-1637.2	—	—	—	—
$(NH_4)_3PO_4 \cdot 3H_2O$		cr	203.1337	—	-2555.6	—	—	—	—
$NH_4H_3P_2O_7$	from $H_3P_2O_7^-$	ai	195.0061	—	-2409.1	-2102.6	—	326.	—
$(NH_4)_2H_2P_2O_7$	from $H_2P_2O_7^{2-}$	ai	212.0368	—	-2543.5	-2168.7	—	389.	—
$(NH_4)_3HP_2O_7$	from $HP_2O_7^{3-}$	ai	229.0675	—	-2672.3	-2210.0	—	385.	—
$(NH_4)_4P_2O_7$		ai	246.0982	—	-2801.2	-2236.3	—	335.	—
NH_4PF_6		cr	163.0029	—	—	—	—	253.09	168.74
$NH_4PF_6 \cdot NH_3$		cr	180.0336	—	—	—	—	333.9	—
NH_4HPO_3F	from HPO_3F^-	ai	117.0171	—	—	-1277.6	—	—	—
$(NH_4)_2PO_3F$		ai	134.0478	—	—	-1333.2	—	—	—

Table 20:As — ARSENIC (Prepared 1964) — Table 20:As

Substance Formula	Description	State	Molar mass g mol⁻¹	0 K: $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar): $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
As	α, gray, metallic	cr	74.9216	0	0	0	5.130	35.1	24.64
	γ, yellow, cubic	cr2	74.9216	—	14.6	—	—	—	—
	β	am	74.9216	—	4.2	—	—	—	—
		g	74.9216	301.42	302.5	261.0	6.197	174.21	20.786
As^+		g	74.9216	1248.1	1255.6	—	6.422	—	—
As^{2+}		g	74.9216	3046.0	3059.8	—	6.197	—	—
As^{3+}		g	74.9216	5781.5	5801.1	—	6.197	—	—
As^{4+}		g	74.9216	10619.	10644.	—	6.197	—	—
As^{5+}		g	74.9216	16661.	16694.	—	6.197	—	—
As^{6+}		g	74.9216	29008.	29045.	—	—	—	—
As_2		g	149.8432	223.01	222.2	171.9	9.418	239.4	35.003
As_4		g	299.6864	—	143.9	92.4	—	314.	—
AsO		g	90.9210	70.63	69.96	—	8.791	—	—
AsO^+		ao	90.9210	—	—	-163.80	—	—	—
AsO_2^-		ao	106.9204	—	-429.03	-349.98	—	40.6	—
AsO_4^{3-}		ao	138.9192	—	-888.14	-648.41	—	-162.8	—
As_2O_4		cr	213.8408	—	-793.79	—	—	—	—
As_2O_5		cr	229.8402	—	-924.87	-782.3	—	105.4	116.52
		aq	229.8402	—	-951.4	—	—	—	—
$As_2O_5 \cdot 4H_2O$		cr	301.9018	—	-2104.6	—	—	—	—
As_4O_6	octahedral	cr	395.6828	—	-1313.94	-1152.43	—	214.2	191.29
	monoclinic	cr2	395.6828	—	-1309.6	-1153.93	—	234.	—
		g	395.6828	—	-1209.2	-1097.8	—	381.	—
		aq	395.6828	—	-1253.5	—	—	—	—
$(As_2O_5)_3 \cdot 5H_2O$		cr	779.5976	—	-4248.4	—	—	—	—
AsH_3		g	77.9456	74.06	66.44	68.93	10.201	222.78	38.07
AsH_3^+		g	77.9456	1043.1	1041.8	—	—	—	—
$HAsO_2$		ao	107.9284	—	-456.5	-402.66	—	125.9	—
$HAsO_4^{2-}$		ao	139.9272	—	-906.34	-714.60	—	-1.7	—
$H_2AsO_3^-$	equivalent to AsO_2^-(ao) + H_2O(l)	ao	124.9358	—	-714.79	-587.13	—	110.5	—
$H_2AsO_4^-$		ao	140.9352	—	-909.56	-753.17	—	117.	—
H_3AsO_3	equivalent to $HAsO_2$(ao) + H_2O(l)	ao	125.9438	—	-742.2	-639.80	—	195.0	—
		aq	125.9438	—	-742.2	—	—	—	—
H_3AsO_4		cr	141.9432	—	-906.3	—	—	—	—
		ao	141.9432	—	-902.5	-766.0	—	184.	—
H_3AsO_4		aq	141.9432	—	-904.6	—	—	—	—
AsF_3		l	131.9168	—	-821.3	-774.16	—	181.21	126.57
		g	131.9168	-781.65	-785.76	-770.76	14.280	289.10	65.61
AsO_3F^{2-}		ao	141.9182	—	—	-1027.45	—	—	—
$HAsO_3F^-$		ao	142.9262	—	—	-1060.96	—	—	—
$AsCl_2$		g	145.8276	67.	67.	—	—	—	—
$AsCl_3$		l	181.2806	—	-305.0	-259.4	—	216.3	—
		g	181.2806	-259.91	-261.5	-248.9	17.309	327.17	75.73
$AsBr_3$		cr	314.6486	—	-197.5	—	—	—	—
		g	314.6486	-106.90	-130.	-159.	19.117	363.87	79.16
AsI_3		cr	455.6348	-58.20	-58.2	-59.4	24.953	213.05	105.77
		g	455.6348	—	—	—	20.225	388.34	80.63
As_2S_2		cr	213.9712	—	-142.7	—	—	—	—

Table 20:As — ARSENIC (Prepared 1964) — Continued — Table 20:As

Substance Formula and Description	State	Molar mass g mol⁻¹	0 K: $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar): $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
As_2S_3	cr	246.0352	—	-169.0	-168.6	—	163.6	116.3
$As_2O_3 \cdot SO_3$	cr	277.9036	—	-1194.32	—	—	—	—
AsN	g	88.9283	197.	196.27	167.97	9.075	225.6	30.42
NH_4AsO_2	ai	124.9591	—	-561.53	-429.29	—	154.8	—
$NH_4H_2AsO_3$ from $H_2ASO_3^-$	ai	142.9745	—	-847.30	-666.43	—	223.8	—
$NH_4H_2AsO_4$	cr	158.9739	—	-1059.8	-832.9	—	172.05	151.17
from $H_2ASO_4^-$	ai	158.9739	—	-1042.07	-832.48	—	230.5	—
in 660 H_2O		158.9739	—	-1042.2	—	—	—	—
$(NH_4)_2HAsO_4$	cr	176.0046	—	-1181.6	—	—	—	—
from $HAsO_{42}^-$	ai	176.0046	—	-1171.35	-873.21	—	225.1	—
$(NH_4)_2HAsO_4$ in 660 H_2O		176.0046	—	-1170.7	—	—	—	—
$(NH_4)_3AsO_4$	cr	193.0353	—	-1286.2	—	—	—	—
	ai	193.0353	—	-1285.66	-886.32	—	177.4	—
$(NH_4)_3AsO_4 \cdot 3H_2O$	cr	247.0815	—	-2166.9	—	—	—	—

Table 21:**Sb** **ANTIMONY** (Prepared 1964) Table 21:**Sb**

Substance Formula	Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
Sb	III	cr	121.7500	0	0	0	5.899	45.69	25.23
	IV, explosive	am	121.7500	—	10.63	—	—	—	—
		g	121.7500	262.04	262.3	222.1	6.197	180.27	20.79
Sb^+		g	121.7500	1095.8	1102.5	—	6.197	—	—
Sb^{2+}		g	121.7500	2690.	2703.	—	6.197	—	—
Sb^{3+}		g	121.7500	5134.	5151.	—	6.197	—	—
Sb^{4+}		g	121.7500	9393.	9418.	—	6.197	—	—
Sb^{5+}		g	121.7500	14770.	14799.	—	—	—	—
Sb_2		g	243.5000	237.48	235.6	187.0	9.874	254.92	36.40
Sb_4		g	487.0000	210.0	205.0	154.8	18.41	352.	—
SbO		g	137.7494	201.	199.45	—	8.878	—	—
SbO^+		ao	137.7494	—	—	-177.11	—	—	—
SbO_2^-		ao	153.7488	—	—	-340.19	—	—	—
Sb_2O_3		aq	291.4982	—	-689.9	—	—	—	—
Sb_2O_4		cr	307.4976	—	-907.5	-795.7	—	127.2	114.60
Sb_2O_5		cr	323.4970	—	-971.9	-829.2	—	125.1	—
		aq	323.4970	—	-956.9	—	—	—	—
Sb_4O_6	II, cubic	cr	582.9964	—	-1440.6	-1268.1	—	220.9	—
	I, orthorhombic	cr2	582.9964	—	-1417.1	-1253.0	—	246.0	202.76
Sb_6O_{13}		cr	938.4922	—	-2805.8	—	—	—	—
SbH_3		g	124.7740	153.239	145.105	147.75	10.468	232.78	41.05
$HSbO_2$		ao	154.7568	—	-487.9	-407.5	—	46.4	—
$Sb(OH)_3$		cr	172.7722	—	—	-685.2	—	—	—
	equivalent to $HSbO_2$(ao) + H_2O(l)	ao	172.7722	—	-773.6	-644.7	—	116.3	—
H_3SbO_4		aq	188.7716	—	-907.1	—	—	—	—
$HSb(OH)_6$		aq	224.8024	—	-1478.6	—	—	—	—
SbF		g	140.7484	-46.	-47.24	—	9.083	—	33.35
SbF_3		cr	178.7452	—	-915.5	—	—	—	—
	in 200 H_2O		178.7452	—	-910.9	—	—	—	—
SbOF		ao	156.7478	—	—	-487.4	—	—	—
H_3SbF_6		aq	238.7644	—	-1876.1	—	—	—	—
$Sb(OH)_2F$		ao	174.7632	—	—	-724.6	—	—	—
SbCl		g	157.2030	-25.	-26.02	—	9.577	—	35.52
$SbCl_2$		g	192.6560	-75.	-77.4	—	—	—	—
$SbCl_3$		cr	228.1090	—	-382.17	-323.67	—	184.1	107.9
$SbCl_3$		g	228.1090	-312.00	-313.8	-301.2	17.861	337.80	76.69
$SbCl_5$		l	299.0150	—	-440.2	-350.1	—	301.	—
		g	299.0150	-392.04	-394.34	-334.29	26.531	401.94	121.13
	in $C_6H_5NO_2$:u		299.0150	—	-483.7	—	—	—	—
SbOCl		cr	173.2024	—	-374.0	—	—	—	—
SbOCl		g	173.2024	-105.	-106.7	—	—	—	—
$Sb_4O_5Cl_2$		cr	637.9030	—	-1451.4	—	—	—	—
$SbBr_3$		cr	361.4770	—	-259.4	-239.3	—	207.1	—
		g	361.4770	-171.67	-194.6	-223.9	19.778	372.86	80.21
	in CS_2:u		361.4770	—	-244.3	—	—	—	—
SbI_3		cr	502.4632	—	-100.4	—	—	—	—
		aq	502.4632	—	-98.7	—	—	—	—
Sb_2S_3	black	cr	339.6920	—	-174.9	-173.6	—	182.0	119.87
	orange	am	339.6920	—	-147.3	—	—	—	—

Table 21:Sb — **ANTIMONY** (Prepared 1964) — Continued — Table 21:Sb

Substance Formula and Description	State	Molar mass	0 K	298.15 K (25°C) and 0.1 MPa (1 bar)				
			$\Delta_f H^\circ_0$	$\Delta_f H^\circ$	$\Delta_f G^\circ$	$H^\circ - H^\circ_0$	S°	C_p°
		g mol^{-1}	kJ mol^{-1}	kJ mol^{-1}			J mol^{-1} K^{-1}	
$Sb_2S_4^{2-}$	ao	371.7560	—	-219.2	-99.5	—	-52.3	—
$Sb_2(SO_4)_3$	cr	531.6848	—	-2402.5	—	—	—	—
Sb_2Te_3	cr	626.3000	—	-56.5	-55.2	—	234.	—
SbN	g	135.7567	268.	266.35	—	8.803	—	31.00
NH_4SbO_2	ai	171.7875	—	—	-419.50	—	—	—
$SbF_3{\cdot}NH_3$	cr	195.7759	—	-1018.8	—	—	—	—
$SbF_3{\cdot}2NH_3$	cr	212.8066	—	-1115.5	—	—	—	—
$SbF_3{\cdot}3NH_3$	cr	229.8373	—	-1200.4	—	—	—	—
$SbF_3{\cdot}4NH_3$	cr	246.8680	—	-1278.2	—	—	—	—
$SbF_3{\cdot}6NH_3$	cr	280.9294	—	-1433.0	—	—	—	—
$(NH_4)_2Sb_2S_4$	ai	407.8334	—	-484.1	-258.0	—	174.5	—

Table 22:**Bi** **BISMUTH** (Prepared 1965) Table 22:**Bi**

Substance Formula and Description	State	Molar mass g mol^{-1}	0 K	298.15 K (25°C) and 0.1 MPa (1 bar)				
			$\Delta_f H_0^\circ$ kJ mol^{-1}	$\Delta_f H^\circ$	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H_0^\circ$	S° J mol^{-1} K^{-1}	C_p
Bi	cr	208.9800	0	0	0	6.427	56.74	25.52
	g	208.9800	207.36	207.1	168.2	6.197	187.005	20.786
Bi^{+}	g	208.9800	910.9	916.7	—	6.197	—	—
Bi^{2+}	g	208.9800	2523.	2536.	—	6.197	—	—
Bi^{3+}	g	208.9800	4987.	5004.	—	6.197	—	—
Bi^{4+}	g	208.9800	9360.	9385.	—	6.197	—	—
Bi^{5+}	g	208.9800	14761.	14790.	—	6.197	—	—
Bi^{3+}	ao	208.9800	—	—	82.8	—	—	—
Bi_2	g	417.9600	222.25	219.7	—	10.268	—	36.94
BiO	g	224.9794	—	—	—	8.996	—	32.68
BiO^{+}	ao	224.9794	—	—	-146.4	—	—	—
Bi_2O_3	cr	465.9582	—	-573.88	-493.7	—	151.5	113.51
$Bi_6O_6^{6+}$	ao	1349.8764	—	—	-928.0	—	—	—
$BiOH^{2+}$	ao	225.9874	—	—	-146.4	—	—	—
BiOOH	cr	241.9868	—	—	-368.1	—	—	—
$Bi(OH)_3$	cr	260.0022	—	-711.3	—	—	—	—
$Bi_6O_6(OH)_3^{3+}$	ao	1400.8986	—	—	-1588.1	—	—	—
$Bi_6(OH)_{12}^{6+}$	ao	1457.9688	—	—	-2350.7	—	—	—
$Bi_9(OH)_{20}^{7+}$	ao	2220.9680	—	—	-3980.5	—	—	—
$Bi_9(OH)_{21}^{6+}$	ao	2237.9753	—	—	-4199.3	—	—	—
$Bi_9(OH)_{22}^{5+}$	ao	2254.9828	—	—	-4421.4	—	—	—
BiCl	cr	244.4330	—	-130.5	-108.3	—	94.6	—
$BiCl^{2+}$	ao	244.4330	—	—	-61.27	—	—	—
$BiCl_2^{+}$	ao	279.8860	—	—	-205.4	—	—	—
$BiCl_3$	cr	315.3390	—	-379.1	-315.0	—	177.0	105.
$BiCl_3$	g	315.3390	-264.93	-265.7	-256.0	19.422	358.85	79.66
in HCl + 26.6 H_2O:u		315.3390	—	-425.5	—	—	—	—
$BiCl_4^{-}$	ao	350.7920	—	—	-481.5	—	—	—
$BiCl_6^{3-}$	ao	421.6980	—	—	-746.74	—	—	—
BiOCl	cr	260.4324	—	-366.9	-322.1	—	120.5	—
$Bi(OH)_2Cl$	cr	278.4478	—	—	-538.44	—	—	—
$BiBr^{2+}$	ao	288.8890	—	—	-33.9	—	—	—
$BiBr_2^{+}$	ao	368.7980	—	—	-150.2	—	—	—
$BiBr_3$	cr	448.7070	—	—	—	—	—	109.
	ao	448.7070	—	—	-264.8	—	—	—
$BiBr_4^{-}$	ao	528.6160	—	—	-377.4	—	—	—
BiOBr	cr	304.8884	—	—	-297.0	—	—	—
BiI^{2+}	ao	335.8844	—	—	15.9	—	—	—
BiI_3	cr	589.6932	—	—	-175.3	—	—	—
BiI_4^{-}	ao	716.5976	—	—	-208.8	—	—	—
BiS	g	241.0440	—	180.	121.	—	285.	—
Bi_2S_3	cr	514.1520	—	-143.1	-140.6	—	200.4	122.2
$Bi_2(SO_4)_3$	cr	706.1448	—	-2544.3	—	—	—	—
BiSe	g	287.9400	—	175.7	—	—	—	—
BiTe	g	336.5800	—	179.1	—	—	—	—
Bi_2Te_3	cr	800.7600	-77.11	-77.4	-77.0	30.907	260.91	120.5
$BiONO_3$	cr	286.9843	—	—	-280.2	—	—	—
NH_4BiCl_4	ai	368.8307	—	—	-560.9	—	—	—
$NH_4BiCl_6^{2-}$	ao	439.7367	—	—	-826.5	—	—	—
$(NH_4)_3BiCl_6$	ai	475.8141	—	—	-984.65	—	—	—

Table 22:**Bi** **BISMUTH** (Prepared 1965) — Continued Table 22:**Bi**

Substance Formula and Description	State	Molar mass g mol^{-1}	0 K $\Delta_f H^\circ_0$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H^\circ_0$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
NH_4BiBr_4	ai	546.6547	—	—	-456.8	—	—	—
NH_4BiI_4	ai	734.6363	—	—	-288.2	—	—	—
$BiAsO_4$	cr	347.8992	—	—	-619.	—	—	—

Table 23:C **CARBON** (Prepared 1966) Table 23:C

Substance Formula	Description	State	Molar mass g mol^{-1}	0 K $\Delta_f H^\circ_0$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H^\circ_0$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
C	graphite, Acheson spectroscopic	cr	12.0112	0	0	0	1.050	5.740	8.527
	diamond	cr2	12.0112	2.423	1.895	2.900	0.523	2.377	6.113
		g	12.0112	711.20	716.682	671.257	6.535	158.096	20.838
C^+		g	12.0112	1797.643	1809.442	—	6.653	—	—
C^{2+}		g	12.0112	4150.252	4167.791	—	6.197	—	—
C^{3+}		g	12.0112	8770.67	8794.43	—	6.197	—	—
C^{4+}		g	12.0112	14993.36	15023.28	—	6.197	—	—
C^{5+}		g	12.0112	52823.8	52859.8	—	6.197	—	—
CO		g	28.0106	-113.801	-110.525	-137.168	8.665	197.674	29.142
		ao	28.0106	—	-120.96	-119.90	—	104.6	—
CO	in CH_3COOH:u in acetic acid		28.0106	—	-110.525	-117.76	—	132.6	—
CO^+		g	28.0106	1238.368	1247.840	—	8.669	—	—
CO^{2+}		g	28.0106	3824.	3841.	—	—	—	—
CO_2		g	44.0100	-393.141	-393.509	-394.359	9.360	213.74	37.11
		ao	44.0100	—	-413.80	-385.98	—	117.6	—
CO_2	in C_2H_5OH:x		44.0100	—	-405.22	-382.05	—	133.1	—
	in $(CH_3)_2CO$:x		44.0100	—	-411.58	-384.52	—	120.1	—
	in CH_3OH:u		44.0100	—	-408.23	—	—	—	—
	in C_6H_6:u		44.0100	—	-398.15	—	—	—	—
	in CCl_4:u		44.0100	—	-411.66	—	—	—	—
CO_2^+		g	44.0100	936.0	943.1	—	10.556	—	—
CO_2^{2+}		g	44.0100	3188.	3201.	—	—	—	—
CO_3^{2-}		ao	60.0094	—	-677.14	-527.81	—	-56.9	—
CH		g	13.0192	592.5	595.80	—	8.623	—	—
CH^+		g	13.0192	1619.2	1628.4	—	8.627	—	—
CH_2		g	14.0272	389.9	390.37	372.92	9.937	194.87	33.76
CH_2^+		g	14.0272	1393.02	1399.63	—	—	—	—
CH_3		g	15.0352	149.03	145.69	147.92	10.42	194.2	38.70
CH_3^+		g	15.0352	1097.00	1099.85	—	—	—	—
CH_4		g	16.0432	-66.818	-74.81	-50.72	9.991	186.264	35.309
CH_4		ao	16.0432	—	-89.04	-34.33	—	83.7	—
CH_4^+		g	16.0432	1150.2	1148.5	—	—	—	—
HCO		g	29.0186	42.7	43.1	28.0	9.983	224.71	34.56
HCO_2^-	formate	ao	45.0180	—	-425.55	-351.0	—	92.	-87.9
HCO_3^-	bicarbonate	ao	61.0174	—	-691.99	-586.77	—	91.2	—
HCHO		g	30.0266	-104.734	-108.57	-102.53	10.016	218.77	35.40
	unhydrolyzed	ao	30.0266	—	-141.8	—	—	—	—
	in 60 H_2O		30.0266	—	-170.7	—	—	—	—
	in 40 CH_3OH		30.0266	—	-171.5	—	—	—	—
$HCHO^+$		g	30.0266	944.45	946.84	—	—	—	—
HCO_2H	formic acid	l	46.0260	—	-424.72	-361.35	—	128.95	99.04
		g	46.0260	—	-378.57	—	—	—	—
		ai	46.0260	—	-425.55	-351.0	—	92.	-87.9
		ao	46.0260	—	-425.43	-372.3	—	163.	—
	in 0.5 H_2O		46.0260	—	-425.232	—	—	—	—
HCO_2H	in 1.0 H_2O		46.0260	—	-425.509	—	—	—	—
	in 2.0 H_2O		46.0260	—	-425.576	—	—	—	—
	in 3.0 H_2O		46.0260	—	-425.500	—	—	—	—

Table 23:C — **CARBON** (Prepared 1966) — Continued — Table 23:C

Substance Formula	Description	State	Molar mass g mol^{-1}	0 K: $\Delta_f H^\circ_0$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar): $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H^\circ_0$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
HCO_2H	in 4.0 H_2O		46.0260	—	-425.433	—	—	—	—
	in 5.0 H_2O		46.0260	—	-425.375	—	—	—	—
	in 6.0 H_2O		46.0260	—	-425.333	—	—	—	—
	in 8.0 H_2O		46.0260	—	-425.283	—	—	—	—
	in 10 H_2O		46.0260	—	-425.270	—	—	—	—
HCO_2H	in 15 H_2O		46.0260	—	-425.266	—	—	—	—
	in 25 H_2O		46.0260	—	-425.274	—	—	—	—
	in 50 H_2O		46.0260	—	-425.320	—	—	—	—
	in 75 H_2O		46.0260	—	-425.350	—	—	—	—
	in 100 H_2O		46.0260	—	-425.371	—	—	—	—
HCO_2H	in 200 H_2O		46.0260	—	-425.404	—	—	—	—
	in 500 H_2O		46.0260	—	-425.421	—	—	—	—
	in 1 000 H_2O		46.0260	—	-425.433	—	—	—	—
	in 10 000 H_2O		46.0260	—	-425.450	—	—	—	—
	in 20 000 H_2O		46.0260	—	-425.458	—	—	—	—
HCO_2H	in 50 000 H_2O		46.0260	—	-425.471	—	—	—	—
	in 100 000 H_2O		46.0260	—	-425.500	—	—	—	—
	in ∞ H_2O		46.0260	—	-425.55	—	—	—	—
HCO_2H^+		g	46.0260	—	720.74	—	—	—	—
H_2CO_3	equivalent to CO_2(ao) + H_2O(l)	ao	62.0254	—	-699.65	-623.08	—	187.4	—
CH_3O^-	in CH_3OH:s methylate		31.0346	—	-193.47	-70.90	—	-41.4	—
CH_3OH	methanol	l	32.0426	—	-238.66	-166.27	—	126.8	81.6
		g	32.0426	-189.765	-200.66	-161.96	11.427	239.81	43.89
		ao	32.0426	—	-245.931	-175.31	—	133.1	—
	in 0.25 H_2O		32.0426	—	-239.237	—	—	—	—
CH_3OH	in 0.50 H_2O		32.0426	—	-239.630	—	—	—	—
	in 1.0 H_2O		32.0426	—	-240.266	—	—	—	—
	in 1.5 H_2O		32.0426	—	-240.810	—	—	—	—
	in 2.0 H_2O		32.0426	—	-241.312	—	—	—	—
	in 2.5 H_2O		32.0426	—	-241.752	—	—	—	—
CH_3OH	in 3.0 H_2O		32.0426	—	-242.136	—	—	—	—
	in 3.5 H_2O		32.0426	—	-242.480	—	—	—	—
	in 4.0 H_2O		32.0426	—	-242.781	—	—	—	—
	in 4.5 H_2O		32.0426	—	-243.044	—	—	—	—
	in 5.0 H_2O		32.0426	—	-243.279	—	—	—	—
CH_3OH	in 5.5 H_2O		32.0426	—	-243.484	—	—	—	—
	in 6.0 H_2O		32.0426	—	-243.659	—	—	—	—
	in 7.0 H_2O		32.0426	—	-243.956	—	—	—	—
	in 8.0 H_2O		32.0426	—	-244.187	—	—	—	—
	in 9.0 H_2O		32.0426	—	-244.375	—	—	—	—
CH_3OH	in 10 H_2O		32.0426	—	-244.509	—	—	—	—
	in 12 H_2O		32.0426	—	-244.756	—	—	—	—
	in 15 H_2O		32.0426	—	-244.986	—	—	—	—
	in 20 H_2O		32.0426	—	-245.220	—	—	—	—
	in 25 H_2O		32.0426	—	-245.358	—	—	—	—
CH_3OH	in 30 H_2O		32.0426	—	-245.454	—	—	—	—
	in 40 H_2O		32.0426	—	-245.572	—	—	—	—
	in 50 H_2O		32.0426	—	-245.643	—	—	—	—
	in 75 H_2O		32.0426	—	-245.739	—	—	—	—

Table 23:C — **CARBON** (Prepared 1966) — Continued — Table 23:C

Substance Formula	Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
CH_3OH	in 100 H_2O		32.0426	—	-245.785	—	—	—	—
	in 150 H_2O		32.0426	—	-245.835	—	—	—	—
	in 200 H_2O		32.0426	—	-245.860	—	—	—	—
	in 300 H_2O		32.0426	—	-245.881	—	—	—	—
	in 400 H_2O		32.0426	—	-245.894	—	—	—	—
CH_3OH	in 500 H_2O		32.0426	—	-245.902	—	—	—	—
	in 1 000 H_2O		32.0426	—	-245.919	—	—	—	—
	in ∞ H_2O		32.0426	—	-245.931	—	—	—	—
	in 0.1 C_6H_6		32.0426	—	-238.505	—	—	—	—
	in 0.15 C_6H_6		32.0426	—	-238.429	—	—	—	—
CH_3OH	in 0.20 C_6H_6		32.0426	—	-238.358	—	—	—	—
	in 0.25 C_6H_6		32.0426	—	-238.287	—	—	—	—
	in 0.50 C_6H_6		32.0426	—	-237.965	—	—	—	—
	in 1.0 C_6H_6		32.0426	—	-237.409	—	—	—	—
	in 1.5 C_6H_6		32.0426	—	-236.957	—	—	—	—
CH_3OH	in 2.0 C_6H_6		32.0426	—	-236.530	—	—	—	—
	in 2.5 C_6H_6		32.0426	—	-236.149	—	—	—	—
	in 3.0 C_6H_6		32.0426	—	-235.806	—	—	—	—
	in 3.5 C_6H_6		32.0426	—	-235.484	—	—	—	—
	in 4.0 C_6H_6		32.0426	—	-235.174	—	—	—	—
CH_3OH	in 4.5 C_6H_6		32.0426	—	-234.886	—	—	—	—
	in 5.0 C_6H_6		32.0426	—	-234.614	—	—	—	—
	in 5.5 C_6H_6		32.0426	—	-234.346	—	—	—	—
	in 6.0 C_6H_6		32.0426	—	-234.095	—	—	—	—
	in 7.0 C_6H_6		32.0426	—	-233.630	—	—	—	—
CH_3OH	in 8.0 C_6H_6		32.0426	—	-233.208	—	—	—	—
	in 9.0 C_6H_6		32.0426	—	-232.831	—	—	—	—
	in 10 C_6H_6		32.0426	—	-232.471	—	—	—	—
	in 12 C_6H_6		32.0426	—	-231.827	—	—	—	—
	in 15 C_6H_6		32.0426	—	-231.007	—	—	—	—
CH_3OH	in 20 C_6H_6		32.0426	—	-229.911	—	—	—	—
	in 10 $(CH_2OH)_2$ in 1,2-ethanediol		32.0426	—	-238.321	—	—	—	—
CH_3OH^+		g	32.0426	856.9	852.3	—	—	—	—
$CH_2(OH)_2$	formaldehyde hydrate	g	48.0420	—	-402.	—	—	—	—
		aq	48.0420	—	-456.5	—	—	—	—
CF_3		g	69.0064	-474.0	-477.	-464.	11.46	264.5	49.58
CF_3^+		g	69.0064	401.2	404.6	—	—	—	—
CF_4		g	88.0048	-918.8	-925.	-879.	12.732	261.61	61.09
	in C_7F_{14}:x in perfluoromethylcyclohexane		88.0048	—	-931.8	-867.3	—	199.2	—
COF_2	carbonyl fluoride	g	66.0074	-631.57	-634.7	-619.2	11.054	258.60	46.82
CH_3F		g	34.0336	—	—	—	10.134	222.91	37.49
CH_2F_2		g	52.0240	-439.19	-446.9	-419.2	10.690	246.71	42.89
CHF_3		g	70.0144	-681.32	-688.3	-653.9	11.565	259.68	51.04
$CHOF$	formyl fluoride	g	48.0170	—	—	—	10.401	246.63	39.92
CCl_3		g	118.3702	59.	59.	—	—	—	—
CCl_3^+		g	118.3702	845.	849.	—	—	—	—
CCl_4		l	153.8232	—	-135.44	-65.21	—	216.40	131.75
		g	153.8232	-100.75	-102.9	-60.59	17.226	309.85	83.30

Table 23:C — **CARBON** (Prepared 1966) — Continued — Table 23:C

Substance Formula	Substance Description	State	Molar mass g mol^{-1}	0 K: $\Delta_f H_0^\circ$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar): $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H_0^\circ$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
CCl_4	in 0.1 C_6H_6		153.8232	—	-135.394	—	—	—	—
	in 0.25 C_6H_6		153.8232	—	-135.344	—	—	—	—
	in 0.50 C_6H_6		153.8232	—	-135.281	—	—	—	—
	in 1.0 C_6H_6		153.8232	—	-135.206	—	—	—	—
	in 1.5 C_6H_6		153.8232	—	-135.156	—	—	—	—
CCl_4	in 2.0 C_6H_6		153.8232	—	-135.122	—	—	—	—
	in 3.0 C_6H_6		153.8232	—	-135.080	—	—	—	—
	in 4.0 C_6H_6		153.8232	—	-135.051	—	—	—	—
	in 5.0 C_6H_6		153.8232	—	-135.030	—	—	—	—
	in 6.0 C_6H_6		153.8232	—	-135.018	—	—	—	—
CCl_4	in 8.0 C_6H_6		153.8232	—	-134.997	—	—	—	—
	in 10 C_6H_6		153.8232	—	-134.980	—	—	—	—
	in 2 CS_2		153.8232	—	-134.56	—	—	—	—
	in 10 CS_2		153.8232	—	-134.06	—	—	—	—
	in 0.10 $CHCl_3$		153.8232	—	-135.352	—	—	—	—
CCl_4	in 0.25 $CHCl_3$		153.8232	—	-135.252	—	—	—	—
	in 0.50 $CHCl_3$		153.8232	—	-135.126	—	—	—	—
	in 1.0 $CHCl_3$		153.8232	—	-134.972	—	—	—	—
	in 1.5 $CHCl_3$		153.8232	—	-134.880	—	—	—	—
	in 2.0 $CHCl_3$		153.8232	—	-134.817	—	—	—	—
CCl_4	in 3.0 $CHCl_3$		153.8232	—	-134.737	—	—	—	—
	in 4.0 $CHCl_3$		153.8232	—	-134.691	—	—	—	—
	in 5.0 $CHCl_3$		153.8232	—	-134.662	—	—	—	—
	in 6.0 $CHCl_3$		153.8232	—	-134.637	—	—	—	—
	in 8.0 $CHCl_3$		153.8232	—	-134.608	—	—	—	—
CCl_4	in 10 $CHCl_3$		153.8232	—	-134.591	—	—	—	—
	in 1.0 CH_2Cl_2		153.8232	—	-134.26	—	—	—	—
	in 3.0 CH_2Cl_2		153.8232	—	-133.64	—	—	—	—
	in 2 CH_3I		153.8232	—	-134.700	—	—	—	—
	in 10 CH_3I		153.8232	—	-134.419	—	—	—	—
CCl_4	in 2 CH_2BrCH_2Br in 1,2-dibromoethane		153.8232	—	-134.10	—	—	—	—
	in 10 CH_2BrCH_2Br		153.8232	—	-133.68	—	—	—	—
$COCl_2$	carbonyl chloride	g	98.9166	-217.11	-218.8	-204.6	12.832	283.53	57.66
CH_3Cl		g	50.4882	-72.910	-80.83	-57.37	10.414	234.58	40.75
		ao	50.4882	—	-101.7	-51.4	—	144.8	—
CH_3Cl^+		g	50.4882	1009.6	1007.9	—	—	—	—
CH_2Cl_2		l	84.9332	—	-121.46	-67.26	—	177.8	100.0
		g	84.9332	-85.613	-92.47	-65.87	11.841	270.23	50.96
	in 1 CCl_4		84.9332	—	-120.29	—	—	—	—
	in 3 CCl_4		84.9332	—	-119.75	—	—	—	—
CH_2Cl_2	in 10 $CHCl_3$		84.9332	—	-121.420	—	—	—	—
	in 2 CH_3I		84.9332	—	-120.993	—	—	—	—
	in 10 CH_3I		84.9332	—	-120.771	—	—	—	—
$CH_2Cl_2^+$		g	84.9332	1009.6	1008.8	—	—	—	—
$CHCl_3$		l	119.3782	—	-134.47	-73.66	—	201.7	113.8
$CHCl_3$		g	119.3782	-98.265	-103.14	-70.34	14.180	295.71	65.69
	in 1 000 H_2O		119.3782	—	-143.5	—	—	—	—
	in 2 CH_2CH_2 in ethene		119.3782	—	-134.428	—	—	—	—
	in 10 CH_2CH_2		119.3782	—	-134.394	—	—	—	—

Table 23:C — CARBON (Prepared 1966) — Continued — Table 23:C

Substance Formula	Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
$CHCl_3$	in 2 CH_3COCH_3 in acetone		119.3782	—	-138.99	—	—	—	—
	in 5 CH_3COCH_3		119.3782	—	-139.24	—	—	—	—
	in 10 CH_3COCH_3		119.3782	—	-139.33	—	—	—	—
	in 0.1 CCl_4		119.3782	—	-134.39	—	—	—	—
	in 0.25 CCl_4		119.3782	—	-134.290	—	—	—	—
$CHCl_3$	in 0.50 CCl_4		119.3782	—	-134.164	—	—	—	—
	in 1.0 CCl_4		119.3782	—	-134.009	—	—	—	—
	in 1.5 CCl_4		119.3782	—	-133.917	—	—	—	—
	in 2.0 CCl_4		119.3782	—	-133.855	—	—	—	—
	in 3.0 CCl_4		119.3782	—	-133.775	—	—	—	—
$CHCl_3$	in 4.0 CCl_4		119.3782	—	-133.729	—	—	—	—
	in 5.0 CCl_4		119.3782	—	-133.700	—	—	—	—
	in 6.0 CCl_4		119.3782	—	-133.675	—	—	—	—
	in 8.0 CCl_4		119.3782	—	-133.645	—	—	—	—
	in 10 CCl_4		119.3782	—	-133.629	—	—	—	—
$CHCl_3$	in 75 $(C_2H_5)_2O$		119.3782	—	-142.67	—	—	—	—
	in 2 CH_3I		119.3782	—	-134.917	—	—	—	—
	in 10 CH_3I		119.3782	—	-135.009	—	—	—	—
	in 2 CH_2BrCH_2Br		119.3782	—	-134.77	—	—	—	—
	in 1,2–dibromoethane								
	in C_6H_7N:u3 in γ–picoline		119.3782	—	-139.126	—	—	—	—
$CHCl_3$	in $C_4H_{11}N$:u2 in diethylamine		119.3782	—	-141.888	—	—	—	—
	in C_6H_7N:u2 in β–picoline		119.3782	—	-138.959	—	—	—	—
	in $C_6H_{15}N$:u2 in triethylamine		119.3782	—	-141.754	—	—	—	—
	in C_7H_9N:u2 in 2,6–lutidine		119.3782	—	-140.976	—	—	—	—
	in C_9H_7N:u2 in quinoline		119.3782	—	-138.532	—	—	—	—
$CHCl_3$	in C_4H_5N:u in pyrrole		119.3782	—	-135.687	—	—	—	—
	in $C_4H_{11}N$:u in n–butylamine		119.3782	—	-140.449	—	—	—	—
	in C_5H_5N:u in pyridine		119.3782	—	-138.524	—	—	—	—
	in C_6H_7N:u in α–picoline		119.3782	—	-139.411	—	—	—	—
	in $C_6H_{15}N$:u in di-isopropylamine		119.3782	—	-142.298	—	—	—	—
$CHCl_3$	in C_7H_9N:u in 2,4–lutidine		119.3782	—	-140.942	—	—	—	—
	in $C_8H_{11}N$:u		119.3782	—	-142.030	—	—	—	—
	in collidine (2,4,6–trimethylpyridine)								
	inC_9H_7N:u in isoquinoline		119.3782	—	-138.156	—	—	—	—
	in $C_8H_{19}N$:u in di–n–butylamine		119.3782	—	-141.252	—	—	—	—
	in $C_{12}H_{27}N$:u in tri–n–butylamine		119.3782	—	-138.139	—	—	—	—
$CHCl_3^+$		g	119.3782	1003.7	1005.0	—	—	—	—
CF_3Cl		g	104.4594	-689.5	-695.	-653.	13.778	285.29	66.86
CF_2Cl_2		g	120.9140	-472.8	-477.	-439.	14.824	300.77	72.26
$CFCl_3$		l	137.3686	—	-301.33	-236.79	—	225.35	121.55
		g	137.3686	-272.8	-276.	-238.	16.079	309.93	78.07
COFCl	carbonyl chlorofluoride	g	82.4620	—	—	—	11.903	276.71	52.38
CH_2ClF		g	68.4786	—	—	—	11.251	264.41	47.03
$CHClF_2$		g	86.4690	—	—	—	12.364	280.90	55.86
$CHCl_2F$		g	102.9236	—	—	—	13.263	293.07	60.92
CBr_3		g	251.7382	197.	176.	—	—	—	—
CBr_3^+		g	251.7382	1001.2	986.6	—	—	—	—

Table 23:C — **CARBON** (Prepared 1966) — Continued — Table 23:C

Substance Formula	Description	State	Molar mass g mol^{-1}	0 K $\Delta_f H^\circ_0$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H^\circ_0$	S° J mol^{-1} K^{-1}	C_p
CBr_4	monoclinic	cr	331.6472	—	18.8	47.7	—	212.5	144.3
		g	331.6472	109.20	79.	67.	20.389	358.05	91.17
$COBr_2$	carbonyl bromide	l	187.8286	—	-127.2	—	—	—	—
		g	187.8286	-80.29	-96.2	-110.9	13.975	309.10	61.84
CH_3Br		g	94.9442	-19.75	-35.1	-25.9	10.611	246.38	42.43
CH_3Br	in C_2H_5OH:u		94.9442	—	-54.73	—	—	—	—
CH_3Br^+		g	94.9442	996.2	987.0	—	—	—	—
CH_2Br_2		g	173.8452	—	—	—	12.636	293.24	54.68
$CHBr_3$		l	252.7462	—	-28.5	-5.0	—	220.9	130.
		g	252.7462	42.84	17.	8.	15.945	330.94	71.21
$CHBr_3^+$		g	252.7462	1056.9	1037.2	—	—	—	—
CF_3Br		g	148.9154	-630.61	-642.7	-616.3	14.464	297.76	69.33
CF_3Br^+		g	148.9154	513.0	507.1	—	—	—	—
CF_2Br_2		g	209.8260	—	—	—	16.284	325.25	77.03
$CFBr_3$		g	270.7366	—	—	—	18.259	345.88	84.39
$COFBr$	carbonyl bromofluoride	g	126.9180	—	—	—	12.468	289.85	54.98
CH_2BrF		g	112.9346	—	—	—	11.636	276.3	49.20
$CHBrF_2$		g	130.9250	—	—	—	13.167	295.1	58.74
$CHFBr_2$		g	191.8356	—	—	—	14.389	316.8	65.10
CCl_3Br		g	198.2792	-36.86	-46.0	-21.3	17.928	332.95	85.27
CBr_2Cl_2		g	242.7352	—	—	—	18.690	347.8	87.07
$CClBr_3$		g	287.1912	—	—	—	19.577	357.8	89.37
$COClBr$	carbonyl bromochloride	g	143.3726	—	—	—	13.380	301.885	59.748
CH_2ClBr		g	129.3892	—	—	—	12.213	287.6	52.72
$CHBrCl_2$		g	163.8342	—	—	—	14.728	316.4	67.40
$CHBr_2Cl$		g	208.2902	—	—	—	15.293	327.7	69.16
CF_2ClBr		g	165.3700	—	—	—	15.514	318.5	74.56
$CFBrCl_2$		g	181.8246	—	—	—	16.711	330.6	80.04
$CFBr_2Cl$		g	226.2806	—	—	—	17.489	342.8	82.38
$CHFClBr$		g	147.3796	—	—	—	13.841	304.3	63.22
CI_4		g	519.6288	—	—	—	22.355	391.94	95.86
CH_3I		l	141.9396	—	-15.5	13.4	—	163.2	126.
		g	141.9396	22.51	13.0	14.7	10.816	254.12	44.10
	in 2 CCl_4		141.9396	—	-14.744	—	—	—	—
	in 10 CCl_4		141.9396	—	-14.410	—	—	—	—
CH_3I	in 2 $CHCl_3$		141.9396	—	-15.962	—	—	—	—
	in 10 $CHCl_3$		141.9396	—	-16.171	—	—	—	—
	in 2 CH_2Cl_2		141.9396	—	-15.004	—	—	—	—
	in 10 CH_2Cl_2		141.9396	—	-14.845	—	—	—	—
CH_3I^+		g	141.9396	943.1	939.7	—	—	—	—
CH_2I_2		l	267.8360	—	66.9	90.4	—	174.1	134.
		g	267.8360	122.42	113.0	95.8	13.272	309.7	57.70
CHI_3		cr	393.7324	—	141.0	—	—	—	—
		g	393.7324	—	—	—	17.180	356.2	74.98
CH_3I_3	in C_7H_{16}:u in n–heptane		395.7484	—	-17.6	—	—	—	—
CF_3I		g	195.9108	—	—	—	14.975	307.38	70.88
CH_2ClI		g	176.3846	—	—	—	12.560	295.9	54.48
CH_2IBr		g	220.8406	—	—	—	12.979	307.6	56.32
CS		g	44.0752	230.	234.	184.	8.707	210.56	29.79
CS_2		l	76.1392	—	89.70	65.27	—	151.34	75.7

Table 23:C — CARBON (Prepared 1966) — Continued — Table 23:C

Substance Formula	Description	State	Molar mass g mol^{-1}	0 K $\Delta_f H^\circ_0$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H^\circ_0$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
CS_2		g	76.1392	116.57	117.36	67.12	10.657	237.84	45.40
		aq	76.1392	—	89.1	—	—	—	—
	in 2 C_6H_6		76.1392	—	91.136	—	—	—	—
	in 10 C_6H_6		76.1392	—	91.579	—	—	—	—
	in 2 CCl_4		76.1392	—	90.54	—	—	—	—
CS_2	in 10 CCl_4		76.1392	—	90.75	—	—	—	—
	in 2 CH_2BrCH_2Br		76.1392	—	91.63	—	—	—	—
	in 1,2-dibromoethane								
	in 10 CH_2BrCH_2Br		76.1392	—	92.05	—	—	—	—
CS_2^+		g	76.1392	1089.5	1096.2	—	—	—	—
COS	carbonyl sulfide	g	60.0746	-142.218	-142.09	-169.34	9.929	231.57	41.51
COS^+		g	60.0746	936.8	943.1	—	—	—	—
CH_3SH		l	48.1072	—	-46.36	-7.68	—	169.20	90.54
		g	48.1072	-12.071	-22.34	-9.30	12.125	255.17	50.25
$SC(SH)_2$	trithiocarbonic acid	l	110.2192	—	25.1	29.3	—	218.	149.8
CH_2SO_4	methylene sulfate	cr	110.0888	—	-688.7	—	—	—	—
HF·COS		g	80.0810	—	-429.3	—	—	—	—
$CSCl_2$		g	114.9812	—	—	—	14.293	299.31	63.51
CSe_2		l	169.9312	—	164.8	—	—	—	—
CN		g	26.0179	434.3	437.6	407.5	8.66	202.6	29.16
CN^+		g	26.0179	1792.8	1802.5	—	—	—	—
CN^-		ao	26.0179	—	150.6	172.4	—	94.1	—
N_3CN	cyanogen azide	cr	68.0380	—	387.4	—	—	—	—
	polymeric	cr2	68.0380	—	343.9	—	—	—	—
OCN^-	cyanate	ao	42.0173	—	-146.0	-97.4	—	106.7	—
$C(NO_2)_4$		l	196.0332	—	36.8	—	—	—	—
HCN		l	27.0259	—	108.87	124.97	—	112.84	70.63
		g	27.0259	135.52	135.1	124.7	9.238	201.78	35.86
		ai	27.0259	—	150.6	172.4	—	94.1	—
		ao	27.0259	—	107.1	119.7	—	124.7	—
HCN^+		g	27.0259	1448.42	1454.23	—	—	—	—
CH_3NH_2	methylamine	l	31.0579	—	-47.3	35.7	—	150.21	—
		g	31.0579	—	-22.97	32.16	—	243.41	53.1
		ao	31.0579	—	-70.17	20.77	—	123.4	—
	in 300 H_2O		31.0579	—	-69.33	—	—	—	—
	in 400 H_2O		31.0579	—	-69.54	—	—	—	—
CH_3NH_2	in 500 H_2O		31.0579	—	-69.66	—	—	—	—
	in 600 H_2O		31.0579	—	-69.75	—	—	—	—
	in 700 H_2O		31.0579	—	-69.87	—	—	—	—
	in 800 H_2O		31.0579	—	-70.00	—	—	—	—
	in 900 H_2O		31.0579	—	-70.12	—	—	—	—
CH_3NH_2	in 1 000 H_2O		31.0579	—	-70.21	—	—	—	—
$CH_3NH_2^+$		g	31.0579	—	832.2	—	—	—	—
$CH_3NH_3^+$		ao	32.0659	—	-124.93	-39.86	—	142.7	—
CH_2N_2	diazirine	g	42.0406	—	—	—	10.514	238.05	42.63
	diazomethane	g2	42.0406	—	—	—	12.079	242.87	52.51
NH_2CN	cyanamide	cr3	42.0406	—	59.0	—	—	—	—
	in 600 H_2O		42.0406	—	74.5	—	—	—	—
NH_4CN		cr	44.0566	—	0.42	—	—	—	134.
		ai	44.0566	—	18.0	93.0	—	207.5	—

Table 23:C **CARBON** (Prepared 1966) — Continued Table 23:C

Substance Formula	Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
NH_4CN		aq	44.0566	—	32.2	—	—	—	—
CH_3NHNH_2	methyl hydrazine	l	46.0726	—	54.0	180.0	—	165.94	134.93
		g	46.0726	115.085	94.35	186.96	14.385	278.81	71.1
$CNH(NH_2)_2$	guanidine	cr	59.0713	—	-56.1	—	—	—	—
CH_2N_4	tetrazole	cr	70.0540	—	237.2	—	—	—	—
CH_2N_4	in 700 $(CH_3)_2CO$		70.0540	—	249.95	—	—	—	—
CH_3N_5	5-aminotetrazole	cr	85.0687	—	207.9	—	—	—	—
HNCO	isocyanic acid	g	43.0253	—	—	—	10.941	237.97	44.85
HOCN	cyanic acid	ai2	43.0253	—	-146.0	-97.4	—	106.7	—
		ao2	43.0253	—	-154.39	-117.1	—	144.8	—
$CH_2NO_2^-$	nitromethane ion of nitro form	aq	60.0327	—	-84.9	—	—	—	—
$HCONH_2$	formamide	l	45.0413	—	-254.0	—	—	—	—
		g	45.0413	—	—	—	10.774	248.68	45.35
	in 200 H_2O		45.0413	—	-247.7	—	—	—	—
CH_3ONO	methyl nitrite	g2	61.0407	—	-69.0	—	—	—	—
CH_3NO_2	nitromethane	l	61.0407	—	-113.09	-14.42	—	171.75	105.98
		g	61.0407	-60.860	-74.73	-6.84	12.899	274.96	57.32
	in 600 H_2O		61.0407	—	-110.5	—	—	—	—
$CH_3NO_2^+$		g	61.0407	1008.3	1000.4	—	—	—	—
CH_3NO_3	methyl nitrate	l	77.0401	-162.42	-159.0	-43.4	34.56	217.1	157.3
CH_3NO_3		g	77.0401	—	-124.7	-39.2	—	318.5	—
HCO_2NH_4	ammonium formate	cr	63.0567	—	-567.48	—	—	—	—
		ai	63.0567	—	-558.06	-430.4	—	205.	-7.9
	in 200 H_2O		63.0567	—	-557.10	—	—	—	—
NH_4HCO_3		cr	79.0561	—	-849.4	-665.9	—	120.9	—
NH_4HCO_3		ai	79.0561	—	-824.50	-666.07	—	204.6	—
		aq	79.0561	—	-821.7	—	—	—	—
CH_3NH_3OH	from $CH_3NH_3^+$	ai	49.0733	—	-354.93	-197.09	—	131.8	—
		ao	49.0733	—	-355.97	-216.38	—	193.3	—
$CO(NH_2)_2$	urea	cr	60.0560	—	-333.51	-197.33	—	104.60	93.14
$CO(NH_2)_2$	in 3.0 H_2O		60.0560	—	-321.164	—	—	—	—
	in 3.5 H_2O		60.0560	—	-320.980	—	—	—	—
	in 4.0 H_2O		60.0560	—	-320.821	—	—	—	—
	in 4.5 H_2O		60.0560	—	-320.678	—	—	—	—
	in 5.0 H_2O		60.0560	—	-320.561	—	—	—	—
$CO(NH_2)_2$	in 5.5 H_2O		60.0560	—	-320.453	—	—	—	—
	in 6 H_2O		60.0560	—	-320.361	—	—	—	—
	in 7 H_2O		60.0560	—	-320.185	—	—	—	—
	in 8 H_2O		60.0560	—	-320.034	—	—	—	—
	in 9 H_2O		60.0560	—	-319.909	—	—	—	—
$CO(NH_2)_2$	in 10 H_2O		60.0560	—	-319.808	—	—	—	—
	in 15 H_2O		60.0560	—	-319.448	—	—	—	—
	in 20 H_2O		60.0560	—	-319.239	—	—	—	—
	in 25 H_2O		60.0560	—	-319.101	—	—	—	—
	in 50 H_2O		60.0560	—	-318.787	—	—	—	—
$CO(NH_2)_2$	in 75 H_2O		60.0560	—	-318.670	—	—	—	—
	in 100 H_2O		60.0560	—	-318.61	—	—	—	—
	in 150 H_2O		60.0560	—	-318.549	—	—	—	—
	in 200 H_2O		60.0560	—	-318.520	—	—	—	—

Table 23:C — **CARBON** (Prepared 1966) — Continued — Table 23:C

Substance Formula	Description	State	Molar mass g mol⁻¹	0 K: $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar): $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
$CO(NH_2)_2$	in 400 H_2O		60.0560	—	-318.469	—	—	—	—
	in ∞ H_2O		60.0560	—	-318.419	—	—	—	—
	in 125 CH_3OH		60.0560	—	-324.34	—	—	—	—
	in 85 C_2H_5OH		60.0560	—	-320.70	—	—	—	—
	in 65 C_3H_7OH in 1-propanol		60.0560	—	-322.04	—	—	—	—
NH_4OCN	ammonium cyanate	cr2	60.0560	—	-304.39	—	—	—	—
		ai2	60.0560	—	-278.7	-176.9	—	220.1	—
NH_2COONH_4	ammonium carbamate	cr	78.0714	—	-645.05	-447.90	—	133.5	—
		ai	78.0714	—	-629.3	—	—	—	—
$CH_3NH_3NO_3$	methylammonium nitrate	cr	94.0708	—	-354.4	—	—	—	—
$CH_3NH_3NO_3$	from $CH_3NH_3^+$	ai	94.0708	—	-332.34	-151.11	—	289.1	—
	in 500 H_2O		94.0708	—	-331.8	—	—	—	—
$(NH_4)_2CO_3$		ai	96.0868	—	-942.15	-686.42	—	169.9	—
	in 400 H_2O		96.0868	—	-913.4	—	—	—	—
$CH(NO_2)_3$	trinitromethane	l	151.0357	—	-21.3	—	—	—	—
$NH_2CONHNO_2$	nitrourea	cr	105.0535	—	-282.4	—	—	—	—
$NH_2CONHNH_2$	semicarbazide	ao	75.0707	—	-166.9	-40.4	—	297.9	—
$CO(NH_2)_2 \cdot HNO_3$	urea nitrate	cr	123.0689	—	-564.0	—	—	—	—
	in 400 H_2O		123.0689	—	-520.1	—	—	—	—
$CO(NH_2)_2 \cdot NH_3$	urea ammine	cr	77.0867	—	-413.0	—	—	—	—
CH_2N_4O	5-hydroxytetrazole	cr	86.0534	—	6.3	—	—	—	—
$CH_4N_4O_2$	nitroguanidine	cr	104.0688	—	-92.59	—	—	—	—
$CNH(NH_2)_2 \cdot HNO_3$	guanidine nitrate	cr	122.0842	—	-387.0	—	—	—	—
	in 1 600 H_2O		122.0842	—	-347.3	—	—	—	—
$CH_5N_5O_2$	nitroaminoguanidine	cr	119.0835	—	22.2	—	—	—	—
$CH_2N_6O_2$	nitroguanylazide	cr	130.0662	—	298.3	—	—	—	—
$CH_4N_6O_3$	5-aminotetrazole nitrate	cr	148.0816	—	-27.6	—	—	—	—
	guanylazide nitrate	cr2	148.0816	—	15.9	—	—	—	—
$CH_8N_6O_3$	diaminoguanidine nitrate	cr	152.1136	—	-157.3	—	—	—	—
CNF	cyanogen fluoride	g	45.0163	—	—	—	10.134	224.66	41.80
CNCl	cyanogen chloride	l	61.4709	—	112.09	—	—	—	—
		g	61.4709	137.252	137.95	131.04	10.669	236.17	44.98
$CCl(NO_2)_3$	trinitrochloromethane	l	185.4807	—	-23.4	—	—	—	163.2
CH_3NH_3Cl	methylamine hydrochloride	cr	67.5189	—	-297.90	-158.82	—	138.62	90.88
	from $CH_3NH_3^+$	ai	67.5189	—	-292.13	-171.08	—	199.2	—
CH_3NH_3Cl	in 50 H_2O		67.5189	—	-291.416	—	—	—	—
	in 75 H_2O		67.5189	—	-291.478	—	—	—	—
	in 100 H_2O		67.5189	—	-291.516	—	—	—	—
	in 150 H_2O		67.5189	—	-291.566	—	—	—	—
	in 200 H_2O		67.5189	—	-291.600	—	—	—	—
CH_3NH_3Cl	in 300 H_2O		67.5189	—	-291.642	—	—	—	—
	in 400 H_2O		67.5189	—	-291.675	—	—	—	—
	in 500 H_2O		67.5189	—	-291.71	—	—	—	—
	in 600 H_2O		67.5189	—	-291.725	—	—	—	—
	in 700 H_2O		67.5189	—	-291.742	—	—	—	—
CH_3NH_3Cl	in 800 H_2O		67.5189	—	-291.759	—	—	—	—

Table 23:C — **CARBON** (Prepared 1966) — Continued — Table 23:C

Substance Formula	Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
CH_3NH_3Cl	in 900 H_2O		67.5189	—	-291.771	—	—	—	—
	in 1 000 H_2O		67.5189	—	-291.784	—	—	—	—
	in 1 500 H_2O		67.5189	—	-291.830	—	—	—	—
	in 2 000 H_2O		67.5189	—	-291.859	—	—	—	—
	in 3 000 H_2O		67.5189	—	-291.905	—	—	—	—
CH_3NH_3Cl	in 4 000 H_2O		67.5189	—	-291.926	—	—	—	—
	in 5 000 H_2O		67.5189	—	-291.943	—	—	—	—
	in 7 000 H_2O		67.5189	—	-291.964	—	—	—	—
	in 10 000 H_2O		67.5189	—	-291.989	—	—	—	—
	in 20 000 H_2O		67.5189	—	-292.018	—	—	—	—
CH_3NH_3Cl	in 50 000 H_2O		67.5189	—	-292.056	—	—	—	—
	in 100 000 H_2O		67.5189	—	-292.072	—	—	—	—
	in ∞ H_2O		67.5189	—	-292.114	—	—	—	—
$NH_2CONHNH_2{\cdot}HCl$	semicarbazide hydrochloride	cr	111.5317	—	—	—	—	—	142.
$CNH(NH_2)_2{\cdot}HClO_4$	guanidine perchlorate	cr	159.5299	—	-313.0	—	—	—	—
$CNH(NH_2)_2{\cdot}HClO_4$		aq	159.5299	—	-269.4	—	—	—	—
$CNBr$	cyanogen bromide	cr	105.9269	—	140.50	—	—	—	—
		g	105.9269	192.76	186.2	165.3	11.079	248.30	46.94
CNI	cyanogen iodide	cr	152.9223	—	166.15	185.03	—	96.2	—
		g	152.9223	226.10	225.5	196.6	11.397	256.80	48.28
CNI		ai	152.9223	—	177.8	188.09	—	125.1	—
	in CCl_4:s		152.9223	—	—	193.48	—	—	—
I_2CN^-		ao	279.8267	—	—	136.14	—	—	—
SCN^-	thiocyanate ion	ao	58.0819	—	76.44	92.71	—	144.3	-40.2
$NOSCN$		ai	88.0880	—	231.0	265.7	—	214.2	—
$HNCS$	isothiocyanic acid	g2	59.0899	—	127.6	113.0	—	247.8	46.9
$HSCN$	thiocyanic acid	ai	59.0899	—	76.44	92.71	—	144.3	-40.2
		ao	59.0899	—	—	97.56	—	—	—
	in 100 H_2O		59.0899	—	77.0	—	—	—	—
$NHCSS^{2-}$		ao	91.1539	—	72.8	—	—	—	—
NH_2CSS^-	dithiocarbamate	ao	92.1619	—	31.4	—	—	—	—
NH_2CSSH	dithiocarbamic acid	aq	93.1699	—	30.1	—	—	—	—
NH_4SCN	ammonium thiocyanate	cr	76.1206	—	-78.7	—	—	—	—
		ai	76.1206	—	-56.07	13.40	—	257.7	39.7
NH_4CNS	in 200 H_2O		76.1206	—	-56.1	—	—	—	—
$CS(NH_2)_2$	thiourea	cr2	76.1206	—	-88.3	—	—	—	—
	in 100 H_2O		76.1206	—	-65.3	—	—	—	—
NH_2CSSNH_4	ammonium dithiocarbamate	cr	110.2006	—	-126.8	—	—	—	—
	in 5 000 H_2O		110.2006	—	-98.95	—	—	—	—
$NH_4CNS{\cdot}SO_2$		cr	140.1834	—	-413.0	—	—	—	—
$CS(NH_2)_2{\cdot}HNO_3$	thiourea nitrate	cr	139.1335	—	-305.9	—	—	—	—
C_2		g	24.0224	823.4	831.90	775.89	10.586	199.418	43.208
C_2^+		g	24.0224	1992.0	2004.6	—	8.686	—	—
$C_2O_4^{2-}$	oxalate	ao	88.0200	—	-825.1	-673.9	—	45.6	—
C_2H^+		g	25.0304	1672.8	1681.1	—	—	—	—
C_2H_2		g	26.0384	227.292	226.73	209.20	10.008	200.94	43.93

Table 23:C — CARBON (Prepared 1966) — Continued — Table 23:C

Substance Formula	Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
C_2H_2		ai	26.0384	—	211.46	217.10	—	123.4	—
$C_2H_2^+$		g	26.0384	1328.0	1333.9	—	—	—	—
$C_2H_3^+$		g	27.0464	1123.0	1125.1	—	—	—	—
C_2H_4		g	28.0544	60.731	52.26	68.15	10.565	219.56	43.56
		ao	28.0544	—	36.36	81.36	—	122.2	—
C_2H_4	in $(C_2H_5)_2SO_4$:x in diethyl sulfate		28.0544	—	43.05	79.56	—	150.6	—
$C_2H_4^+$		g	28.0544	1074.53	1072.23	—	—	—	—
C_2H_5	ethyl radical	g	29.0624	119.2	107.5	133.1	11.88	252.0	46.69
$C_2H_5^+$		g	29.0624	912.	908.	—	—	—	—
C_2H_6		g	30.0704	-69.132	-84.68	-32.82	11.950	229.60	52.63
C_2H_6		ao	30.0704	—	-102.09	-17.01	—	118.4	—
	in C_8H_{18}:x in 2,2,4-trimethylpentane		30.0704	—	-97.15	-24.04	—	158.6	—
	in $(C_4F_9)_3N$:x in perfluorotributylamine		30.0704	—	-95.14	-24.34	—	166.1	—
$C_2H_6^+$		g	30.0704	1042.49	1033.16	—	—	—	—
$HC_2O_4^-$		ao	89.0280	—	-818.4	-698.34	—	149.4	—
CH_2CO	ketene	g	42.0378	-44.60	-47.7	-48.5	11.795	247.63	51.76
CH_2CO^+		g	42.0378	882.8	886.2	—	—	—	—
$(CHO)_2$	glyoxal	g	58.0372	—	-211.96	—	—	—	—
$(COOH)_2$	oxalic acid	cr	90.0360	—	-827.2	—	—	—	117.
		ai	90.0360	—	-825.1	-673.9	—	45.6	—
$(COOH)_2$	in 300 H_2O		90.0360	—	-818.64	—	—	—	—
	in 400 H_2O		90.0360	—	-818.77	—	—	—	—
	in 500 H_2O		90.0360	—	-818.85	—	—	—	—
	in 1 000 H_2O		90.0360	—	-819.06	—	—	—	—
	in 2 000 H_2O		90.0360	—	-819.23	—	—	—	—
$(COOH)_2$	in 5 000 H_2O		90.0360	—	-819.39	—	—	—	—
	in 10 000 H_2O		90.0360	—	-819.52	—	—	—	—
	in CH_3OH:u		90.0360	—	-823.4	—	—	—	—
	in C_2H_5OH:u		90.0360	—	-821.7	—	—	—	—
	in C_3H_7OH:u in 1-propanol		90.0360	—	-819.2	—	—	—	—
$(COOH)_2 \cdot 2H_2O$		cr	126.0668	—	-1426.7	—	—	—	—
CH_3CO	acetyl radical	g	43.0458	—	-18.8	—	—	—	—
CH_3COO^-	acetate	ao	59.0452	—	-486.01	-369.31	—	86.6	-6.3
$CH_2OHCO_2^-$	glycolate	ao	75.0446	—	-652.3	—	—	—	—
C_2H_4O	ethylene oxide	l	44.0538	—	-77.82	-11.76	—	153.85	87.95
C_2H_4O		g	44.0538	-40.120	-52.63	-13.01	10.862	242.53	47.91
		aq	44.0538	—	-84.1	—	—	—	—
CH_3CHO	acetaldehyde	l2	44.0538	—	-192.30	-128.12	—	160.2	—
		g2	44.0538	-155.39	-166.19	-128.86	12.59	250.3	57.3
	in 1 000 H_2O		44.0538	—	-199.07	—	—	—	—
CH_3CHO	in 1 000 H_2O:i3 unhydrated CH_3CHO		44.0538	—	-210.66	—	—	—	—
CH_3CHO^+		g	44.0538	830.9	826.3	—	—	—	—
CH_3COOH	acetic acid	l	60.0532	—	-484.5	-389.9	—	159.8	124.3
		g	60.0532	-418.283	-432.25	-374.0	13.749	282.5	66.5
		ai	60.0532	—	-486.01	-369.31	—	86.6	-6.3
CH_3COOH		ao	60.0532	—	-485.76	-396.46	—	178.7	—

Table 23:C — CARBON (Prepared 1966) — Continued — Table 23:C

Substance Formula	Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
CH_3COOH	in 0.5 H_2O		60.0532	—	-483.942	—	—	—	—
	in 1.0 H_2O		60.0532	—	-483.846	—	—	—	—
	in 1.5 H_2O		60.0532	—	-483.788	—	—	—	—
	in 2.0 H_2O		60.0532	—	-483.804	—	—	—	—
	in 2.5 H_2O		60.0532	—	-483.896	—	—	—	—
CH_3COOH	in 3.0 H_2O		60.0532	—	-483.972	—	—	—	—
	in 4.0 H_2O		60.0532	—	-484.080	—	—	—	—
	in 4.5 H_2O		60.0532	—	-484.118	—	—	—	—
	in 5.0 H_2O		60.0532	—	-484.152	—	—	—	—
	in 6.0 H_2O		60.0532	—	-484.218	—	—	—	—
CH_3COOH	in 7.0 H_2O		60.0532	—	-484.294	—	—	—	—
	in 8.0 H_2O		60.0532	—	-484.373	—	—	—	—
	in 9.0 H_2O		60.0532	—	-484.453	—	—	—	—
	in 10 H_2O		60.0532	—	-484.536	—	—	—	—
	in 12 H_2O		60.0532	—	-484.683	—	—	—	—
CH_3COOH	in 15 H_2O		60.0532	—	-484.854	—	—	—	—
	in 20 H_2O		60.0532	—	-485.039	—	—	—	—
	in 25 H_2O		60.0532	—	-485.160	—	—	—	—
	in 30 H_2O		60.0532	—	-485.248	—	—	—	—
	in 40 H_2O		60.0532	—	-485.365	—	—	—	—
CH_3COOH	in 50 H_2O		60.0532	—	-485.398	—	—	—	—
	in 75 H_2O		60.0532	—	-485.541	—	—	—	—
	in 100 H_2O		60.0532	—	-485.591	—	—	—	—
	in 150 H_2O		60.0532	—	-485.645	—	—	—	—
	in 200 H_2O		60.0532	—	-485.670	—	—	—	—
CH_3COOH	in 300 H_2O		60.0532	—	-485.695	—	—	—	—
	in 500 H_2O		60.0532	—	-485.721	—	—	—	—
	in 1 000 H_2O		60.0532	—	-485.741	—	—	—	—
	in 10 000 H_2O		60.0532	—	-485.771	—	—	—	—
	in 20 000 H_2O		60.0532	—	-485.783	—	—	—	—
CH_3COOH	in 50 000 H_2O		60.0532	—	-485.792	—	—	—	—
	in 100 000 H_2O		60.0532	—	-485.804	—	—	—	—
	in ∞ H_2O		60.0532	—	-486.01	—	—	—	—
	in 5 C_6H_6		60.0532	—	-482.4	—	—	—	—
	in 10 C_6H_6		60.0532	—	-481.6	—	—	—	—
CH_3COOH	in 15 C_6H_6		60.0532	—	-481.2	—	—	—	—
	in 25 C_6H_6		60.0532	—	-480.3	—	—	—	—
	in 5 CH_3COCH_3 in acetone		60.0532	—	-487.23	—	—	—	—
	in 10 CH_3COCH_3		60.0532	—	-487.60	—	—	—	—
	in 15 CH_3COCH_3		60.0532	—	-487.90	—	—	—	—
CH_3COOH	in 25 CH_3COCH_3		60.0532	—	-488.27	—	—	—	—
	in 50 CH_3COCH_3		60.0532	—	-488.61	—	—	—	—
	in 5 $(C_2H_5)_2O$		60.0532	—	-484.67	—	—	—	—
	in 10 $(C_2H_5)_2O$		60.0532	—	-484.63	—	—	—	—
	in 15 $(C_2H_5)_2O$		60.0532	—	-484.59	—	—	—	—
CH_3COOH^+		g	60.0532	609.2	601.7	—	—	—	—
$HCOOCH_3$	methyl formate	l2	60.0532	—	-379.07	—	—	—	121.
		g2	60.0532	—	-350.2	—	—	—	—
	in 100 H_2O:i2		60.0532	—	-383.7	—	—	—	—
$CH_2OHCOOH$	hydroxyacetic acid (glycolic acid)	cr	76.0526	—	-664.0	—	—	—	—

Table 23:C — CARBON (Prepared 1966) — Continued — Table 23:C

Substance Formula	Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
$CH_2OHCOOH$	in 5 H_2O		76.0526	—	-652.87	—	—	—	—
	in 6 H_2O		76.0526	—	-652.54	—	—	—	—
	in 8 H_2O		76.0526	—	-652.24	—	—	—	—
	in 10 H_2O		76.0526	—	-652.03	—	—	—	—
	in 15 H_2O		76.0526	—	-651.78	—	—	—	—
$CH_2OHCOOH$	in 25 H_2O		76.0526	—	-651.53	—	—	—	—
	in 50 H_2O		76.0526	—	-651.32	—	—	—	—
	in 100 H_2O		76.0526	—	-651.20	—	—	—	—
	in 200 H_2O		76.0526	—	-651.11	—	—	—	—
	in 400 H_2O		76.0526	—	-651.0	—	—	—	—
$CH(OH)_2COOH$		cr	92.0520	—	-835.5	—	—	—	—
	dihydroxyacetic acid (glyoxylic acid)								
	in 100 H_2O		92.0520	—	-823.8	—	—	—	—
$(HCO_2H)_2$	formic acid dimer	g2	92.0520	—	-816.21	—	—	—	—
$CH_3CH_2O^-$	ethylate	ao	45.0618	—	—	-102.4	—	—	—
C_2H_5OH	ethanol	l	46.0698	—	-277.69	-174.78	—	160.7	111.46
C_2H_5OH		g	46.0698	-217.438	-235.10	-168.49	14.184	282.70	65.44
		ao	46.0698	—	-288.3	-181.64	—	148.5	—
	in 0.25 H_2O		46.0698	—	-277.977	—	—	—	—
	in 0.5 H_2O		46.0698	—	-278.140	—	—	—	—
	in 1.0 H_2O		46.0698	—	-278.600	—	—	—	—
C_2H_5OH	in 1.5 H_2O		46.0698	—	-279.140	—	—	—	—
	in 2.0 H_2O		46.0698	—	-279.671	—	—	—	—
	in 2.5 H_2O		46.0698	—	-280.169	—	—	—	—
	in 3.0 H_2O		46.0698	—	-280.629	—	—	—	—
	in 3.5 H_2O		46.0698	—	-281.073	—	—	—	—
C_2H_5OH	in 4.0 H_2O		46.0698	—	-281.491	—	—	—	—
	in 4.5 H_2O		46.0698	—	-281.889	—	—	—	—
	in 5.0 H_2O		46.0698	—	-282.274	—	—	—	—
	in 5.5 H_2O		46.0698	—	-282.633	—	—	—	—
	in 6.0 H_2O		46.0698	—	-282.964	—	—	—	—
C_2H_5OH	in 7.0 H_2O		46.0698	—	-283.545	—	—	—	—
	in 8.0 H_2O		46.0698	—	-284.039	—	—	—	—
	in 9.0 H_2O		46.0698	—	-284.428	—	—	—	—
	in 10 H_2O		46.0698	—	-284.776	—	—	—	—
	in 12 H_2O		46.0698	—	-285.294	—	—	—	—
C_2H_5OH	in 15 H_2O		46.0698	—	-285.909	—	—	—	—
	in 20 H_2O		46.0698	—	-286.466	—	—	—	—
	in 25 H_2O		46.0698	—	-286.834	—	—	—	—
	in 30 H_2O		46.0698	—	-287.081	—	—	—	—
	in 40 H_2O		46.0698	—	-287.399	—	—	—	—
C_2H_5OH	in 50 H_2O		46.0698	—	-287.608	—	—	—	—
	in 75 H_2O		46.0698	—	-287.876	—	—	—	—
	in 100 H_2O		46.0698	—	-288.010	—	—	—	—
	in 200 H_2O		46.0698	—	-288.227	—	—	—	—
	in 500 H_2O		46.0698	—	-288.248	—	—	—	—
C_2H_5OH	in 1 000 H_2O		46.0698	—	-288.265	—	—	—	—
	in ∞ H_2O		46.0698	—	-288.3	—	—	—	—
	in 0.1 C_6H_6		46.0698	—	-277.541	—	—	—	—

Table 23:C **CARBON** (Prepared 1966) — Continued Table 23:C

Substance Formula	Description	State	Molar mass g mol^{-1}	0 K $\Delta_f H_0^\circ$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H_0^\circ$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
C_2H_5OH	in 0.15 C_6H_6		46.0698	—	-277.449	—	—	—	—
	in 0.2 C_6H_6		46.0698	—	-277.366	—	—	—	—
	in 0.25 C_6H_6		46.0698	—	-277.274	—	—	—	—
	in 0.5 C_6H_6		46.0698	—	-276.521	—	—	—	—
	in 1.0 C_6H_6		46.0698	—	-276.211	—	—	—	—
C_2H_5OH	in 1.5 C_6H_6		46.0698	—	-275.608	—	—	—	—
	in 2.0 C_6H_6		46.0698	—	-275.098	—	—	—	—
	in 2.5 C_6H_6		46.0698	—	-274.654	—	—	—	—
	in 3.0 C_6H_6		46.0698	—	-274.257	—	—	—	—
	in 3.5 C_6H_6		46.0698	—	-273.901	—	—	—	—
C_2H_5OH	in 4.0 C_6H_6		46.0698	—	-273.583	—	—	—	—
	in 4.5 C_6H_6		46.0698	—	-273.282	—	—	—	—
	in 5.0 C_6H_6		46.0698	—	-273.006	—	—	—	—
	in 5.5 C_6H_6		46.0698	—	-272.747	—	—	—	—
	in 6.0 C_6H_6		46.0698	—	-272.483	—	—	—	—
C_2H_5OH	in 7.0 C_6H_6		46.0698	—	-271.981	—	—	—	—
	in 8.0 C_6H_6		46.0698	—	-271.500	—	—	—	—
	in 9.0 C_6H_6		46.0698	—	-271.048	—	—	—	—
	in 10 C_6H_6		46.0698	—	-270.646	—	—	—	—
	in 12 C_6H_6		46.0698	—	-269.943	—	—	—	—
C_2H_5OH	in 15 C_6H_6		46.0698	—	-269.106	—	—	—	—
	in 20 C_6H_6		46.0698	—	-267.985	—	—	—	—
	in 25 C_6H_6		46.0698	—	-267.190	—	—	—	—
	in 30 C_6H_6		46.0698	—	-266.542	—	—	—	—
	in 40 C_6H_6		46.0698	—	-265.496	—	—	—	—
C_2H_5OH	in 50 C_6H_6		46.0698	—	-264.805	—	—	—	—
	in 75 C_6H_6		46.0698	—	-263.801	—	—	—	—
	in 100 C_6H_6		46.0698	—	-263.249	—	—	—	—
	in 5 H_2SO_4		46.0698	—	-326.23	—	—	—	—
	in 10 H_2SO_4		46.0698	—	-328.86	—	—	—	—
C_2H_5OH	in 15 H_2SO_4		46.0698	—	-329.99	—	—	—	—
	in 20 H_2SO_4		46.0698	—	-330.66	—	—	—	—
	in 25 H_2SO_4		46.0698	—	-331.16	—	—	—	—
	in 30 H_2SO_4		46.0698	—	-331.58	—	—	—	—
	in 50 H_2SO_4		46.0698	—	-332.75	—	—	—	—
C_2H_5OH	in 2 CH_3CN		46.0698	—	-276.236	—	—	—	—
	in 10 CH_3CN		46.0698	—	-277.060	—	—	—	—
$C_2H_5OH^+$		g	46.0698	793.7	782.4	—	—	—	—
$(CH_3)_2O$	dimethyl ether	g2	46.0698	-166.293	-184.05	-112.59	14.083	266.38	64.39
	in 500 H_2O:i2		46.0698	—	-218.4	—	—	—	—
$CH_3OCH_3^+$		g2	46.0698	798.3	787.0	—	—	—	—
$(CH_2OH)_2$	1,2–ethanediol	l	62.0692	—	-454.80	-323.08	—	166.9	149.8
	in 0.1 H_2O		62.0692	—	-454.97	—	—	—	—
	in 0.2 H_2O		62.0692	—	-455.14	—	—	—	—
	in 0.3 H_2O		62.0692	—	-455.30	—	—	—	—
$(CH_2OH)_2$	in 0.5 H_2O		62.0692	—	-455.55	—	—	—	—
	in 0.7 H_2O		62.0692	—	-455.80	—	—	—	—
	in 1.0 H_2O		62.0692	—	-456.10	—	—	—	—
	in 1.5 H_2O		62.0692	—	-456.56	—	—	—	—
	in 2.0 H_2O		62.0692	—	-456.98	—	—	—	—

Table 23:C — **CARBON** (Prepared 1966) — Continued — Table 23:C

Substance Formula	Description	State	Molar mass g mol⁻¹	0 K: $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar): $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
$(CH_2OH)_2$	in 2.5 H_2O		62.0692	—	-457.31	—	—	—	—
	in 3.0 H_2O		62.0692	—	-457.60	—	—	—	—
	in 3.5 H_2O		62.0692	—	-457.86	—	—	—	—
	in 4.0 H_2O		62.0692	—	-458.11	—	—	—	—
	in 4.5 H_2O		62.0692	—	-458.32	—	—	—	—
$(CH_2OH)_2$	in 5.0 H_2O		62.0692	—	-458.52	—	—	—	—
	in 5.5 H_2O		62.0692	—	-458.73	—	—	—	—
	in 6.0 H_2O		62.0692	—	-458.90	—	—	—	—
	in 7.0 H_2O		62.0692	—	-459.03	—	—	—	—
	in 8.0 H_2O		62.0692	—	-459.40	—	—	—	—
$(CH_2OH)_2$	in 9.0 H_2O		62.0692	—	-459.61	—	—	—	—
	in 10 H_2O		62.0692	—	-459.78	—	—	—	—
	in 12 H_2O		62.0692	—	-460.07	—	—	—	—
	in 15 H_2O		62.0692	—	-460.41	—	—	—	—
	in 10 CH_3OH		62.0692	—	-454.198	—	—	—	—
$(CH_2OH)_2 \cdot 2H_2O$		cr	98.1000	—	-1028.4	—	—	—	—
CH_3CH_2OOH	ethyl hydrogen peroxide	l2	62.0692	—	-243.	—	—	—	—
$CH_3CH(OH)_2$	in 1 000 H_2O:i3 acetaldehyde hydrate		62.0692	—	-506.22	—	—	—	—
$(CH_2OH)_2O$	bis(hydroxymethyl) ether	g	78.0686	—	-561.	—	—	—	—
		ao	78.0686	—	-632.2	—	—	—	—
$(CH_2OH)_2O_2$	bis(hydroxymethyl)peroxide	cr	94.0680	—	-669.	—	—	—	—
		g	94.0680	—	-577.	—	—	—	—
	in 500 H_2O		94.0680	—	-649.	—	—	—	—
$1/n\ (C_2F_4)_n$	Teflon; form stable at 25°C	cr	100.0160	—	-820.5	—	—	—	—
C_2F_4	tetrafluoroethene	g2	100.0160	-647.18	-650.6	-615.9	16.330	300.06	80.46
$C_2F_4^+$		g	100.0160	329.3	332.2	—	—	—	—
C_2F_6	hexafluoroethane	g	138.0128	-1288.7	-1297.	-1213.	20.38	332.3	106.7
$CHCF$	fluoroacetylene	g	44.0288	—	—	—	11.460	231.65	52.38
CH_2CHF	vinyl fluoride	g	46.0448	—	—	—	11.347	252.74	50.46
CH_3CH_2F	ethyl fluoride	g	48.0608	—	—	—	12.80	264.5	58.6
$1/n\ (CH_2CF_2)_n$	1,1-difluoroethene, polymeric	cr3	64.0352	—	-479.40	—	—	—	—
$CHFCHF$	cis-1,2-difluoroethene	g	64.0352	—	—	—	12.644	268.26	58.20
CH_2CF_2	1,1-difluoroethene	g2	64.0352	-321.96	-328.9	-305.4	12.468	266.2	60.08
$CH_2CF_2^+$		g	64.0352	672.0	671.1	—	—	—	—
CH_3CHF_2	1,1-difluoroethane	g	66.0512	-464.34	-478.2	-420.8	13.97	282.5	67.8
CH_3CF_3	1,1,1-trifluoroethane	g	84.0416	-723.54	-736.4	-667.3	15.192	279.89	78.20
CHF_2CH_2F	1,1,2-trifluoroethane	g2	84.0416	—	-730.9	—	—	—	—
CF_3CH_2F	1,1,1,2-tetrafluoroethane	g	102.0320	—	—	—	17.067	317.47	87.11
CH_3COF	acetyl fluoride	l	62.0442	—	-463.71	—	—	—	—
		g	62.0442	—	-438.9	—	—	—	—
CFH_2COOH	fluoroacetic acid	cr	78.0436	—	-688.3	—	—	—	—
CH_2FCH_2OH	2-fluoroethanol	l	64.0602	—	-465.7	—	—	—	—
CHF_2COOH	difluoroacetic acid	l	96.0340	—	-869.4	—	—	—	—
CHF_2CH_2OH	2,2-difluoroethanol	l	82.0506	—	-689.5	—	—	—	—

Table 23:C — **CARBON** (Prepared 1966) — Continued — Table 23:C

Substance Formula	and Description	State	Molar mass g mol^{-1}	0 K $\Delta_f H^\circ_0$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H^\circ_0$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
CF_3CH_2OH	2,2,2–trifluoroethanol	l	100.0410	—	-859.4	—	—	—	—
C_2Cl_4	tetrachloroethene	l	165.8344	—	-52.3	4.7	—	266.9	141.0
		g	165.8344	-11.30	-12.1	22.6	19.606	341.1	94.93
$C_2Cl_4^+$		g	165.8344	887.8	893.3	—	—	—	—
C_2Cl_6	I, cubic	cr1	236.7404	—	-192.5	—	—	—	—
C_2Cl_6	II, monoclinic	cr2	236.7404	—	-200.4	—	—	—	—
	III, triclinic	cr3	236.7404	—	-202.9	—	—	—	—
		g	236.7404	-139.45	-141.8	-57.7	27.24	398.8	136.8
$(COCl)_2$	trans–oxalyl chloride	g	126.9272	—	—	—	18.941	331.9	90.83
CCl_3COO^-	trichloroacetate	aq	162.3802	—	-516.3	—	—	—	—
CCl_3COCl		l	181.8338	—	-278.86	—	—	—	—
	trichloroacetyl chloride								
CHCCl	chloroacetylene	g	60.4834	—	—	—	11.786	241.99	54.31
$1/n\cdot(CH_2CHCl)_n$	polyvinyl chloride	cr2	62.4994	—	-94.1	—	—	—	59.4
CH_2CHCl	vinyl chloride	l	62.4994	—	14.6	—	—	—	—
		g	62.4994	43.14	35.6	51.9	11.820	263.99	53.72
CH_2CHCl^+		g	62.4994	1007.5	1006.3	—	—	—	—
C_2H_5Cl	ethyl chloride	l	64.5154	—	-136.52	-59.31	—	190.79	104.35
		g	64.5154	-97.617	-112.17	-60.39	13.301	276.00	62.80
$C_2H_5Cl^+$		g	64.5154	961.9	953.5	—	—	—	—
CH_2CCl_2	1,1–dichloroethene	cr	96.9444	-32.93	—	—	—	—	—
CH_2CCl_2	1,1–dichloroethene, polymeric	cr4	96.9444	—	-100.4	—	—	—	—
		l	96.9444	—	-24.3	24.54	28.397	201.54	111.29
		g	96.9444	8.401	2.43	25.18	13.770	288.97	67.07
CHClCHCl	cis–1,2–dichloroethene	l2	96.9444	—	-27.6	22.11	—	198.41	113.
		g2	96.9444	9.749	3.77	26.31	13.761	289.60	65.06
CHClCHCl	in 2 CHClCHCl:i2		96.9444	—	-27.188	—	—	—	—
	in trans–1,2–dichloroethene								
	in 10 CHClCHCl:i2		96.9444	—	-26.719	—	—	—	—
	trans–1,2–dichloroethene	l3	96.9444	—	-23.14	27.34	—	195.85	113.
		g3	96.9444	11.556	6.15	28.57	14.339	290.02	66.65
	in 2 CHClCHCl:i3		96.9444	—	-22.799	—	—	—	—
	in cis–1,2–dichloroethene								
CHClCHCl	in 10 CHClCHCl:i3		96.9444	—	-22.736	—	—	—	—
$CHClCHCl^+$		g2	96.9444	941.0	941.0	—	—	—	—
		g3	96.9444	942.7	943.5	—	—	—	—
CH_3CHCl_2	1,1–dichloroethane	l	98.9604	—	-160.2	-75.6	—	211.75	126.27
		g	98.9604	-116.608	-129.41	-72.53	15.410	305.12	76.23
CH_2ClCH_2Cl	1,2–dichloroethane	l2	98.9604	—	-165.23	-79.52	—	208.53	129.3
		g2	98.9604	-118.646	-129.79	-73.87	17.07	308.39	78.7
	in 1 C_6H_6		98.9604	—	-165.101	—	—	—	—
	in 5 C_6H_6		98.9604	—	-165.117	—	—	—	—
$CH_2ClCH_2Cl^+$		g	98.9604	947.3	942.2	—	—	—	—
$CHClCCl_2$	trichloroethene	l	131.3894	—	-42.3	12.2	—	228.4	120.5
		g	131.3894	-4.318	-7.78	18.07	16.631	324.8	80.25
$CHClCCl_2^+$		g	131.3894	907.5	910.0	—	—	—	—
CH_3CCl_3	1,1,1–trichloroethane	l	133.4054	—	—	—	—	227.44	144.14
		g	133.4054	—	—	—	18.37	323.1	93.3
$CHCl_2CH_2Cl$	1,1,2–trichloroethane	l2	133.4054	—	-182.0	-89.9	—	232.63	—

Table 23:C — **CARBON** (Prepared 1966) — Continued — Table 23:C

Substance Formula	Description	State	Molar mass g mol^{-1}	0 K: $\Delta_f H_0^\circ$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar): $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H_0^\circ$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
$CHCl_2CH_2Cl$		g2	133.4054	-131.319	-142.00	-80.90	17.878	337.21	88.99
CCl_3CH_2Cl	1,1,1,2-tetrachloroethane	g	167.8504	—	—	—	20.447	356.04	102.72
$CHCl_2CHCl_2$	1,1,2,2-tetrachloroethane	l2	167.8504	—	-196.6	-94.9	—	246.9	165.7
		g2	167.8504	-140.83	-149.4	-81.9	20.384	362.82	100.79
$CHCl_2CCl_3$	pentachloroethane	l	202.2954	—	-187.9	—	—	—	195.4
$CHCl_2CCl_3$		g	202.2954	—	—	—	23.292	380.64	117.74
	in 2 C_6H_6		202.2954	—	-189.24	—	—	—	—
	in 10 C_6H_6		202.2954	—	-188.53	—	—	—	—
	in 2 CH_3COCH_3		202.2954	—	-192.80	—	—	—	—
	in 10 CH_3COCH_3		202.2954	—	-193.84	—	—	—	—
$CHCl_2CCl_3$	in 1 $(C_2H_5)_2O$		202.2954	—	-193.84	—	—	—	—
	in 150 $(C_2H_5)_2O$		202.2954	—	-196.15	—	—	—	—
CH_2ClCOO^-	chloroacetate	aq	93.4902	—	-501.298	—	—	—	—
CH_3COCl	acetyl chloride	l	78.4988	—	-273.80	-207.99	—	200.8	117.
		g	78.4988	-234.530	-243.51	-205.80	14.77	295.1	67.8
CH_3COCl^+		g	78.4988	812.5	809.6	—	—	—	—
CH_2ClCHO	monochloroacetaldehyde	l2	78.4988	—	-257.3	—	—	—	—
$CH_2ClCOOH$	monochloroacetic acid, I	cr	94.4982	—	-511.7	—	—	—	—
	monochloroacetic acid, II	cr2	94.4982	—	-510.95	—	—	—	—
	monochloroacetic acid, III	cr3	94.4982	—	-508.19	—	—	—	—
$CH_2ClCOOH$		ai	94.4982	—	-501.298	—	—	—	—
		ao	94.4982	—	-496.402	—	—	—	—
	in 1 000 H_2O		94.4982	—	-497.56	—	—	—	—
	in 1 500 H_2O		94.4982	—	-497.574	—	—	—	—
	in 2 000 H_2O		94.4982	—	-497.624	—	—	—	—
$CH_2ClCOOH$	in 3 000 H_2O		94.4982	—	-497.745	—	—	—	—
	in 4 000 H_2O		94.4982	—	-497.854	—	—	—	—
	in 5 000 H_2O		94.4982	—	-497.955	—	—	—	—
	in 7 000 H_2O		94.4982	—	-498.130	—	—	—	—
	in 10 000 H_2O		94.4982	—	-498.348	—	—	—	—
$CH_2ClCOOH$	in 20 000 H_2O		94.4982	—	-498.867	—	—	—	—
	in 50 000 H_2O		94.4982	—	-499.620	—	—	—	—
	in 100 000 H_2O		94.4982	—	-500.155	—	—	—	—
CH_2ClCH_2OH	2-chloroethanol	l	80.5148	—	-295.4	—	—	—	—
	in 200 H_2O		80.5148	—	-300.8	—	—	—	—
$(CH_3)_2O{\cdot}HCl$		g	82.5308	—	-304.6	-204.1	—	345.7	—
$CHCl_2COO^-$	dichloroacetate	ao	127.9352	—	-512.1	—	—	—	—
$CH_2ClCOCl$	chloroacetylchloride	l	112.9438	—	-283.88	—	—	—	—
$CHCl_2COOH$	dichloroacetic acid	l	128.9432	—	-497.9	—	—	—	184.
		ai	128.9432	—	-512.1	—	—	—	—
$CHCl_2COOH$		ao	128.9432	—	-503.8	—	—	—	—
	in 200 H_2O		128.9432	—	-506.64	—	—	—	—
	in 1 350 H_2O		128.9432	—	-508.73	—	—	—	—
	in 10 C_6H_6		128.9432	—	-497.77	—	—	—	—
	in 1 CH_3COCH_3		128.9432	—	-507.48	—	—	—	—
$CHCl_2COOH$	in 5 CH_3COCH_3		128.9432	—	-510.28	—	—	—	—

Table 23:C **CARBON** (Prepared 1966) — Continued Table 23:C

Substance Formula	and Description	State	Molar mass $g\ mol^{-1}$	0 K $\Delta_f H_0^\circ$ $kJ\ mol^{-1}$	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$	$\Delta_f G^\circ$ $kJ\ mol^{-1}$	$H^\circ - H_0^\circ$	S° $J\ mol^{-1}\ K^{-1}$	C_p
$CHCl_2COOH$	in 1 $(C_2H_5)_2O$		128.9432	—	–509.78	—	—	—	—
	in 5 $(C_2H_5)_2O$		128.9432	—	–514.67	—	—	—	—
CCl_3CHO	trichloroacetaldehyde; chloral	l	147.3888	—	–236.19	—	—	—	151.
		g	147.3888	—	–196.6	—	—	—	—
	unhydrated	aq	147.3888	—	–227.6	—	—	—	—
CCl_3CHO	in 500 H_2O		147.3888	—	–286.2	—	—	—	—
$CHCl_2COCl$	dichloroacetylchloride	l2	147.3888	—	–281.46	—	—	—	—
CCl_3COOH	trichloroacetic acid	cr	163.3882	—	–505.0	—	—	—	—
		ai	163.3882	—	–516.3	—	—	—	—
	in 50 H_2O		163.3882	—	–509.95	—	—	—	—
CCl_3COOH	in 100 H_2O		163.3882	—	–512.79	—	—	—	—
	in 150 H_2O		163.3882	—	–513.92	—	—	—	—
	in 200 H_2O		163.3882	—	–514.51	—	—	—	—
	in 500 H_2O		163.3882	—	–515.34	—	—	—	—
	in 10 C_5H_{12} in n–pentane		163.3882	—	–472.58	—	—	—	—
CCl_3COOH	in 20 C_5H_{12}		163.3882	—	–473.63	—	—	—	—
	in 30 C_5H_{12}		163.3882	—	–474.26	—	—	—	—
	in 40 C_5H_{12}		163.3882	—	–474.67	—	—	—	—
	in 50 C_5H_{12}		163.3882	—	–475.01	—	—	—	—
	in 100 C_5H_{12}		163.3882	—	–476.6	—	—	—	—
CCl_3COOH	in 10 C_2H_5OH		163.3882	—	–504.05	—	—	—	—
	in 20 C_2H_5OH		163.3882	—	–504.80	—	—	—	—
	in 30 C_2H_5OH		163.3882	—	–505.30	—	—	—	—
	in 40 C_2H_5OH		163.3882	—	–505.76	—	—	—	—
	in 50 C_2H_5OH		163.3882	—	–506.10	—	—	—	—
CCl_3COOH	in 100 C_2H_5OH		163.3882	—	–507.9	—	—	—	—
	in 5 $(CH_3)_2CO$		163.3882	—	–519.86	—	—	—	—
	in 10 $(CH_3)_2CO$		163.3882	—	–520.36	—	—	—	—
	in 20 $(CH_3)_2CO$		163.3882	—	–520.99	—	—	—	—
	in 30 $(CH_3)_2CO$		163.3882	—	–521.37	—	—	—	—
CCl_3COOH	in 40 $(CH_3)_2CO$		163.3882	—	–521.62	—	—	—	—
	in 50 $(CH_3)_2CO$		163.3882	—	–521.7	—	—	—	—
	in 20 $(C_2H_5)_2O$		163.3882	—	–504.21	—	—	—	—
	in 50 $(C_2H_5)_2O$		163.3882	—	–506.18	—	—	—	—
	in 100 $(C_2H_5)_2O$		163.3882	—	–507.1	—	—	—	—
$CCl_3CH(OH)_2$	chloral hydrate	cr	165.4042	—	–576.1	—	—	—	142.
		g	165.4042	—	–448.5	—	—	—	—
	in 700 H_2O		165.4042	—	–572.0	—	—	—	—
	in 150 $CHCl_3$		165.4042	—	–548.9	—	—	—	—
CF_2CFCl	chlorotrifluoroethene	g	116.4706	–552.46	–555.2	–523.8	17.138	322.11	83.93
CF_3CF_2Cl	chloropentafluoroethane	g	154.4674	—	—	—	—	357.8	—
CF_2CCl_2	1,1–difluorodichloroethene	g	132.9252	—	–319.2	—	—	—	—
$CFClCFCl$	cis+trans equil., 1,2–difluorodichloroethene	g2	132.9252	—	–327.2	—	—	—	—
	trans–1,2–diflurordichloroethene	g3	132.9252	—	—	—	18.025	327.7	87.82
CF_2ClCF_2Cl	1,1,2,2–tetrafluorodichloroethane	g	170.9220	—	–890.4	—	—	—	—

Table 23:C — CARBON (Prepared 1966) — Continued — Table 23:C

Substance Formula	Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
CF_3CCl_3	1,1,1-trifluorotrichloroethane	g	187.3766	—	—	—	23.47	370.8	120.5
$CF_2ClCFCl_2$	1,1,2-trifluorotrichloroethane	l2	187.3766	—	-788.14	—	—	—	173.6
		g2	187.3766	—	-759.4	—	—	—	—
$CFCl_2CF_2Cl^+$		g2	187.3766	—	403.8	—	—	—	—
CCl_3CF_2Cl	1,1-difluorotetrachloroethane	g	203.8312	-484.30	-489.9	-407.0	23.64	382.9	123.4
CCl_3CFCl_2	fluoropentachloroethane	g	220.2858	—	—	—	25.19	394.7	130.5
CF_2CHCl	1,1-difluorochloroethene	g	98.4802	-310.66	-315.5	-289.1	14.937	302.99	72.09
CH_3CF_2Cl	1,1-difluoro-1-chloroethane	l	100.4962	—	—	—	—	—	131.4
		g	100.4962	—	—	—	15.98	307.2	82.8
CF_3CH_2Cl	1,1,1-trifluorochloroethane	g	118.4866	—	—	—	17.61	326.5	89.1
$CHFCCl_2$	1,1-dichlorofluorenthene	g	114.9348	—	—	—	15.769	313.9	76.48
CH_3CFCl_2	1,1-dichloro-1-fluoroethane	g	116.9508	—	—	—	17.24	320.2	88.7
CF_3CHCl_2	1,1,1-trifluorodichloroethane	g	152.9316	—	—	—	20.13	352.8	102.5
C_2Br_4	tetrabromoethene	g	343.6584	—	—	—	22.485	387.1	102.68
CBr_3CBr_3	hexabromoethane	g	503.4764	—	—	—	29.740	441.9	139.33
$CHCBr$	bromoacetylene	g	104.9394	—	—	—	12.100	253.7	55.69
CH_2CHBr	vinyl bromide	g	106.9554	93.14	78.2	80.8	12.155	275.84	55.52
CH_2CHBr^+		g	106.9554	1038.9	1030.1	—	—	—	—
C_2H_5Br	ethyl bromide	l	108.9714	—	-92.01	-27.70	—	198.7	100.8
		g	108.9714	-42.627	-64.52	-26.48	13.636	286.71	64.52
C_2H_5Br	in 2 000 CH_3OH		108.9714	—	-90.83	—	—	—	—
$CH_3CH_2Br^+$		g	108.9714	950.2	934.7	—	—	—	—
$CHBrCHBr$	cis-1,2-dibromoethene	g	185.8564	—	—	—	14.606	311.32	68.78
	trans-1,2-dibromoethene	g2	185.8564	—	—	—	15.405	313.49	70.25
CH_3CHBr_2	1,1-dibromoethane	g	187.8724	—	—	—	16.48	327.7	80.8
CH_2BrCH_2Br	1,2-dibromoethane	l2	187.8724	—	-81.2	-20.9	—	223.30	136.02
		g2	187.8724	—	-38.33	-10.30	—	331.1	86.6
	in 2 CS_2		187.8724	—	-78.91	—	—	—	—
	in 10 CS_2		187.8724	—	-77.70	—	—	—	—
	in 2 CCl_4		187.8724	—	-79.66	—	—	—	—
CH_2BrCH_2Br	in 10 CCl_4		187.8724	—	-79.37	—	—	—	—
	in 5 $CHCl_3$		187.8724	—	-81.50	—	—	—	—
$CHBr_2CHBr_2$	1,1,2,2-tetrabromoethane	l	345.6744	—	—	—	—	—	165.7
CH_3COBr	acetyl bromide	l	122.9548	—	-223.38	—	—	—	—
$CH_2BrCOOH$	monobromoacetic acid	cr	138.9542	—	—	—	—	—	119.16
CBr_3CHO	tribromoacetaldehyde; bromal	l	280.7568	—	-130.25	—	—	—	—
$CBr_3CH(OH)_2$	bromal hydrate	cr	298.7722	—	-469.	—	—	—	—

Table 23:C **CARBON** (Prepared 1966) — Continued Table 23:C

Substance Formula	Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
$CBr_3CH(OH)_2$		aq	298.7722	—	-460.	—	—	—	—
CF_2CFBr	bromotrifluoroethene	g	160.9266	—	—	—	17.732	334.8	85.81
CF_3CF_2Br	bromopentafluoroethane	g	198.9234	—	—	—	20.84	358.7	109.2
CF_2CBr_2	1,1–difluorodibromoethene	g	221.8372	—	—	—	18.983	349.5	90.29
CF_2BrCF_2Br	1,2–dibromotetrafluoroethane	g	259.8340	—	-780.3	—	—	—	—
CF_2CHBr	1,1–difluorobromoethene	g	142.9362	—	—	—	15.405	314.3	73.76
CF_3CH_2Br	1,1,1–trifluorobromoethane	g	162.9426	—	—	—	17.987	337.30	90.67
CHF_2CF_2Br	1,1,2,2–tetrafluorobromoethane	g	180.9330	—	-824.2	—	—	—	—
CH_2ClCH_2Br	1–chloro–2–bromoethane	l	143.4164	—	—	—	—	—	130.1
$CHClBrCHClBr$	1,2–dichloro–1,2–dibromoethane	g	256.7624	—	-36.8	—	—	—	—
CF_2CBrCl	1,1–difluorochlorobromoethene	g	177.3812	—	—	—	18.347	343.2	88.53
$CF_2BrCHCl_2$	1,1–difluoro–1–bromodichloroethane	g	213.8422	—	-451.5	—	—	—	—
$CICI$	diiodoacetylene	g	277.8312	—	—	—	16.322	313.07	70.33
C_2I_4	tetraiodoethene	cr	531.6400	—	305.	—	—	—	—
CH_2CHI	vinyl iodide	g	153.9508	—	—	—	12.665	285.0	57.91
C_2H_5I	ethyl iodide	l	155.9668	—	-40.2	14.7	—	211.7	115.1
		g	155.9668	8.16	-7.70	19.17	14.02	306.0	66.9
	in 2 000 CH_3OH		155.9668	—	-37.03	—	—	—	—
$C_2H_5I^+$		g	155.9668	908.3	898.7	—	—	—	—
$CHICHI$	cis–1,2–diiodoethene	g	279.8472	—	—	—	16.041	334.03	74.27
$CHICHI$	trans–1,2–diiodoethene	g2	279.8472	—	—	—	16.531	335.29	73.81
CH_2ICH_2I	1,2–diiodoethane	cr	281.8632	—	0.4	57.8	—	197.	—
		g	281.8632	—	66.5	78.7	—	348.2	80.3
CH_3COI	acetyl iodide	l	169.9502	—	-162.51	—	—	—	—
CF_3CF_2I	iodopentafluoroethane	g	245.9188	—	—	—	21.42	371.6	110.5
CF_3CH_2I	1,1,1–trifluoroiodoethane	g	209.9380	—	—	—	18.150	344.54	91.13
CH_2BrCH_2I	1–bromo–2–iodoethane	cr	234.8678	—	-47.3	—	—	—	—
C_2H_4S	thiacyclopropane	l	60.1184	—	51.92	94.29	—	162.51	—
		g	60.1184	94.399	82.38	97.06	11.431	255.38	53.68
$(CH_3)_2S$	2–thiapropane (dimethyl sulphide)	l	62.1344	—	-65.06	6.16	—	196.40	118.11
$(CH_3)_2S$		g	62.1344	-21.058	-37.24	7.30	15.732	285.96	74.10
$(CH_3)_2S^+$		g	62.1344	816.7	806.7	—	—	—	—
C_2H_5SH	ethanethiol	l2	62.1344	—	-73.35	-5.26	—	207.02	117.86
		g2	62.1344	-29.037	-45.81	-4.33	15.134	296.21	72.68
$HSCH_2CH_2SH$	1,2–ethanedithiol	l2	94.1984	—	-53.68	—	—	—	—
CH_3SSCH_3	2,3–dithiabutane	l	94.1984	—	-62.01	7.09	—	235.39	146.11
		g	94.1984	-7.238	-23.60	15.30	19.962	336.75	94.31
$CH_3SSCH_3^+$		g	94.1984	795.	782.	—	—	—	—
CH_3COSH	thiolacetic acid	l	76.1178	—	-218.0	—	—	—	—
		g	76.1178	—	—	—	17.121	313.32	80.88
$C_2H_4SO_3$	ethylene sulfite	l	108.1166	—	-499.2	—	—	—	—
	in 2 800 H_2O		108.1166	—	-496.6	—	—	—	—
$(CH_3)_2SO$	dimethyl sulfoxide	l	78.1338	—	-203.3	-99.0	—	188.3	147.3

Table 23:C **CARBON** (Prepared 1966) — Continued Table 23:C

Substance Formula and Description		State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$	S° J mol⁻¹ K⁻¹	C_p
$(CH_3)_2SO$		g	78.1338	-131.491	-150.46	-81.42	17.288	306.38	88.95
	in 2 H_2O		78.1338	—	-212.00	—	—	—	—
	in 10 H_2O		78.1338	—	-218.45	—	—	—	—
$(CH_3)_2SO_2$	dimethyl sulfone	cr	94.1332	—	-451.0	-302.4	—	142.	—
		g	94.1332	-348.5	-371.1	-272.7	18.0	310.6	100.0
$(CH_3)_2SO_3$	dimethyl sulfite	l	110.1326	—	-530.1	—	—	—	—
	in 2 800 H_2O		110.1326	—	-530.9	—	—	—	—
$C_2H_5HSO_4$	ethyl sulfuric acid	aq	126.1320	—	-875.7	—	—	—	—
$(CHO)_2 \cdot 2H_2SO_3$	glyoxal hydrogen sulfite	aq	222.1936	—	-1567.7	—	—	—	—
NCCN	cyanogen	g	52.0358	307.047	308.95	297.36	12.669	241.90	56.82
$(NO_2)_3CC(NO_2)_3$	hexanitroethane	cr	300.0554	—	119.7	—	—	—	—
CH_3CN	acetonitrile	l	41.0531	—	31.38	77.22	—	149.62	91.46
		g	41.0531	72.266	65.23	82.58	12.100	245.12	52.22
	in 2 C_2H_5OH		41.0531	—	32.723	—	—	—	—
	in 10 C_2H_5OH		41.0531	—	31.886	—	—	—	—
CH_3CN^+		g	41.0531	1251.4	1250.6	—	—	—	—
CH_3NC	methyl isocyanide	g2	41.0531	155.44	149.0	165.7	12.657	246.92	52.93
		l2	41.0531	—	117.2	159.5	—	159.	—
C_2H_4NH	ethylenimine	l	43.0691	—	91.92	—	—	—	—
		g	43.0691	—	126.4	—	—	—	—
$(CH_3)_2NH$	dimethylamine	l	45.0851	—	-43.9	70.0	—	182.34	137.7
		g	45.0851	—	-18.45	68.51	—	273.07	70.7
		ai	45.0851	—	-70.63	58.08	—	133.1	—
	in 400 H_2O		45.0851	—	-71.55	—	—	—	—
	in 700 H_2O		45.0851	—	-71.96	—	—	—	—
$(CH_3)_2NH$	in 1 000 H_2O		45.0851	—	-72.4	—	—	—	—
$(CH_3)_2NH^+$		g	45.0851	—	782.8	—	—	—	—
$C_2H_5NH_2$	ethylamine	g2	45.0851	—	-47.15	—	—	—	69.9
		l2	45.0851	—	-74.1	—	—	—	130.
	in 400 H_2O:i2		45.0851	—	-101.3	—	—	—	—
$C_2H_5NH_2^+$		g2	45.0851	—	813.8	—	—	—	—
$(CH_3)_2NH_2^+$	dimethylammonium ion	ao	46.0931	—	-120.25	-3.22	—	172.4	—
$C_2H_5NH_3^+$	ethylammonium ion	aq2	46.0931	—	-156.1	—	—	—	—
$(CH_3)_2NNH_2$	1,1–dimethyl hydrazine	l	60.0998	—	49.4	206.9	—	197.99	164.05
		g	60.0998	—	84.43	210.63	—	302.53	—
$(CH_3NH)_2$	1,2–dimethyl hydrazine	l2	60.0998	—	55.6	212.7	—	199.16	171.04
		g2	60.0998	—	94.98	218.54	—	311.36	—
$NH_2CH_2CH_2NH_2$	ethylenediamine	l3	60.0998	—	-24.35	—	—	—	209.
	in 200 H_2O		60.0998	—	-55.73	—	—	—	—
$NH_2CH_2CH_2NH_2 \cdot H_2O$	ethylenediamine hydrate	l	78.1152	—	-321.7	—	—	—	—
$NH_2CH_2CH_2NH_3^+$	ethyleneamineammonium ion	aq	61.1078	—	-105.9	—	—	—	—
$NH_3CH_2CH_2NH_3^{2+}$	ethylenediammoniaum ion	aq	62.1158	—	-150.6	—	—	—	—
$C_2H_4N_4$	3–amino–1,2,4–triazole	cr	84.0812	—	77.0	—	—	—	—
$CNH(NH_2)(NHCN)$	cyanoguanidine	cr2	84.0812	—	22.6	179.6	—	129.29	118.83
	in 250 H_2O		84.0812	—	46.9	—	—	—	—
C_2HN_5	5–cyanotetrazole	cr	95.0639	—	402.1	—	—	—	—

Table 23:C — **CARBON** (Prepared 1966) — Continued — Table 23:C

Substance Formula	Description	State	Molar mass $g\ mol^{-1}$	0 K: $\Delta_f H^\circ_0$ $kJ\ mol^{-1}$	298.15 K (25°C) and 0.1 MPa (1 bar): $\Delta_f H^\circ$ $kJ\ mol^{-1}$	$\Delta_f G^\circ$ $kJ\ mol^{-1}$	$H^\circ - H^\circ_0$ $kJ\ mol^{-1}$	S° $J\ mol^{-1}\ K^{-1}$	C_p $J\ mol^{-1}\ K^{-1}$
$C_2H_5N_5$	1-methyl-5-aminotetrazole	cr	99.0959	—	193.51	—	—	—	—
	2-methyl-5-aminotetrazole	cr2	99.0959	—	210.9	—	—	—	—
	5-methylaminotetrazole	cr3	99.0959	—	202.30	—	—	—	—
$C_2H_4N_4 \cdot NH_3$	cyanoguanidine ammine	cr	101.1119	—	-51.9	—	—	—	—
$C_2H_5N_7$	5-guanylaminotetrazole	cr	127.1093	—	169.5	—	—	—	—
$C_2H_4N_{10}$	5,5′-hydrazotetrazole	cr	168.1214	—	565.3	—	—	—	—
$C_2H_6N_{10} \cdot H_2O$	1-(5-tetrazolyl)-4-guanyltetrazene hydrate	cr	188.1528	—	189.1	—	—	—	—
$H_2NCOCOO^-$	oxamate ion	aq	88.0433	—	-640.6	—	—	—	—
CH_3NCO	methyl isocyanate	l	57.0525	—	-92.0	—	—	—	—
$HOCH_2CN$	glycolic nitrile	l2	57.0525	—	-141.0	—	—	—	—
$HOCH_2CN$	in 200 H_2O		57.0525	—	-140.6	—	—	—	—
$H_2NCOCOOH$	oxamic acid	cr	89.0513	—	-671.1	—	—	—	—
	in 800 H_2O		89.0513	—	-640.6	—	—	—	—
$NH_2CH_2COO^-$	glycinate	ao	74.0599	—	-469.780	-314.833	—	119.41	—
$CH_3CHNO_2^-$	nitroethane ion	aq2	74.0599	—	-126.8	—	—	—	—
CH_3CHNOH	acetaldoxime (high-melting)	cr	59.0685	—	-77.8	—	—	—	—
	acetaldoxime (low-melting)	l3	59.0685	—	-81.6	—	—	—	—
		aq	59.0685	—	-68.2	—	—	—	—
CH_3CONH_2	acetamide	cr2	59.0685	—	-318.0	—	—	—	67.
	in 200 H_2O		59.0685	—	-309.2	—	—	—	—
CH_3CONH_2	in 32 C_2H_5OH		59.0685	—	-307.1	—	—	—	—
$CH_2OHCONH_2$	glycolamide	cr5	75.0679	—	—	—	—	—	113.
$C_2H_5NO_2$	nitroethane	l	75.0679	—	-140.2	—	—	—	138.
		g	75.0679	—	-98.58	—	—	—	—
	nitroethane, acid form	aq	75.0679	—	-128.4	—	—	—	—
$C_2H_5NO_2$	nitroethane, nitro form	aq2	75.0679	—	-134.	—	—	—	—
CH_3CH_2ONO	ethyl nitrite	l3	75.0679	—	-128.9	—	—	—	—
		g3	75.0679	—	-104.2	—	—	—	—
NH_2CH_2COOH	glycine	cr4	75.0679	-508.000	-528.10	-368.44	16.180	103.51	99.20
		ai4	75.0679	—	-469.780	-314.833	—	119.41	—
NH_2CH_2COOH		ao4	75.0679	—	-513.988	-370.647	—	158.32	—
	in 20 H_2O		75.0679	—	-514.770	—	—	—	—
	in 25 H_2O		75.0679	—	-514.657	—	—	—	—
	in 30 H_2O		75.0679	—	-514.569	—	—	—	—
	in 40 H_2O		75.0679	—	-514.465	—	—	—	—
NH_2CH_2COOH	in 50 H_2O		75.0679	—	-514.389	—	—	—	—
	in 75 H_2O		75.0679	—	-514.268	—	—	—	—
	in 100 H_2O		75.0679	—	-514.201	—	—	—	—
	in 150 H_2O		75.0679	—	-514.130	—	—	—	—
	in 200 H_2O		75.0679	—	-514.092	—	—	—	—
NH_2CH_2COOH	in 300 H_2O		75.0679	—	-514.059	—	—	—	—
	in 400 H_2O		75.0679	—	-514.042	—	—	—	—
	in 500 H_2O		75.0679	—	-514.029	—	—	—	—
	in 700 H_2O		75.0679	—	-514.017	—	—	—	—
	in 1 000 H_2O		75.0679	—	-514.009	—	—	—	—
NH_2CH_2COOH	in 100 000 H_2O		75.0679	—	-513.988	—	—	—	—

Table 23:C — CARBON (Prepared 1966) — Continued — Table 23:C

Substance Formula and Description	State	Molar mass g mol^{-1}	0 K $\Delta_f H^\circ_0$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H^\circ_0$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
$HOCH_2CH_2NO_2$ 2–nitroethanol	l	91.0673	—	-351.5	—	—	—	—
$CH_3CH_2ONO_2$ ethyl nitrate	cr2	91.0673	-188.376	—	—	—	—	—
	l2	91.0673	—	-190.33	-42.91	38.669	247.19	170.3
	g2	91.0673	—	-154.05	-36.79	—	348.34	—
$NH_4HC_2O_4$ ammonium bioxalate	cr	107.0667	—	—	—	—	—	151.
$NH_4HC_2O_4$ from $HC_2O_4^-$	ai	107.0667	—	-951.0	-777.64	—	262.8	—
$NH_3CH_2COOH^+$	ao	76.0759	—	-517.912	-384.061	—	190.20	—
CH_3COONH_4 ammonium acetate	cr	77.0839	—	-616.14	—	—	—	—
	ai	77.0839	—	-618.52	-448.61	—	200.0	73.6
in 2.0 H_2O		77.0839	—	-609.450	—	—	—	—
CH_3COONH_4 in 2.5 H_2O		77.0839	—	-609.692	—	—	—	—
in 3.0 H_2O		77.0839	—	-609.902	—	—	—	—
in 3.5 H_2O		77.0839	—	-610.119	—	—	—	—
in 4.0 H_2O		77.0839	—	-610.362	—	—	—	—
in 4.5 H_2O		77.0839	—	-610.638	—	—	—	—
CH_3COONH_4 in 5.0 H_2O		77.0839	—	-610.948	—	—	—	—
in 5.5 H_2O		77.0839	—	-611.241	—	—	—	—
in 6 H_2O		77.0839	—	-611.533	—	—	—	—
in 7 H_2O		77.0839	—	-612.094	—	—	—	—
in 8 H_2O		77.0839	—	-612.559	—	—	—	—
CH_3COONH_4 in 9 H_2O		77.0839	—	-612.956	—	—	—	—
in 10 H_2O		77.0839	—	-613.291	—	—	—	—
in 12 H_2O		77.0839	—	-613.730	—	—	—	—
in 15 H_2O		77.0839	—	-614.169	—	—	—	—
in 20 H_2O		77.0839	—	-614.776	—	—	—	—
CH_3COONH_4 in 25 H_2O		77.0839	—	-615.132	—	—	—	—
in 30 H_2O		77.0839	—	-615.425	—	—	—	—
in 40 H_2O		77.0839	—	-615.826	—	—	—	—
in 50 H_2O		77.0839	—	-616.098	—	—	—	—
in 75 H_2O		77.0839	—	-616.512	—	—	—	—
CH_3COONH_4 in 100 H_2O		77.0839	—	-616.751	—	—	—	—
in 150 H_2O		77.0839	—	-617.035	—	—	—	—
in 200 H_2O		77.0839	—	-617.203	—	—	—	—
in 300 H_2O		77.0839	—	-617.383	—	—	—	—
in 400 H_2O		77.0839	—	-617.504	—	—	—	—
CH_3COONH_4 in 500 H_2O		77.0839	—	-617.579	—	—	—	—
in 600 H_2O		77.0839	—	-617.634	—	—	—	—
in 700 H_2O		77.0839	—	-617.680	—	—	—	—
in 800 H_2O		77.0839	—	-617.713	—	—	—	—
in 900 H_2O		77.0839	—	-617.747	—	—	—	—
CH_3COONH_4 in 1 000 H_2O		77.0839	—	-617.768	—	—	—	—
in 1 500 H_2O		77.0839	—	-617.855	—	—	—	—
in 2 000 H_2O		77.0839	—	-617.906	—	—	—	—
in 3 000 H_2O		77.0839	—	-617.960	—	—	—	—
in 4 000 H_2O		77.0839	—	-617.998	—	—	—	—
CH_3COONH_4 in 5 000 H_2O		77.0839	—	-618.023	—	—	—	—
in 7 000 H_2O		77.0839	—	-618.052	—	—	—	—
in 10 000 H_2O		77.0839	—	-618.081	—	—	—	—
in 20 000 H_2O		77.0839	—	-618.123	—	—	—	—
in 50 000 H_2O		77.0839	—	-618.161	—	—	—	—

Table 23:C — **CARBON** (Prepared 1966) — Continued — Table 23:C

Substance Formula and Description	State	Molar mass g mol^{-1}	0 K $\Delta_f H^\circ_0$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H^\circ_0$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
CH_3COONH_4 in 100 000 H_2O		77.0839	—	-618.178	—	—	—	—
in ∞ H_2O		77.0839	—	-618.52	—	—	—	—
$CH_2OHCOONH_4$ ammonium glycolate	cr	93.0833	—	-797.5	—	—	—	—
in 200 H_2O		93.0833	—	-784.5	—	—	—	—
$CH_3NH_3HCO_3$ in 1 000 H_2O methylammonium bicarbonate		93.0833	—	-813.4	—	—	—	—
$CH(OH)_2COONH_4$ ammonium glyoxylate	aq	109.0827	—	-956.9	—	—	—	—
$(CH_3)_2NH_2OH$ dimethylammonium hydroxide	ao	63.1005	—	-356.43	-179.06	—	202.9	—
$1/n(C_2H_4ON_2)_n$ methylene urea, polymeric	cr	72.0672	—	-326.8	—	—	—	—
$(CONH_2)_2$ oxamide	cr	88.0666	—	-514.6	—	—	—	—
$(CHNOH)_2$ glyoxime	cr2	88.0666	—	-88.7	—	—	—	—
$HCONHCONH_2$ formylurea	cr3	88.0666	—	-492.9	—	—	—	—
in 2 000 H_2O		88.0666	—	-461.5	—	—	—	—
$(CH_2NO_3)_2$ ethylene glycol dinitrate	cr	152.0642	—	-246.4	—	—	—	—
$(CH_3)_2NNO$ dimethylnitrosoamine	l	74.0832	—	4.6	—	—	—	—
$(CH_3)_2NNO_2$ dimethylnitramine	cr2	90.0826	—	-70.3	—	—	—	—
$CH_3CH_2NHNO_2$ ethylnitramine	l	90.0826	—	-93.7	—	—	—	—
$CH_2(COOH)NH_3NO_3$ glycinium nitrate	cr	138.0808	—	-728.	—	—	—	—
$(CH_3)_2NH_2NO_3$ dimethylammonium nitrate	cr	108.0980	—	-350.2	—	—	—	—
	ai	108.0980	—	-327.61	-114.47	—	318.8	—
$C_2H_5NH_3NO_3$ ethylammonium nitrate	l2	108.0980	—	-366.9	—	—	—	—
$C_2H_5NH_3NO_3$	aq2	108.0980	—	-363.6	—	—	—	—
$HOCH_2CH_2NH_3NO_3$ ethanolammonium nitrate	cr	124.0974	—	-577.	—	—	—	—
$(NH_4)_2C_2O_4$ ammonium oxalate	cr2	124.0974	—	-1123.0	—	—	—	226.
	ai2	124.0974	—	-1089.9	-832.4	—	272.4	—
in 2 100 H_2O		124.0974	—	-1092.9	—	—	—	—
$(NH_4)_2C_2O_4 \cdot H_2O$	cr	142.1128	—	-1425.5	—	—	—	—
$CH_3C(NO_2)_3$ 1,1,1–trinitroethane	cr	165.0629	—	0.0	—	—	—	—
$HOCH_2CH_2N_3$ 2–triazoethanol	l	87.0819	—	94.6	—	—	—	—
$NO_3CH_2CH_2NH_3NO_3$ nitroxyethylammonium nitrate	cr	169.0949	—	-468.2	—	—	—	—
$C_2H_4N_4O$ 5–methoxytetrazole	cr	100.0806	—	69.0	—	—	—	—
$C_2H_4N_4O_2$ urazine	cr	116.0800	—	-263.2	—	—	—	—
azodicarbamide	cr2	116.0800	—	-292.5	—	—	—	—
$C_2H_6N_4O_2$ hydrazodicarbamide	cr	118.0960	—	-498.69	—	—	—	—
$(CONHNH_2)_2$ oxalyldihydrazide	cr2	118.0960	—	-295.8	—	—	—	—
$(CH_2NH_3NO_3)_2$ ethylenediammonium nitrate	cr	186.1256	—	-653.5	—	—	—	—
$(CH_2NH_3NO_3)_2$ in 400 H_2O		186.1256	—	-566.5	—	—	—	—
$C_2H_3N_5O_2$ 3–nitramino–1,2,4–triazole	cr	129.0787	—	112.5	—	—	—	—
$C_2H_5N_5O_3$ 1–formamido–2–nitroguanidine	cr	147.0941	—	-146.9	—	—	—	—
3–amino–1,2,4–triazole nitrate	cr2	147.0941	—	-171.1	—	—	—	—
$H_2NC(NH)NHCONHNO_2$ nitroguanylurea	cr3	147.0941	—	-313.4	—	—	—	—
$H_2NC(NH)NHCONH_3NO_3$ guanylurea nitrate	cr	165.1095	—	-427.2	—	—	—	—

Table 23:C — CARBON (Prepared 1966) — Continued — Table 23:C

Substance Formula and Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
$(CH_2N(NH_4)NO_2)_2$ ammonium salt of ethylenedinitramine	cr	184.1562	—	-335.6	—	—	—	—
$CHN_4{\cdot}N(NO_2)NH_3C(NH)NH_2$ guanidine salt of 5-nitroaminotetrazole	cr	189.1375	—	111.3	—	—	—	—
CF_3CN trifluoroacetonitrile	g	95.0243	—	—	—	15.820	298.09	77.86
$CHF_2CH_2NH_2$ 2,2-difluoroethylamine	l	81.0659	—	-497.9	—	—	—	—
CH_2FCONH_2 fluoroacetamide	cr	77.0589	—	-496.6	—	—	—	—
CHF_2CONH_2 difluoroacetamide	cr	95.0493	—	-700.0	—	—	—	—
$CHF_2CH_2NHNO_2$ 2,2-difluoroethylnitramine	cr	126.0634	—	-502.1	—	—	—	—
CCl_3CN trichloroacetonitrile	g	144.3881	—	—	—	19.694	336.59	96.06
CH_2ClCN chloroacetonitrile	g	75.4981	—	—	—	13.523	286.17	61.46
$(CH_3)_2NH_2Cl$ dimethylammonium chloride; from $(CH_3)_2NH_2{}^+$	ai	81.5461	—	-287.40	-134.44	—	228.9	—
$(CH_3)_2NH_2Cl$ in 50 H_2O		81.5461	—	-286.884	—	—	—	—
in 100 H_2O		81.5461	—	-286.943	—	—	—	—
in 150 H_2O		81.5461	—	-286.964	—	—	—	—
in 200 H_2O		81.5461	—	-286.981	—	—	—	—
in 300 H_2O		81.5461	—	-287.006	—	—	—	—
$(CH_3)_2NH_2Cl$ in 400 H_2O		81.5461	—	-287.0	—	—	—	—
in 500 H_2O		81.5461	—	-287.039	—	—	—	—
in 600 H_2O		81.5461	—	-287.052	—	—	—	—
in 700 H_2O		81.5461	—	-287.068	—	—	—	—
in 800 H_2O		81.5461	—	-287.077	—	—	—	—
$(CH_3)_2NH_2Cl$ in 900 H_2O		81.5461	—	-287.089	—	—	—	—
in 1 000 H_2O		81.5461	—	-287.098	—	—	—	—
in 1 500 H_2O		81.5461	—	-287.135	—	—	—	—
in 2 000 H_2O		81.5461	—	-287.156	—	—	—	—
in 3 000 H_2O		81.5461	—	-287.190	—	—	—	—
$(CH_3)_2NH_2Cl$ in 4 000 H_2O		81.5461	—	-287.211	—	—	—	—
in 5 000 H_2O		81.5461	—	-287.227	—	—	—	—
in 7 000 H_2O		81.5461	—	-287.248	—	—	—	—
in 10 000 H_2O		81.5461	—	-287.265	—	—	—	—
in 20 000 H_2O		81.5461	—	-287.294	—	—	—	—
$(CH_3)_2NH_2Cl$ in 50 000 H_2O		81.5461	—	-287.332	—	—	—	—
in 100 000 H_2O		81.5461	—	-287.349	—	—	—	—
in ∞ H_2O		81.5461	—	-287.40	—	—	—	—
$C_2H_5NH_3Cl$ in 400 H_2O:i2 ethylammonium chloride		81.5461	—	-323.8	—	—	—	—
$NH_2CH_2CH_2NH_3Cl$ in 5 000 H_2O aminoethylammonium chloride		96.5608	—	-273.2	—	—	—	—
$(CH_2NH_3Cl)_2$ ethylenediammonium dichloride	cr	133.0218	—	-513.4	—	—	—	—
in 5 000 H_2O		133.0218	—	-485.01	—	—	—	—
$CH_2ClCONH_2$ chloroacetamide	cr	93.5135	—	-339.3	—	—	—	—
in 2 500 H_2O		93.5135	—	-315.1	—	—	—	—
$CH_2(COOH)NH_3Cl$ from $(CH_2COOH)NH_3{}^+$; glycinium chloride	ai	111.5289	—	-685.071	-515.289	—	246.9	—
$CH_2(COOH)NH_3Cl$ in 200 H_2O		111.5289	—	-684.5	—	—	—	—

Table 23:C — **CARBON** (Prepared 1966) — Continued — Table 23:C

Substance Formula and Description	State	Molar mass g mol^{-1}	0 K $\Delta_f H^\circ_0$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H^\circ_0$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
$CH_2ClCOONH_4$ chloroacetate	cr2	111.5289	—	-643.1	—	—	—	—
in 200 H_2O		111.5289	—	-632.2	—	—	—	—
$CHCl_2CONH_2$ in 5 000 H_2O dichloroacetamide		127.9585	—	-321.3	—	—	—	—
CCl_3CONH_2 trichloroacetamide	cr	162.4035	—	-359.0	—	—	—	—
in 2 000 H_2O		162.4035	—	-323.0	—	—	—	—
CCl_3COONH_4 trichloroacetate	cr	180.4189	—	-655.6	—	—	—	—
in 200 H_2O		180.4189	—	-651.0	—	—	—	—
$CCl_3COONH_4 \cdot 2H_2O$	cr	216.4497	—	-1280.3	—	—	—	—
CCl_3COONH_3OH in 300 H_2O		196.4183	—	-652.3	—	—	—	—
CF_2ClCN difluorochloroacetonitrile	g	111.4789	—	—	—	16.711	318.51	82.01
$CFCl_2CN$ fluorodichloroacetonitrile	g	127.9335	—	—	—	18.188	332.19	88.99
$I(CN)_2^-$	ao	178.9402	—	—	358.24	—	—	—
$(SCN)_2$ thiocyanogen	l	116.1638	—	310.9	—	—	—	—
CH_3NCS methyl isothiocyanate	cr	73.1171	—	79.5	—	—	—	—
	g	73.1171	140.00	131.0	144.4	14.493	290.02	65.48
CH_3NCS^+	g	73.1171	1032.6	1029.7	—	—	—	—
CH_3SCN methyl thiocyanate	l2	73.1171	—	118.8	—	—	—	—
	g2	73.1171	—	160.2	—	—	—	—
CH_3SCN^+	g2	73.1171	—	1137.2	—	—	—	—
$NH_2CH_2CH_2SO_3^-$	ao	124.1393	—	-719.31	-509.26	—	200.0	—
$NH_2CH_2CH_2SO_3H$ taurine	cr	125.1473	—	-785.3	-561.7	—	154.0	140.6
	ai	125.1473	—	-719.31	-509.26	—	200.0	—
	ao	125.1473	—	-761.15	-560.98	—	233.0	—
in 50 H_2O		125.1473	—	-761.86	—	—	—	—
in 100 H_2O		125.1473	—	-761.61	—	—	—	—
$NH_2CH_2CH_2SO_3H$ in 150 H_2O		125.1473	—	-761.49	—	—	—	—
in ∞ H_2O		125.1473	—	-761.15	—	—	—	—
$(CHO)_2 \cdot 2NH_4HSO_3$ in 800 H_2O glyoxal ammonium bisulfite		256.2550	—	-1948.1	—	—	—	—
$(CHO)_2 \cdot 2NH_4HSO_3 \cdot H_2O$	cr	274.2704	—	-2276.5	—	—	—	—
$((CH_3)(NO_2)N)_2SO_2$ N,N–dinitro–N,N–dimethylsulfamine	cr	214.1576	—	-274.9	—	—	—	—
$(CNH(NH_2)(NH_3))_2SO_4$ guanidine sulfate	cr	216.2202	—	-1205.0	—	—	—	—
	aq	216.2202	—	-1176.5	—	—	—	—
CH_3COOCH_3 methyl acetate	l	74.0804	—	-445.26	—	—	—	—
$(CH_3)_3N$ trimethylamine	l	59.1123	—	-46.0	101.0	—	208.45	135.19
	g	59.1123	—	-24.31	99.08	—	287.1	—
$(CH_3)_3N$	ai	59.1123	—	-76.02	93.13	—	133.5	—
in 400 H_2O		59.1123	—	-76.99	—	—	—	—
in 700 H_2O		59.1123	—	-77.40	—	—	—	—
in 1 000 H_2O		59.1123	—	-77.8	—	—	—	—
$(CH_3)_3NH^+$	ao	60.1203	—	-112.93	37.40	—	196.6	—
$(CH_3)_2NH_2HCO_3$ in 1 000 H_2O trimethylammonium bicarbonate		107.1105	—	-808.8	—	—	—	—
$(CH_3)_3NHOH$	ao	77.1277	—	-361.83	-144.01	—	203.3	—
$(CH_3)_3NHNO_3$ trimethylammonium nitrate	cr	122.1252	—	-343.9	—	—	—	—

Table 23:C — CARBON (Prepared 1966) — Continued — Table 23:C

Substance Formula and Description	State	Molar mass g mol^{-1}	0 K: $\Delta_fH_0^\circ$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar): Δ_fH° kJ mol^{-1}	Δ_fG° kJ mol^{-1}	$H^\circ - H_0^\circ$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
$(CH_3)_3NHNO_3$	ai	122.1252	—	-320.29	-73.85	—	343.1	—
$(CH_3NH_3)_2CO_3$ in 2 000 H_2O		124.1412	—	-914.6	—	—	—	—
$(CNH(NH_2)(NH_3))_2CO_3$ guanidine carbonate	cr	180.1680	—	-971.11	-557.09	—	295.4	258.86
$(CH_3)_3NHCl$ trimethylammonium chloride	cr	95.5733	—	-281.54	—	—	—	—
from $(CH_3)_3NH^+$	ai	95.5733	—	-280.08	-93.82	—	253.1	—
$(CH_3)_3NHCl$ in 50 H_2O		95.5733	—	-280.412	—	—	—	—
in 100 H_2O		95.5733	—	-280.169	—	—	—	—
in 150 H_2O		95.5733	—	-280.060	—	—	—	—
in 200 H_2O		95.5733	—	-279.993	—	—	—	—
in 300 H_2O		95.5733	—	-279.939	—	—	—	—
$(CH_3)_3NHCl$ in 400 H_2O		95.5733	—	-279.9	—	—	—	—
in 500 H_2O		95.5733	—	-279.897	—	—	—	—
in 700 H_2O		95.5733	—	-279.884	—	—	—	—
in 1 000 H_2O		95.5733	—	-279.880	—	—	—	—
in 2 000 H_2O		95.5733	—	-279.884	—	—	—	—
$(CH_3)_3NHCl$ in 3 000 H_2O		95.5733	—	-279.905	—	—	—	—
in 4 000 H_2O		95.5733	—	-279.918	—	—	—	—
in 5 000 H_2O		95.5733	—	-279.926	—	—	—	—
in 7 000 H_2O		95.5733	—	-279.943	—	—	—	—
in 10 000 H_2O		95.5733	—	-279.960	—	—	—	—
$(CH_3)_3NHCl$ in 20 000 H_2O		95.5733	—	-279.981	—	—	—	—
in 50 000 H_2O		95.5733	—	-280.014	—	—	—	—
in 100 000 H_2O		95.5733	—	-280.027	—	—	—	—
in ∞ H_2O		95.5733	—	-280.08	—	—	—	—
$(CH_3COOH)_2$ acetic acid dimer	g	120.1064	—	-928.43	—	—	—	—
$(C_2H_5)_2O$ diethyl ether	l	74.1242	—	-279.57	—	—	—	—
	g	74.1242	—	-252.13	—	—	—	—
in 2 C_2HCl_5		74.1242	—	-285.77	—	—	—	—
in 10 C_2HCl_5		74.1242	—	-287.40	—	—	—	—
in 2 $CHCl_2COOH$ in dichloroacetic acid		74.1242	—	-293.47	—	—	—	—
$(C_2H_5)_2O$ in 10 $CHCl_2COOH$		74.1242	—	-293.76	—	—	—	—
$(C_2H_5)_2S$ diethyl sulfide	l	90.1888	—	-118.95	11.92	—	269.28	171.42
	g	90.1888	-55.02	-83.09	18.29	22.874	368.13	117.03
$(C_2H_5)_2NH$ diethylamine	l	73.1395	—	-103.3	—	—	—	—
	g	73.1395	—	-71.42	—	—	—	—
$(C_2H_5)_2NH$ in 30 H_2O		73.1395	—	-133.5	—	—	—	—
in 200 H_2O		73.1395	—	-134.3	—	—	—	—
$(C_2H_5)_2NH_2^+$	aq	74.1475	—	-188.7	—	—	—	—
$C_2H_5NH_3OOCCH_3$ in 500 H_2O ethylammonium acetate		105.1383	—	-641.8	—	—	—	—
$(CH_3)_3NHHCO_3$ in 1 000 H_2O trimethylammonium bicarbonate		121.1377	—	-802.5	—	—	—	—
$CH_2OHCOONH_4 \cdot CH_2OHCOOH$ ammonium acid glycolate	cr	169.1359	—	-1477.4	—	—	—	—
$(C_2H_5)_2NH_2NO_3$ diethylammonium nitrate	cr	136.1524	—	-418.8	—	—	—	—
	aq	136.1524	—	-396.2	—	—	—	—
$(CO(NH_2)(NH_3))_2C_2O_4$ urea oxalate	cr	210.1480	—	-1529.7	—	—	—	—

Table 23:C — CARBON (Prepared 1966) — Continued — Table 23:C

Substance Formula and Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
$(CO(NH_2)(NH_3))_2C_2O_4$ in 500 H_2O		210.1480	—	-1457.7	—	—	—	—
$(C_2H_5)_2NH_2Cl$ diethylammonium chloride	cr	109.6005	—	-358.2	—	—	—	—
in 200 H_2O		109.6005	—	-355.43	—	—	—	—
$CH_2ClCOONH_4{\cdot}CH_2ClCOOH{\cdot}H_2O$ ammonium acid monochloroacetate	cr	224.0425	—	-1453.5	—	—	—	—
$CCl_3COONH_4{\cdot}CCl_3COOH{\cdot}H_2O$ ammonium acid trichloroacetate	cr	361.8225	—	-1461.1	—	—	—	—
$(C_2H_5NH_3)_2SO_4$ in 1 000 H_2O diethylammonium sulfate		188.2478	—	-1220.1	—	—	—	—
$(CH_3)_3NHOOCCH_3$ in 400 H_2O trimethylammonium acetate		119.1655	—	-597.9	—	—	—	—
$((CH_3)_2NH_2)_2CO_3$ in 2 000 H_2O dimethylammonium carbonate		152.1956	—	-906.3	—	—	—	—
$(CH_3CHO)_3$ paraldehyde	l	132.1614	—	-686.97	—	—	—	—
$(C_2H_5)_3N$ triethylamine	l	101.1939	—	-134.3	—	—	—	—
$(C_2H_5)_3N$	g	101.1939	—	-95.8	—	—	—	—
	aq	101.1939	—	-174.1	—	—	—	—
$(C_2H_5)_3NH^+$ triethylammonium ion	aq	102.2019	—	-216.7	—	—	—	—
$(C_2H_5)_3NHNO_3$ triethylammonium nitrate	cr	164.2068	—	-447.7	—	—	—	—
	aq	164.2068	—	-424.3	—	—	—	—
$(C_2H_5)_3NHCl$ triethylammonium chloride	cr	137.6549	—	-385.8	—	—	—	—
in 25 H_2O		137.6549	—	-383.59	—	—	—	—
$((CH_3)_3NH)_2SO_4$ in 800 H_2O trimethylammonium sulfate		216.3022	—	-1133.4	—	—	—	—
$((CH_3)_3NH)_2CO_3$ in 2 000 H_2O trimethylammonium carbonate		180.2500	—	-887.8	—	—	—	—
$(CH_3CHO)_4$ metaldehyde	cr	176.2152	—	-940.6	—	—	—	—

Table 24:Si — SILICON (Prepared 1965) — Table 24:Si

Substance Formula	Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H_0^\circ$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H_0^\circ$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
Si		cr	28.0860	0	0	0	3.217	18.83	20.00
		am	28.0860	—	4.2	—	—	—	—
		g	28.0860	451.29	455.6	411.3	7.552	167.97	22.251
Si^{+}		g	28.0860	1237.79	1248.13	—	7.343	—	—
Si^{2+}		g	28.0860	2814.91	2830.31	—	6.197	—	—
Si^{3+}		g	28.0860	6046.47	6068.06	—	6.197	—	—
Si^{4+}		g	28.0860	10401.97	10429.75	—	6.197	—	—
Si^{5+}		g	28.0860	26492.7	26527.0	—	6.197	—	—
Si^{6+}		g	28.0860	46277.6	46317.7	—	6.197	—	—
Si^{7+}		g	28.0860	70065.	70111.	—	6.197	—	—
Si^{8+}		g	28.0860	99316.	99370.	—	6.197	—	—
Si^{9+}		g	28.0860	133193.	133252.	—	6.197	—	—
Si^{10+}		g	28.0860	171925.	171992.	—	6.197	—	—
Si^{11+}		g	28.0860	217861.	217932.	—	6.197	—	—
Si_2		g	56.1720	591.28	594.	536.	9.29	229.89	34.39
Si_3		g	84.2580	612.5	615.	—	12.1	—	54.0
SiO		g	44.0854	-100.75	-99.6	-126.4	8.711	211.61	29.92
SiO_2	α quartz	cr	60.0848	-905.978	-910.94	-856.64	6.933	41.84	44.43
	α cristobalite	cr2	60.0848	-904.572	-909.48	-855.43	6.991	42.68	44.18
	α tridymite	cr3	60.0848	-904.246	-909.06	-855.26	7.084	43.5	44.60
SiO_2		am	60.0848	—	-903.49	-850.70	—	46.9	44.4
		g	60.0848	—	-322.	—	—	—	—
		ai	60.0848	—	-897.0	—	—	—	—
SiH		g	29.0940	360.	361.00	—	8.657	—	—
SiH_3^{+}		g	31.1100	1014.6	1014.6	—	—	—	—
SiH_4		g	32.1180	43.9	34.3	56.9	10.531	204.62	42.84
SiH_4^{+}		g	32.1180	1169.0	1165.7	—	—	—	—
Si_2H_6		g	62.2200	96.40	80.3	127.3	15.765	272.66	80.79
$Si_2H_6^{+}$		g	62.2200	1063.	1050.	—	—	—	—
Si_3H_8		l	92.3220	—	92.5	—	—	—	—
Si_3H_8		g	92.3220	—	120.9	—	—	—	—
H_2SiO_3		cr	78.1002	—	-1188.7	-1092.4	—	134.	—
		ao	78.1002	—	-1182.8	-1079.4	—	109.	—
H_4SiO_4		cr	96.1156	—	-1481.1	-1332.9	—	192.	—
		ao	96.1156	—	-1468.6	-1316.6	—	180.	—
	equivalent to H_2SiO_3(ao) + H_2O(l)								
$HSi(OH)_6^{-}$		ao	131.1384	—	—	-1734.5	—	—	—
$H_2(Si(OH)_6)$		ao	132.1464	—	-2040.1	-1790.9	—	322.	—
	equivalent to H_2SiO_3(ao) + $2H_2O$(l)								
$H_2Si_2O_5$		cr	138.1850	—	-2088.7	-1943.4	—	192.	—
$H_6Si_2O_7$		cr	174.2158	—	-2669.4	-2425.7	—	331.	—
SiF		g	47.0844	4.	7.1	-24.3	9.456	225.79	32.64
SiF_2		g	66.0828	-618.19	-619.	-628.	11.004	252.74	43.89
SiF_4		g	104.0796	-1609.42	-1614.94	-1572.65	15.326	282.49	73.64
		ai	104.0796	—	—	-1607.4	—	—	—
SiF_4^{+}		g	104.0796	-143.9	-143.1	—	—	—	—
SiF_6^{2-}		ao	142.0764	—	-2389.1	-2199.4	—	122.2	—
SiH_3F		g	50.1084	—	—	—	10.950	238.39	47.40
$SiHF_3$		g	86.0892	—	—	—	11.996	271.90	60.54
H_2SiF_6		ai	144.0924	—	—	—	—	—	—

Substance Formula	Description	State	Molar mass g mol^{-1}	0 K $\Delta_f H^\circ_0$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H^\circ_0$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
H_2SiF_6	in 363 HF + 1 785 H_2O		144.0924	—	-2379.4	—	—	—	—
	in 160 HF + 720 H_2O		144.0924	—	-2398.3	—	—	—	—
	in 762 HF + 3 385 H_2O		144.0924	—	-2375.7	—	—	—	—
	in 41 HF + 175 H_2O		144.0924	—	-2376.5	—	—	—	—
SiCl		g	63.5390	188.	189.91	—	9.485	—	36.86
$SiCl_2$		g	98.9920	-165.73	-165.64	-177.19	12.47	280.4	50.88
$SiCl_4$		l	169.8980	—	-687.0	-619.84	—	239.7	145.31
		g	169.8980	-654.829	-657.01	-616.98	19.384	330.73	90.25
SiH_3Cl		g	66.5630	—	—	—	11.435	250.65	51.04
SiH_2Cl_2		g	101.0080	—	—	—	13.154	285.71	60.46
$SiCl_3H$		l	135.4530	—	-539.3	-482.52	—	227.6	—
		g	135.4530	-507.94	-513.0	-482.0	16.200	313.87	75.81
SiBr		g	107.9950	214.64	209.	—	10.04	—	38.62
$SiBr_4$		l	347.7220	—	-457.3	-443.9	—	277.8	—
		g	347.7220	-385.472	-415.5	-431.8	22.246	377.88	97.11
SiH_3Br		g	111.0190	—	—	—	11.765	262.40	52.84
SiH_2Br_2		g	189.9200	—	—	—	14.272	309.7	65.52
$SiHBr_3$		l	268.8210	—	-355.6	-336.4	—	248.1	—
		g	268.8210	-291.261	-317.6	-328.5	17.916	348.55	80.75
$SiCl_3Br$		g	214.3540	—	—	—	19.506	350.06	90.88
$SiCl_2Br_2$		g	258.8100	—	—	—	20.732	369.1	93.72
$SiClBr_3$		g	303.2660	—	—	—	21.426	377.1	95.35
SiI_4		cr	535.7036	—	-189.5	—	—	—	—
SiH_3I		g	158.0144	—	—	—	12.075	270.94	54.39
SiS		g	60.1500	111.3	112.47	60.89	8.933	223.66	32.26
SiS_2		cr	92.2140	—	-207.1	—	—	—	—
SiSe		g	107.0460	96.	99.50	—	9.12	—	33.64
$SiSe_2$		cr	186.0060	—	-29.	—	—	—	—
SiTe		g	155.6860	130.	129.66	—	9.29	—	34.77
SiN		g	42.0927	485.	486.52	456.08	8.732	216.76	30.17
Si_3N_4	α	cr	140.2848	—	-743.5	-642.6	—	101.3	—
$NH_4HSi(OH)_6$	from $HSi(OH)_6^-$	ai	149.1771	—	—	-1813.9	—	—	—
$SiF_4{\cdot}2NH_3$		cr	138.1410	—	-1937.	—	—	—	—
$(NH_4)_2SiF_6$	hexagonal	cr	178.1538	-2651.78	-2681.69	-2365.29	42.325	280.24	228.11
	cubic	cr2	178.1538	-2652.271	-2680.56	-2365.37	43.924	284.47	247.90
$(NH_4)_2SiF_6$	from SiF_6^{2-}	ai	178.1538	—	-2653.9	-2357.8	—	348.9	—
	in 555 H_2O		178.1538	—	-2651.003	—	—	—	—
	in 795 H_2O		178.1538	—	-2650.418	—	—	—	—
	in 1 500 H_2O		178.1538	—	-2649.309	—	—	—	—
	in 2 775 H_2O		178.1538	—	-2647.275	—	—	—	—
SiC	β, cubic	cr	40.0972	-64.27	-65.3	-62.8	3.268	16.61	26.86
	α, hexagonal	cr2	40.0972	—	-62.8	-60.2	—	16.48	26.69
		g	40.0972	734.7	741.	—	10.0	—	—
SiC_2		g	52.1084	609.6	615.	—	10.5	—	—
Si_2C		g	68.1832	548.5	552.	—	11.3	—	—
Si_2C_2		g	80.1944	699.	—	—	—	—	—
Si_2C_3		g	92.2056	736.	—	—	—	—	—
Si_3C		g	96.2692	674.	—	—	—	—	—
$SiH_3(CH_3)$	methylsilane	g	46.1452	—	—	—	13.665	256.50	65.86
SiH_3CCH	silylacetylene	g	56.1404	—	—	—	14.690	269.35	72.55

Table 24:Si SILICON (Prepared 1965) — Continued Table 24:Si

Substance Formula and Description	State	Molar mass g mol^{-1}	0 K $\Delta_f H_0^\circ$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H_0^\circ$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
SiH_3CHCH_2 vinylsilane	g	58.1564	—	-8.	—	—	—	—
$SiH_2(CH_3)_2$ dimethylsilane	g	60.1724	—	—	—	17.962	299.64	92.05
$SiH_3C_2H_5$ ethylsilane	g2	60.1724	-121.	—	—	—	—	—
$SiH(CH_3)_3$ trimethylsilane	g	74.1996	—	—	—	22.276	331.02	117.91
$Si(CH_3)_4$ tetramethylsilane	l	88.2268	—	-264.	-100.	—	277.27	204.10
$Si(CH_3)_4$	g	88.2268	-208.247	-239.111	-99.910	27.359	359.01	143.89
$SiH(C_2H_5)_3$ triethylsilane	l	116.2812	—	-226.	—	—	—	—
$Si(C_2H_5)_4$ tetraethylsilane	l	144.3356	—	-285.	—	—	—	—
$SiH(OCH_3)_3$ trimethoxysilane	l	122.1978	—	-833.	—	—	—	—
$Si(OCH_3)_4$ tetramethoxysilane	l	152.2244	—	-1264.	—	—	—	—
$SiH(OC_2H_5)_3$ triethoxysilane	l	164.2794	—	-946.	—	—	—	—
$Si(OC_2H_5)_4$ tetraethoxysilane	l	208.3332	—	-1397.	—	—	—	—
$((CH_3)_3Si)_2O$ hexamethyldisiloxane	cr	162.3826	-789.31	—	—	—	—	—
	l	162.3826	—	-815.0	-541.5	67.655	433.84	311.37
	g	162.3826	-728.31	-777.72	-534.48	43.97	535.03	238.49
$(CH_3)_3SiCl$ trimethylchlorosilane	l	108.6446	—	-382.8	-246.40	—	278.2	—
	g	108.6446	—	-352.79	-243.50	—	369.1	—
$Si(OC_2H_5)_3Cl$ triethoxychlorosilane	l	198.7244	—	-1232.2	—	—	—	—
$SiF_4 \cdot N(CH_3)_3$	cr	163.1919	—	-1754.4	—	—	—	—
$SiF_4 \cdot 2N(CH_3)_3$	cr	222.3042	—	-1838.9	—	—	—	—

Table 25:**Ge** **GERMANIUM** (Prepared 1965) Table 25:**Ge**

Substance Formula	Description	State	Molar mass g mol^{-1}	0 K $\Delta_f H^\circ_0$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H^\circ_0$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
Ge		cr	72.5900	0	0	0	4.623	31.09	23.347
		g	72.5900	373.80	376.6	335.9	7.397	167.900	30.731
Ge^+		g	72.5900	1136.00	1143.74	—	6.205	—	—
Ge^{2+}		g	72.5900	2673.45	2687.38	—	6.197	—	—
Ge^{3+}		g	72.5900	5975.55	5995.67	—	6.197	—	—
Ge^{4+}		g	72.5900	10385.9	10412.3	—	6.197	—	—
Ge^{5+}		g	72.5900	19405.	19435.	—	—	—	—
Ge_2		g	145.1800	473.	473.13	416.3	9.58	252.8	35.6
Ge_3		g	217.7700	473.	472.58	415.4	13.68	285.0	57.7
Ge_4		g	290.3600	477.	476.89	415.9	18.41	329.8	80.3
GeO	brown	cr	88.5894	—	-261.9	-237.2	—	50.	—
	yellow	cr2	88.5894	—	—	-207.1	—	—	—
		g	88.5894	-46.	-46.19	-73.19	8.795	224.29	30.92
GeO_2	hexagonal	cr	104.5888	—	-551.0	-497.0	—	55.27	52.09
		am	104.5888	—	-537.2	—	—	—	—
Ge_2O_2		g	177.1788	—	-469.	—	—	—	—
Ge_3O_3		g	265.7682	—	-887.	—	—	—	—
GeH_4		g	76.6220	101.63	90.8	113.4	10.740	217.13	45.02
GeH_4^+		g	76.6220	1194.5	1189.5	—	—	—	—
Ge_2H_6		l	151.2280	—	137.32	—	—	—	—
Ge_2H_6		g	151.2280	—	162.3	—	—	—	—
$Ge_2H_6^+$		g	151.2280	—	1377.	—	—	—	—
Ge_3H_8		l	225.8340	—	193.7	—	—	—	—
		g	225.8340	—	226.8	—	—	—	—
$Ge_3H_8^+$		g	225.8340	—	1159.	—	—	—	—
H_2GeO_3		aq	122.6042	—	-818.93	—	—	—	—
GeF		g	91.5884	-33.	-33.35	—	9.142	—	34.73
GeF_2		g	110.5868	-506.	—	—	—	—	—
GeF_4		g	148.5836	—	—	—	17.418	302.86	81.84
GeH_3F		g	94.6124	—	—	—	11.427	252.78	51.63
H_2GeF_6		aq	188.5964	—	-2015.4	—	—	—	—
GeCl		g	108.0430	155.	155.18	124.2	9.581	247.	36.86
$GeCl_4$		l	214.4020	—	-531.8	-462.7	—	245.6	—
		g	214.4020	-493.96	-495.8	-457.3	21.129	347.72	96.11
$GeCl_4^+$		g	214.4020	652.3	656.5	—	—	—	—
GeH_3Cl		g	111.0670	—	—	—	11.987	263.70	54.73
$GeHCl_3$		l	179.9570	—	—	—	—	224.3	—
		g	179.9570	—	—	—	17.539	330.90	81.17
GeBr		g	152.4990	243.	235.64	—	9.853	—	37.11
$GeBr_2$		g	232.4080	—	-62.8	-106.7	—	331.1	—
$GeBr_4$		l	392.2260	—	-347.7	-331.4	—	280.7	—
		g	392.2260	-270.33	-300.0	-318.0	23.999	396.17	101.84
GeH_3Br		g	155.5230	—	—	—	12.410	274.83	56.36
GeI_2		cr	326.3988	—	-88.	-84.	—	134.	—
		g	326.3988	—	46.9	-4.2	—	318.	—
GeI_4		cr	580.2076	—	-141.8	-144.3	—	271.1	—
		g	580.2076	-51.51	-56.9	-106.3	25.61	428.93	104.14
	in HCl + 14.3 H_2O:u		580.2076	—	-149.16	—	—	—	—
$GeIH_3$		g	202.5184	—	—	—	12.707	283.16	57.53
GeS		cr	104.6540	—	-69.0	-71.5	—	71.	—

Table 25:Ge — **GERMANIUM** (Prepared 1965) — Continued — Table 25:Ge

Substance Formula and Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
GeS	g	104.6540	92.0	92.	42.	9.142	234.	33.68
GeS_2	cr	136.7180	—	-189.5	—	—	—	—
GeSe	cr	151.5500	—	-92.0	—	—	—	—
	g	151.5500	96.	95.56	—	9.46	—	35.23
GeTe	cr	200.1900	—	-25.	—	—	—	—
GeTe	g	200.1900	176.77	176.	—	9.71	—	35.94
$GeTe_2$	g	327.7900	—	184.	—	—	—	—
Ge_3N_4	cr	273.7968	—	-63.2	—	—	—	—
GeP	cr	103.5638	—	-21.	-17.	—	63.	—
GeC	g	84.6012	628.	632.	—	—	—	—
GeC^+	g	84.6012	1623.	1632.	—	—	—	—
GeC_2	g	96.6124	594.	598.	—	—	—	—
Ge_2C	g	157.1912	544.	548.	—	—	—	—
Ge_3C	g	229.7812	569.	573.	—	—	—	—
$Ge(C_2H_5)_4$	l	188.8396	—	-207.1	—	—	—	—
GeSi	g	100.6760	527.	531.	—	—	—	—
Ge_2Si	g	173.2660	515.	519.	—	—	—	—
Ge_3Si	g	245.8560	506.	510.	—	—	—	—
GeSiC	g	112.6872	531.	536.	—	—	—	—
Ge_2SiC	g	185.2772	577.	582.	—	—	—	—

Table 26:**Sn** — **TIN** (Prepared 1965) — Table 26:**Sn**

Substance Formula	Description	State	Molar mass g mol^{-1}	0 K $\Delta_f H^\circ_0$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H^\circ_0$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
Sn	I, white	cr	118.6900	0	0	0	6.297	51.55	26.99
	II, gray	cr2	118.6900	–1.552	–2.09	0.13	5.757	44.14	25.77
		g	118.6900	302.00	302.1	267.3	6.213	168.486	21.259
Sn^+		g	118.6900	1010.56	1016.84	—	6.197	—	—
Sn^{2+}		g	118.6900	2422.37	2434.80	—	6.197	—	—
Sn^{3+}		g	118.6900	5365.39	5384.05	—	6.197	—	—
Sn^{4+}		g	118.6900	9295.6	9320.7	—	6.197	—	—
Sn^{5+}		g	118.6900	16269.9	16300.9	—	6.197	—	—
Sn^{2+}	$\mu(NaClO_4)=3.0$	ao	118.6900	—	–8.8	–27.2	—	–17.	—
Sn^{4+}	in HCl + ∞ H_2O:ao		118.6900	—	30.5	2.5	—	–117.	—
SnO		cr	134.6894	—	–285.8	–256.9	—	56.5	44.31
		g	134.6894	16.82	15.1	–8.4	8.858	232.11	31.59
SnO_2		cr	150.6888	—	–580.7	–519.6	—	52.3	52.59
Sn_2O_2		g	269.3788	—	–251.	—	—	—	—
Sn_3O_3		g	404.0682	—	–527.	—	—	—	—
Sn_4O_4		g	538.7576	—	–808.	—	—	—	—
SnH_4		g	122.7220	174.81	162.8	188.3	11.167	227.68	48.95
SnH_4^+		g	122.7220	1212.1	1206.2	—	—	—	—
$SnOH^+$		ao	135.6974	—	–286.2	–254.8	—	50.	—
$SnOOH^+$		ao	151.6968	—	—	–474.0	—	—	—
$Sn(OH)_2$	precipitated	cr	152.7048	—	–561.1	–491.6	—	155.	—
$Sn(OH)_4$	precipitated	cr	186.7196	—	–1110.0	—	—	—	—
SnF^+		ao	137.6884	—	—	–335.1	—	—	—
SnO(OH)F		ao	170.6952	—	—	–788.6	—	—	—
$SnCl^+$	$\mu NaClO_4)=3.0$	ao	154.1430	—	–164.8	–164.8	—	96.	—
$SnCl_2$		cr	189.5960	—	–325.1	—	—	—	—
	$\mu(NaClO_4)=3.0$	ao	189.5960	—	–329.7	–299.5	—	172.	—
	in HCl + 200 H_2O:u		189.5960	—	–331.8	—	—	—	—
$SnCl_2{\cdot}2H_2O$		cr	225.6268	—	–921.3	—	—	—	—
$SnCl_3^-$	$\mu(NaClO_4)=3.0$	ao	225.0490	—	–487.0	–430.0	—	259.	—
$SnCl_4$		l	260.5020	—	–511.3	–440.1	—	258.6	165.3
		g	260.5020	–469.28	–471.5	–432.2	22.405	365.8	98.3
	in HCl + ∞ H_2O:ao		260.5020	—	–638.1	–522.5	—	109.	—
	in $HCOOC_2H_5$:u in ethyl formate		260.5020	—	–584.5	—	—	—	—
	in $CH_3COOC_2H_5$:u in ethyl acetate		260.5020	—	–584.1	—	—	—	—
$SnCl_4$	in $C_3H_7COOC_2H_5$:u in ethyl butyrate		260.5020	—	–579.1	—	—	—	—
	in $C_6H_5COOC_2H_5$:u in ethyl benzoate		260.5020	—	–546.4	—	—	—	—
$SnCl_4^+$		g	260.5020	677.0	680.7	—	—	—	—
$SnCl_6^{2-}$		aq	331.4080	—	–970.3	—	—	—	—
SnOHCl		ao	171.1504	—	–453.5	–392.0	—	126.	—
$SnOHCl{\cdot}H_2O$		cr	189.1658	—	—	–648.4	—	—	—
$SnBr^+$	$\mu(NaClO_4)=3.0$	ao	198.5990	—	–124.7	–135.6	—	96.	—
$SnBr_2$		cr	278.5080	—	–243.5	—	—	—	—
	$\mu(NaClO_4)=3.0$	ao	278.5080	—	–246.0	–241.8	—	188.	—
	in HCl + 200 H_2O:u		278.5080	—	–237.7	—	—	—	—
$SnBr_3^-$	$\mu(NaClO_4)=3.0$	ao	358.4170	—	–374.9	–346.8	—	251.	—

Table 26:Sn — TIN (Prepared 1965) — Continued — Table 26:Sn

Substance Formula and Description		State	Molar mass g mol⁻¹	0 K $\Delta_f H_0^\circ$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H_0^\circ$	S° J mol⁻¹ K⁻¹	C_p
$SnBr_4$		cr	438.3260	—	–377.4	–350.2	—	264.4	—
		g	438.3260	–283.964	–314.6	–331.4	25.029	411.94	103.39
	in $CH_3COOC_4H_9$:u2 in butyl acetate		438.3260	—	–391.6	—	—	—	—
	in $HCOOC_2H_5$:u in ethyl formate		438.3260	—	–420.5	—	—	—	—
	in $CH_3COOC_2H_5$:u in ethyl acetate		438.3260	—	–392.0	—	—	—	—
$SnBr_4$	in $HCOOC_4H_9$:u in butyl formate		438.3260	—	–418.4	—	—	—	—
	in $C_3H_7COOC_2H_5$:u in ethyl butyrate		438.3260	—	–386.2	—	—	—	—
$SnBr_4{\cdot}8H_2O$		cr	582.4492	—	–2767.7	—	—	—	—
		l	582.4492	—	–2725.0	—	—	—	—
SnOHBr		ao	215.6064	—	–407.5	–362.7	—	146.	—
$SnCl_3Br$		g	304.9580	—	—	—	23.045	388.4	100.0
$SnClBr_3$		g	393.8700	—	—	—	24.142	408.5	102.1
SnI_2		cr	372.4988	—	–143.5	—	—	—	—
	in HCl + 200 H_2O:u		372.4988	—	–119.2	—	—	—	—
SnI_4		cr	626.3076	—	—	—	—	—	84.9
SnI_4		g	626.3076	—	—	—	26.610	446.1	105.4
SnS		cr	150.7540	—	–100.	–98.3	—	77.0	49.25
		g	150.7540	—	119.2	—	—	—	—
SnS_2		cr	182.8180	—	—	—	—	87.4	70.12
$SnSO_4^{2+}$		ao	214.7516	—	—	–724.2	—	—	—
$Sn(SO_4)_2$		cr	310.8132	—	–1629.2	—	—	—	—
		ao	310.8132	—	—	–1481.8	—	—	—
SnSe		cr	197.6500	—	–90.8	—	—	—	—
		g	197.6500	—	128.9	—	—	—	—
SnTe		cr	246.2900	—	–61.1	—	—	—	—
SnTe		g	246.2900	—	160.7	—	—	—	—
NH_4SnCl_3		ai	243.0877	—	–619.7	–509.5	—	372.	—
$SnCl_2{\cdot}2.5NH_3$		cr	232.1727	—	–602.5	—	—	—	—
$(NH_4)_2SnCl_6$		cr	367.4854	—	–1236.8	—	—	—	—
		aq	367.4854	—	–1229.7	—	—	—	—
$SnCl_2{\cdot}4NH_3$		cr	257.7188	—	–735.1	—	—	—	—
$SnCl_2{\cdot}9NH_3$		cr	342.8723	—	–1142.2	—	—	—	—
$SnBr_2{\cdot}NH_3$		cr	295.5387	—	–364.	—	—	—	—
NH_4SnBr_3		ai	376.4557	—	–507.5	–426.3	—	364.	—
$SnBr_2{\cdot}2NH_3$		cr	312.5694	—	–472.4	—	—	—	—
$(NH_4)_2SnBr_6$		cr	634.2214	—	—	—	—	502.9	267.65
$SnBr_2{\cdot}3NH_3$		cr	329.6001	—	–574.0	—	—	—	—
$SnBr_2{\cdot}5NH_3$		cr	363.6615	—	–754.0	—	—	—	—
$SnBr_2{\cdot}9NH_3$		cr	431.7843	—	–1063.2	—	—	—	—
$SnI_2{\cdot}NH_3$		cr	389.5295	—	–255.	—	—	—	—
$SnI_2{\cdot}2NH_3$		cr	406.5602	—	–356.9	—	—	—	—
$SnI_2{\cdot}3NH_3$		cr	423.5909	—	–456.5	—	—	—	—
$SnI_2{\cdot}5NH_3$		cr	457.6523	—	–641.4	—	—	—	—
$SnI_2{\cdot}9NH_3$		cr	525.7751	—	–964.4	—	—	—	—
$SnCl_4{\cdot}1.5PH_3$		cr	311.4987	—	–618.4	—	—	—	—
$Sn(CH_3)_2H_2$		l	150.7764	—	60.7	—	—	—	—

Substance Formula and Description	State	Molar mass g mol^{-1}	0 K $\Delta_f H^\circ_0$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H^\circ_0$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
$Sn(CH_3)_2H_2$	g	150.7764	—	88.	—	—	—	—
$Sn(CH_3)_3H$	l	164.8036	—	-8.8	—	—	—	—
	g	164.8036	—	21.	—	—	—	—
$Sn(CH_3)_4$	l	178.8308	—	-52.3	—	—	—	—
	g	178.8308	—	-18.8	—	—	—	—
$Sn(C_2H_5)_2H_2$	l2	178.8308	—	8.8	—	—	—	—
	g2	178.8308	—	46.0	—	—	—	—
$Sn(CH_3)_3C_2H_5$	l	192.8580	—	-66.9	—	—	—	—
	g	192.8580	—	-29.	—	—	—	—
$Sn(CHCH_2)_4$	l	226.8756	—	301.	—	—	—	—
$Sn(C_2H_5)_4$	l	234.9396	—	-95.8	—	—	—	—
	g	234.9396	—	-45.6	—	—	—	—
$Sn_2(CH_3)_6$	l	327.5912	—	-90.4	—	—	—	—
in C_6H_{12}:u in cyclohexane		327.5912	—	-88.3	—	—	—	—
$Sn(CH_3)_2Cl_2$	cr	219.6664	—	-336.4	—	—	—	—
$Sn(CH_3)_3Br$	l	243.7046	—	-189.1	—	—	—	—
$Sn(CH_3)_3I$	l	290.7000	—	-135.6	—	—	—	—
in CCl_4:u		290.7000	—	-130.5	—	—	—	—

Table 27:**Pb** **LEAD** (Prepared 1965) Table 27:**Pb**

Substance Formula and Description		State	Molar mass g mol⁻¹	0 K $\Delta_f H_0^\circ$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H_0^\circ$	S° J mol⁻¹ K⁻¹	C_p
Pb		cr	207.1900	0	0	0	6.878	64.81	26.44
		g	207.1900	195.64	195.0	161.9	6.197	175.373	20.786
	in Hg;x, saturated		207.1900	—	0.029	-1.130	—	68.70	—
Pb^+		g	207.1900	911.238	916.765	—	6.197	—	—
Pb^{2+}		g	207.1900	2361.62	2373.33	—	6.197	—	—
Pb^{3+}		g	207.1900	5443.09	5461.00	—	6.197	—	—
Pb^{4+}		g	207.1900	9526.51	9550.61	—	6.197	—	—
Pb^{5+}		g	207.1900	16167.	16196.	—	6.197	—	—
Pb^{2+}		ao	207.1900	—	-1.7	-24.43	—	10.5	—
PbO	yellow	cr	223.1894	-215.334	-217.32	-187.89	9.234	68.70	45.77
PbO	red	cr2	223.1894	—	-218.99	-188.93	—	66.5	45.81
$PbO{\cdot}1/3H_2O$		cr	229.1945	—	—	-266.5	—	—	—
PbO_2		cr	239.1888	—	-277.4	-217.33	—	68.6	64.64
Pb_2O_3		cr	462.3782	—	—	—	—	151.9	107.70
Pb_3O_4		cr	685.5676	—	-718.4	-601.2	—	211.3	146.9
$PbOH^+$		ao	224.1974	—	—	-226.3	—	—	—
$HPbO_2^-$		ao	240.1968	—	—	-338.42	—	—	—
$Pb(OH)_2$		cr	241.2048	—	—	-452.2	—	—	—
	precipitated	cr2	241.2048	—	-515.9	—	—	—	—
H_2PbO_2		ao	241.2048	—	—	-400.8	—	—	—
$Pb(OH)_3^-$		ao	258.2122	—	—	-575.6	—	—	—
	equivalent to $HPbO_2^-$(ao) + H_2O(l)								
$Pb_3(OH)_4^{2+}$		ao	689.5996	—	-1037.6	-888.6	—	234.	—
$Pb_4(OH)_4^{4+}$		ao	896.7896	—	-1066.1	-936.3	—	234.	—
$Pb_6(OH)_8^{4+}$		ao	1379.1992	—	-2089.9	-1800.2	—	498.	—
PbF^+		ao	226.1884	—	—	310.37	—	—	—
PbF_2		cr	245.1868	—	-664.0	-617.1	—	110.5	—
		ai	245.1868	—	-666.9	-582.00	—	-17.2	—
		ao	245.1868	—	—	-596.6	—	—	—
PbF_4		cr	283.1836	—	-941.8	—	—	—	—
$PbCl^+$		ao	242.6430	—	—	-164.81	—	—	—
$PbCl_2$		cr	278.0960	—	-359.41	-314.10	—	136.0	—
		ai	278.0960	—	-336.0	-286.86	—	123.4	—
		ao	278.0960	—	—	-297.16	—	—	—
$PbCl_3^-$		ao	313.5490	—	—	-426.3	—	—	—
$PbCl_4$		l	349.0020	—	-329.3	—	—	—	—
$PbCl_4$	in CCl_4:u		349.0020	—	-326.31	—	—	—	—
$PbClO_3^+$		ao	290.6412	—	—	-30.58	—	—	—
$Pb(ClO_3)_2$		ao	374.0924	—	—	-36.86	—	—	—
$PbO{\cdot}PbCl_2$		cr	501.2854	—	-605.4	—	—	—	—
$(PbO)_2{\cdot}PbCl_2$		cr	724.4748	—	-836.0	—	—	—	—
$(PbO)_3{\cdot}PbCl_2$		cr	947.6642	—	-1060.2	—	—	—	—
PbClOH		cr	259.6504	—	—	-391.2	—	—	—
$(Pb(OH)_2)_3{\cdot}PbCl_2$		cr	1001.7104	—	—	-1682.6	—	—	—
PbFCl		cr	261.6414	—	-534.7	-488.2	—	121.8	—
$PbBr^+$		ao	287.0990	—	—	-134.7	—	—	—
$PbBr_2$		cr	367.0080	—	-278.7	-261.92	—	161.5	80.12
		ai	367.0080	—	-244.8	-232.34	—	175.3	—
		ao	367.0080	—	—	-240.6	—	—	—
$PbBr_3^-$		ao	446.9170	—	—	-343.1	—	—	—

Substance Formula and Description		State	Molar mass g mol^{-1}	0 K $\Delta_f H_0^\circ$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H_0^\circ$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
$PbBrO_3^+$		ao	335.0972	—	—	-16.33	—	—	—
$Pb(BrO_3)_2$		cr	463.0044	—	—	-16.30	—	—	—
		ai	463.0044	—	-136.15	12.78	—	333.9	—
$PbO{\cdot}PbBr_2$		cr	590.1974	—	-514.2	—	—	—	—
$(PbO)_2{\cdot}PbBr_2$		cr	813.3868	—	-741.8	—	—	—	—
$(PbO)_3{\cdot}PbBr_2$		cr	1036.5762	—	-970.3	—	—	—	—
$PbBrF$		cr	306.0974	—	—	-455.6	—	—	—
PbI^+		ao	334.0944	—	—	-87.0	—	—	—
PbI_2		cr	460.9988	-174.93	-175.48	-173.64	19.523	174.85	77.36
		ai	460.9988	—	-112.1	-127.57	—	233.0	—
PbI_2		ao	460.9988	—	—	-143.5	—	—	—
PbI_3^-		ao	587.9032	—	—	-198.7	—	—	—
PbI_4^{2-}		ao	714.8076	—	—	-254.8	—	—	—
$Pb(IO_3)_2$		cr	556.9952	—	-495.4	-351.4	—	313.0	—
$PbI_2{\cdot}HI{\cdot}5H_2O$		cr	678.9882	—	-1676.1	—	—	—	—
PbS		cr	239.2540	—	-100.4	-98.7	—	91.2	49.50
$PbSO_3$		cr	287.2522	—	-669.9	—	—	—	—
$PbSO_4$		cr	303.2516	-911.36	-919.94	-813.14	20.062	148.57	103.207
PbS_2O_3		cr	319.3162	—	-674.0	—	—	—	—
PbS_2O_6		aq	367.3144	—	-1200.0	—	—	—	—
$PbS_2O_6{\cdot}4H_2O$		cr	439.3760	—	-2379.0	—	—	—	—
PbS_3O_6		cr	399.3784	—	-1216.3	—	—	—	—
$PbSO_4{\cdot}PbO$		cr	526.4410	—	-1171.5	-1032.1	—	206.7	—
$PbSO_4{\cdot}2PbO$		cr	749.6304	—	-1399.1	-1230.0	—	274.5	—
$PbSO_4{\cdot}3PbO$		cr	972.8198	—	-1626.7	-1427.5	—	340.6	—
$PbSe$		cr	286.1500	—	-102.9	-101.7	—	102.5	50.2
$PbSeO_3$		cr	334.1482	—	-537.6	—	—	—	—
$PbSeO_4$		cr	350.1476	—	-609.2	-504.9	—	167.8	—
$PbTe$		cr	334.7900	—	-70.7	-69.5	—	110.0	50.54
$PbTeO_3{\cdot}0.667H_2O$		am	394.8045	—	-776.1	—	—	—	—
$PbTeO_4$		cr	398.7876	—	-753.	—	—	—	—
$Pb(N_3)_2$	monoclinic	cr	291.2302	—	478.2	624.8	—	148.1	—
	orthorhombic	cr2	291.2302	—	476.1	622.3	—	149.4	—
$PbNO_3^+$		ao	269.1949	—	—	-141.8	—	—	—
$Pb(NO_3)_2$		cr	331.1998	—	-451.9	—	—	—	—
$Pb(NO_3)_2$		ai	331.1998	—	-416.3	-246.93	—	303.3	—
	in 40 H_2O		331.1998	—	-430.5	—	—	—	—
	in 100 H_2O		331.1998	—	-425.9	—	—	—	—
	in 200 H_2O		331.1998	—	-423.4	—	—	—	—
	in 400 H_2O		331.1998	—	-421.3	—	—	—	—
$Pb(NO_3)_2$	in 10 000 H_2O		331.1998	—	-418.4	—	—	—	—
$Pb(N_3)_2{\cdot}PbO$		cr	514.4196	—	—	333.2	—	—	—
$Pb(NO_3)_2{\cdot}NH_3$		cr	348.2305	—	-554.4	—	—	—	—
$Pb(NO_3)_2{\cdot}3NH_3$		cr	382.2919	—	-745.2	—	—	—	—
$Pb(NO_3)_2{\cdot}6NH_3$		cr	433.3840	—	-977.8	—	—	—	—
$PbCl_2{\cdot}NH_3$		cr	295.1267	—	-461.9	—	—	—	—
$PbCl_2{\cdot}1.5NH_3$		cr	303.6420	—	-508.8	—	—	—	—
$PbCl_2{\cdot}2NH_3$		cr	312.1574	—	-554.8	—	—	—	—
$PbCl_2{\cdot}3.25NH_3$		cr	333.4458	—	-661.1	—	—	—	—
$PbCl_2{\cdot}8NH_3$		cr	414.3416	—	-1038.9	—	—	—	—

Substance Formula and Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H_0^\circ$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H_0^\circ$	S° J mol⁻¹ K⁻¹	C_p
$(PbCl_2)_2 \cdot NH_4Cl$	cr	609.6837	—	-1034.49	-842.87	—	401.7	—
$PbBr_2 \cdot NH_3$	cr	384.0387	—	-390.4	—	—	—	—
$PbBr_2 \cdot 2NH_3$	cr	401.0694	—	-484.5	—	—	—	—
$PbBr_2 \cdot 3NH_3$	cr	418.1001	—	-570.3	—	—	—	—
$PbBr_2 \cdot 5.5NH_3$	cr	460.6768	—	-778.2	—	—	—	—
$PbBr_2 \cdot 8NH_3$	cr	503.2536	—	-977.0	—	—	—	—
$PbI_2 \cdot 0.5NH_3$	cr	469.5141	—	-229.3	—	—	—	—
$PbI_2 \cdot NH_3$	cr	478.0295	—	-280.3	—	—	—	—
$PbI_2 \cdot 2NH_3$	cr	495.0602	—	-373.6	—	—	—	—
$PbI_2 \cdot 5NH_3$	cr	546.1523	—	-632.6	—	—	—	—
$PbI_2 \cdot 8NH_3$	cr	597.2444	—	-866.1	—	—	—	—
$(PbI_2)_3 \cdot 4NH_4I$	cr	1962.7688	—	-1313.8	—	—	—	—
$(PbI_2)_3 \cdot 4NH_4I \cdot 6H_2O$	cr	2070.8612	—	-3071.1	—	—	—	—
$PbSO_4 \cdot 2NH_3$	cr	337.3130	—	-1099.6	-833.3	—	197.5	—
$PbSO_4 \cdot 4NH_3$	cr	371.3744	—	-1265.2	-866.6	—	337.6	—
$PbP_2O_7^{2-}$	ao	381.1334	—	—	-2007.3	—	—	—
$Pb(P_2O_7)_2^{6-}$	aq	555.0768	—	-4546.3	—	—	—	—
$Pb_3(PO_4)_2$	cr	811.5128	—	—	—	—	353.1	256.27
$PbHPO_3$	cr	287.1700	—	-979.1	—	—	—	—
$PbHPO_4$	cr	303.1694	—	—	-1202.8	—	—	—
$(PbI_2)_3 \cdot PI_3$	cr	1794.6834	—	-552.3	—	—	—	—
$(PbI_2)_3 \cdot PI_3 \cdot 12H_2O$	cr	2010.8682	—	-4087.3	—	—	—	—
$(PbI_2)_3 \cdot AsI_3$	cr	1838.6312	—	-466.9	—	—	—	—
$(PbI_2)_3 \cdot AsI_3 \cdot 12H_2O$	cr	2054.8160	—	-3983.6	—	—	—	—
$(PbI_2)_3 \cdot SbI_3$	cr	1885.4596	—	-537.2	—	—	—	—
$(PbI_2)_3 \cdot SbI_3 \cdot 12H_2O$	cr	2101.6444	—	-4089.0	—	—	—	—
$PbCO_3$	cr	267.1994	—	-699.1	-625.5	—	131.0	87.40
PbC_2O_4 oxalate	cr	295.2100	—	-851.4	-750.1	—	146.0	105.4
	ai	295.2100	—	-826.8	-698.2	—	56.1	—
$PbO \cdot PbCO_3$	cr	490.3888	—	-918.4	-816.7	—	204.2	—
$Pb(CH_3)_4$	l	267.3308	—	97.9	—	—	—	—
	g	267.3308	—	135.90	—	—	—	—
$Pb(CHCH_2)_4$ tetravinyl lead	l	315.3756	—	891.	—	—	—	—
$Pb(C_2H_5)_4$	l	323.4396	—	52.7	—	—	—	—
	g	323.4396	—	109.58	—	—	—	—
$Pb(HCO_2)^+$ formate	ao	252.2080	—	—	-379.5	—	—	—
$Pb(HCO_2)_2$	cr	297.2260	—	-878.6	—	—	—	—
	ai	297.2260	—	-852.7	-726.12	—	192.	—
	ao	297.2260	—	—	-733.8	—	—	—
$Pb(CH_3CO_2)^+$ acetate	ao	266.2352	—	—	-406.2	—	—	—
$Pb(CH_3CO_2)_2$	cr	325.2804	—	-963.83	—	—	—	—
	ai	325.2804	—	-973.6	-763.04	—	182.8	—
	ao	325.2804	—	—	-779.7	—	—	—
in 400 H_2O		325.2804	—	-969.68	—	—	—	—
$Pb(CH_3CO_2)_2 \cdot 3H_2O$	cr	379.3266	—	-1851.50	—	—	—	—
$PbCl_2 \cdot PbCO_3$	cr	545.2954	—	—	-952.2	—	—	—
$Pb(CN)_2 \cdot 2PbO \cdot H_2O$	cr	723.6200	—	-517.6	—	—	—	—
$PbCNS^+$	ao	265.2719	—	—	63.2	—	—	—
$Pb(SCN)_2$ thiocyanate	cr	323.3538	—	—	134.3	—	—	—
	ai	323.3538	—	151.0	160.99	—	299.2	—

Table 27:**Pb** | **LEAD** (Prepared 1965) — Continued | Table 27:**Pb**

Substance Formula and Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H_0^\circ$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H_0^\circ$	S° J mol⁻¹ K⁻¹	C_p
$Pb(SCN)_2$	ao	323.3538	—	—	154.4	—	—	—
$PbSiO_3$	cr	283.2742	—	-1145.70	-1062.10	—	109.6	90.04
	am	283.2742	—	-1137.6	—	—	—	—
Pb_2SiO_4	cr	506.4636	—	-1363.1	-1252.6	—	186.6	137.15
	am	506.4636	—	-1348.1	—	—	—	—
$PbI_2{\cdot}SnI_2$	cr	833.4976	—	-268.6	—	—	—	—
$PbI_2{\cdot}SnI_2{\cdot}8H_2O$	cr	977.6208	—	-2639.7	—	—	—	—

Table 28:**B** **BORON** (Prepared 1965) Table 28:**B**

Substance Formula	Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
B		cr	10.8110	0	0	0	1.213	5.86	11.09
	x denotes undetermined zero point entropy	am	10.8110	3.870	3.8	—	1.318	6.53+x	11.97
		g	10.8110	557.64	562.7	518.8	6.322	153.45	20.799
B^+		g	10.8110	1358.29	1369.47	—	6.197	—	—
B^{2+}		g	10.8110	3785.3	3802.8	—	6.197	—	—
B^{3+}		g	10.8110	7445.0	7468.4	—	6.197	—	—
B^{4+}		g	10.8110	32470.8	32500.5	—	6.197	—	—
B_2		g	21.6220	824.	830.5	774.0	8.761	201.90	30.54
BO		g	26.8104	22.01	25.	-4.	8.673	203.54	29.20
BO_2		g	42.8098	-301.21	-300.4	-305.9	10.682	229.56	43.01
BO_2^-		ao	42.8098	—	-772.37	-678.89	—	-37.2	—
B_2O_2		g	53.6208	-456.10	-454.8	-462.3	12.385	242.49	57.28
B_2O_3		cr	69.6202	-1266.626	-1272.77	-1193.65	9.301	53.97	62.93
		am	69.6202	—	-1254.53	-1182.3	—	77.8	61.1
		g	69.6202	-842.7	-843.79	-831.97	14.334	279.81	66.86
$B_4O_7^{2-}$		ao	155.2398	—	—	-2604.8	—	—	—
BH		g	11.8190	446.4	449.61	419.60	8.640	171.86	29.16
BH^+		g	11.8190	1389.1	1398.3	—	—	—	—
BH_3		g	13.8350	—	100.	—	—	—	—
BH_4^-		ao	14.8430	—	48.16	114.35	—	110.5	—
B_2H_6		g	27.6700	51.42	35.6	86.7	11.954	232.11	56.90
	in C_5H_{12}:x in n–pentane		27.6700	—	25.1	96.3	—	164.8	—
$B_2H_6^+$		g	27.6700	1149.3	1139.7	—	—	—	—
B_4H_{10}		g	53.3240	—	66.1	—	—	—	—
B_5H_9		cr	63.1270	57.011	—	—	—	—	—
B_5H_9		l	63.1270	—	42.68	171.82	29.836	184.22	151.13
		g	63.1270	102.09	73.2	175.0	15.322	275.92	96.78
B_5H_{11}		l	65.1430	—	73.2	—	—	—	—
		g	65.1430	—	103.3	—	—	—	—
B_6H_{10}		l	74.9460	—	56.27	—	—	—	—
B_6H_{10}		g	74.9460	—	94.6	—	—	—	—
$B_{10}H_{14}$		cr	122.2220	-2.075	-45.2	192.3	28.292	176.56	217.94
		g	122.2220	78.111	31.55	216.34	24.845	353.2	179.66
HBO_2	cubic	cr1	43.8178	—	-804.04	—	—	—	—
	monoclinic	cr2	43.8178	—	-794.25	-723.4	—	38.	—
HBO_2	orthorhombic	cr3	43.8178	—	-788.77	-721.7	—	50.	—
		g	43.8178	-558.48	-561.9	-551.0	10.686	240.06	42.22
H_2BOH		g	29.8344	—	—	-268.	—	—	—
$HB(OH)_2$		g	45.8338	—	—	-523.	—	—	—
H_3BO_3		cr	61.8332	-1080.777	-1094.33	-968.92	13.389	88.83	81.38
H_3BO_3		g	61.8332	—	-994.1	—	—	—	—
		ao	61.8332	—	-1072.32	-968.75	—	162.3	—
	in 60 H_2O		61.8332	—	-1072.589	—	—	—	—
	in 100 H_2O		61.8332	—	-1072.518	—	—	—	—
	in 200 H_2O		61.8332	—	-1072.460	—	—	—	—
H_3BO_3	in 500 H_2O		61.8332	—	-1072.418	—	—	—	—
	in 1 000 H_2O		61.8332	—	-1072.40	—	—	—	—
	in 5 000 H_2O		61.8332	—	-1072.376	—	—	—	—
	in 10 000 H_2O		61.8332	—	-1072.36	—	—	—	—

Table 28:**B** **BORON** (Prepared 1965) — Continued Table 28:**B**

Substance Formula	Description	State	Molar mass g mol^{-1}	0 K $\Delta_f H^\circ_0$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H^\circ_0$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
$B(OH)_4^-$		ao	78.8406	—	-1344.03	-1153.17	—	102.5	—
	equivalent to BO_2^-(ao) + $2H_2O$(l)								
$H_2BO_3{\cdot}H_2O_2^-$		ao	94.8400	—	—	-1057.6	—	—	—
$H_2BO_3{\cdot}H_3BO_3{\cdot}2H_2O_2^-$		ao	190.6880	—	—	-2161.5	—	—	—
$(BOH)_3$		g	83.4552	—	-1209.	—	—	—	—
$(HBO_2)_3$		g	131.4534	—	-2276.	—	—	—	—
$HB_4O_7^-$		ao	156.2478	—	—	-2685.1	—	—	—
$H_2B_4O_7$		ao	157.2558	—	—	-2719.9	—	—	—
BF		g	29.8094	-125.23	-122.2	-149.8	8.694	200.48	29.58
BF_3		g	67.8062	-1134.207	-1137.00	-1120.33	11.648	254.12	50.46
	in 50 H_2O		67.8062	—	-1240.1	—	—	—	—
BF_3	in $C_6H_5NO_2$:s		67.8062	—	-1173.2	-1112.5	—	105.9	—
BF_4^-		ao	86.8046	—	-1574.9	-1486.9	—	180.	—
B_2F_4		g	97.6156	-1437.12	-1440.1	-1410.4	17.07	317.3	79.08
BOF		g	45.8088	—	-607.	—	—	—	—
$(BOF)_3$		g	137.4264	—	-2377.	—	—	—	—
HBF_4	in 14.67 HF + 58.72 H_2O		87.8126	—	-1571.1	—	—	—	—
$B(OH)_2F$		g	63.8242	—	-1044.7	—	—	—	—
$BOHF_2$		g	65.8152	—	-1091.6	—	—	—	—
$BF_2(OH)_2^-$		ao	82.8226	—	—	-1340.9	—	—	—
BF_3OH^-		ao	84.8136	—	-1527.2	-1414.5	—	167.	—
$B_3O_3FH_2$		g	101.4456	—	-1602.	—	—	—	—
$B_3O_3F_2H$		g	119.4360	—	-1992.	—	—	—	—
$B_3F_4O_3OH^{2-}$		ao	173.4322	—	-3152.6	—	—	—	—
BCl		g	46.2640	146.	149.49	120.90	8.862	213.24	31.67
BCl_3		cr	117.1700	-440.99	—	—	—	—	—
BCl_3		l	117.1700	—	-427.2	-387.4	28.79	206.3	106.7
		g	117.1700	-402.84	-403.76	-388.72	14.067	290.10	62.72
	in $(CH_3)_2O$:u		117.1700	—	-615.0	—	—	—	—
	in CH_3COCl:u		117.1700	—	-516.7	—	—	—	—
	in $C_6H_5NO_2$:u		117.1700	—	-463.6	—	—	—	—
B_2Cl_4		l	163.4340	—	-523.0	-464.8	—	262.3	137.7
		g	163.4340	-489.90	-490.4	-460.6	20.33	357.4	95.40
BOCl		g	62.2634	—	-314.	—	—	—	—
$(BOCl)_3$		g	186.7902	—	-1633.4	-1550.1	—	381.	—
$(BOCl)_4$		g	249.0536	—	-2100.	—	—	—	—
$B_3O_3H_2Cl$		g	117.9002	—	-1314.	—	—	—	—
$B_3O_3HCl_2$		g	152.3452	—	-1418.	—	—	—	—
$BClF_2$		g	84.2608	—	-890.4	-876.1	—	272.	—
BCl_2F		g	100.7154	—	-645.2	-631.3	—	285.	—
BBr		g	90.7200	242.55	238.1	195.4	8.983	225.00	32.93
BBr_3		l	250.5380	—	-239.7	-238.5	—	229.7	—
		g	250.5380	-183.38	-205.64	-232.50	15.711	324.24	67.78
	in $C_6H_5NO_2$:u		250.5380	—	-292.0	—	—	—	—
$BBrF_2$		g	128.7168	—	—	—	12.778	286.38	56.44
$BFBr_2$		g	189.6274	—	—	—	14.167	309.98	62.30
BCl_2Br		g	161.6260	—	—	—	14.548	310.39	64.39
$BClBr_2$		g	206.0820	—	—	—	15.100	321.86	66.02
BI_3		g	391.5242	75.	71.13	20.72	16.836	349.18	70.79
BS		g	42.8750	339.	342.00	288.75	8.724	216.21	30.04

Table 28:B BORON (Prepared 1965) — Continued Table 28:B

Substance Formula	Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
BS_2		g	74.9390	—	121.	—	—	—	—
B_2S_2		g	85.7500	—	151.	—	—	—	—
B_2S_3		cr	117.8140	—	-240.6	—	—	—	—
		g	117.8140	—	67.	—	—	—	—
$SF_4 \cdot BF_3$		cr	175.8638	—	-2025.	—	—	—	—
BN		cr	24.8177	-251.46	-254.4	-228.4	2.628	14.81	19.71
		g	24.8177	644.	647.47	614.49	8.686	212.28	29.46
$(NH_3)_2 \cdot B_2H_6$		cr	61.7314	—	-192.	—	—	—	—
$NH_3 \cdot B_3H_7$	β, tetragonal; ammonia triborane	cr	56.5197	—	—	—	28.146	165.81	209.
		g	56.5197	—	—	—	—	285.	—
$B_3N_3H_6$		l	80.5011	—	-541.0	-392.65	—	199.6	—
		g	80.5011	-486.202	-511.75	-390.00	16.502	288.68	96.82
NH_4BO_2		ai	60.8485	—	-904.87	-758.19	—	76.1	—
	in 220 H_2O		60.8485	—	-903.7	—	—	—	—
NH_4BO_3		ai	76.8479	—	-817.6	—	—	—	—
$NH_4BO_3 \cdot 0.5H_2O$		cr	85.8556	—	-997.0	—	—	—	—
$NH_4B_5O_8 \cdot 4H_2O$		cr	272.1505	—	—	—	198.175	388.99	357.06
$NH_3 \cdot BF_3$		cr	84.8369	—	-1353.9	—	—	—	—
$B_3N_3H_3Cl_3$	β, trichloroborazole	cr	183.8361	—	-1066.9	—	—	—	—
		g	183.8361	—	-995.0	—	—	—	—
BP	cubic	cr	41.7848	—	-79.	—	—	—	—
$B_{13}P_2$		cr	202.4906	—	-167.	—	—	—	—
$(PH_3)_2 \cdot B_2H_6$		cr	95.6656	—	-113.	—	—	—	—
PF_3BH_3		g	101.8040	—	-854.0	—	—	—	—
$POCl_3 \cdot BCl_3$		cr	270.5022	—	-1072.4	-920.8	—	310.	—
$PH_3 \cdot BCl_3$		cr	151.1678	—	-505.8	-391.5	—	192.	—
BC		g	22.8222	824.	—	—	—	—	—
BC_2		g	34.8334	757.	—	—	—	—	—
B_2C		g	33.6332	757.	—	—	—	—	—
B_4C		cr	55.2552	-70.84	-71.	-71.	5.619	27.11	52.80
$B(CH_3)_3$		l	55.9166	—	-143.1	-32.1	—	238.9	—
		g	55.9166	-97.82	-124.3	-35.9	16.029	314.7	88.49
	in C_7H_{16}:u in n–heptane		55.9166	—	-144.3	—	—	—	—
	in $C_6H_5NO_2$:u		55.9166	—	-149.75	—	—	—	—
$B(C_2H_5)_3$		cr	97.9982	-177.99	—	—	—	—	—
$B(C_2H_5)_3$		l	97.9982	—	-194.6	9.4	54.48	336.69	241.21
		g	97.9982	—	-157.69	16.11	—	437.8	—
BH_3CO		g	41.8456	-104.834	-111.21	-92.9	12.929	249.35	59.45
$BH(OCH_3)_2$	dimethoxyborane	l	73.8882	—	-605.4	-473.5	—	238.	—
		g	73.8882	-557.31	-579.5	-473.5	18.24	324.0	87.91
$B(OCH_3)_3$	trimethoxyborane	cr	103.9148	-926.55	—	—	—	—	—
		l	103.9148	—	-933.9	-744.6	47.91	283.7	192.00
		g	103.9148	—	-899.6	-740.4	—	385.	—
$B(OC_2H_5)_3$	triethoxyborane	l	145.9964	—	-1049.3	—	—	—	—
		g	145.9964	—	-1005.8	—	—	—	—
$(CH_3)_2O \cdot 2B_2H_6$		g	101.4098	—	-126.	71.	—	653.	—
$(CH_3)_2O \cdot BF_3$		l	113.8760	—	-1418.0	—	—	—	—
		g	113.8760	—	-1374.4	-1245.9	—	385.	—
$(C_2H_5)_2O \cdot BF_3$		l	141.9304	—	-1482.4	—	—	—	—

Table 28:B — BORON (Prepared 1965) — Continued — Table 28:B

Substance Formula and Description	State	Molar mass g mol⁻¹	0 K: $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar): $\Delta_f H^\circ$	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$	S° J mol⁻¹ K⁻¹	C_p
$(C_2H_5)_2O{\cdot}BF_3$	g	141.9304	—	-1438.5	—	—	—	—
$(CH_3O)_2BCl$ dimethoxychloroborane	l	108.3332	—	-779.40	—	—	—	—
	g	108.3332	—	-745.6	—	—	—	—
$B(OC_2H_5)Cl_2$	l	126.7788	—	-659.0	—	—	—	—
	g	126.7788	—	-623.8	—	—	—	—
$CH_3COCl{\cdot}BCl_3$	l	195.6688	—	-703.7	—	—	—	—
$B(OC_2H_5)_2Cl$	l	136.3876	—	-860.2	—	—	—	—
	g	136.3876	—	-820.1	—	—	—	—
$(CH_3)_2S{\cdot}BH_3$	l	75.9694	—	-86.6	35.3	—	230.	—
	g	75.9694	—	-44.4	48.2	—	326.	—
$(C_2H_5)_2S{\cdot}BH_3$	l	104.0238	—	-170.7	6.9	—	313.8	—
	g	104.0238	—	-127.6	23.2	—	404.3	—
$BH_3NH_2CH_3$	cr	44.8929	—	-134.7	—	—	—	—
$(CH_3)_3N{\cdot}BH_3$	cr	72.9473	—	-142.51	70.71	—	187.0	—
	g	72.9473	-47.07	-84.9	87.2	22.05	324.8	127.95
$(CH_3)_3B{\cdot}NH_3$	cr2	72.9473	—	-284.1	-79.3	—	218.	—
	g2	72.9473	—	-226.4	-60.1	—	343.	—
$B(CH_3)_3{\cdot}NH_2CH_3$	cr	86.9745	—	-269.0	-43.7	—	285.	—
	g	86.9745	—	-220.1	-27.0	—	393.	—
$(CH_3)_4N{\cdot}BH_4$	cr	88.9905	—	-159.4	134.6	—	184.1	—
$(CH_3)_4N{\cdot}BH_4$	ai	88.9905	—	-136.4	118.7	—	314.6	—
$(CH_3)_3N{\cdot}B(CH_3)_3$	cr	115.0289	—	-278.7	29.2	—	280.	—
	g	115.0289	—	-220.1	46.7	—	419.	—
$(C_2H_5)_2NH{\cdot}B(CH_3)_3$	cr	129.0561	—	-331.4	—	—	—	—
	g	129.0561	—	-263.2	—	—	—	—
$(CH_3)_3NB_3H_7$	cr	98.6013	—	—	—	36.535	228.45	217.48
$B(OCH_3)_3{\cdot}NH_3$	cr	120.9455	—	-1063.	—	—	—	—
$B(OCH_2CH_2)_3N$ triethanolamine borate	cr	156.9791	—	—	—	28.041	183.18	187.23
$(CH_3)_3N{\cdot}BF_3$	g	126.9185	—	-1273.6	—	—	—	—
$(CH_3)_3P{\cdot}B(CH_3)_3$	cr	131.9960	—	-342.3	—	—	—	—
$(CH_3)_3P{\cdot}B(CH_3)_3$	g	131.9960	—	-285.8	—	—	—	—
$BF_3{\cdot}P(CH_3)_3$	cr	143.8856	—	-1369.8	—	—	—	—
	g	143.8856	—	-1307.9	—	—	—	—
$(CH_3)_3As{\cdot}B(CH_3)_3$	cr	175.9438	—	-209.	—	—	—	—
$(CH_3)_3As{\cdot}BF_3$	cr	187.8334	—	-1222.	—	—	—	—
BSi	g	38.8970	724.	—	—	—	—	—
BSi_2	g	66.9830	732.	—	—	—	—	—
BSiC	g	50.9082	686.	—	—	—	—	—
$PbO{\cdot}B_2O_3$	vit	292.8096	—	-1529.7	—	—	—	110.9
$PbO{\cdot}2B_2O_3$	vit	362.4298	—	-2813.3	—	—	—	173.2

Table 29:**Al** **ALUMINUM** (Prepared 1965) Table 29:**Al**

Substance Formula	and Description	State	Molar mass g mol^{-1}	0 K $\Delta_f H_0^\circ$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H_0^\circ$	S° J mol^{-1} K^{-1}	C_p
Al		cr	26.9815	0	0	0	4.577	28.33	24.35
		g	26.9815	324.01	326.4	285.7	6.920	164.54	21.38
Al^+		g	26.9815	901.543	909.359	—	6.197	—	—
Al^{2+}		g	26.9815	2718.207	2732.219	—	6.197	—	—
Al^{3+}		g	26.9815	5462.97	5483.17	—	6.197	—	—
Al^{4+}		g	26.9815	17040.39	17066.79	—	6.197	—	—
Al^{5+}		g	26.9815	31882.1	31914.7	—	6.197	—	—
Al^{6+}		g	26.9815	50260.3	50299.2	—	6.197	—	—
Al^{7+}		g	26.9815	73554.7	73599.9	—	6.213	—	—
Al^{8+}		g	26.9815	101014.	101065.	—	6.197	—	—
Al^{9+}		g	26.9815	132863.	132921.	—	6.197	—	—
Al^{10+}		g	26.9815	171339.	171402.	—	6.197	—	—
Al^{11+}		g	26.9815	213995.	214062.	—	6.197	—	—
Al^{3+}		ao	26.9815	—	-531.	-485.	—	-321.7	—
Al_2		g	53.9630	485.	485.93	433.30	9.75	233.2	36.4
AlO		g	42.9809	91.34	91.2	65.3	8.791	218.39	30.88
AlO^+		g	42.9809	1010.9	1017.1	—	—	—	—
AlO_2^-		ao	58.9803	—	-930.9	-830.9	—	-36.8	—
Al_2O		g	69.9624	-127.82	-130.	-159.	11.615	259.35	45.69
$(AlO)_2$		g	85.9618	—	-393.	—	—	—	—
Al_2O_3	α, corundum	cr	101.9612	-1663.52	-1675.7	-1582.3	10.016	50.92	79.04
	δ	cr2	101.9612	—	-1666.5	—	—	—	—
	ρ	cr3	101.9612	—	-1657.	—	—	—	—
	κ	cr4	101.9612	—	-1662.3	—	—	—	—
	γ	cr5	101.9612	—	-1656.9	—	—	—	—
Al_2O_3		am	101.9612	—	-1632.	—	—	—	—
$Al_2O_3{\cdot}H_2O$	boehmite	cr	119.9766	-1963.43	-1980.7	-1831.7	17.652	96.86	131.25
	diaspore	cr2	119.9766	-1977.57	-1998.91	-1841.78	13.60	70.67	106.19
$Al_2O_3{\cdot}3H_2O$	gibbsite	cr	156.0074	-2550.976	-2586.67	-2310.21	24.912	136.90	183.47
	bayerite	cr2	156.0074	—	-2576.5	—	—	—	—
AlH		g	27.9895	259.	259.24	231.15	8.665	187.89	29.37
AlH_3		cr	30.0055	—	-46.	—	—	—	—
$AlOH^{2+}$		ao	43.9889	—	—	-694.1	—	—	—
$Al(OH)_3$		am	78.0037	—	-1276.	—	—	—	—
$Al(OH)_4^-$		ao	95.0111	—	-1502.5	-1305.3	—	102.9	—
	equivalent to AlO_2^-(ao) + $2H_2O$(l)								
AlF		g	45.9799	-258.07	-258.2	-283.7	8.895	215.00	31.92
AlF^{2+}		ao	45.9799	—	—	-803.	—	—	—
AlF_2^+		ao	64.9783	—	—	-1113.	—	—	—
AlF_3		cr	83.9767	-1497.96	-1504.1	-1425.0	11.623	66.44	75.10
		g	83.9767	-1200.85	-1204.6	-1188.2	14.10	277.1	62.63
AlF_3		ai	83.9767	—	-1531.	-1322.	—	-363.2	—
		ao	83.9767	—	-1519.	-1414.	—	-25.	—
	in 450 H_2O		83.9767	—	-1529.3	—	—	—	—
	in HF + 8 H_2O:u		83.9767	—	-1547.2	—	—	—	—
AlF_6^{3-}		ao	140.9719	—	-2522.5	—	—	—	—
Al_2F_6		g	167.9534	—	-2628.	—	—	—	—
AlOF		g	61.9793	—	-590.	—	—	—	—
H_3AlF_6	in 800 HF + 8 000 H_2O		143.9959	—	-2489.5	—	—	—	—
AlCl		g	62.4345	-47.86	-47.7	-74.1	9.355	228.14	34.98

Substance Formula	Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
$AlCl_2$		g	97.8875	—	-331.	—	—	—	—
$AlCl_3$		cr	133.3405	-703.00	-704.2	-628.8	17.171	110.67	91.84
		g	133.3405	—	-583.2	—	—	—	—
		ai	133.3405	—	-1033.	-879.	—	-152.3	—
	in 1 000 H_2O		133.3405	—	-1034.7	—	—	—	—
$AlCl_3$	in 3 000 H_2O		133.3405	—	-1035.67	—	—	—	—
	in 5 000 H_2O		133.3405	—	-1035.75	—	—	—	—
	in 10 000 H_2O		133.3405	—	-1035.79	—	—	—	—
	in 30 000 H_2O		133.3405	—	-1035.5	—	—	—	—
	in 50 000 H_2O		133.3405	—	-1034.87	—	—	—	—
$AlCl_3$	in 100 000 H_2O		133.3405	—	-1033.4	—	—	—	—
	in 0.04185 HCl + 230 H_2O		133.3405	—	-1031.65	—	—	—	—
	in 0.1092 HCl + 600 H_2O		133.3405	—	-1032.95	—	—	—	—
	in 2.072 HCl + 230 H_2O		133.3405	—	-1028.59	—	—	—	—
	in 5.405 HCl + 600 H_2O		133.3405	—	-1029.81	—	—	—	—
$AlCl_3$	in 4.144 HCl + 230 H_2O		133.3405	—	-1025.41	—	—	—	—
	in 10.810 HCl + 600 H_2O		133.3405	—	-1026.63	—	—	—	—
	in 8.287 HCl + 230 H_2O		133.3405	—	-1019.10	—	—	—	—
	in 21.619 HCl + 600 H_2O		133.3405	—	-1020.27	—	—	—	—
	in 12.431 HCl + 230 H_2O		133.3405	—	-1012.74	—	—	—	—
$AlCl_3$	in 32.429 HCl + 600 H_2O		133.3405	—	-1013.91	—	—	—	—
	in 14.505 HCl + 230 H_2O		133.3405	—	-1012.49	—	—	—	—
	in 37.834 HCl + 600 H_2O		133.3405	—	-1010.69	—	—	—	—
	in 16.575 HCl + 230 H_2O		133.3405	—	-1006.34	—	—	—	—
	in 43.238 HCl + 600 H_2O		133.3405	—	-1007.51	—	—	—	—
$AlCl_3$	in 18.649 HCl + 230 H_2O		133.3405	—	-1003.16	—	—	—	—
	in 48.643 HCl + 600 H_2O		133.3405	—	-1004.24	—	—	—	—
	in $SiCl_4$:x		133.3405	—	-692.5	-602.4	—	63.	—
$AlCl_3 \cdot 6H_2O$		cr	241.4329	2645.58	-2691.6	-2261.1	49.12	318.0	296.2
Al_2Cl_6		g	266.6810	—	-1290.8	-1220.4	—	490.	—
AlOCl		cr	78.4339	—	-791.6	—	—	—	—
		g	78.4339	—	-339.	—	—	—	—
AlBr		g	106.8905	3.10	-4.	-42.	9.544	239.52	35.56
$AlBr_3$		cr	266.7085	—	-527.2	—	—	—	101.7
		g	266.7085	—	-425.1	—	—	—	—
$AlBr_3$		ai	266.7085	—	-895.	-799.	—	-74.5	—
	in 3 000 H_2O		266.7085	—	-896.2	—	—	—	—
	in HBr + 8.5 H_2O:u		266.7085	—	-860.6	—	—	—	—
	in C_6H_6:u		266.7085	—	-521.3	—	—	—	—
	in $C_6H_5CH_3$:u		266.7085	—	-524.3	—	—	—	—
$AlBr_3$	in C_2H_5Br:u		266.7085	—	-529.3	—	—	—	—
	in CH_3I:u		266.7085	—	-527.6	—	—	—	—
	in C_2H_5I:u		266.7085	—	-530.9	—	—	—	—
Al_2Br_6		g	533.4170	—	-970.7	—	—	—	—
AlI		g	153.8859	67.	65.52	—	9.75	—	35.98
AlI_3		cr	407.6947	—	-313.8	-300.8	—	159.	98.7
		g	407.6947	—	-207.5	—	—	—	—
		ai	407.6947	—	-699.	-640.	—	12.1	—
		aq	407.6947	—	-693.7	—	—	—	—
Al_2I_6		g	815.3894	—	-516.7	—	—	—	—

Table 29:**Al** | **ALUMINUM** (Prepared 1965) — Continued | Table 29:**Al**

Substance Formula and Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H_0^\circ$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H_0^\circ$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
AlS	g	59.0455	201.	200.92	150.09	9.088	230.61	33.39
Al_2S_3	cr	150.1550	—	-724.	—	—	—	—
$Al_2(SO_4)_3$	cr	342.1478	—	-3440.84	-3099.94	—	239.3	259.41
	ai	342.1478	—	-3791.	-3205.	—	-583.2	—
	aq	342.1478	—	-3774.8	—	—	—	—
$Al_2(SO_4)_3 \cdot 6H_2O$	cr	450.2402	—	-5311.71	-4622.08	—	469.0	492.9
$Al_2(SO_4)_3 \cdot 18H_2O$	cr	666.4250	—	-8878.9	—	—	—	—
$AlCl_3 \cdot 0.5SO_2$	cr	165.3719	—	-890.8	—	—	—	—
$AlCl_3 \cdot SO_2$	cr	197.4033	—	-1061.1	—	—	—	—
$AlCl_3 \cdot H_2S$	cr	167.4205	—	-763.2	—	—	—	—
$AlBr_3 \cdot H_2S$	cr	300.7885	—	-588.3	—	—	—	—
$AlI_3 \cdot 2H_2S$	cr	475.8547	—	-431.4	—	—	—	—
Al_2Se_3	cr	290.8430	—	-565.	—	—	—	—
Al_2Te_3	cr	436.7630	—	-326.	—	—	—	—
AlN	cr	40.9882	-312.96	-318.0	-287.0	3.870	20.17	30.12
$Al(NO_3)_3$	ai	212.9962	—	-1155.	-820.	—	117.6	—
in 361.6 HCl + 4 585 H_2O		212.9962	—	-1137.763	—	—	—	—
$Al(NO_3)_3 \cdot 6H_2O$	cr	321.0886	—	-2850.48	-2203.39	—	467.8	433.0
$Al(NO_3)_3 \cdot 9H_2O$	cr	375.1348	—	-3757.06	—	—	—	—
$AlCl_3 \cdot NH_3$	cr	150.3712	—	-889.5	—	—	—	—
$AlCl_3 \cdot NH_4Cl$	cr	186.8322	—	-1074.5	—	—	—	—
$AlCl_3 \cdot 3NH_3$	cr	184.4326	—	-1184.1	—	—	—	—
$AlCl_3 \cdot 5NH_3$	cr	218.4940	—	-1419.2	—	—	—	—
$AlCl_3 \cdot 6NH_3$	cr	235.5247	—	-1520.5	—	—	—	393.
$AlCl_3 \cdot 7NH_3$	cr	252.5554	—	-1609.2	—	—	—	—
$AlCl_3 \cdot NH_4Cl \cdot 6NH_3$	cr	289.0164	—	-1863.6	—	—	—	—
$AlCl_3 \cdot 14NH_3$	cr	371.7703	—	-2160.2	—	—	—	—
$AlBr_3 \cdot NH_3$	cr	283.7392	—	-743.1	—	—	—	—
$AlBr_3 \cdot 3NH_3$	cr	317.8006	—	-1057.3	—	—	—	—
$AlBr_3 \cdot 5NH_3$	cr	351.8620	—	-1323.0	—	—	—	—
$AlBr_3 \cdot 6NH_3$	cr	368.8927	—	-1435.1	—	—	—	—
$AlBr_3 \cdot 7NH_3$	cr	385.9234	—	-1525.9	—	—	—	—
$AlBr_3 \cdot 9NH_3$	cr	419.9848	—	-1688.2	—	—	—	—
$AlBr_3 \cdot 14NH_3$	cr	505.1383	—	-2080.3	—	—	—	—
$AlI_3 \cdot NH_3$	cr	424.7254	—	-497.9	—	—	—	—
$AlI_3 \cdot 3NH_3$	cr	458.7868	—	-861.5	—	—	—	—
$AlI_3 \cdot 5NH_3$	cr	492.8482	—	-1204.6	—	—	—	—
$AlI_3 \cdot 6NH_3$	cr	509.8789	—	-1309.2	—	—	—	—
$AlI_3 \cdot 7NH_3$	cr	526.9096	—	-1404.2	—	—	—	—
$AlI_3 \cdot 9NH_3$	cr	560.9710	—	-1568.6	—	—	—	—
$AlI_3 \cdot 13NH_3$	cr	629.0938	—	-1882.8	—	—	—	—
$AlI_3 \cdot 20NH_3$	cr	748.3087	—	-2430.1	—	—	—	—
$NH_4Al(SO_4)_2$	cr	237.1434	—	-2352.2	-2038.2	—	216.3	226.44
	ai	237.1434	—	-2481.	-2054.	—	-168.2	—
in 500 H_2O		237.1434	—	-2473.75	—	—	—	—
$NH_4Al(SO_4)_2$ in 1 000 H_2O		237.1434	—	-2475.42	—	—	—	—
in 1 500 H_2O		237.1434	—	-2476.17	—	—	—	—
in 2 000 H_2O		237.1434	—	-2477.01	—	—	—	—
in 2 500 H_2O		237.1434	—	-2477.81	—	—	—	—
in 3 000 H_2O		237.1434	—	-2478.60	—	—	—	—

Table 29:Al — **ALUMINUM** (Prepared 1965) — Continued — Table 29:Al

Substance Formula and Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
$NH_4Al(SO_4)_2$ in 3 500 H_2O		237.1434	—	-2479.19	—	—	—	—
$NH_4Al(SO_4)_2 \cdot 12H_2O$	cr	453.3282	—	-5942.37	-4937.20	—	697.1	683.2
$(NH_4)_2O \cdot 3Al_2O_3 \cdot 4SO_3 \cdot 6H_2O$	cr	786.3016	—	-10078.0	-8891.4	—	687.0	775.3
$(NH_4)_2O \cdot 3Al_2O_3 \cdot 5SO_3 \cdot 9H_2O$	cr	920.4100	—	-11544.9	—	—	—	—
AlP	cr	57.9553	—	-166.5	—	—	—	—
$AlPO_4$ berlinite	cr	121.9529	-1721.30	-1733.8	-1617.9	14.761	90.79	93.18
$AlCl_3 \cdot PH_3$	cr	167.3383	—	-740.1	—	—	—	—
$AlBr_3 \cdot PH_3$	cr	300.7063	—	-581.6	—	—	—	—
$H_6(NH_4)_3Al_5(PO_4)_8 \cdot 18H_2O$ ammonium taranakite	cr	1279.1200	-18262.53	-18547.7	-16164.8	239.262	1422.1	1592.0
$AlAs$	cr	101.9031	—	-116.3	—	—	—	—
Al_2C_2	g	77.9854	510.	—	—	—	—	—
Al_4C_3	cr	143.9596	-203.80	-208.8	-196.2	16.468	88.95	116.78
$Al(CH_3)_3$	cr	72.0871	-124.52	—	—	—	—	—
	l	72.0871	—	-136.4	-9.9	33.949	209.41	155.60
	g	72.0871	—	-74.1	—	—	—	—
$Al_2(CH_3)_6$	g	144.1742	—	-230.91	-9.53	—	524.8	—
$Al(CH_3COO)_3$ acetate	cr	204.1171	—	-1892.4	—	—	—	—
$(CH_3)_2S \cdot Al(CH_3)_3$	l	134.2215	—	-230.	—	—	—	—
	g	134.2215	—	-184.	—	—	—	—
$(CH_3)_3N \cdot AlCl_3$	cr	192.4528	—	-879.1	—	—	—	—
$(CH_3)_3N \cdot AlBr_3$	cr	325.8208	—	-711.3	—	—	—	—
Al_2SiO_5 andalusite	cr	162.0460	-2573.298	-2590.27	-2442.66	17.096	93.22	122.72
kyanite	cr2	162.0460	-2576.260	-2594.29	-2443.88	16.041	83.81	121.71
sillimanite	cr3	162.0460	-2571.106	-2587.76	-2440.99	17.41	96.11	124.52
$Al_2Si_2O_7 \cdot 2H_2O$ kaolinite	cr	258.1616	—	-4119.6	-3799.7	—	205.0	246.14
$Al_2Si_2O_7 \cdot 2H_2O$ halloysite	cr2	258.1616	—	-4101.2	-3780.5	—	203.3	246.27
dickite	cr3	258.1616	—	-4118.3	-3795.9	—	197.1	239.49
$Al_6Si_2O_{13}$ mullite	cr	426.0532	—	-6816.2	-6432.7	—	255.	326.10
$Al_2Si_4O_{10}(OH)_2$ monoclinic, pyrophyllite	cr	360.3158	—	-5642.04	-5268.14	—	239.41	294.34
$(AlI_3)_2 \cdot 3PbI_2$	cr	2198.3857	—	-979.	—	—	—	—
$(AlI_3)_2 \cdot 3PbI_2 \cdot 10H_2O$	cr	2378.5397	—	-4694.	—	—	—	—
AlB_2	cr	48.6035	—	-151.	—	—	—	—
AlB_{12} α	cr	156.7135	—	-266.1	—	—	—	—
$Al(BH_4)_3$	l	71.5105	—	-16.3	145.0	—	289.1	194.6
	g	71.5105	—	13.	147.	—	379.2	—

Table 30:**Ga** — **GALLIUM** (Prepared 1965) — Table 30:**Ga**

Substance Formula and Description	State	Molar mass g mol^{-1}	0 K $\Delta_f H^\circ_0$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H^\circ_0$	S° J mol^{-1} K^{-1}	C_p
Ga	cr	69.7200	0	0	0	5.569	40.88	25.86
	l	69.7200	—	5.56	—	—	—	—
	g	69.7200	276.	277.0	238.9	6.552	169.06	25.36
Ga^+	g	69.7200	855.00	861.65	—	6.197	—	—
Ga^{2+}	g	69.7200	2834.2	2847.2	—	6.197	—	—
Ga^{3+}	g	69.7200	5797.4	5816.6	—	6.197	—	—
Ga^{4+}	g	69.7200	11987.	12016.	—	—	—	—
Ga^{2+}	ao	69.7200	—	—	-88.	—	—	—
Ga^{3+}	ao	69.7200	—	-211.7	-159.0	—	-331.	—
Ga_2	g	139.4400	439.	438.5	—	—	—	—
GaO	g	85.7194	280.	279.5	253.5	8.899	231.1	32.05
GaO_3^{3-}	ao	117.7182	—	—	-619.	—	—	—
Ga_2O	cr	155.4394	—	-356.	—	—	—	—
	g	155.4394	—	-88.	—	—	—	—
Ga_2O_3 β, rhombic	cr	187.4382	—	-1089.1	-998.3	—	84.98	92.05
GaH	g	70.7280	222.	220.5	193.7	8.66	195.46	29.29
GaOH	g	86.7274	-113.	-114.6	—	—	—	—
$GaOH^{2+}$	ao	86.7274	—	—	-380.3	—	—	—
$HGaO_3^{2-}$	ao	118.7262	—	—	-686.	—	—	—
$Ga(OH)_2^+$	ao	103.7348	—	—	-597.4	—	—	—
$H_2GaO_3^-$	ao	119.7342	—	—	-745.	—	—	—
$Ga(OH)_3$	cr	120.7422	—	-964.4	-831.3	—	100.	—
GaF	g	88.7184	-251.	-251.9	—	9.067	—	33.26
GaF^{2+}	ao	88.7184	—	-536.8	-464.9	—	-226.	—
GaF_2^+	ao	107.7168	—	-863.2	-764.8	—	-146.	—
GaF_3	cr	126.7152	—	-1163.	-1085.3	—	84.	—
	aq	126.7152	—	-1205.4	—	—	—	—
GaCl	g	105.1730	-79.	-79.9	-106.3	9.58	240.3	35.56
$GaCl_3$	cr	176.0790	—	-524.7	-454.8	—	142.	—
	g	176.0790	—	-447.7	—	—	—	—
$GaCl_3$	aq	176.0790	—	-713.0	—	—	—	—
$(GaCl_3)_2$	g	352.1580	—	-975.3	—	—	—	—
GaBr	g	149.6290	-42.	-49.8	-90.0	9.92	252.0	36.40
$GaBr_3$	cr	309.4470	—	-386.6	-359.8	—	180.	—
	g	309.4470	—	-293.	—	—	—	—
$GaBr_4^-$	ao	389.3560	—	-661.9	-550.2	—	36.0	—
GaI	g	196.6244	31.0	28.9	—	10.08	—	36.65
GaI_3	cr	450.4332	—	-238.9	—	—	—	—
	g	450.4332	—	-142.3	—	—	—	—
$(GaI_3)_2$	g	900.8664	—	-318.	—	—	—	—
$Ga_2(SO_4)_3$	cr	427.6248	—	—	—	—	—	261.1
Ga_2Te_3	cr	522.2400	—	—	—	—	—	172.4
GaN	cr	83.7267	—	-110.5	—	—	—	—
	g	83.7267	—	176.	151.	—	226.	—
$GaCl_3 \cdot NH_3$	cr	193.1097	—	-714.6	—	—	—	—
$GaCl_3 \cdot NH_3$	g	193.1097	—	-628.0	—	—	—	—
$GaCl_3 \cdot 3NH_3$	cr	227.1711	—	-965.2	—	—	—	—
$GaCl_3 \cdot 5NH_3$	cr	261.2325	—	-1194.5	—	—	—	—
$GaCl_3 \cdot 6NH_3$	cr	278.2632	—	-1288.3	—	—	—	—
$GaCl_3 \cdot 7NH_3$	cr	295.2939	—	-1373.6	—	—	—	—

Table 30:Ga — GALLIUM (Prepared 1965) — Continued — Table 30:Ga

Substance Formula and Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H_0^\circ$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H_0^\circ$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
$GaCl_3 \cdot 14NH_3$	cr	414.5088	—	-1925.	—	—	—	—
$GaBr_3 \cdot NH_3$	cr	326.4777	—	-564.4	—	—	—	—
$GaBr_3 \cdot 5NH_3$	cr	394.6005	—	-1066.9	—	—	—	—
$GaBr_3 \cdot 6NH_3$	cr	411.6312	—	-1168.6	—	—	—	—
$GaBr_3 \cdot 7NH_3$	cr	428.6619	—	-1258.1	—	—	—	—
$GaBr_3 \cdot 9NH_3$	cr	462.7233	—	-1418.	—	—	—	—
$GaBr_3 \cdot 14NH_3$	cr	547.8768	—	-1807.	—	—	—	—
$GaI_3 \cdot NH_3$	cr	467.4639	—	-402.5	—	—	—	—
$GaI_3 \cdot 5NH_3$	cr	535.5867	—	-901.7	—	—	—	—
$GaI_3 \cdot 6NH_3$	cr	552.6174	—	-1011.3	—	—	—	—
$GaI_3 \cdot 7NH_3$	cr	569.6481	—	-1102.5	—	—	—	—
$GaI_3 \cdot 9NH_3$	cr	603.7095	—	-1265.7	—	—	—	—
$GaI_3 \cdot 13NH_3$	cr	671.8323	—	-1586.	—	—	—	—
$GaI_3 \cdot 20NH_3$	cr	791.0472	—	-2134.	—	—	—	—
GaP	cr	100.6938	—	-88.	—	—	—	—
$GaPO_4$	cr	164.6914	—	—	-1297.4	—	—	—
$GaCl_3 \cdot PCl_3$	cr	313.4118	—	-858.6	—	—	—	—
$GaCl_3 \cdot POCl_3$	cr	329.4112	—	-1164.4	—	—	—	—
GaAs	cr	144.6416	—	-71.	-67.8	—	64.18	46.23
GaSb	cr	191.4700	—	-41.8	-38.9	—	76.07	48.53
Ga_2C_2	g	163.4624	—	561.	—	—	—	—
$Ga(CH_3)_3$	l	114.8256	—	-78.2	—	—	—	—
	g	114.8256	—	-45.2	—	—	—	—
$GaCl_3 \cdot CH_3Cl$	cr	226.5672	—	-633.0	—	—	—	—
$(GaCl_3)_2 \cdot CH_3Cl$	cr	402.6462	—	-1160.2	—	—	—	—
$(GaCl_3)_2 \cdot C_2H_5Cl$	cr	416.6734	—	-1198.7	—	—	—	—
$GaCl_3 \cdot CH_3COCl$	cr	254.5778	—	-815.5	—	—	—	—
$GaCl_3 \cdot (CH_3)_2CO$	cr	234.1600	—	-836.8	—	—	—	—
$GaCl_3 \cdot (C_2H_5)_2O$	cr	250.2032	—	-842.7	—	—	—	—
$GaCl_3 \cdot 2(C_2H_5)_2O$	cr	308.3280	—	-1147.3	—	—	—	—
$GaBr_3 \cdot CH_3Br$	cr	404.3912	—	-449.8	—	—	—	—
$(GaBr_3)_2 \cdot CH_3Br$	cr	713.8382	—	-836.0	—	—	—	—
$GaCH_3I_2$	cr	338.5640	—	-205.9	—	—	—	—
$Ga(CH_3)_3 \cdot (CH_3)_2S$	l	176.9600	—	-188.7	—	—	—	—
	g	176.9600	—	-138.	—	—	—	—

Table 31:**In** | **INDIUM** (Prepared 1965) | Table 31:**In**

Substance Formula and Description	State	Molar mass g mol^{-1}	0 K: $\Delta_f H_0^\circ$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar): $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H_0^\circ$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
In	cr	114.8200	0	0	0	6.602	57.82	26.74
	g	114.8200	243.72	243.30	208.71	6.19	173.79	20.84
In^{+}	g	114.8200	778.086	783.864	—	6.197	—	—
In^{2+}	g	114.8200	2598.7	2610.8	—	6.197	—	—
In^{3+}	g	114.8200	5305.	5322.	—	6.197	—	—
In^{4+}	g	114.8200	10556.	10581.	—	6.197	—	—
In^{+}	ao	114.8200	—	—	-12.1	—	—	—
In^{2+}	ao	114.8200	—	—	-50.7	—	—	—
In^{3+}	ao	114.8200	—	-105.	-98.0	—	-151.	—
In_2	g	229.6400	383.7	380.91	—	10.46	—	—
InO	g	130.8194	389.	387.0	364.4	8.95	236.5	32.55
In_2O_3	cr	277.6382	—	-925.79	-830.68	—	104.2	92.
InH	g	115.8280	218.	215.5	190.31	8.682	207.64	29.58
InOH	g	131.8274	-75.	-79.	—	—	—	—
$InOH^{2+}$	ao	131.8274	—	-370.3	-313.0	—	-88.	—
$In(OH)_2^{+}$	ao	148.8348	—	-619.	-525.0	—	25.	—
InF	g	133.8184	-201.7	-203.38	—	9.196	—	—
InCl II	cr	150.2730	—	-186.2	—	—	—	—
	g	150.2730	—	-75.	—	—	—	—
$InCl^{+}$	g	150.2730	—	849.	—	—	—	—
$InCl_3$	cr	221.1790	—	-537.2	—	—	—	—
	g	221.1790	—	-374.0	—	—	—	—
In_2Cl_3	g	335.9990	—	-433.5	—	—	—	—
InBr	cr	194.7290	—	-175.3	-169.0	—	113.	—
	g	194.7290	-48.1	-56.9	-94.34	10.067	259.48	36.65
$InBr_3$	cr	354.5470	—	-428.9	—	—	—	—
	g	354.5470	—	-282.0	—	—	—	—
in HCl + 20 H_2O:u		354.5470	—	-501.2	—	—	—	—
InI	cr	241.7244	—	-116.3	-120.5	—	130.	—
	g	241.7244	10.54	7.5	-37.7	10.196	267.34	36.82
InI_3	cr	495.5332	—	-238.	—	—	—	—
	g	495.5332	—	-120.5	—	—	—	—
InS	cr	146.8840	—	-138.1	-131.8	—	67.	—
	g	146.8840	—	238.	—	—	—	—
In_2S	g	261.7040	—	63.	12.1	—	318.	—
In_2S_3	cr	325.8320	—	-427.	-412.5	—	163.6	117.99
In_3S_4	cr	472.7160	—	-591.2	—	—	—	—
In_4S_5	cr	619.6000	—	-753.	—	—	—	—
$InSO_4^{+}$	ao	210.8816	—	—	-863.9	—	—	—
$In_2(SO_4)_3$	cr	517.8248	—	-2787.	-2439.	—	272.	280.
InSe	cr	193.7800	—	-117.	—	—	—	—
In_2Se_3	cr	466.5200	—	-343.	—	—	—	—
InTe	cr	242.4200	—	-96.	—	—	—	—
In_2Te_3	cr	612.4400	—	-197.	—	—	—	—
InN	cr	128.8267	—	-17.6	—	—	—	—
$InCl_3 \cdot NH_3$	cr	238.2097	—	-680.3	—	—	—	—
$InCl_3 \cdot 2NH_3$	cr	255.2404	—	-815.9	—	—	—	—
$InCl_3 \cdot 3NH_3$	cr	272.2711	—	-948.1	—	—	—	—
$InCl_3 \cdot 5NH_3$	cr	306.3325	—	-1148.5	—	—	—	—
$InCl_3 \cdot 7NH_3$	cr	340.3939	—	-1318.	—	—	—	—

Table 31:In | **INDIUM** (Prepared 1965) — Continued | Table 31:**In**

Substance Formula and Description	State	Molar mass g mol^{-1}	0 K $\Delta_f H_0^\circ$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H_0^\circ$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
$InCl_3 \cdot 15NH_3$	cr	476.6395	—	-1950.	—	—	—	—
$InBr_3 \cdot 3NH_3$	cr	405.6391	—	-829.7	—	—	—	—
$InBr_3 \cdot 5NH_3$	cr	439.7005	—	-1051.4	—	—	—	—
$InBr_3 \cdot 7NH_3$	cr	473.7619	—	-1226.7	—	—	—	—
$InBr_3 \cdot 15NH_3$	cr	610.0075	—	-1883.	—	—	—	—
$InI_3 \cdot 2NH_3$	cr	529.5946	—	-497.9	—	—	—	—
$InI_3 \cdot 5NH_3$	cr	580.6867	—	-852.7	—	—	—	—
$InI_3 \cdot 7NH_3$	cr	614.7481	—	-1048.9	—	—	—	—
$InI_3 \cdot 9NH_3$	cr	648.8095	—	-1222.1	—	—	—	—
$InI_3 \cdot 13NH_3$	cr	716.9323	—	-1544.	—	—	—	—
$InI_3 \cdot 21NH_3$	cr	853.1779	—	-2176.	—	—	—	—
InP	cr	145.7938	—	-88.7	-77.0	—	59.8	45.44
InAs	cr	189.7416	—	-58.6	-53.6	—	75.7	47.78
InSb	cr	236.5700	—	-30.5	-25.5	—	86.2	49.45
	g	236.5700	—	344.3	—	—	—	—
$InSb_2$	g	358.3200	—	314.	—	—	—	—
$InC_2O_4^+$ oxalate	ao	202.8400	—	—	-804.5	—	—	—
$In(C_2O_4)_2^-$	ao	290.8600	—	—	-1540.	—	—	—
$InCl_3 \cdot 2(CH_3)_2S$	cr	313.3838	—	-674.0	—	—	—	—
$InBr_3 \cdot 2(CH_3)_2S$	cr	446.7518	—	-610.4	—	—	—	—
$InI_3 \cdot 2(CH_3)_2S$	cr	587.7380	—	-331.	—	—	—	—
$InSCN^{2+}$	ao	172.9019	—	—	60.2	—	—	—
$In(CNS)_2^+$	ao	230.9838	—	—	67.4	—	—	—
$In(CNS)_3$	ao	289.0657	—	—	164.9	—	—	—

Table 32:Tl — **THALLIUM** (Prepared 1965) — Table 32:Tl

Substance Formula	Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H_0^\circ$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H_0^\circ$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
Tl		cr	204.3700	0	0	0	6.828	64.18	26.32
		g	204.3700	182.845	182.21	147.41	6.197	180.963	20.786
	in Hg:u, saturated		204.3700	—	0.318	−0.259	—	66.11	—
Tl^+		g	204.3700	772.199	777.764	—	6.197	—	—
Tl^{2+}		g	204.3700	2743.210	2754.971	—	6.197	—	—
Tl^{3+}		g	204.3700	5621.2	5639.2	—	6.197	—	—
Tl^+		ao	204.3700	—	5.36	−32.40	—	125.5	—
Tl^{3+}		ao	204.3700	—	196.6	214.6	—	−192.	—
Tl_2O		cr	424.7394	—	−178.7	−147.3	—	126.	—
Tl_2O_3		cr	456.7382	—	—	−311.7	—	—	—
Tl_2O_4		cr	472.7376	—	—	−347.2	—	—	—
TlOH		cr	221.3774	—	−238.9	−195.8	—	88.	—
		ai	221.3774	—	−224.64	−189.63	—	114.6	—
		ao	221.3774	—	—	−194.1	—	—	—
	in 350 H_2O		221.3774	—	−226.44	—	—	—	—
TlOH	in 500 H_2O		221.3774	—	−226.69	—	—	—	—
	in 750 H_2O		221.3774	—	−227.02	—	—	—	—
	in 1 000 H_2O		221.3774	—	−227.32	—	—	—	—
	in 1 500 H_2O		221.3774	—	−227.69	—	—	—	—
	in 2 000 H_2O		221.3774	—	−227.94	—	—	—	—
TlOH	in ∞ H_2O		221.3774	—	−224.64	—	—	—	—
$TlOH^{2+}$		ao	221.3774	—	—	−15.9	—	—	—
$Tl(OH)_2^+$		ao	238.3848	—	—	−244.7	—	—	—
$Tl(OH)_3$		cr	255.3922	—	—	−507.0	—	—	—
TlF		cr	223.3684	—	−324.7	—	—	—	—
TlF		g	223.3684	—	−182.4	—	—	—	—
		ai	223.3684	—	−327.27	−311.19	—	111.7	—
		ao	223.3684	—	—	−311.7	—	—	—
	in 800 H_2O		223.3684	—	−328.4	—	—	—	—
$TlHF_2$		cr	243.3748	—	—	—	18.025	146.11	88.91
$TlHF_2$	in 800 H_2O		243.3748	—	−645.6	—	—	—	—
TlCl		cr	239.8230	−205.397	−204.14	−184.92	12.678	111.25	50.92
		g	239.8230	—	−67.8	—	—	—	—
$TlCl^+$		g	239.8230	—	874.5	—	—	—	—
		ai	239.8230	—	−161.80	−163.62	—	182.0	—
TlCl		ao	239.8230	—	−167.78	−166.97	—	172.8	—
$TlCl^{2+}$		ao	239.8230	—	4.2	40.6	—	−79.	—
$TlCl_2^+$		ao	275.2760	—	−179.9	−123.8	—	29.	—
$TlCl_2^-$		ao	275.2760	—	—	−295.8	—	—	—
$TlCl_3$		cr	310.7290	—	−315.1	—	—	—	—
$TlCl_3$		ai	310.7290	—	−305.0	−179.0	—	−23.0	—
		ao	310.7290	—	−351.5	−274.4	—	134.	—
		aq	310.7290	—	−351.5	—	—	—	—
$TlCl_3 \cdot 4H_2O$		cr	382.7906	—	−1503.7	—	—	—	—
$TlCl_4^-$		ao	346.1820	—	−519.2	−421.7	—	243.	—
Tl_2Cl_2		g	479.6460	—	−206.7	—	—	—	—
$TlClO_3$		ai	287.8212	—	−98.62	−40.35	—	287.9	—
		ao	287.8212	—	—	−43.20	—	—	—
TlBr		cr	284.2790	—	−173.2	−167.36	—	120.5	—
		g	284.2790	—	−37.7	—	—	—	—

Table 32:Tl **THALLIUM** (Prepared 1965) — Continued Table 32:Tl

Substance Formula and Description		State	Molar mass g mol^{-1}	0 K $\Delta_f H^\circ_0$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H^\circ_0$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
$TlBr^+$		g	284.2790	—	850.6	—	—	—	—
		ai	284.2790	—	-116.19	-136.36	—	207.9	—
		ao	284.2790	—	-126.44	-141.84	—	192.17	—
$TlBr^{2+}$		ao	284.2790	—	37.7	56.5	—	-54.	—
$TlBr_2{}^+$		ao	364.1880	—	-109.2	-89.6	—	84.	—
$TlBr_2{}^-$		ao	364.1880	—	-225.1	-246.0	—	351.	—
$TlBr_3$		ai	444.0970	—	-168.2	-97.1	—	54.	—
		ao	444.0970	—	-249.8	-224.7	—	205.	—
		aq	444.0970	—	-249.8	—	—	—	—
$TlBr_3 \cdot 4H_2O$		cr	516.1586	—	-1402.5	—	—	—	—
$TlBr_4{}^-$		ao	524.0060	—	-380.3	-352.3	—	335.	—
$TlBrO_3$		cr	332.2772	—	-119.7	-36.4	—	168.2	—
		ai	332.2772	—	-61.71	-13.80	—	287.0	—
$TlBrCl^-$		ao	319.7320	—	—	-272.3	—	—	—
$TlCl_2Br$		aq	355.1850	—	-317.6	—	—	—	—
$TlCl_2Br \cdot 4H_2O$		cr	427.2466	—	-1472.8	—	—	—	—
$TlBr_2Cl$		aq	399.6410	—	-283.7	—	—	—	—
$TlClBr_2 \cdot 4H_2O$		cr	471.7026	—	-1439.7	—	—	—	—
TlI		cr	331.2744	—	-123.8	-125.39	—	127.6	—
		g	331.2744	—	7.1	—	—	—	—
TlI		ai	331.2744	—	-49.83	-83.97	—	236.8	—
		ao	331.2744	—	—	-92.5	—	—	—
$TlI_2{}^-$		ao	458.1788	—	—	-146.8	—	—	—
$TlI_4{}^-$		ao	711.9876	—	—	-164.4	—	—	—
$TlIO_3$		cr	379.2726	—	-267.4	-191.83	—	176.6	—
$TlIO_3$		ai	379.2726	—	-215.9	-160.2	—	243.9	—
$TlIBr^-$		ao	411.1834	—	—	-200.8	—	—	—
Tl_2S		cr	440.8040	—	-97.1	-93.7	—	151.	—
$TlSO_4{}^-$		ao	300.4316	—	-904.83	-784.8	—	167.	—
Tl_2SO_4		cr	504.8016	—	-931.8	-830.42	—	230.5	—
Tl_2SO_4		ai	504.8016	—	-898.56	-809.33	—	271.1	—
$TlHSO_4$	in $H_2SO_4 + 30H_2O$:u		301.4396	—	-888.7	—	—	—	—
Tl_2Se		cr	487.7000	—	-59.	-59.0	—	172.	—
Tl_2SeO_4		cr	551.6976	—	-632.	-528.8	—	234.	—
$Tl_2(SeO_3)_3$		cr	789.6146	—	—	-901.1	—	—	—
Tl_2Te		cr	536.3400	—	-92.	—	—	—	—
TlN_3		cr	246.3901	—	233.5	294.52	—	146.9	—
$TlNO_3$		cr	266.3749	—	-243.93	-152.40	—	160.7	99.50
		ai	266.3749	—	-202.00	-143.66	—	272.0	—
		ao	266.3749	—	-204.72	-145.75	—	269.9	—
$TlNO_3{}^{2+}$		ao	266.3749	—	—	90.4	—	—	—
$TlNH_3{}^+$		ao	221.4007	—	—	-53.9	—	—	—
$TlCl \cdot 3NH_3$		cr	290.9151	—	-429.3	—	—	—	—
$TlCl_3 \cdot 3NH_3$		cr	361.8211	—	-564.8	—	—	—	—
$TlBr \cdot 3NH_3$		cr	335.3711	—	-398.7	—	—	—	—
$TlI \cdot 3NH_3$		cr	382.3665	—	-349.4	—	—	—	—
Tl_2CO_3		cr	468.7494	—	-700.0	-614.6	—	155.2	—
$TlOCH_3$		cr	235.4046	—	-205.4	—	—	—	—
$TlCH_3CO_2$	acetate	cr	263.4152	—	-527.6	—	—	—	—
		ai	263.4152	—	-480.66	-401.71	—	212.1	—

Table 32:Tl — **THALLIUM** (Prepared 1965) — Continued — Table 32:Tl

Substance Formula and Description		State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
$TlCH_3CO_2$		aq	263.4152	—	-484.5	—	—	—	—
$TlOC_2H_5$		l	249.4318	—	-236.4	—	—	—	—
		aq	249.4318	—	-234.3	—	—	—	—
$Tl(CN)_4^-$		ao	308.4416	—	—	703.	—	—	—
TlONC	thallous fulminate	cr	246.3873	—	115.5	—	—	—	—
TlCNS		cr	262.4519	—	28.5	38.55	—	163.	—
		ai	262.4519	—	81.80	60.31	—	269.9	—
		ao	262.4519	—	69.41	55.75	—	243.5	—

Table 33:**Zn** — **ZINC** (Prepared 1967) — Table 33:**Zn**

Substance Formula	Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
Zn		cr	65.3700	0	0	0	5.648	41.63	25.40
		g	65.3700	130.181	130.729	95.145	6.197	160.984	20.786
	in Hg:u, 2-phase		65.3700	—	0	0	—	41.63	—
Zn^{+}		g	65.3700	1036.561	1043.305	—	6.197	—	—
Zn^{2+}		g	65.3700	2769.85	2782.78	—	6.197	—	—
Zn^{3+}		g	65.3700	6602.4	6621.6	—	6.197	—	—
Zn^{2+}		ao	65.3700	—	-153.89	-147.06	—	-112.1	46.
ZnO		cr	81.3694	—	-348.28	-318.30	—	43.64	40.25
ZnO_2^{2-}		ao	97.3688	—	—	-384.24	—	—	—
$ZnO_2 \cdot 2H_2O$		cr	133.3996	—	-868.6	—	—	—	—
$ZnO \cdot 2ZnO_2 \cdot 2H_2O$		cr	312.1378	—	-1542.2	—	—	—	—
$ZnO \cdot 2ZnO_2 \cdot 3H_2O$		cr	330.1532	—	-1835.1	—	—	—	—
$ZnOH^{+}$		ao	82.3774	—	—	-330.1	—	—	—
$HZnO_2^{-}$		ao	98.3768	—	—	-457.08	—	—	—
$Zn(OH)_2$	γ	cr	99.3848	—	—	-553.81	—	—	—
$Zn(OH)_2$	β	cr2	99.3848	—	-641.91	-553.52	—	81.2	—
	ε	cr3	99.3848	—	-643.25	-555.07	—	81.6	72.4
	precipitated	cr4	99.3848	—	-642.2	—	—	—	—
		ai	99.3848	—	-613.88	-461.56	—	-133.5	-251.
		ao	99.3848	—	—	-522.73	—	—	—
$Zn(OH)_3^{-}$		ao	116.3922	—	—	-694.22	—	—	—
$Zn(OH)_4^{2-}$		ao	133.3996	—	—	-858.52	—	—	—
ZnF^{+}		ao	84.3684	—	—	-433.00	—	—	—
ZnF_2		cr	103.3668	-761.78	-764.4	-713.3	11.828	73.68	65.65
		ai	103.3668	—	-819.14	-704.64	—	-139.7	-167.
$ZnCl^{+}$		ao	100.8230	—	—	-275.3	—	—	—
$ZnCl_2$		cr	136.2760	-415.283	-415.05	-369.398	15.054	111.46	71.34
		g	136.2760	—	-266.1	—	—	—	—
		ai	136.2760	—	-488.19	-409.50	—	0.8	-226.
		ao	136.2760	—	—	-403.7	—	—	—
$ZnCl_2$	in aq HCl:u		136.2760	—	-461.1	—	—	—	—
	in 4.0 H_2O		136.2760	—	-443.09	—	—	—	—
	in 5.0 H_2O		136.2760	—	-450.16	—	—	—	—
	in 6.0 H_2O		136.2760	—	-452.12	—	—	—	—
	in 7.0 H_2O		136.2760	—	-453.55	—	—	—	—
$ZnCl_2$	in 8.0 H_2O		136.2760	—	-454.80	—	—	—	—
	in 10 H_2O		136.2760	—	-456.77	—	—	—	—
	in 12 H_2O		136.2760	—	-458.44	—	—	—	—
	in 15 H_2O		136.2760	—	-460.37	—	—	—	—
	in 20 H_2O		136.2760	—	-463.00	—	—	—	—
$ZnCl_2$	in 25 H_2O		136.2760	—	-465.01	—	—	—	—
	in 30 H_2O		136.2760	—	-466.73	—	—	—	—
	in 40 H_2O		136.2760	—	-469.44	—	—	—	—
	in 50 H_2O		136.2760	—	-471.54	—	—	—	—
	in 75 H_2O		136.2760	—	-475.93	—	—	—	—
$ZnCl_2$	in 100 H_2O		136.2760	—	-477.98	—	—	—	—
	in 200 H_2O		136.2760	—	-481.91	—	—	—	—
	in 400 H_2O		136.2760	—	-483.75	—	—	—	—
	in 500 H_2O		136.2760	—	-484.17	—	—	—	—
	in 1 000 H_2O		136.2760	—	-485.43	—	—	—	—

Table 33:Zn — ZINC (Prepared 1967) — Continued — Table 33:Zn

Substance Formula	Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
$ZnCl_2$	in ∞ H_2O		136.2760	—	-488.19	—	—	—	—
	in 300 C_2H_5OH		136.2760	—	-456.1	—	—	—	—
$ZnCl_2^+$		g	136.2760	—	869.0	—	—	—	—
$ZnCl_3^-$		ao	171.7290	—	—	-540.5	—	—	—
$ZnCl_4^{2-}$		ao	207.1820	—	—	-666.0	—	—	—
$ZnClO_4^+$		ao	164.8206	—	—	-163.1	—	—	—
$Zn(ClO_4)_2$		ai	264.2712	—	-412.54	-164.10	—	251.9	—
	in 7 H_2O		264.2712	—	-402.71	—	—	—	—
	in 8 H_2O		264.2712	—	-403.55	—	—	—	—
	in 9 H_2O		264.2712	—	-404.51	—	—	—	—
$Zn(ClO_4)_2$	in 11 H_2O		264.2712	—	-405.97	—	—	—	—
	in 12 H_2O		264.2712	—	-407.06	—	—	—	—
	in 15 H_2O		264.2712	—	-408.11	—	—	—	—
	in 20 H_2O		264.2712	—	-409.11	—	—	—	—
	in 30 H_2O		264.2712	—	-410.24	—	—	—	—
$Zn(ClO_4)_2$	in 50 H_2O		264.2712	—	-410.45	—	—	—	—
	in 75 H_2O		264.2712	—	-410.66	—	—	—	—
	in 100 H_2O		264.2712	—	-410.87	—	—	—	—
	in 200 H_2O		264.2712	—	-411.16	—	—	—	—
	in 500 H_2O		264.2712	—	-412.54	—	—	—	—
$Zn(ClO_4)_2$	in 1 000 H_2O		264.2712	—	-412.5	—	—	—	—
$Zn(ClO_4)_2 \cdot 6H_2O$		cr	372.3636	—	-2133.38	-1555.2	—	545.6	—
$ZnCl_2 \cdot 3ZnO \cdot 5H_2O$		cr	470.4612	—	-2884.4	—	—	—	—
$ZnCl_2 \cdot 4ZnO \cdot 11H_2O$		cr	659.9230	—	-4951.3	—	—	—	—
$ZnCl_2 \cdot 5ZnO \cdot 8H_2O$		cr	687.2462	—	-4432.1	—	—	—	—
$ZnCl_2 \cdot 8ZnO \cdot 10H_2O$		cr	967.3852	—	-6030.8	—	—	—	—
$Zn(OH)Cl$		ao	117.8304	—	—	-472.7	—	—	—
$Zn_2(OH)_3Cl$		cr	217.2152	—	—	-1050.1	—	—	—
$ZnBr^+$		ao	145.2790	—	—	-247.7	—	—	—
$ZnBr_2$		cr	225.1880	—	-328.65	-312.13	—	138.5	—
$ZnBr_2$		ai	225.1880	—	-396.98	-354.97	—	52.7	-238.
		ao	225.1880	—	—	-349.4	—	—	—
	in 400 H_2O		225.1880	—	-392.38	—	—	—	—
$ZnBr_2 \cdot 2H_2O$		cr	261.2188	—	-937.2	-799.5	—	198.7	—
$ZnBr_3^-$		ao	305.0970	—	—	-448.9	—	—	—
$ZnBr_2 \cdot 4ZnO \cdot 13H_2O$		cr	784.8658	—	-5436.7	—	—	—	—
ZnI^+		ao	192.2744	—	—	-182.0	—	—	—
ZnI_2		cr	319.1788	—	-208.03	-208.95	—	161.1	—
		ai	319.1788	—	-264.26	-250.20	—	110.5	-238.
		ao	319.1788	—	—	-240.6	—	—	—
ZnI_2	in 3 000 H_2O		319.1788	—	-256.9	—	—	—	—
ZnI_3^-		ao	446.0832	—	—	-291.6	—	—	—
ZnI_4^{2-}		ao	572.9876	—	—	-340.1	—	—	—
$Zn(IO_3)_2$		cr	415.1752	—	—	-433.70	—	—	—
		ai	415.1752	—	-596.6	-402.8	—	124.7	—
$ZnI_2 \cdot 5ZnO \cdot 11H_2O$		cr	924.1952	—	-4959.7	—	—	—	—
ZnS	wurtzite	cr	97.4340	—	-192.63	—	—	—	—
	sphalerite	cr2	97.4340	—	-205.98	-201.29	—	57.7	46.0
$ZnSO_4$		cr	161.4316	—	-982.8	-871.5	—	110.5	99.2
		ai	161.4316	—	-1063.15	-891.59	—	-92.0	-247.

Table 33:**Zn** — **ZINC** (Prepared 1967) — Continued — Table 33:**Zn**

Substance Formula and Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
$ZnSO_4$	ao	161.4316	—	-1047.7	-904.9	—	5.0	—
in 15 H_2O		161.4316	—	-1053.904	—	—	—	—
in 20 H_2O		161.4316	—	-1055.447	—	—	—	—
in 25 H_2O		161.4316	—	-1056.682	—	—	—	—
in 30 H_2O		161.4316	—	-1057.100	—	—	—	—
$ZnSO_4$ in 40 H_2O		161.4316	—	-1057.531	—	—	—	—
in 50 H_2O		161.4316	—	-1057.711	—	—	—	—
in 75 H_2O		161.4316	—	-1057.949	—	—	—	—
in 100 H_2O		161.4316	—	-1058.121	—	—	—	—
in 150 H_2O		161.4316	—	-1058.343	—	—	—	—
$ZnSO_4$ in 200 H_2O		161.4316	—	-1058.569	—	—	—	—
in 300 H_2O		161.4316	—	-1058.690	—	—	—	—
in 400 H_2O		161.4316	—	-1058.849	—	—	—	—
in 500 H_2O		161.4316	—	-1059.004	—	—	—	—
in 750 H_2O		161.4316	—	-1059.288	—	—	—	—
$ZnSO_4$ in 1 000 H_2O		161.4316	—	-1059.493	—	—	—	—
in 1 500 H_2O		161.4316	—	-1059.782	—	—	—	—
in 2 000 H_2O		161.4316	—	-1059.987	—	—	—	—
in 3 000 H_2O		161.4316	—	-1060.150	—	—	—	—
in 5 000 H_2O		161.4316	—	-1060.657	—	—	—	—
$ZnSO_4$ in 7 500 H_2O		161.4316	—	-1060.966	—	—	—	—
in 10 000 H_2O		161.4316	—	-1061.180	—	—	—	—
in 15 000 H_2O		161.4316	—	-1061.426	—	—	—	—
in 20 000 H_2O		161.4316	—	-1061.648	—	—	—	—
in 30 000 H_2O		161.4316	—	-1061.928	—	—	—	—
$ZnSO_4$ in 50 000 H_2O		161.4316	—	-1062.230	—	—	—	—
in 100 000 H_2O		161.4316	—	-1062.518	—	—	—	—
in 200 000 H_2O		161.4316	—	-1062.736	—	—	—	—
in 500 000 H_2O		161.4316	—	-1062.920	—	—	—	—
in 1 000 000 H_2O		161.4316	—	-1063.008	—	—	—	—
$ZnSO_4$ in ∞ H_2O		161.4316	—	-1063.15	—	—	—	—
$ZnSO_4 \cdot H_2O$	cr	179.4470	—	-1304.49	-1131.99	—	138.5	—
$ZnSO_4 \cdot 6H_2O$	cr	269.5240	—	-2777.46	-2324.44	—	363.6	357.69
$ZnSO_4 \cdot 7H_2O$	cr	287.5394	—	-3077.75	-2562.67	—	388.7	383.42
ZnS_2O_6	aq	225.4944	—	-1352.3	—	—	—	—
$ZnS_2O_6 \cdot 6H_2O$	cr	333.5868	—	-3076.1	—	—	—	—
$ZnO \cdot 2ZnSO_4$	cr	404.2326	—	-2306.6	-2058.8	—	279.9	—
$ZnSO_4 \cdot Zn(OH)_2$	cr	260.8164	—	—	-1470.1	—	—	—
ZnSe	cr	144.3300	—	-163.	-163.	—	84.	—
$ZnSeO_3$	ai	192.3282	—	-663.2	-516.7	—	-99.2	—
$ZnSeO_3 \cdot H_2O$	cr	210.3436	—	-930.9	-792.8	—	163.	—
$ZnSeO_4$	cr	208.3276	—	-664.4	—	—	—	—
	ai	208.3276	—	-753.1	-588.2	—	-58.2	—
in 1 200 H_2O		208.3276	—	-737.39	—	—	—	—
$ZnSeO_4 \cdot H_2O$	cr	226.3430	—	-982.8	—	—	—	—
$ZnSeO_4 \cdot 6H_2O$	cr	316.4200	—	-2458.1	—	—	—	—
ZnTe	cr	192.9700	—	-117.6	—	—	—	—
ZnN_3^+	ao	107.3901	—	—	198.4	—	—	—
$Zn(N_3)_2$	cr	149.4102	—	218.	—	—	—	—
	ao	149.4102	—	—	542.3	—	—	—

Table 33:**Zn** **ZINC** (Prepared 1967) — Continued Table 33:**Zn**

Substance Formula and Description		State	Molar mass g mol^{-1}	0 K $\Delta_fH^\circ_0$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) Δ_fH° kJ mol^{-1}	Δ_fG° kJ mol^{-1}	$H^\circ-H^\circ_0$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
Zn_3N_2		cr	224.1234	—	-22.6	—	—	—	109.
$Zn(NO_3)_2$		cr	189.3798	—	-483.7	—	—	—	—
		ai	189.3798	—	-568.61	-369.57	—	180.7	-126.
	in 1.5 H_2O		189.3798	—	-506.7	—	—	—	—
	in 2.0 H_2O		189.3798	—	-513.8	—	—	—	—
$Zn(NO_3)_2$	in 2.5 H_2O		189.3798	—	-519.7	—	—	—	—
	in 3.0 H_2O		189.3798	—	-525.5	—	—	—	—
	in 3.5 H_2O		189.3798	—	-530.5	—	—	—	—
	in 4.0 H_2O		189.3798	—	-535.6	—	—	—	—
	in 4.5 H_2O		189.3798	—	-539.3	—	—	—	—
$Zn(NO_3)_2$	in 5 H_2O		189.3798	—	-543.1	—	—	—	—
	in 6 H_2O		189.3798	—	-548.9	—	—	—	—
	in 7 H_2O		189.3798	—	-553.1	—	—	—	—
	in 8 H_2O		189.3798	—	-556.5	—	—	—	—
	in 9 H_2O		189.3798	—	-559.0	—	—	—	—
$Zn(NO_3)_2$	in 10 H_2O		189.3798	—	-560.61	—	—	—	—
	in 12 H_2O		189.3798	—	-562.92	—	—	—	—
	in 15 H_2O		189.3798	—	-564.80	—	—	—	—
	in 20 H_2O		189.3798	—	-565.93	—	—	—	—
	in 25 H_2O		189.3798	—	-566.35	—	—	—	—
$Zn(NO_3)_2$	in 30 H_2O		189.3798	—	-566.64	—	—	—	—
	in 50 H_2O		189.3798	—	-567.18	—	—	—	—
	in 100 H_2O		189.3798	—	-567.64	—	—	—	—
	in 200 H_2O		189.3798	—	-567.48	—	—	—	—
	in 500 H_2O		189.3798	—	-566.97	—	—	—	—
$Zn(NO_3)_2$	in 1 000 H_2O		189.3798	—	-567.10	—	—	—	—
	in 2 000 H_2O		189.3798	—	-567.4	—	—	—	—
	in ∞ H_2O		189.3798	—	-568.61	—	—	—	—
$Zn(NO_3)_2{\cdot}H_2O$		cr	207.3952	—	-805.0	—	—	—	—
$Zn(NO_3)_2{\cdot}2H_2O$		cr	225.4106	—	-1110.27	—	—	—	—
$Zn(NO_3)_2{\cdot}4H_2O$		cr	261.4414	—	-1699.12	—	—	—	—
$Zn(NO_3)_2{\cdot}6H_2O$		cr	297.4722	—	-2306.64	-1772.71	—	456.9	323.0
$ZnNH_3^{2+}$		ao	82.4007	—	—	-185.7	—	—	—
$Zn(NH_2)_2$		cr	97.4154	—	-159.8	—	—	—	—
$ZnN_2H_4^{2+}$		ao	97.4154	—	—	-36.8	—	—	—
$Zn(NH_3)_2^{2+}$		ao	99.4314	—	—	-225.0	—	—	—
$Zn(NH_3)_3^{2+}$		ao	116.4621	—	—	-264.3	—	—	—
$Zn(N_2H_4)_2^{2+}$		ao	129.4608	—	—	89.7	—	—	—
$Zn(NH_3)_4^{2+}$		ao	133.4928	—	-533.5	-301.9	—	301.	—
$Zn(N_2H_4)_3^{2+}$		ao	161.5062	—	—	217.4	—	—	—
$Zn(N_2H_4)_4^{2+}$		ao	193.5516	—	—	345.1	—	—	—
$Zn(NH_3)_4(NO_3)_2$		ai	257.5026	—	-951.4	—	—	—	—
$Zn(NO_3)_2{\cdot}4Zn(OH)_2$		cr	586.9190	—	—	-2612.1	—	—	—
$ZnCl_2{\cdot}NH_3$		cr	153.3067	—	-560.7	—	—	—	—
$ZnCl_2{\cdot}2NH_3$		cr	170.3374	—	-677.4	-503.2	—	264.0	—
$ZnCl_2{\cdot}2N_2H_4$		cr	200.3668	—	-480.28	—	—	—	—
$ZnCl_2{\cdot}4NH_3$		cr	204.3988	—	-869.0	-554.9	—	378.2	—
$ZnCl_2{\cdot}4NH_3{\cdot}0.5H_2O$		cr	213.4065	—	-1020.5	—	—	—	—
$ZnCl_2{\cdot}5NH_3{\cdot}H_2O$		cr	239.4449	—	-1215.9	—	—	—	—
$ZnCl_2{\cdot}6NH_3$		cr	238.4602	—	-1053.1	-597.1	—	486.6	—

Substance Formula and Description	State	Molar mass g mol^{-1}	0 K $\Delta_f H^\circ_0$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H^\circ_0$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
$(ZnCl_2)_3 \cdot 6NH_4Cl \cdot H_2O$	cr	747.7936	—	-3483.6	—	—	—	—
$ZnCl_2 \cdot 8NH_4Cl \cdot ZnO$	cr	645.5790	—	-3218.8	—	—	—	—
$(ZnCl_2)_3 \cdot 10NH_4Cl \cdot ZnO$	cr	1025.1144	—	-4417.9	—	—	—	—
$(ZnCl_2)_6 \cdot 12NH_3 \cdot ZnO$	cr	1103.3938	—	-4080.7	—	—	—	—
$ZnBr_2 \cdot NH_3$	cr	242.2187	—	-470.7	—	—	—	—
$ZnBr_2 \cdot 2NH_3$	cr	259.2494	—	-592.0	—	—	—	—
$ZnBr_2 \cdot 2N_2H_4$	cr	289.2788	—	-400.49	—	—	—	—
$ZnBr_2 \cdot 4NH_3$	cr	293.3108	—	-810.9	—	—	—	—
$ZnBr_2 \cdot 6NH_3$	cr	327.3722	—	-1002.1	—	—	—	—
$ZnBr_2 \cdot 6NH_3 \cdot H_2O$	cr	345.3876	—	-1303.7	—	—	—	—
$ZnI_2 \cdot NH_3$	cr	336.2095	—	-351.5	—	—	—	—
$ZnI_2 \cdot 2NH_3$	cr	353.2402	—	-476.1	—	—	—	—
$ZnI_2 \cdot 2N_2H_4$	cr	383.2696	—	-264.26	—	—	—	—
$ZnI_2 \cdot 4NH_3$	cr	387.3016	—	-693.7	—	—	—	—
$ZnI_2 \cdot 6NH_3$	cr	421.3630	—	-883.7	—	—	—	—
$ZnSO_4 \cdot (NH_4)_2SO_4$	cr	293.5706	—	-2201.6	—	—	—	—
$ZnSO_4 \cdot (NH_4)_2SO_4 \cdot 6H_2O$	cr	401.6630	—	-3996.6	—	—	—	—
Zn_3P_2	cr	258.0576	—	-473.	—	—	—	—
$Zn(PO_3)_2$	cr	223.3140	—	-2083.2	—	—	—	—
	am	223.3140	—	-2030.5	—	—	—	—
$Zn_2(P_2O_7)$	cr	304.6834	—	-2510.4	—	—	—	—
$Zn_3(PO_4)_2$	cr	386.0528	—	-2892.4	—	—	—	—
$Zn_3P_4O_{13}$	am	527.9974	—	-4479.4	—	—	—	—
$Zn_5(P_3O_{10})_2$	am	832.6808	—	-6916.6	—	—	—	—
$ZnAs_2$	cr	215.2132	—	-41.8	—	—	—	—
Zn_3As_2	cr	345.9532	—	-32.2	—	—	—	—
$Zn_3(AsO_4)_2$	cr	473.9484	—	—	-1895.	—	—	—
ZnSb	cr	187.1200	—	-14.6	—	—	—	—
$ZnCO_3$	cr	125.3794	—	-812.78	-731.52	—	82.4	79.71
$ZnCO_3 \cdot H_2O$	cr	143.3948	—	—	-970.6	—	—	—
ZnC_2O_4 oxalate	ai	153.3900	—	-979.1	-820.8	—	-66.5	—
	ao	153.3900	—	—	-849.3	—	—	—
$ZnC_2O_4 \cdot 2H_2O$	cr	189.4208	—	-1564.8	-1345.8	—	195.4	—
$Zn(C_2O_4)_2^{2-}$	ao	241.4100	—	-1802.0	-1537.5	—	130.	—
CH_3Zn^+	g	80.4052	—	900.	—	—	—	—
$Zn(CH_3)_2$	l	95.4404	—	23.4	—	—	—	—
	g	95.4404	—	53.01	—	—	—	—
$(CH_3)_2Zn^+$	g	95.4404	—	927.6	—	—	—	—
$Zn(C_2H_5)_2$	l	123.4948	—	10.5	—	—	—	—
	g	123.4948	—	50.6	—	—	—	—
$ZnCHO_2^+$ formate	ao	110.3880	—	-501.2	—	—	—	—
$Zn(CHO_2)_2$	cr	155.4060	—	-986.6	—	—	—	—
	ai	155.4060	—	-1005.00	-848.8	—	71.	—
	ao	155.4060	—	—	-854.3	—	—	—
in 500 H_2O		155.4060	—	-1003.3	—	—	—	—
$Zn(CHO_2)_2 \cdot 2H_2O$	cr	191.4368	—	-1584.9	—	—	—	—
$Zn(CHO_2)_3^-$	ao	200.4240	—	—	-1202.7	—	—	—
$Zn(CHO_2)_4^{2-}$	ao	245.4420	—	—	-1555.0	—	—	—
$Zn(CH_3CO_2)_2$ acetate	cr	183.4604	—	-1078.6	—	—	—	—
in 50 H_2O		183.4604	—	-1104.6	—	—	—	—

Table 33:**Zn** ZINC (Prepared 1967) — Continued Table 33:**Zn**

Substance Formula and Description	State	Molar mass g mol^{-1}	0 K $\Delta_f H^\circ_0$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H^\circ_0$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
$Zn(CH_3CO_2)_2$ in 100 H_2O		183.4604	—	-1112.1	—	—	—	—
in 200 H_2O		183.4604	—	-1113.8	—	—	—	—
in 400 H_2O		183.4604	—	-1117.5	—	—	—	—
in 800 H_2O		183.4604	—	-1119.47	—	—	—	—
$Zn(CH_3CO_2)_2 \cdot H_2O$	cr	201.4758	—	-1376.1	—	—	—	—
$Zn(CH_3CO_2)_2 \cdot 2H_2O$	cr	219.4912	—	-1672.3	—	—	—	—
$Zn(CH_2OHCOO)_2$ glycolate	cr	215.4592	—	-1466.9	—	—	—	—
in 200 H_2O		215.4592	—	-1466.5	—	—	—	—
$Zn(CH_2OHCOO)_2 \cdot H_2O$	cr	233.4746	—	-1767.3	—	—	—	—
$Zn(CN)_2$	cr	117.4058	—	95.8	—	—	—	—
$Zn(CN)_4^{2-}$	ao	169.4416	—	342.3	446.9	—	226.	—
$(Zn(CN)_2)_3 \cdot ZnO$	cr	433.5868	—	-57.7	—	—	—	—
$ZnNH_2CH_2CH_2NH_2^{2+}$ ethylenediamine	aq	125.4698	—	-237.7	—	—	—	—
$Zn(NH_2CH_2CH_2NH_2)_2^{2+}$	aq	185.5696	—	-323.0	—	—	—	—
$Zn(NH_2CH_2CH_2NH_2)_3^{2+}$	aq	245.6694	—	-407.5	—	—	—	—
$Zn(CH_3CO_2)_2 \cdot NH_3$ acetate	cr	200.4911	—	-1202.9	—	—	—	—
$Zn(CH_3CO_2)_2 \cdot 2NH_3$	cr	217.5218	—	-1302.5	—	—	—	—
$Zn(CH_2OHCOO)_2 \cdot 2NH_3$ glycolate	cr	249.5206	—	-1693.7	—	—	—	—
$Zn(CH_3CO_2)_2 \cdot 4NH_3$	cr	251.5832	—	-1479.0	—	—	—	—
$Zn(CH_2OHCOO)_2 \cdot 4NH_3$	cr	283.5820	—	-1881.5	—	—	—	—
$Zn(CH_3CO_2)_2 \cdot 6NH_3$	cr	285.6446	—	-1648.1	—	—	—	—
$Zn(CH_2OHCOO)_2 \cdot 6NH_3$	cr	317.6434	—	-2050.6	—	—	—	—
$Zn(CH_3CO_2)_2 \cdot 8NH_3$	cr	319.7060	—	-1816.3	—	—	—	—
$ZnCl_2 \cdot NH_2CH_2CH_2NH_2$	cr	196.3758	—	-569.0	—	—	—	—
$ZnCl_2 \cdot 3NH_2CH_2CH_2NH_2$	cr	316.5754	—	-727.2	—	—	—	—
$ZnBr_2 \cdot NH_2CH_2CH_2NH_2$	cr	285.2878	—	-446.4	—	—	—	—
$ZnBr_2 \cdot 3NH_2CH_2CH_2NH_2$	cr	405.4874	—	-657.7	—	—	—	—
$ZnI_2 \cdot NH_2CH_2CH_2NH_2$	cr	379.2786	—	-358.2	—	—	—	—
$ZnI_2 \cdot 3NH_2CH_2CH_2NH_2$	cr	499.4782	—	-541.0	—	—	—	—
$Zn(CNS)_2$	ao	181.5338	—	—	33.1	—	—	—
$Zn(CNS)_4^{2-}$	ao	297.6976	—	—	216.4	—	—	—
$Zn(NH_3)_2CS_3$	cr	207.6346	—	-346.9	-184.0	—	180.	—
$ZnSiO_3$	cr	141.4542	—	-1260.2	—	—	—	—
Zn_2SiO_4	cr	222.8236	—	-1636.74	-1523.16	—	131.4	123.34
$PbI_2 \cdot 2ZnI_2$	cr	1099.3564	—	-588.3	—	—	—	—
$Zn(BO_2)_2$	cr	150.9896	—	—	-1562.99	—	—	—
$ZnAl_2O_4$	cr	183.3306	—	-2065.2	—	—	—	—
$Al_2Cl_6 \cdot 1.5ZnCl_2$	cr	471.0950	—	-1992.8	—	—	—	—

Table 34:Cd **CADMIUM** (Prepared 1967) Table 34:Cd

Substance Formula	Substance Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
Cd	γ	cr	112.4000	0	0	0	6.238	51.76	25.98
	α	cr2	112.4000	—	–0.59	–0.59	—	51.76	—
		g	112.4000	112.05	112.01	77.41	6.197	167.746	20.786
	in Hg:u, 2–phase		112.4000	—	–21.246	–9.740	—	13.159	—
Cd^+		g	112.4000	979.81	985.96	—	6.197	—	—
Cd^{2+}		g	112.4000	2611.19	2623.54	—	6.197	—	—
		ao	112.4000	—	–75.90	–77.612	—	–73.2	—
CdO		cr	128.3994	—	–258.2	–228.4	—	54.8	43.43
CdO_2^{2-}		ao	144.3988	—	—	–284.4	—	—	—
$CdOH^+$		ao	129.4074	—	—	–261.1	—	—	—
$HCdO_2^-$		ao	145.4068	—	—	–363.5	—	—	—
$Cd(OH)_2$	precipitated	cr	146.4148	—	–560.7	–473.6	—	96.	—
		ai	146.4148	—	–535.89	–392.10	—	–94.6	—
		ao	146.4148	—	—	–442.6	—	—	—
$Cd(OH)_3^-$		ao	163.4222	—	—	–600.7	—	—	—
equivalent to $HCdO_2^-$(ao) + H_2O(l)									
$Cd(OH)_4^{2-}$		ao	180.4296	—	—	–758.4	—	—	—
equivalent to CdO_2^-(ao) + $2H_2O$(l)									
CdF_2		cr	150.3968	—	–700.4	–647.7	—	77.4	—
		ai	150.3968	—	–741.15	–635.18	—	–100.8	—
$CdCl^+$		ao	147.8530	—	–240.6	–224.39	—	43.5	—
$CdCl_2$		cr	183.3060	–391.945	–391.50	–343.93	15.862	115.27	74.68
$CdCl_2$		ai	183.3060	—	–410.20	–340.068	—	39.7	—
		ao	183.3060	—	–405.0	–359.29	—	121.8	—
	in 200 H_2O		183.3060	—	–405.275	—	—	—	—
	in 400 H_2O		183.3060	—	–405.948	—	—	—	—
	in 500 H_2O		183.3060	—	–406.137	—	—	—	—
$CdCl_2$	in 800 H_2O		183.3060	—	–406.492	—	—	—	—
	in 1 000 H_2O		183.3060	—	–406.651	—	—	—	—
	in 2 000 H_2O		183.3060	—	–407.145	—	—	—	—
	in 3 000 H_2O		183.3060	—	–407.430	—	—	—	—
	in 5 000 H_2O		183.3060	—	–407.781	—	—	—	—
$CdCl_2$	in 10 000 H_2O		183.3060	—	–408.392	—	—	—	—
	in 50 000 H_2O		183.3060	—	–409.522	—	—	—	—
	in 100 000 H_2O		183.3060	—	–409.747	—	—	—	—
	in ∞ H_2O		183.3060	—	–410.20	—	—	—	—
$CdCl_2 \cdot H_2O$		cr	201.3214	—	–688.44	–586.975	—	167.8	—
$CdCl_2 \cdot 2.5H_2O$		cr	228.3445	—	–1131.94	–943.939	—	227.2	—
$CdCl_3^-$		ao	218.7590	—	–561.1	–487.0	—	202.9	—
$Cd(ClO_4)_2$		ai	311.3012	—	–334.55	–94.65	—	290.8	—
	in 6.7 H_2O		311.3012	—	–320.5	—	—	—	—
	in 10 H_2O		311.3012	—	–327.6	—	—	—	—
$Cd(ClO_4)_2$	in 20 H_2O		311.3012	—	–331.4	—	—	—	—
	in 30 H_2O		311.3012	—	–332.6	—	—	—	—
	in 50 H_2O		311.3012	—	–333.9	—	—	—	—
	in 100 H_2O		311.3012	—	–334.3	—	—	—	—
	in 1 000 H_2O		311.3012	—	–334.3	—	—	—	—
$Cd(ClO_4)_2 \cdot 6H_2O$		cr	419.3936	—	–2052.7	—	—	—	—
$CdCl_2 \cdot 2HCl \cdot 7H_2O$		cr	382.3358	—	–2739.7	—	—	—	—
$Cd(OH)Cl$		cr	164.8604	—	–497.9	–425.9	—	88.	—

Table 34:**Cd** **CADMIUM** (Prepared 1967) — Continued Table 34:**Cd**

Substance Formula	Description	State	Molar mass g mol⁻¹	0 K: $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar): $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
Cd(OH)Cl		ao	164.8604	—	—	-403.7	—	—	—
$CdBr^+$		ao	192.3090	—	-200.8	-193.94	—	39.7	—
$CdBr_2$		cr	272.2180	-303.152	-316.18	-296.31	17.719	137.2	76.65
		ai	272.2180	—	-318.99	-285.52	—	91.6	—
		ao	272.2180	—	—	-302.1	—	—	—
$CdBr_2$	in 13.45 H_2O		272.2180	—	-319.557	—	—	—	—
	in 100 H_2O		272.2180	—	-319.068	—	—	—	—
	in 200 H_2O		272.2180	—	-319.210	—	—	—	—
	in 400 H_2O		272.2180	—	-319.373	—	—	—	—
	in 500 H_2O		272.2180	—	-319.423	—	—	—	—
$CdBr_2$	in 800 H_2O		272.2180	—	-319.532	—	—	—	—
	in 1 000 H_2O		272.2180	—	-319.557	—	—	—	—
	in 2 000 H_2O		272.2180	—	-319.545	—	—	—	—
	in 5 000 H_2O		272.2180	—	-319.390	—	—	—	—
	in 10 000 H_2O		272.2180	—	-319.277	—	—	—	—
$CdBr_2$	in 20 000 H_2O		272.2180	—	-319.143	—	—	—	—
	in 50 000 H_2O		272.2180	—	-319.030	—	—	—	—
	in 100 000 H_2O		272.2180	—	-318.984	—	—	—	—
	in 500 000 H_2O		272.2180	—	-318.959	—	—	—	—
	in ∞ H_2O		272.2180	—	-318.99	—	—	—	—
$CdBr_2{\cdot}4H_2O$		cr	344.2796	—	-1492.56	-1247.837	—	316.3	—
$CdBr_3^-$		ao	352.1270	—	—	-407.5	—	—	—
CdBrOH		cr	209.3164	—	-454.8	—	—	—	—
CdI^+		ao	239.3044	—	-141.0	-141.4	—	43.1	—
CdI_2		cr	366.2088	-203.01	-203.3	-201.38	19.100	161.1	79.96
CdI_2		ai	366.2088	—	-186.27	-180.75	—	149.4	—
		ao	366.2088	—	—	-201.3	—	—	—
	in 400 H_2O		366.2088	—	-198.008	—	—	—	—
	in 500 H_2O		366.2088	—	-197.493	—	—	—	—
	in 800 H_2O		366.2088	—	-196.564	—	—	—	—
CdI_2	in 1 000 H_2O		366.2088	—	-196.125	—	—	—	—
	in 2 000 H_2O		366.2088	—	-194.682	—	—	—	—
	in 5 000 H_2O		366.2088	—	-192.841	—	—	—	—
	in 10 000 H_2O		366.2088	—	-191.230	—	—	—	—
	in 20 000 H_2O		366.2088	—	-190.004	—	—	—	—
CdI_2	in 50 000 H_2O		366.2088	—	-188.560	—	—	—	—
	in 100 000 H_2O		366.2088	—	-187.724	—	—	—	—
	in 500 000 H_2O		366.2088	—	-186.690	—	—	—	—
	in ∞ H_2O		366.2088	—	-186.27	—	—	—	—
	in CH_3OH:u		366.2088	—	-233.5	—	—	—	—
CdI_2	in C_2H_5OH:u		366.2088	—	-223.8	—	—	—	—
CdI_3^-		ao	493.1132	—	—	-259.4	—	—	—
CdI_4^{2-}		ao	620.0176	—	-341.8	-315.9	—	326.	—
$Cd(IO_3)_2$		cr	462.2052	—	—	-377.01	—	—	—
		ai	462.2052	—	-518.4	-333.4	—	163.6	—
CdIOH		cr	256.3118	—	-375.7	—	—	—	—
CdS		cr	144.4640	—	-161.9	-156.5	—	64.9	—
$CdSO_4$		cr	208.4616	-923.492	-933.28	-822.72	18.217	123.039	99.58
		ai	208.4616	—	-985.16	-822.13	—	-53.1	—
	in 15 H_2O		208.4616	—	-972.24	—	—	—	—

Table 34:**Cd** **CADMIUM** (Prepared 1967) — Continued Table 34:**Cd**

Substance Formula and Description		State	Molar mass g mol⁻¹	0 K $\Delta_f H_0^\circ$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H_0^\circ$	S° J mol⁻¹ K⁻¹	C_p
$CdSO_4$	in 20 H_2O		208.4616	—	-974.33	—	—	—	—
	in 30 H_2O		208.4616	—	-976.00	—	—	—	—
	in 50 H_2O		208.4616	—	-976.92	—	—	—	—
	in 75 H_2O		208.4616	—	-977.55	—	—	—	—
	in 100 H_2O		208.4616	—	-977.88	—	—	—	—
$CdSO_4$	in 150 H_2O		208.4616	—	-978.30	—	—	—	—
	in 200 H_2O		208.4616	—	-978.55	—	—	—	—
	in 400 H_2O		208.4616	—	-979.223	—	—	—	—
	in 500 H_2O		208.4616	—	-979.449	—	—	—	—
	in 800 H_2O		208.4616	—	-979.884	—	—	—	—
$CdSO_4$	in 1 000 H_2O		208.4616	—	-980.495	—	—	—	—
	in 2 000 H_2O		208.4616	—	-980.721	—	—	—	—
	in 3 000 H_2O		208.4616	—	-981.119	—	—	—	—
	in 5 000 H_2O		208.4616	—	-981.675	—	—	—	—
	in 7 000 H_2O		208.4616	—	-982.052	—	—	—	—
$CdSO_4$	in 10 000 H_2O		208.4616	—	-982.428	—	—	—	—
	in 20 000 H_2O		208.4616	—	-983.123	—	—	—	—
	in 50 000 H_2O		208.4616	—	-983.859	—	—	—	—
	in 100 000 H_2O		208.4616	—	-984.286	—	—	—	—
	in 500 000 H_2O		208.4616	—	-984.863	—	—	—	—
$CdSO_4$	in ∞ H_2O		208.4616	—	-985.16	—	—	—	—
$CdSO_4 \cdot H_2O$		cr	226.4770	-1222.092	-1239.55	-1068.73	23.355	154.030	134.56
$CdSO_4 \cdot 8/3H_2O$		cr	256.5026	-1702.721	-1729.4	-1465.141	35.551	229.630	213.26
CdS_2O_6	in 800 H_2O		272.5244	—	-1272.8	—	—	—	—
$CdSO_4 \cdot 2.5H_2SO_4$		cr	453.6556	—	-3220.0	—	—	—	—
$CdSO_4 \cdot 2Cd(OH)_2$		cr	501.2912	—	—	-1797.3	—	—	—
$(CdSO_4)_2 \cdot Cd(OH)_2$		cr	563.3380	—	—	-2157.9	—	—	—
CdSe		cr	191.3600	—	—	—	—	—	—
$CdSeO_3$		cr	239.3582	—	-575.3	-497.8	—	142.3	—
		ai	239.3582	—	-584.9	-447.2	—	-60.2	—
$CdSeO_4$		cr	255.3576	—	-633.0	-531.7	—	164.4	—
		ai	255.3576	—	-674.9	-518.8	—	-19.2	—
	in 1 200 H_2O		255.3576	—	-680.3	—	—	—	—
$CdSeO_4 \cdot H_2O$		cr	273.3730	—	-942.2	—	—	—	—
CdTe		cr	240.0000	—	-92.5	-92.0	—	100.	—
CdN_3^+		ao	154.4201	—	—	262.0	—	—	—
$Cd(N_3)_2$		cr	196.4402	—	452.	—	—	—	—
		ai	196.4402	—	474.38	618.9	—	142.7	—
		ao	196.4402	—	—	604.7	—	—	—
$Cd(N_3)_3^-$		ao	238.4603	—	—	949.1	—	—	—
$Cd(N_3)_4^{2-}$		ao	280.4804	—	—	1295.2	—	—	—
Cd_3N_2		cr	365.2134	—	161.9	—	—	—	—
$CdNO_2^+$		ao	158.4055	—	—	-123.4	—	—	—
$Cd(NO_3)_2$		cr	236.4098	—	-456.31	—	—	—	—
		ai	236.4098	—	-490.62	-300.11	—	219.7	—
$Cd(NO_3)_2$	in 2.5 H_2O		236.4098	—	-467.31	—	—	—	—
	in 3.0 H_2O		236.4098	—	-470.16	—	—	—	—
	in 3.5 H_2O		236.4098	—	-472.67	—	—	—	—
	in 4.0 H_2O		236.4098	—	-474.76	—	—	—	—
	in 4.5 H_2O		236.4098	—	-476.43	—	—	—	—

Table 34:**Cd** — **CADMIUM** (Prepared 1967) — Continued — Table 34:**Cd**

Substance Formula	Description	State	Molar mass g mol⁻¹	0 K: $\Delta_f H_0^\circ$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar): $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H_0^\circ$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
$Cd(NO_3)_2$	in 5.0 H_2O		236.4098	—	-477.77	—	—	—	—
	in 6 H_2O		236.4098	—	-480.20	—	—	—	—
	in 7 H_2O		236.4098	—	-481.58	—	—	—	—
	in 8 H_2O		236.4098	—	-482.83	—	—	—	—
	in 9 H_2O		236.4098	—	-483.80	—	—	—	—
$Cd(NO_3)_2$	in 10 H_2O		236.4098	—	-484.51	—	—	—	—
	in 12 H_2O		236.4098	—	-485.60	—	—	—	—
	in 15 H_2O		236.4098	—	-486.56	—	—	—	—
	in 20 H_2O		236.4098	—	-487.377	—	—	—	—
	in 25 H_2O		236.4098	—	-488.160	—	—	—	—
$Cd(NO_3)_2$	in 50 H_2O		236.4098	—	-488.377	—	—	—	—
	in 100 H_2O		236.4098	—	-488.620	—	—	—	—
	in 200 H_2O		236.4098	—	-488.750	—	—	—	—
	in 400 H_2O		236.4098	—	-488.86	—	—	—	—
	in 500 H_2O		236.4098	—	-488.884	—	—	—	—
$Cd(NO_3)_2$	in 1 000 H_2O		236.4098	—	-488.959	—	—	—	—
	in 2 000 H_2O		236.4098	—	-489.001	—	—	—	—
	in 5 000 H_2O		236.4098	—	-489.055	—	—	—	—
	in 10 000 H_2O		236.4098	—	-489.093	—	—	—	—
	in ∞ H_2O		236.4098	—	-490.62	—	—	—	—
$Cd(NO_3)_2 \cdot 2H_2O$		cr	272.4406	—	-1055.62	—	—	—	—
$Cd(NO_3)_2 \cdot 4H_2O$		cr	308.4714	—	-1648.96	—	—	—	—
$Cd(NH_3)^{2+}$		ao	129.4307	—	—	-118.8	—	—	—
$Cd(NH_2)_2$		cr	144.4454	—	-57.7	—	—	—	—
$Cd(N_2H_4)^{2+}$		ao	144.4454	—	—	37.3	—	—	—
$Cd(NH_3)_2^{2+}$		ao	146.4614	—	-266.1	-158.9	—	144.8	—
$Cd(N_2H_4)_2^{2+}$		ao	176.4908	—	—	164.6	—	—	—
$Cd(NH_3)_4^{2+}$		ao	180.5228	—	-450.2	-226.1	—	336.4	—
$Cd(N_2H_4)_3^{2+}$		ao	208.5362	—	—	290.6	—	—	—
$Cd(N_2H_4)_4^{2+}$		ao	240.5816	—	—	412.5	—	—	—
$Cd(NH_3)(NO_3)_2$		aq	253.4405	—	-582.8	—	—	—	—
$Cd(NH_3)_2(NO_3)_2$		aq	270.4712	—	-677.4	—	—	—	—
$Cd(NH_3)_3(NO_3)_2$		aq	287.5019	—	-771.5	—	—	—	—
$Cd(NH_3)_4(NO_3)_2$		aq	304.5326	—	-866.1	—	—	—	—
$Cd(NH_3)_5(NO_3)_2$		aq	321.5633	—	-960.6	—	—	—	—
$Cd(NH_3)_6(NO_3)_2$		aq	338.5940	—	-1055.2	—	—	—	—
$CdCl_2 \cdot NH_3$		cr	200.3367	—	-519.	—	—	—	—
$CdCl_2 \cdot NH_4Cl \cdot 0.5H_2O$		cr	245.8054	—	-868.6	—	—	—	—
$CdCl_2 \cdot 2NH_3$		cr	217.3674	—	-636.0	-443.8	—	213.	—
$CdCl_2 \cdot 4NH_3$		cr	251.4288	—	-817.6	-485.9	—	331.	—
$CdCl_2 \cdot 4NH_4Cl$		cr	397.2728	—	-1653.5	—	—	—	—
$CdCl_2 \cdot 6NH_3$		cr	285.4902	—	-995.4	-527.6	—	456.9	—
$CdCl_2 \cdot 10NH_3$		cr	353.6130	—	-1300.4	—	—	—	—
$CdBr_2 \cdot NH_3$		cr	289.2487	—	-432.2	—	—	—	—
$CdBr_2 \cdot NH_4Br \cdot 0.5H_2O$		cr	379.1734	—	-720.1	—	—	—	—
$CdBr_2 \cdot 2NH_3$		cr	306.2794	—	-550.2	—	—	—	—
$CdBr_2 \cdot 6NH_3$		cr	374.4022	—	-913.8	—	—	—	—
$CdBr_2 \cdot 12NH_3$		cr	476.5864	—	-1376.1	—	—	—	—
$CdI_2 \cdot NH_4I \cdot 0.5H_2O$		cr	520.1596	—	-561.5	—	—	—	—
$CdI_2 \cdot 2NH_3$		cr	400.2702	—	-435.1	—	—	—	—

Substance Formula and Description	State	Molar mass g mol⁻¹	0 K	298.15 K (25°C) and 0.1 MPa (1 bar)				
			$\Delta_f H_0^\circ$ kJ mol^{-1}	$\Delta_f H^\circ$	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H_0^\circ$	S° J mol^{-1} K^{-1}	C_p
$CdI_2 \cdot 6NH_3$	cr	468.3930	—	-723.8	—	—	—	—
$(NH_4)_2Cd_2(SO_4)_3$	cr	549.0622	—	—	—	72.300	485.72	393.3
Cd_3P_2	cr	399.1476	—	-114.6	—	—	—	—
$CdP_2O_7^{2-}$	ao	286.3434	—	—	-2046.2	—	—	—
$Cd_3(PO_4)_2$	cr	527.1428	—	—	-2456.3	—	—	—
$CdAs_2$	cr	262.2432	—	-17.6	—	—	—	—
Cd_3As_2	cr	487.0432	—	-41.8	—	—	—	—
$Cd_3(AsO_4)_2$	cr	615.0384	—	—	-1716.1	—	—	—
CdSb	cr	234.1500	—	-14.39	-13.01	—	92.9	—
Cd_3Sb_2	cr	580.7000	—	-58.2	—	—	—	—
$CdCO_3$	cr	172.4094	—	-750.6	-669.4	—	92.5	—
CdC_2O_4 oxalate	cr	200.4200	—	-912.5	—	—	—	—
	ai	200.4200	—	-900.8	-751.4	—	-27.6	—
	ao	200.4200	—	—	-774.4	—	—	—
$CdC_2O_4 \cdot 3H_2O$	cr	254.4662	—	—	-1507.7	—	—	—
$Cd(C_2O_4)_2^{2-}$	ao	288.4400	—	—	-1458.4	—	—	—
$Cd_2C_2O_4^{2+}$	ao	312.8200	—	—	-860.2	—	—	—
CH_3Cd^+	g	127.4352	—	895.	—	—	—	—
$Cd(CH_3)_2$	l	142.4704	—	63.6	139.0	—	201.88	132.01
	g	142.4704	—	101.55	146.88	—	303.0	—
$(CH_3)_2Cd^+$	g	142.4704	—	933.9	—	—	—	—
$Cd(CHO_2)^+$	ao	157.4180	—	—	-435.9	—	—	—
$Cd(CHO_2)_2$ formate	ai	202.4360	—	-927.01	-779.09	—	109.	—
	ao	202.4360	—	—	-789.8	—	—	—
$Cd(CH_3CO_2)^+$ acetate	ao	171.4452	—	—	-456.8	—	—	—
$Cd(CHO_2)_3^-$	ao	247.4540	—	—	-1141.2	—	—	—
$Cd(CHO_2)_4^{2-}$	ao	292.4720	—	—	-1489.	—	—	—
$Cd(CH_3CO_2)_2$	ai	230.4904	—	-1047.92	-816.22	—	100.0	—
	ao	230.4904	—	—	-828.3	—	—	—
$Cd(CH_3CO_2)_3^-$	ao	289.5356	—	—	-1200.1	—	—	—
$Cd(CH_3CO_2)_4^{2-}$	ao	348.5808	—	—	-1567.0	—	—	—
$CdCN^+$	ao	138.4179	—	—	64.4	—	—	—
$Cd(CN)_2$	cr	164.4358	—	162.3	—	—	—	—
	ai	164.4358	—	225.5	267.4	—	115.1	—
	ao	164.4358	—	—	208.0	—	—	—
$Cd(CN)_2$ in 600 H_2O		164.4358	—	169.0	—	—	—	—
$Cd(CN)_3^-$	ao	190.4537	—	—	354.9	—	—	—
$Cd(CN)_4^{2-}$	ao	216.4716	—	428.0	507.6	—	322.	—
$Cd(ONC)_2$ cadmium fulminate	cr	196.4346	—	377.	—	—	—	—
$(Cd(CN)_2)_2 \cdot CdO \cdot 5H_2O$	cr	547.3480	—	-1500.4	—	—	—	—
$Cd(NH_2CH_3)^{2+}$ methylamine	ao	143.4579	—	—	-72.7	—	—	—
$Cd(NH_2CH_2CH_2NH_2)^{2+}$ ethylenediamine	ao	172.4998	—	-161.1	—	—	—	—
$Cd(NH_2CH_3)_2^{2+}$	ao	174.5158	—	-245.6	-63.4	—	167.4	—
$Cd(NH_2CH_3)_3^{2+}$	ao	205.5737	—	—	-49.1	—	—	—
$Cd(NH_2CH_2CH_2NH_2)_2^{2+}$	ao	232.5996	—	-243.5	—	—	—	—
$Cd(NH_2CH_3)_4^{2+}$	ao	236.6316	—	-413.8	-31.9	—	353.5	—
$Cd(NH_2CH_2CH_2NH_2)_3^{2+}$	ao	292.6994	—	-325.5	—	—	—	—
$Cd(NH_2CH_2COO)^+$ glycinate	ao	186.4599	—	—	-365.6	—	—	—
$Cd(NH_2CH_2COO)_2$	ao	260.5198	—	—	-657.5	—	—	—
$Cd(NH_2CH_2CH_2NH_2)_3Cl_2$	cr	363.6054	—	-702.16	—	—	—	—

Table 34:**Cd** **CADMIUM** (Prepared 1967) — Continued Table 34:**Cd**

Substance Formula and Description	State	Molar mass g mol^{-1}	0 K $\Delta_f H^\circ_0$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H^\circ_0$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
$Cd(NH_2CH_2CH_2NH_2)_3Cl_2$	aq	363.6054	—	-653.79	—	—	—	—
$Cd(NH_2CH_2CH_2NH_2)_3Br_2$	cr	452.5174	—	-618.94	—	—	—	—
	aq	452.5174	—	-564.88	—	—	—	—
$CdCNS^+$	ao	170.4819	—	—	7.5	—	—	—
$Cd(CNS)_2$	cr	228.5638	—	52.01	—	—	—	—
$Cd(CNS)_2$	ai	228.5638	—	76.99	107.81	—	215.1	—
	ao	228.5638	—	—	97.1	—	—	—
$Cd(CNS)_3^-$	ao	286.6457	—	—	189.6	—	—	—
$(Cd((NH_2)_2CS)_3)^{2+}$ thiourea	aq	340.7618	—	-341.0	—	—	—	—
$Cd((NH_2)_2CS)_3(NO_3)_2$	aq	464.7716	—	-755.6	—	—	—	—
$CdSiO_3$	cr	188.4842	—	-1189.09	-1105.36	—	97.5	88.58
$(CdI_2)_2 \cdot PbI_2$	cr	1193.4164	—	-535.6	—	—	—	—
$Cd(BO_2)_2$	cr	198.0196	—	—	-1484.71	—	—	—

Table 35:**Hg** | **MERCURY** (Prepared 1967) | Table 35:**Hg**

Substance Formula	and Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
Hg		cr	200.5900	0	—	—	—	—	—
		l	200.5900	—	0	0	9.343	76.02	27.983
		g	200.5900	64.463	61.317	31.820	6.197	174.96	20.786
		ao	200.5900	—	37.7	39.3	—	71.	—
Hg^+		g	200.5900	1071.52	1074.58	—	6.197	—	—
Hg^{2+}		g	200.5900	2881.23	2890.47	—	6.197	—	—
Hg^{3+}		g	200.5900	6184.	6192.	—	6.197	—	—
Hg^{2+}		ao	200.5900	—	171.1	164.40	—	-32.2	—
Hg_2		g	401.1800	116.3	108.8	68.2	10.96	288.05	37.40
Hg_2^+		g	401.1800	1023.4	1022.2	—	—	—	—
Hg_2^{2+}		ao	401.1800	—	172.4	153.52	—	84.5	—
HgO	red, orthorhombic	cr	216.5894	—	-90.83	-58.539	—	70.29	44.06
	yellow	cr2	216.5894	—	-90.46	-58.409	—	71.1	—
	hexagonal	cr3	216.5894	—	-89.5	-58.22	—	73.6	—
		g	216.5894	—	—	—	9.29	241.9	34.10
HgH		g	201.5980	244.18	239.32	216.00	8.694	219.60	29.96
$HgOH^+$		ao	217.5974	—	-84.5	-52.3	—	71.	—
$HHgO_2^-$		ao	233.5968	—	—	-190.3	—	—	—
$Hg(OH)_2$		ao	234.6048	—	-355.2	-274.8	—	142.	—
HgF		g	219.5884	8.	4.2	-17.2	9.29	248.56	34.56
HgF^+		ao	219.5884	—	-158.2	-123.4	—	-4.	—
Hg_2F_2		cr	439.1768	—	—	-435.5	—	—	—
HgCl		g	236.0430	88.	84.1	62.7	9.83	259.89	36.32
$HgCl^+$		ao	236.0430	—	-18.8	-5.4	—	75.	—
$HgCl_2$		cr	271.4960	—	-224.3	-178.6	—	146.0	—
$HgCl_2$		ao	271.4960	—	-216.3	-173.2	—	155.	—
	in 200 C_5H_5N in pyridine		271.4960	—	-280.3	—	—	—	—
	in CH_3OH:u		271.4960	—	-227.23	—	—	—	—
	in C_2H_5OH:u		271.4960	—	-224.43	—	—	—	—
$HgCl_3^-$		ao	306.9490	—	-388.7	-309.1	—	209.	—
$HgCl_4^{2-}$		ao	342.4020	—	-554.0	-446.8	—	293.	—
Hg_2Cl_2		cr	472.0860	—	-265.22	-210.745	—	192.5	—
$HgBr^+$		ao	280.4990	—	6.3	8.8	—	79.	—
$HgBr_2$		cr	360.4080	—	-170.7	-153.1	—	172.	—
		ao	360.4080	—	-160.7	-143.1	—	172.	—
$HgBr_2$	in CH_3OH:u		360.4080	—	-172.42	—	—	—	—
	in C_2H_5OH:u		360.4080	—	-172.17	—	—	—	—
$HgBr_3^-$		ao	440.3170	—	-293.3	-259.4	—	259.	—
$HgBr_4^{2-}$		ao	520.2260	—	-431.0	-371.1	—	310.	—
Hg_2Br_2		cr	560.9980	—	-206.90	-181.075	—	218.	—
$HgBr_2 \cdot HgO$		cr	576.9974	—	-275.3	—	—	—	—
$HgBr_2 \cdot 2HgO$		cr	793.5868	—	-370.7	—	—	—	—
$HgBr_2 \cdot 3HgO$		cr	1010.1762	—	-469.4	—	—	—	—
$HgBr_2 \cdot 4HgO$		cr	1226.7656	—	-566.1	—	—	—	—
HgBrCl		g	315.9520	—	—	—	14.460	299.47	59.25
HgBrCl		ao	315.9520	—	-190.4	-161.9	—	167.	—
HgI		g	327.4944	137.7	132.38	88.42	10.652	281.53	37.61
HgI^+		ao	327.4944	—	43.1	39.7	—	79.	—
HgI_2	red	cr	454.3988	—	-105.4	-101.7	—	180.	—
	yellow	cr2	454.3988	—	-102.9	—	—	—	—

Table 35:**Hg** **MERCURY** (Prepared 1967) — Continued Table 35:**Hg**

Substance Formula and Description		State	Molar mass g mol⁻¹	0 K $\Delta_f H_0^\circ$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H_0^\circ$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
HgI_2		g	454.3988	-10.88	-17.2	-59.9	16.23	336.13	61.09
		ao	454.3988	—	-79.5	-75.3	—	176.	—
	in 200 C_5H_5N in pyridine		454.3988	—	-147.3	—	—	—	—
	in CH_3OH:u		454.3988	—	-97.70	—	—	—	—
HgI_3^-		ao	581.3032	—	-152.7	-148.5	—	301.	—
HgI_4^{2-}		ao	708.2076	—	-235.1	-211.7	—	360.	—
Hg_2I_2		cr	654.9888	—	-121.34	-111.00	—	233.5	—
$HgICl$		ao	362.9474	—	-147.3	-128.9	—	176.	—
$HgBrI$		g	407.4034	—	—	—	15.552	320.56	60.84
		ao	407.4034	—	-117.6	-111.7	—	192.	—
$HgIBr_3^{2-}$		ao	567.2214	—	—	-336.95	—	—	—
$HgI_2Br_2^{2-}$		ao	614.2168	—	—	-297.66	—	—	—
HgI_3Br^{2-}		ao	661.2122	—	—	-256.0	—	—	—
HgS	red	cr	232.6540	—	-58.2	-50.6	—	82.4	48.41
	black	cr2	232.6540	—	-53.6	-47.7	—	88.3	—
HgS		g	232.6540	—	—	—	9.92	254.75	—
HgS_2^{2-}		ao	264.7180	—	—	41.9	—	—	—
$HgSO_4$		cr	296.6516	—	-707.5	—	—	—	—
		ao	296.6516	—	—	-588.2	—	—	—
Hg_2SO_4		cr	497.2416	—	-743.12	-625.815	—	200.66	131.96
$HgSO_4{\cdot}2HgO$		cr	729.8304	—	-933.0	—	—	—	—
$Hg(HS)_2$		ao	266.7340	—	—	-26.7	—	—	—
$HgSe$		cr	279.5500	—	-46.	—	—	—	—
		g	279.5500	71.	75.7	31.3	10.29	267.13	36.8
$HgSeO_3$		cr	327.5482	—	—	-284.5	—	—	—
Hg_2SeO_3		cr	528.1382	—	—	-297.4	—	—	—
$HgTe$		cr	328.1900	—	-42.	—	—	—	—
		g	328.1900	—	—	—	10.50	275.12	—
$Hg_2(N_3)_2$		cr	485.2202	—	594.1	746.5	—	205.	—
$Hg(NO_3)_2$	in 400 H_2O		324.5998	—	-244.3	—	—	—	—
$Hg(NO_3)_2{\cdot}0.5H_2O$		cr	333.6075	—	-392.5	—	—	—	—
$Hg_2(NO_3)_2$	in 400 H_2O		525.1898	—	-246.0	—	—	—	—
$Hg_2(NO_3)_2{\cdot}2H_2O$		cr	561.2206	—	-868.2	—	—	—	—
$Hg(NO_3)_2{\cdot}2HgO{\cdot}H_2O$		cr	775.7940	—	-750.6	—	—	—	—
$(Hg_2N)_2O$	Millon's oxide	cr	846.3728	—	318.8	—	—	—	—
$(Hg_2N)_2O{\cdot}H_2O$		cr	864.3882	—	20.5	—	—	—	—
$(Hg_2N)_2O{\cdot}4H_2O$		cr	918.4344	—	-869.9	—	—	—	—
$Hg(NH_3)_2^{2+}$		ao	234.6514	—	-93.7	10.6	—	180.	—
$Hg(NH_3)_3^{2+}$		ao	251.6821	—	-187.4	-21.6	—	264.	—
$Hg(NH_3)_4^{2+}$		ao	268.7128	—	-282.8	-51.7	—	335.	—
$(NHg_2Cl)_2{\cdot}H_2O$		cr	919.2948	—	-233.9	—	—	—	—
$(NHg_2Cl)_2{\cdot}2H_2O$		cr	937.3102	—	-530.9	—	—	—	—
$(NHg_2Cl)_2{\cdot}HgCl_2$		cr	1172.7754	—	-207.1	—	—	—	—
$HgCl_2{\cdot}NOCl$		cr	336.9551	—	—	-109.	—	—	—
$HgCl_2{\cdot}2/3NH_3$		cr	282.8498	—	-310.0	—	—	—	—
$HgCl_2{\cdot}2NH_3$		cr	305.5574	—	-461.1	—	—	—	—
$HgCl_2{\cdot}8NH_3$		cr	407.7416	—	-951.0	—	—	—	—
$HgCl_2{\cdot}9.5NH_3$		cr	433.2876	—	-1065.7	—	—	—	—
$NHg_2Cl{\cdot}NH_4Cl$		cr	504.1314	—	-307.5	—	—	—	—
$Hg_2Cl_2{\cdot}2NH_3$		cr	506.1474	—	-477.0	—	—	—	—

Table 35:**Hg** **MERCURY** (Prepared 1967) — Continued Table 35:**Hg**

Substance Formula and Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
$NHg_2Cl \cdot 3NH_4Cl$	cr	611.1148	—	-934.7	—	—	—	—
$(NHg_2Cl)_2 \cdot NH_3$	cr	918.3101	—	-45.2	—	—	—	—
$(NHg_2Cl)_2 \cdot 2NH_3$	cr	935.3408	—	-112.5	—	—	—	—
NHg_2Br	cr	495.0957	—	62.8	—	—	—	—
$(NHg_2Br)_2 \cdot HgBr_2$	cr	1350.5994	—	-90.8	—	—	—	—
$(NHg_2Br)_4 \cdot HgBr_2$	cr	2340.7907	—	16.7	—	—	—	—
$HgBr_2 \cdot 2NH_3$	cr	394.4694	—	-398.3	—	—	—	—
$HgBr_2 \cdot 8NH_3$	cr	496.6536	—	-870.7	—	—	—	—
$NHg_2Br \cdot NH_4Br$	cr	593.0434	—	-234.3	—	—	—	—
$NHg_2Br \cdot 3NH_4Br$	cr	788.9388	—	-776.6	—	—	—	—
$HgINO_3$	cr	389.4993	—	-180.	—	—	—	—
$HgI_2 \cdot 4/3NH_3$	cr	477.1064	—	-282.8	-143.4	—	25.5	—
$HgI_2 \cdot 2NH_3$	cr	488.4602	—	-300.4	-155.1	—	289.	—
$HgI_2 \cdot 6NH_3$	cr	556.5830	—	-610.9	-187.5	—	523.	—
$Hg_2P_2O_7^{2-}$	ao	575.1234	—	—	-1820.	—	—	—
$Hg_2(OH)P_2O_7^{3-}$	ao	592.1308	—	—	-2012.	—	—	—
HgC_2O_4 oxalate	cr	288.6100	—	-678.2	—	—	—	—
$Hg(C_2O_4)_2^{2-}$	ao	376.6300	—	—	-1234.1	—	—	—
Hg_2CO_3	cr	461.1894	—	-553.5	-468.1	—	180.	—
$Hg_2C_2O_4$	cr	489.2000	—	—	-593.2	—	—	—
$HgCH_3$	g	215.6252	—	167.	—	—	—	—
CH_3Hg^+	g	215.6252	938.9	929.3	—	—	—	—
$Hg(CH_3)_2$	l	230.6604	—	59.8	140.3	—	209.	—
	g	230.6604	113.26	94.39	146.1	17.95	306.	83.3
$(CH_3)_2Hg^+$	g	230.6604	991.2	978.6	—	—	—	—
$Hg(CH_3)(C_2H_5)$	l	244.6876	—	46.4	—	—	—	—
$Hg(C_2H_5)_2$	l	258.7148	—	30.1	—	—	—	—
	g	258.7148	—	75.3	—	—	—	—
in CH_3OH:u		258.7148	—	35.86	—	—	—	—
$Hg(CH_3COO)^+$ acetate	ao	259.6352	—	—	-222.5	—	—	—
$Hg(CH_3COO)_2$	cr	318.6804	—	-816.7	—	—	—	—
in 200 H_2O		318.6804	—	-801.7	—	—	—	—
$Hg_2(OH)C_2O_4^-$	ao	506.2074	—	—	-752.2	—	—	—
$Hg_2(CH_3COO)_2$	cr	519.2704	—	-835.1	-641.2	—	326.	—
$HgCH_3Cl$	cr	251.0782	—	-116.3	—	—	—	—
$HgCH_3Cl$	g	251.0782	—	-52.3	—	—	—	—
in C_2H_5OH:u		251.0782	—	-98.7	—	—	—	—
HgC_2H_5Cl	cr	265.1054	—	-139.3	—	—	—	—
	g	265.1054	—	-62.8	—	—	—	—
in CH_3OH:u		265.1054	—	-117.6	—	—	—	—
HgClCHCHCl cis–chlorovinylmercuric chloride	cr	297.5344	—	-54.4	—	—	—	—
trans–chlorovinylmercuric chloride	cr2	297.5344	—	-36.0	—	—	—	—
$HgCl_2 \cdot CH_3OH$	cr	303.5386	—	-473.2	-345.9	—	243.	—
$HgCH_3Br$	cr	295.5342	—	-85.8	—	—	—	—
	g	295.5342	—	-18.4	—	—	—	—
$HgCH_3Br$ in C_2H_5OH:u		295.5342	—	-69.0	—	—	—	—
HgC_2H_5Br	cr	309.5614	—	-106.7	—	—	—	—
	g	309.5614	—	-30.1	—	—	—	—

Table 35:**Hg** **MERCURY** (Prepared 1967) — Continued Table 35:**Hg**

Substance Formula and Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
HgC_2H_5Br in CH_3OH:u		309.5614	—	-87.4	—	—	—	—
$HgCH_3I$	cr	342.5296	—	-42.7	—	—	—	—
	g	342.5296	—	21.8	—	—	—	—
HgC_2H_5I	cr	356.5568	—	-65.7	—	—	—	—
	g	356.5568	—	13.8	—	—	—	—
HgC_2H_5I in CH_3OH:u		356.5568	—	-45.6	—	—	—	—
$HgCN^+$	ao	226.6079	—	225.5	233.9	—	84.5	—
$Hg(CN)_2$	cr	252.6258	—	263.6	—	—	—	—
	g	252.6258	—	381.	—	—	—	—
	ao	252.6258	—	278.2	312.2	—	165.3	—
$Hg(CN)_3^-$	ao	278.6437	—	397.1	463.2	—	225.1	—
$Hg(CN)_4^{2-}$	ao	304.6616	—	526.3	618.5	—	305.	—
$Hg(ONC)_2$ mercuric fulminate	cr	284.6246	—	268.	—	—	—	—
$Hg(CN)_2 \cdot HgO$	cr	469.2152	—	163.6	—	—	—	—
$(Hg(CN)_2)_3 \cdot HgO$	cr	974.4668	—	663.6	—	—	—	—
$Hg(CH_3NH_2)^{2+}$ methylamine	ao	231.6479	—	—	136.0	—	—	—
$Hg(CH_3NH_2)_2^{2+}$	ao	262.7058	—	-54.8	104.3	—	268.	—
$Hg(C_2H_4(NH_2)_2)_2^{2+}$ ethylenediamine	ao	320.7896	—	-67.4	—	—	—	—
$Hg(NH_2CH_2COO)^+$ glycinate	ao	274.6499	—	—	-209.1	—	—	—
$Hg(NH_2CH_2COO)_2$	ao	348.7098	—	-859.4	-575.1	—	268.	—
$Hg(CN)_2Cl^-$	ao	288.0788	—	—	182.5	—	—	—
$Hg(CN)_3Cl^{2-}$	ao	314.0967	—	—	335.	—	—	—
$HgClC_2H_4(NH_2)_2^+$ ethylenediamine	ao	296.1428	—	-141.0	—	—	—	—
$HgCl_2 \cdot C_2H_4(NH_2)_2$	cr	331.5958	—	-361.9	—	—	—	—
$Hg(CN)_2 \cdot NH_4Cl \cdot 0.75H_2O$	cr	319.6290	—	-268.2	—	—	—	—
$HgCl(NH_2CH_2COO)$ glycinate	ao	310.1029	—	-544.3	-376.4	—	197.	—
$Hg(CN)_3Br^{2-}$	ao	358.5527	—	—	356.	—	—	—
$HgBr_2 \cdot C_2H_4(NH_2)_2$ glycinate	cr	420.5078	—	-287.9	—	—	—	—
$Hg(CN)_2 \cdot NH_4Br \cdot H_2O$	cr	368.5889	—	-307.9	—	—	—	—
$HgI_2 \cdot C_2H_4(NH_2)_2$ ethylenediamine	cr	514.4986	—	-197.5	—	—	—	—
$Hg(CN)_2 \cdot NH_4I \cdot 0.25H_2O$	cr	402.0727	—	-40.6	—	—	—	—
$Hg(CNS)_2$	ao	316.7538	—	196.2	251.5	—	157.3	—
$Hg(CNS)_3^-$	ao	374.8357	—	—	328.5	—	—	—
$Hg(CNS)(CN)_3^{2-}$	ao	336.7256	—	—	553.2	—	—	—
$Hg(CNS)_4^{2-}$	ao	432.9176	—	326.4	411.4	—	456.	—
$Hg_2(CNS)_2$	cr	517.3438	—	—	227.6	—	—	—
$Hg((NH_2)_2CS)_4^{2+}$ thiourea	ao	505.0724	—	-274.5	—	—	—	—
$Hg(CNS)Cl$	ao	294.1249	—	—	35.2	—	—	—
$Hg(CNS)Br$	ao	338.5809	—	—	51.1	—	—	—
Hg_5Tl_2	cr	1411.6900	—	-10.5	—	—	—	—
$(Hg(CN)_2)_2 \cdot ZnCl_2 \cdot 7H_2O$	cr	767.6354	—	-1991.2	—	—	—	—
$(Hg(CN)_2)_2 \cdot ZnBr_2 \cdot 8H_2O$	cr	874.5628	—	-2220.9	—	—	—	—
$Hg(CN)_2 \cdot CdCl_2 \cdot 2H_2O$	cr	471.9626	—	-739.7	—	—	—	—
$Hg(CN)_2 \cdot CdBr_2 \cdot 3H_2O$	cr	578.8900	—	-955.6	—	—	—	—
$(Hg(CN)_2)_2 \cdot CdI_2 \cdot 8H_2O$	cr	1015.5836	—	-2038.0	—	—	—	—

Table 36:**Cu** **COPPER** (Prepared 1968) Table 36:**Cu**

Substance Formula	Substance Description	State	Molar mass g mol^{-1}	0 K: $\Delta_f H^\circ_0$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar): $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H^\circ_0$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
Cu		cr	63.5400	0	0	0	5.004	33.150	24.435
		g	63.5400	337.15	338.32	298.58	6.197	166.38	20.786
	in Hg:u, 2-phase		63.5400	—	-5.23	-0.987	—	18.91	—
Cu^+		g	63.5400	1082.618	1089.986	—	6.197	—	—
Cu^{2+}		g	63.5400	3040.51	3054.07	—	6.197	—	—
Cu^{3+}		g	63.5400	6594.4	6614.5	—	—	—	—
Cu^+		ao	63.5400	—	71.67	49.98	—	40.6	—
Cu^{2+}		ao	63.5400	—	64.77	65.49	—	-99.6	—
Cu_2		g	127.0800	484.1	484.17	431.92	9.916	241.57	36.61
Cu_2^+		g	127.0800	1238.	1243.	—	—	—	—
CuO		cr	79.5394	—	-157.3	-129.7	—	42.63	42.30
CuO_2^{2-}		ao	95.5388	—	—	-183.6	—	—	—
Cu_2O		cr	143.0794	—	-168.6	-146.0	—	93.14	63.64
CuH		cr	64.5480	—	21.3	—	—	—	—
		g	64.5480	—	293.	—	—	—	—
$HCuO_2^-$		ao	96.5468	—	—	-258.5	—	—	—
$Cu(OH)_2$		cr	97.5548	—	-449.8	—	—	—	—
		ai	97.5548	—	-395.22	-249.01	—	-120.9	—
CuF^+		ao	82.5384	—	-261.1	-220.5	—	-67.	—
CuF_2		cr	101.5368	—	-542.7	—	—	—	—
$CuF_2 \cdot 2H_2O$		cr	137.5676	—	—	-981.4	—	—	—
CuCl		cr	98.9930	—	-137.2	-119.86	—	86.2	48.5
$CuCl^+$		ao	98.9930	—	—	-68.2	—	—	—
	in $HCl+65H_2O$:u		98.9930	—	-98.7	—	—	—	—
$CuCl_2$		cr	134.4460	-220.87	-220.1	-175.7	14.983	108.07	71.88
$CuCl_2$		ao	134.4460	—	—	-197.9	—	—	—
	in 10 H_2O		134.4460	—	-245.60	—	—	—	—
	in 15 H_2O		134.4460	—	-250.50	—	—	—	—
	in 20 H_2O		134.4460	—	-253.72	—	—	—	—
	in 25 H_2O		134.4460	—	-255.73	—	—	—	—
$CuCl_2$	in 30 H_2O		134.4460	—	-257.32	—	—	—	—
	in 50 H_2O		134.4460	—	-261.08	—	—	—	—
	in 100 H_2O		134.4460	—	-264.55	—	—	—	—
	in 200 H_2O		134.4460	—	-266.90	—	—	—	—
	in 400 H_2O		134.4460	—	-269.0	—	—	—	—
$CuCl_2$	in 500 H_2O		134.4460	—	-269.53	—	—	—	—
	in 800 H_2O		134.4460	—	-270.41	—	—	—	—
	in 1 000 H_2O		134.4460	—	-270.70	—	—	—	—
	in 2 000 H_2O		134.4460	—	-270.79	—	—	—	—
	in $HCl+25H_2O$:u		134.4460	—	-254.0	—	—	—	—
$CuCl_2$	in $HCl+8.8H_2O$:u		134.4460	—	-234.3	—	—	—	—
	in 5 C_2H_5OH		134.4460	—	-233.38	—	—	—	—
	in 7 C_2H_5OH		134.4460	—	-234.43	—	—	—	—
	in 10 C_2H_5OH		134.4460	—	-236.02	—	—	—	—
	in 15 C_2H_5OH		134.4460	—	-237.15	—	—	—	—
$CuCl_2$	in 20 C_2H_5OH		134.4460	—	-237.94	—	—	—	—
	in 25 C_2H_5OH		134.4460	—	-238.53	—	—	—	—
	in 30 C_2H_5OH		134.4460	—	-238.95	—	—	—	—
	in 50 C_2H_5OH		134.4460	—	-239.66	—	—	—	—
	in 100 C_2H_5OH		134.4460	—	-240.50	—	—	—	—

Table 36:Cu — **COPPER** (Prepared 1968) — Continued — Table 36:Cu

Substance Formula and Description		State	Molar mass g mol⁻¹	0 K $\Delta_f H_0^\circ$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H_0^\circ$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
$CuCl_2$	in 200 C_2H_5OH		134.4460	—	-241.00	—	—	—	—
$CuCl_2\cdot 2H_2O$		cr	170.4768	—	-821.3	-655.9	—	167.	—
$CuCl_2^-$		ao	134.4460	—	—	-240.1	—	—	—
$CuCl_3^{2-}$		ao	169.8990	—	—	-376.	—	—	—
$Cu(ClO_3)_2$	in 1 000 H_2O		230.4424	—	-139.7	—	—	—	—
$Cu(ClO_4)_2$		ai	262.4412	—	-193.89	48.45	—	264.4	—
$Cu(ClO_4)_2\cdot 6H_2O$		cr	370.5336	—	-1928.4	—	—	—	—
Cu_2OCl_2		cr	213.9854	—	-377.	—	—	—	—
$CuCl_2\cdot 3CuO$		cr	373.0642	—	-686.2	—	—	—	—
$CuCl_2\cdot 3CuO\cdot 4H_2O$		cr	445.1258	—	-1920.5	—	—	—	—
$CuCl_2\cdot 3Cu(OH)_2$		cr	427.1104	—	—	-1339.5	—	—	—
CuBr		cr	143.4490	-99.41	-104.6	-100.8	12.104	96.11	54.73
$CuBr^+$		ao	143.4490	—	—	-49.8	—	—	—
$CuBr_2$		cr	223.3580	—	-141.8	—	—	—	—
	in 400 H_2O		223.3580	—	-177.8	—	—	—	—
$CuBr_2\cdot 4H_2O$		cr	295.4196	—	-1326.3	—	—	—	—
$CuBr_2\cdot 3Cu(OH)_2$		cr	516.0224	—	-1582.0	-1280.9	—	285.	—
$Cu(BrO_3)_2\cdot 3Cu(OH)_2$		cr	612.0188	—	—	-1021.4	—	—	—
CuI		cr	190.4444	—	-67.8	-69.5	—	96.7	54.06
$Cu(IO_3)_2$		ai	413.3452	—	-377.8	-190.3	—	137.2	—
$Cu(IO_3)_2\cdot H_2O$		cr	431.3606	—	-692.0	-468.5	—	247.3	—
$Cu(IO_3)_2\cdot 3Cu(OH)_2$		cr	706.0096	—	—	-669.1	—	—	—
CuS		cr	95.6040	—	-53.1	-53.6	—	66.5	47.82
Cu_2S	α	cr	159.1440	—	-79.5	-86.2	—	120.9	76.32
$CuSO_3^-$		ao	143.6022	—	—	-481.1	—	—	—
$CuSO_4$		cr	159.6016	—	-771.36	-661.8	—	109.	100.0
		ai	159.6016	—	-844.50	-679.04	—	-79.5	—
		ao	159.6016	—	—	-692.18	—	—	—
	in 40 H_2O		159.6016	—	-837.582	—	—	—	—
	in 50 H_2O		159.6016	—	-837.988	—	—	—	—
$CuSO_4$	in 100 H_2O		159.6016	—	-838.365	—	—	—	—
	in 150 H_2O		159.6016	—	-838.633	—	—	—	—
	in 200 H_2O		159.6016	—	-838.808	—	—	—	—
	in 300 H_2O		159.6016	—	-839.043	—	—	—	—
	in 400 H_2O		159.6016	—	-839.23	—	—	—	—
$CuSO_4$	in 500 H_2O		159.6016	—	-839.390	—	—	—	—
	in 700 H_2O		159.6016	—	-839.662	—	—	—	—
	in 1 000 H_2O		159.6016	—	-839.980	—	—	—	—
	in 1 500 H_2O		159.6016	—	-840.428	—	—	—	—
	in 2 000 H_2O		159.6016	—	-840.607	—	—	—	—
$CuSO_4$	in 3 000 H_2O		159.6016	—	-840.967	—	—	—	—
	in 4 000 H_2O		159.6016	—	-841.227	—	—	—	—
	in 5 000 H_2O		159.6016	—	-841.432	—	—	—	—
	in 7 000 H_2O		159.6016	—	-841.737	—	—	—	—
	in 10 000 H_2O		159.6016	—	-842.047	—	—	—	—
$CuSO_4$	in 15 000 H_2O		159.6016	—	-842.398	—	—	—	—
	in 20 000 H_2O		159.6016	—	-842.557	—	—	—	—
	in 30 000 H_2O		159.6016	—	-842.959	—	—	—	—
	in 50 000 H_2O		159.6016	—	-843.310	—	—	—	—
	in 100 000 H_2O		159.6016	—	-843.670	—	—	—	—

Table 36:**Cu** **COPPER** (Prepared 1968) — Continued Table 36:**Cu**

Substance Formula	Substance Description	State	Molar mass g mol^{-1}	0 K: $\Delta_f H^\circ_0$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar): $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H^\circ_0$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
$CuSO_4$	in 200 000 H_2O		159.6016	—	-843.913	—	—	—	—
	in 500 000 H_2O		159.6016	—	-844.097	—	—	—	—
	in ∞ H_2O		159.6016	—	-844.50	—	—	—	—
$CuSO_4 \cdot H_2O$		cr	177.6170	—	-1085.83	-918.11	—	146.0	134.
$CuSO_4 \cdot 3H_2O$		cr	213.6478	—	-1684.31	-1399.96	—	221.3	205.
$CuSO_4 \cdot 5H_2O$		cr	249.6786	—	-2279.65	-1879.745	—	300.4	280.
CuS_2O_6		ai	223.6644	—	-1133.4	—	—	—	—
$Cu(SO_3)_2^{3-}$		ao	223.6644	—	—	-972.2	—	—	—
$CuS_2O_6 \cdot 5H_2O$		cr	313.7414	—	-2583.2	—	—	—	—
$Cu(SO_3)_3^{5-}$		ao	303.7266	—	—	-1462.9	—	—	—
Cu_2SO_3		ai	207.1422	—	-492.0	-386.6	—	50.	—
Cu_2SO_4		cr	223.1416	—	-751.4	—	—	—	—
$CuO \cdot CuSO_4$		cr	239.1410	—	-936.4	—	—	—	—
$CuSO_4 \cdot 2Cu(OH)_2$	antlerite	cr	354.7112	—	—	-1446.6	—	—	—
$CuSO_4 \cdot 3Cu(OH)_2$	brochantite	cr	452.2660	—	—	-1817.7	—	—	—
$CuSO_4 \cdot 3Cu(OH)_2 \cdot H_2O$	langite	cr	470.2814	—	-2485.	-2044.0	—	335.	—
$CuSe$		cr	142.5000	—	-39.54	—	—	—	—
$CuSe_2$		cr	221.4600	—	-43.1	—	—	—	—
Cu_2Se		cr	206.0400	—	-59.4	—	—	—	—
$CuSeO_3$		cr	190.4982	—	—	-348.1	—	—	—
$CuSeO_3$		ai	190.4982	—	-444.3	-304.1	—	-86.6	—
$CuSeO_4$		cr	206.4976	—	-478.48	—	—	—	—
	in 700 H_2O		206.4976	—	-533.5	—	—	—	—
$CuSeO_4 \cdot 5H_2O$		cr	296.5746	—	-1953.76	—	—	—	—
Cu_2Te		cr	254.6800	—	21.	—	—	—	—
CuN_3		cr	105.5601	—	279.1	344.8	—	100.	—
CuN_3^+		ao	105.5601	—	397.1	—	—	—	—
$Cu(N_3)_2$		cr	147.5802	—	598.3	—	—	—	—
Cu_3N		cr	204.6267	—	74.5	—	—	—	92.
$Cu(NO_3)_2$		cr	187.5498	—	-302.9	—	—	—	—
$Cu(NO_3)_2$		ai	187.5498	—	-349.95	-157.02	—	193.3	—
	in 10 H_2O		187.5498	—	-346.27	—	—	—	—
	in 12 H_2O		187.5498	—	-348.44	—	—	—	—
	in 15 H_2O		187.5498	—	-349.70	—	—	—	—
	in 25 H_2O		187.5498	—	-350.74	—	—	—	—
$Cu(NO_3)_2$	in 50 H_2O		187.5498	—	-350.70	—	—	—	—
	in 100 H_2O		187.5498	—	-350.41	—	—	—	—
	in 200 H_2O		187.5498	—	-350.49	—	—	—	—
	in 400 H_2O		187.5498	—	-351.79	—	—	—	—
	in 800 H_2O		187.5498	—	-353.1	—	—	—	—
$Cu(NO_3)_2$	in ∞ H_2O		187.5498	—	-349.95	—	—	—	—
$Cu(NO_3)_2 \cdot 3H_2O$		cr	241.5960	—	-1217.1	—	—	—	—
$Cu(NO_3)_2 \cdot 6H_2O$		cr	295.6422	—	-2110.8	—	—	—	—
$Cu(NH_3)^{2+}$		ao	80.5707	—	-38.9	15.60	—	12.1	—
$Cu(NH_3)_2^{2+}$		ao	97.6014	—	-142.3	-30.36	—	111.3	—
$Cu(NH_3)_3^{2+}$		ao	114.6321	—	-245.6	-72.97	—	199.6	—
$Cu(NH_3)_4^{2+}$		ao	131.6628	—	-348.5	-111.07	—	273.6	—
$Cu(NH_3)_5^{2+}$		ao	148.6935	—	—	-134.14	—	—	—
$Cu(NH_3)_4(NO_3)_2$		cr	255.6726	—	-828.4	—	—	—	—
	in 250 H_2O		255.6726	—	-759.65	—	—	—	—

Table 36:Cu — COPPER (Prepared 1968) — Continued — Table 36:Cu

Substance Formula and Description	State	Molar mass g mol^{-1}	0 K $\Delta_f H^\circ_0$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H^\circ_0$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
$Cu(NO_3)_2 \cdot 3Cu(OH)_2$	cr	480.2142	—	-1739.7	-1277.9	—	399.2	—
$CuCl \cdot NH_3$	cr	116.0237	—	-258.6	—	—	—	—
$CuCl \cdot 1.5NH_3$	cr	124.5390	—	-310.0	—	—	—	—
$CuCl_2 \cdot 2NH_3$	cr	168.5074	—	-489.5	—	—	—	—
$CuCl_2 \cdot 2NH_3 \cdot 0.25H_2O$	cr	173.0112	—	-570.7	—	—	—	—
$CuCl_2 \cdot 2NH_4Cl$	cr	241.4294	—	-850.6	—	—	—	—
$CuCl_2 \cdot 2NH_4Cl \cdot 2H_2O$	cr	277.4602	—	-1471.9	—	—	—	—
$CuCl \cdot 3NH_3$	cr	150.0851	—	-436.0	—	—	—	—
$CuCl_2 \cdot 10/3NH_3$	cr	191.2150	—	-629.7	—	—	—	—
$CuCl_2 \cdot 4NH_3 \cdot 2H_2O$	cr	238.5996	—	-1294.5	—	—	—	—
$CuCl_2 \cdot 5NH_3$	cr	219.5995	—	-791.6	—	—	—	—
$CuCl_2 \cdot 5NH_3 \cdot 0.5H_2O$	cr	228.6072	—	-931.4	—	—	—	—
$CuCl_2 \cdot 5NH_3 \cdot 1.5H_2O$	cr	246.6226	—	-1217.5	—	—	—	—
$CuCl_2 \cdot 6NH_3$	cr	236.6302	—	-873.2	—	—	—	—
$CuCl_2 \cdot 10NH_3$	cr	304.7530	—	-1184.5	—	—	—	—
$CuBr \cdot NH_3$	cr	160.4797	—	-219.7	—	—	—	—
$CuBr \cdot 1.5NH_3$	cr	168.9950	—	-271.5	—	—	—	—
$CuBr_2 \cdot 2NH_3$	cr	257.4194	—	-406.3	—	—	—	—
$CuBr \cdot 3NH_3$	cr	194.5411	—	-397.5	—	—	—	—
$CuBr_2 \cdot 10/3NH_3$	cr	280.1270	—	-553.1	—	—	—	—
$CuBr_2 \cdot 5NH_3$	cr	308.5115	—	-720.1	—	—	—	—
$CuBr_2 \cdot 6NH_3$	cr	325.5422	—	-807.1	—	—	—	—
$CuBr_2 \cdot 10NH_3$	cr	393.6650	—	-1119.2	—	—	—	—
$CuI \cdot 0.5NH_3$	cr	198.9597	—	-127.2	—	—	—	—
$CuI \cdot NH_3$	cr	207.4751	—	-182.0	—	—	—	—
$CuI \cdot 2NH_3$	cr	224.5058	—	-278.2	—	—	—	—
$CuI \cdot 3NH_3$	cr	241.5365	—	-369.9	—	—	—	—
$CuSO_4 \cdot NH_3$	cr	176.6323	—	-912.1	—	—	—	—
$CuSO_4 \cdot 2NH_3$	cr	193.6630	—	-1038.5	—	—	—	—
$CuSO_4 \cdot (NH_4)_2SO_4$	cr	291.7406	—	-2054.3	—	—	—	—
$CuSO_4 \cdot (NH_4)_2SO_4 \cdot 2H_2O$	cr	327.7714	—	-2627.6	—	—	—	—
$CuSO_4 \cdot (NH_4)_2SO_4 \cdot 6H_2O$	cr	399.8330	—	-3771.9	—	—	—	—
$(Cu(NH_3)_4)SO_4$	cr	227.7244	—	-1263.6	—	—	—	—
$(Cu(NH_3)_4)SO_4 \cdot 1.5H_2O$	cr	254.7475	—	-1698.3	—	—	—	—
$CuSO_4 \cdot 5NH_3$	cr	244.7551	—	-1372.8	—	—	—	—
CuP_2	cr	125.4876	—	-121.	—	—	—	—
Cu_3P	cr	221.5938	—	-151.5	—	—	—	—
$CuP_2O_7^{2-}$	ao	237.4834	—	—	-1891.4	—	—	—
$Cu(P_2O_7)_2^{6-}$	ao	411.4268	—	—	-3823.4	—	—	—
$Cu_2P_2O_7$	cr	301.0234	—	—	-1874.3	—	—	—
$Cu_2P_2O_7$	ai	301.0234	—	-2141.4	-1788.1	—	-318.	—
$Cu_3(PO_4)_2$	cr	380.5628	—	—	-2051.3	—	—	—
$CuCl \cdot PH_3$	cr	132.9908	—	-183.7	—	—	—	—
$CuCl \cdot 2PH_3$	cr	166.9886	—	-214.2	—	—	—	—
$CuBr \cdot PH_3$	cr	177.4468	—	-148.1	—	—	—	—
$CuBr \cdot 2PH_3$	cr	211.4446	—	-184.1	—	—	—	—
$CuI \cdot PH_3$	cr	224.4422	—	-106.7	—	—	—	—
$CuI \cdot 2PH_3$	cr	258.4400	—	-141.0	—	—	—	—
$Cu(NH_3)_2P_2O_7^{2-}$	ao	271.5448	—	—	-1992.6	—	—	—
Cu_3As	cr	265.5416	—	-11.7	—	—	—	—

Table 36:**Cu** **COPPER** (Prepared 1968) — Continued Table 36:**Cu**

Substance Formula and Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
$Cu_3(AsO_4)_2$	cr	468.4584	—	—	-1300.7	—	—	—
	ai	468.4584	—	-1581.97	-1100.35	—	-624.3	—
Cu_2Sb	cr	248.8300	—	-11.7	—	—	—	—
Cu_3Sb	cr	312.3700	—	-8.	—	—	—	—
CuC_2O_4 oxalate	cr	151.5600	—	—	-661.8	—	—	—
CuC_2O_4	ai	151.5600	—	-760.2	-608.7	—	-54.0	—
	ao	151.5600	—	—	-640.5	—	—	—
$Cu(C_2O_4)_2^{2-}$	ao	239.5800	—	-1592.0	-1335.8	—	146.	—
$Cu(CHO_2)^+$ formate	ao	108.5580	—	—	-296.6	—	—	—
$Cu(CHO_2)_2$	cr	153.5760	—	-781.2	—	—	—	—
$Cu(CHO_2)_2$	ai	153.5760	—	-786.34	-636.3	—	84.	—
in 400 H_2O		153.5760	—	-785.3	—	—	—	—
$Cu(CHO_2)_2 \cdot 4H_2O$	cr	225.6376	—	-1961.0	—	—	—	—
$CuCH_3COO^+$ acetate	ao	122.5852	—	—	-316.54	—	—	—
$Cu(CH_3COO)_2$	cr	181.6304	—	-893.3	—	—	—	—
$Cu(CH_3COO)_2$	ai	181.6304	—	-907.26	-673.13	—	73.6	—
	ao	181.6304	—	—	-693.84	—	—	—
in 400 H_2O		181.6304	—	-904.6	—	—	—	—
$Cu(CH_3COO)_2 \cdot H_2O$	cr	199.6458	—	-1189.1	—	—	—	—
$Cu(CH_2OHCOO)_2$ glycolate	cr	213.6292	—	-1251.4	—	—	—	—
$Cu(CH_2OHCOO)_2$ in 200 H_2O		213.6292	—	-1246.8	—	—	—	—
$CuCO_3 \cdot Cu(OH)_2$ malachite	cr	221.1042	—	-1051.4	-893.6	—	186.2	—
$(CuCO_3)_2 \cdot Cu(OH)_2$ azurite	cr	344.6536	—	-1632.2	-1315.5	—	0	—
$(CuCl)_2 \cdot CO \cdot 2H_2O$	cr	262.0274	—	-941.	—	—	—	—
$(CuCl)_2 \cdot C_2H_2$	cr	224.0244	—	-97.5	-31.86	—	212.1	—
$(CuCl)_3 \cdot C_2H_2$	cr	323.0174	—	-236.0	-152.72	—	297.1	—
$CuCl_2 \cdot 2CH_3OH$	cr	198.5312	—	-710.4	-511.5	—	328.4	—
$CuCl_2 \cdot 2C_2H_5OH$	cr	226.5856	—	-745.2	-527.8	—	539.3	—
$CuSO_4 \cdot 2CH_3OH$	cr	223.6868	—	-1283.2	—	—	—	—
$Cu(C_2H_5OSO_3)_2$ in 600 H_2O ethylsulfate		313.7880	—	-1684.5	—	—	—	—
$CuCN$	cr	89.5579	—	96.2	111.3	—	84.5	—
$Cu(CN)_2^-$	ao	115.5758	—	—	257.8	—	—	—
$Cu(CN)_3^{2-}$	ao	141.5937	—	—	403.8	—	—	—
$Cu(CN)_4^{3-}$	ao	167.6116	—	—	566.6	—	—	—
$CuONC$ cuprous fulminate	cr	105.5573	—	110.0	—	—	—	—
$Cu(NH_2CH_2CH_2NH_2)^{2+}$ ethylenediamine	ao	123.6398	—	-44.4	—	—	—	—
$Cu(NH_2CH_2CH_2NH_2)_2^{2+}$	ao	183.7396	—	-151.9	—	—	—	—
$Cu(NH_2CH_2COO)^+$ glycinate	ao	137.5999	—	-430.1	-298.2	—	100.	—
$Cu(HCOO)_2 \cdot 2NH_3$ formate	cr	187.6374	—	-992.9	—	—	—	—
$Cu(HCOO)_2 \cdot 4NH_3$	cr	221.6988	—	-1188.7	—	—	—	—
$Cu(HCOO)_2 \cdot 6NH_3$	cr	255.7602	—	-1343.1	—	—	—	—
$Cu(NH_2CH_2COO)_2$ α	cr	211.6598	—	-938.5	—	—	—	—
β	cr2	211.6598	—	-932.6	—	—	—	—
	ao	211.6598	—	-926.8	-653.7	—	264.	—
$Cu(NH_2CH_2COO)_2 \cdot H_2O$ monoclinic	cr	229.6752	—	-1238.0	—	—	—	—
$Cu(NH_2CH_2COO)_2 \cdot H_2O$ rhombic	cr2	229.6752	—	-1236.4	—	—	—	—
$Cu(CH_3COO)_2 \cdot 2NH_3$ acetate	cr	215.6918	—	-1125.1	—	—	—	—
$Cu(CH_2OHCOO)_2 \cdot 2NH_3$ glycolate	cr	247.6906	—	-1479.0	—	—	—	—
$Cu(CH_2NH_2COO)_2 \cdot 2NH_3$ glycinate	cr	245.7212	—	-1115.0	—	—	—	—

Table 36:Cu COPPER (Prepared 1968) — Continued Table 36:Cu

Substance Formula and Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
$Cu(NH_3)_4(CH_3COO)_2$	cr	249.7532	—	-1316.3	—	—	—	—
$Cu(NH_3)_4(CH_2OHCOO)_2$	cr	281.7520	—	-1670.3	—	—	—	—
$Cu(NH_3)_4(CH_2NH_2COO)_2$	cr	279.7826	—	-1318.4	—	—	—	—
$Cu(CH_3COO)_2\cdot 6NH_3$	cr	283.8146	—	-1501.2	—	—	—	—
$Cu(CH_2OHCOO)_2\cdot 6NH_3$	cr	315.8134	—	-1856.9	—	—	—	—
$CuCl_2\cdot NH_2CH_2CH_2NH_2$ ethylenediamine	cr	194.5458	—	-385.8	—	—	—	—
$CuCl_2\cdot 2(NH_2CH_2CH_2NH_2)$	cr	254.6456	—	-489.5	—	—	—	—
$CuBr_2\cdot NH_2CH_2CH_2NH_2$ ethylenediamine	cr	283.4578	—	-301.2	—	—	—	—
$CuBr_2\cdot 2(NH_2CH_2CH_2NH_2)$	cr	343.5576	—	-427.2	—	—	—	—
CuCNS	cr	121.6219	—	—	69.9	—	—	—
CuCNS	ai	121.6219	—	148.11	142.69	—	184.9	—
$CuCNS^+$	ao	121.6219	—	—	144.89	—	—	—
$Cu(CNS)_2$	ai	179.7038	—	217.65	250.91	—	189.1	—
	ao	179.7038	—	—	229.90	—	—	—
$Cu(CNS)_4^{3-}$	ao	295.8676	—	328.4	364.1	—	644.	—
CuSn	g	182.2300	466.1	—	—	—	—	—
Cu_3Sn	cr	309.3100	—	-31.8	—	—	—	—
CuAl	cr	90.5215	—	-41.0	—	—	—	—
$CuAl_2$	cr	117.5030	—	-40.79	—	—	—	—
Cu_2Al	cr	154.0615	—	-69.0	—	—	—	—
Cu_3Al	cr	217.6015	—	-70.3	—	—	—	—
Cu_3Al_2	cr	244.5830	—	-109.6	—	—	—	—
$CuAl_2O_4$	cr	181.5006	—	-1812.9	—	—	—	—
$Cu_2Al_2O_4$	cr	245.0406	—	-1874.	—	—	—	—
Cu_2Cd_3	cr	464.2800	—	-23.0	—	—	—	—

Table 37:**Ag** — **SILVER** (Prepared 1968) — Table 37:**Ag**

Substance Formula	Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H_0^\circ$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H_0^\circ$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
Ag		cr	107.8700	0	0	0	5.745	42.55	25.351
		g	107.8700	284.09	284.55	245.65	6.197	172.997	20.786
Ag^+		g	107.8700	1015.08	1021.73	—	6.197	—	—
Ag^{2+}		g	107.8700	3088.2	3101.2	—	6.197	—	—
Ag^{3+}		g	107.8700	6448.4	6467.6	—	—	—	—
Ag^+		ao	107.8700	—	105.579	77.107	—	72.68	21.8
Ag^{2+}	in $HClO_4$ + 11.5 H_2O:u		107.8700	—	268.6	269.0	—	-88.	—
Ag_2		g	215.7400	411.3	409.99	358.75	10.17	257.13	36.99
Ag_2^+		g	215.7400	1120.5	1125.5	—	—	—	—
Ag_2O		cr	231.7394	-29.430	-31.05	-11.20	14.213	121.3	65.86
Ag_2O_2		cr	247.7388	—	-24.3	27.6	—	117.	88.
Ag_2O_3		cr	263.7382	—	33.9	121.4	—	100.	—
$AgOH$		ai	124.8774	—	-124.415	-80.137	—	61.92	-126.8
		ao	124.8774	—	—	-92.0	—	—	—
$Ag(OH)_2^-$		ao	141.8848	—	—	-260.2	—	—	—
AgF		cr	126.8684	—	-204.6	—	—	—	—
		ai	126.8684	—	-227.07	-201.69	—	59.0	-84.9
		ao	126.8684	—	-238.9	-203.7	—	25.9	—
	in 8 H_2O		126.8684	—	-222.589	—	—	—	—
	in 9 H_2O		126.8684	—	-222.823	—	—	—	—
AgF	in 10 H_2O		126.8684	—	-222.957	—	—	—	—
	in 15 H_2O		126.8684	—	-223.183	—	—	—	—
	in 25 H_2O		126.8684	—	-223.296	—	—	—	—
	in 50 H_2O		126.8684	—	-223.367	—	—	—	—
	in 100 H_2O		126.8684	—	-223.400	—	—	—	—
AgF	in 200 H_2O		126.8684	—	-223.417	—	—	—	—
	in 400 H_2O		126.8684	—	-223.4	—	—	—	—
	in ∞ H_2O		126.8684	—	-227.07	—	—	—	—
$AgF·2H_2O$		cr	162.8992	—	-800.8	-671.0	—	174.9	130.
$AgF·4H_2O$		cr	198.9300	—	-1388.3	-1147.0	—	268.	209.
AgF_2		cr	145.8668	—	-360.	—	—	—	—
$AgHF_2$		aq	146.8748	—	-549.8	—	—	—	—
$AgCl$		cr	143.3230	—	-127.068	-109.789	—	96.2	50.79
		g	143.3230	—	—	—	9.669	245.92	35.86
		ai	143.3230	—	-61.580	-54.120	—	129.3	-114.6
$AgCl$		ao	143.3230	—	-72.8	-72.8	—	154.0	—
$AgCl_2^-$		ao	178.7760	—	-245.2	-215.4	—	231.4	—
$AgClO_2$		cr	175.3218	—	8.79	75.8	—	134.56	87.32
		ai	175.3218	—	38.9	94.2	—	174.1	—
$AgClO_3$		cr	191.3212	—	-30.29	64.5	—	142.	—
$AgClO_3$		ai	191.3212	—	1.59	69.14	—	235.1	—
$AgClO_4$		cr	207.3206	—	-31.13	—	—	—	—
		ai	207.3206	—	-23.77	68.57	—	254.8	—
	in 500 H_2O		207.3206	—	-23.4	—	—	—	—
$Ag(ClO_4)_2$	in $HClO_4$ + 4.5 H_2O:u		306.7712	—	10.0	—	—	—	—
$AgBr$		cr	187.7790	—	-100.37	-96.90	—	107.1	52.38
		ai	187.7790	—	-15.98	-26.86	—	155.2	-120.1
		ao	187.7790	—	—	-51.0	—	—	—
$AgBr_2^-$		ao	267.6880	—	—	-172.4	—	—	—
$AgBr_3^{2-}$		ao	347.5970	—	—	-284.5	—	—	—

Table 37:**Ag** — **SILVER** (Prepared 1968) — Continued — Table 37:**Ag**

Substance Formula and Description		State	Molar mass g mol⁻¹	0 K $\Delta_f H_0^\circ$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H_0^\circ$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
$AgBrO_3$		cr	235.7772	—	-10.5	71.34	—	151.9	—
		ai	235.7772	—	38.49	95.70	—	234.39	—
$AgCl_3Br^{3-}$		ao	294.1380	—	—	-465.6	—	—	—
$AgClBr_3^{3-}$		ao	383.0500	—	—	-420.0	—	—	—
AgI		cr	234.7744	—	-61.84	-66.19	—	115.5	56.82
AgI		ai	234.7744	—	50.38	25.52	—	184.1	-120.5
		ao	234.7744	—	—	-12.1	—	—	—
AgI_2^-		ao	361.6788	—	—	-87.0	—	—	—
AgI_3^{2-}		ao	488.5832	—	-182.0	-153.9	—	253.1	—
AgI_4^{3-}		ao	615.4876	—	—	-209.6	—	—	—
$AgIO_3$		cr	282.7726	—	-171.1	-93.7	—	149.4	102.93
		ai	282.7726	—	-115.9	-51.0	—	191.2	—
$(AgI)_3 \cdot HI \cdot 7H_2O$		cr	958.3434	—	-2251.4	—	—	—	—
$Ag_2H_3IO_6$		cr	441.6648	—	—	—	—	248.70	198.3
Ag_2S	α, orthorhombic	cr	247.8040	-33.999	-32.59	-40.67	17.305	144.01	76.53
Ag_2S	β	cr2	247.8040	—	-29.41	-39.46	—	150.6	—
$AgSO_3^-$		ao	187.9322	—	—	-440.1	—	—	—
$AgSO_4^-$		ao	203.9316	—	-797.5	-674.8	—	134.	—
$Ag(S_2O_3)_2^{3-}$		ao	332.1224	—	-1285.7	—	—	—	—
Ag_2SO_3		cr	295.8022	—	-490.8	-411.2	—	158.2	—
Ag_2SO_3		ai	295.8022	—	-424.3	-332.2	—	116.3	—
		ao	295.8022	—	—	-381.1	—	—	—
Ag_2SO_4		cr	311.8016	—	-715.88	-618.41	—	200.4	131.38
		ai	311.8016	—	-698.10	-590.30	—	165.7	-251.
$Ag_2S_2O_6$		aq	375.8644	—	-987.0	—	—	—	—
$Ag_2S_2O_6 \cdot 2H_2O$		cr	411.8952	—	-1603.7	—	—	—	—
Ag_2Se		cr	294.7000	-39.41	-38.	-44.4	18.74	150.71	81.76
Ag_2SeO_3		cr	342.6982	—	-365.3	-304.1	—	230.1	—
		ai	342.6982	—	-297.9	-215.4	—	159.	—
Ag_2SeO_4		cr	358.6976	—	-420.5	-334.2	—	248.5	—
Ag_2SeO_4		ai	358.6976	—	-387.9	-287.0	—	199.6	—
Ag_2Te		cr	343.3400	-38.95	-37.2	-43.1	19.33	154.8	87.4
AgN_3		cr	149.8901	—	308.8	376.2	—	104.2	—
		ai	149.8901	—	380.70	425.1	—	180.7	—
Ag_3N		cr	337.6167	—	270.3	—	—	—	—
$AgNO_2$		cr	153.8755	—	-45.06	19.13	—	128.20	80.21
		ai	153.8755	—	0.8	44.8	—	195.8	-75.7
	in 400 H_2O		153.8755	—	-8.20	—	—	—	—
$AgNO_3$		cr	169.8749	—	-124.39	-33.41	—	140.92	93.05
		ai	169.8749	—	-101.80	-34.16	—	219.2	-64.9
$AgNO_3$		ao	169.8749	—	—	-32.49	—	—	—
	in 50 H_2O		169.8749	—	-104.244	—	—	—	—
	in 100 H_2O		169.8749	—	-103.081	—	—	—	—
	in 200 H_2O		169.8749	—	-102.370	—	—	—	—
	in 400 H_2O		169.8749	—	-102.002	—	—	—	—
$AgNO_3$	in 500 H_2O		169.8749	—	-101.931	—	—	—	—
	in 1 000 H_2O		169.8749	—	-101.788	—	—	—	—
	in 2 000 H_2O		169.8749	—	-101.730	—	—	—	—
	in 5 000 H_2O		169.8749	—	-101.709	—	—	—	—
	in 10 000 H_2O		169.8749	—	-101.717	—	—	—	—

Table 37:**Ag** **SILVER** (Prepared 1968) — Continued Table 37:**Ag**

Substance Formula and Description		State	Molar mass g mol^{-1}	0 K	298.15 K (25°C) and 0.1 MPa (1 bar)				
				$\Delta_f H_0^\circ$ kJ mol^{-1}	$\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H_0^\circ$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
$AgNO_3$	in 50 000 H_2O		169.8749	—	-101.747	—	—	—	—
	in ∞ H_2O		169.8749	—	-101.80	—	—	—	—
	in 15 000 CH_3OH		169.8749	—	-121.34	—	—	—	—
$Ag(NO_2)_2^-$		ao	199.8810	—	—	-9.9	—	—	—
$Ag_2N_2O_2$	hyponitrite	cr	275.7522	—	85.8	—	—	—	—
$Ag_2N_2O_2$		aq	275.7522	—	194.1	—	—	—	—
$Ag(NH_3)^+$		ao	124.9007	—	—	31.68	—	—	—
$Ag(NH_3)_2^+$		ao	141.9314	—	-111.29	-17.12	—	245.2	—
$Ag(NH_3)_2NO_3$		cr	203.9363	—	-355.6	—	—	—	—
	From $Ag(NH_3)_2^+$	ai	203.9363	—	-318.65	-128.38	—	391.6	—
$Ag(NH_3)_3NO_3$		cr	220.9670	—	-441.4	—	—	—	—
$AgCl{\cdot}NH_3$		cr	160.3537	—	-223.0	-131.7	—	139.7	—
$AgCl{\cdot}1.5NH_3$		cr	168.8690	—	-269.0	-141.3	—	163.6	—
$Ag(NH_3)_2Cl$		ai	177.3844	—	-278.45	-148.34	—	301.7	—
		ao	177.3844	—	—	-146.34	—	—	—
$Ag(NH_3)_3Cl$		cr	194.4151	—	-397.5	-161.3	—	237.7	—
$Ag(NH_3)_2ClO_4$		cr	241.3820	—	-281.6	—	—	—	—
	in 1 000 H_2O		241.3820	—	-240.2	—	—	—	—
$Ag(NH_3)_3ClO_4$		cr	258.4127	—	-364.0	—	—	—	—
	in 1 600 H_2O		258.4127	—	-320.9	—	—	—	—
$AgBr{\cdot}NH_3$		cr	204.8097	—	-191.2	-116.7	—	160.7	—
$AgBr{\cdot}1.5NH_3$		cr	213.3250	—	-236.0	-125.8	—	187.0	—
$Ag(NH_3)_2Br$		ai	221.8404	—	-232.84	-121.08	—	327.6	—
		ao	221.8404	—	—	-122.29	—	—	—
$Ag(NH_3)_3Br$		cr	238.8711	—	-359.8	-146.2	—	277.8	—
$Ag_3I(NO_3)_2$		cr	574.5242	—	-324.3	—	—	—	—
$AgI{\cdot}0.5NH_3$		cr	243.2897	—	-110.9	—	—	—	—
$AgI{\cdot}NH_3$		cr	251.8051	—	-152.7	—	—	—	—
AgP_2		cr	169.8176	—	-46.0	—	—	—	—
AgP_3		cr	200.7914	—	-69.5	—	—	—	—
$AgPO_3$		aq	186.8420	—	-872.07	—	—	—	—
Ag_3PO_4		cr	418.5814	—	—	-879.	—	—	—
$(AgPO_3)_3{\cdot}H_2O$		cr	578.5414	—	-2925.9	—	—	—	—
$Ag_4P_2O_7$		cr	605.4234	—	-1895.	—	—	—	—
$AgI{\cdot}0.5PH_3$		cr	251.7733	—	-79.1	—	—	—	—
Ag_3AsO_4		cr	462.5292	—	—	-542.6	—	—	—
		ai	462.5292	—	-571.41	-417.08	—	55.6	—
Ag_2C_2	acetylide	cr	239.7624	—	350.6	—	—	—	—
Ag_2CO_3		cr	275.7494	—	-505.8	-436.8	—	167.4	112.26
$Ag_2C_2O_4$	oxalate	cr	303.7600	—	-673.2	-584.0	—	209.	—
$AgC_2H_4^+$	ethylene	ao	135.9244	—	111.3	147.3	—	130.	—
$AgCH_3CO_2$	acetate	cr	166.9152	—	-398.7	-307.69	—	149.8	—
		ai	166.9152	—	-380.45	-292.21	—	159.4	15.5
		ao	166.9152	—	—	-296.35	—	—	—
$Ag(CH_3CO_2)_2^-$		ao	225.9604	—	—	-665.16	—	—	—
$Ag_2(CH_3CO_2)^+$		ao	274.7852	—	—	-221.56	—	—	—
$Ag_2C_2{\cdot}AgCl$	acetylide	cr	383.0854	—	209.6	—	—	—	—
$(Ag_2C_2)_2{\cdot}AgCl$		cr	622.8478	—	544.3	—	—	—	—
$Ag_2C_2{\cdot}AgI$		cr	474.5368	—	283.3	—	—	—	—

Table 37:**Ag** **SILVER** (Prepared 1968) — Continued Table 37:**Ag**

Substance Formula and Description		State	Molar mass g mol⁻¹	0 K $\Delta_f H_0^\circ$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H_0^\circ$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
$Ag_2C_2 \cdot 2AgI$		cr	709.3112	—	216.3	—	—	—	—
$Ag_2C_2 \cdot Ag_2SO_4$		cr	551.5640	—	-382.4	—	—	—	—
$(Ag_2C_2)_2 \cdot Ag_2SO_4$		cr	791.3264	—	-71.1	—	—	—	—
AgCN		cr	133.8879	143.737	146.0	156.9	13.414	107.19	66.73
		ai	133.8879	—	256.1	249.4	—	166.9	—
$AgCN_2$	silver cyanamide	cr	147.8946	—	235.1	—	—	—	—
$Ag(CN)_2^-$		ao	159.9058	—	270.3	305.5	—	192.	—
AgONC	silver fulminate	cr	149.8873	—	180.	—	—	—	—
AgOCN	silver cyanate	cr2	149.8873	—	-95.4	-58.1	—	121.	—
$Ag_2C_2 \cdot AgNO_3$		cr	409.6373	—	200.4	—	—	—	—
$AgCN \cdot NH_3$		cr	150.9186	—	42.	—	—	—	—
$Ag(CH_3NH_2)_2^+$	methylamine	ao	169.9858	—	—	79.7	—	—	—
$Ag((CH_3)_2NH)_2^+$	dimethylamine	ao	198.0402	—	—	163.0	—	—	—
$Ag(CN)OH^-$		ao	150.8953	—	—	15.5	—	—	—
$Ag(NH_2CH_2COO)$	glycinate	ao	181.9299	—	-355.2	-257.6	—	289.	—
$AgCl \cdot CH_3NH_2$	methylamine	cr	174.3809	—	-202.13	-83.98	—	186.2	—
$AgBr \cdot CH_3NH_2$		cr	218.8369	—	-174.72	-70.36	—	197.1	—
AgSCN	thiocyanate	cr	165.9519	—	87.9	101.39	—	131.0	63.
		ai	165.9519	—	182.00	169.80	—	217.1	-18.4
		ao	165.9519	—	—	142.7	—	—	—
AgSCN	in 200 C_5H_5N in pyridine		165.9519	—	69.62	—	—	—	—
$Ag(SCN)_2^-$		ao	224.0338	—	—	215.1	—	—	—
$Ag(SCN)_3^{2-}$		ao	282.1157	—	—	300.9	—	—	—
$Ag(SCN)_4^{3-}$		ao	340.1976	—	—	392.2	—	—	—
$Ag(CS(NH_2)_2)_3^+$	thiourea	aq	336.2318	—	-218.4	—	—	—	—
AgSn		g	226.5600	454.0	451.9	—	—	—	—
$AgCl \cdot AlCl_3$		cr	276.6635	—	-842.2	—	—	—	—
$AgBr \cdot AlBr_3$		cr	454.4875	—	-669.0	—	—	—	—
$AgBr \cdot 2AlBr_3$		cr	721.1960	—	-1150.6	—	—	—	—
Ag_2HgI_4		cr	923.9476	—	—	—	—	—	198.7
AgCu		g	171.4100	451.0	450.32	—	—	—	—

Table 38:**Au** — **GOLD** (Prepared 1967) — Table 38:**Au**

Substance Formula and Description	State	Molar mass g mol^{-1}	0 K $\Delta_f H^\circ_0$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H^\circ_0$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
Au	cr	196.9670	0	0	0	6.008	47.40	25.418
	g	196.9670	365.93	366.1	326.3	6.197	180.503	20.786
Au^{+}	g	196.9670	1256.08	1262.44	—	6.197	—	—
Au^{2+}	g	196.9670	3230.	3243.	—	6.197	—	—
Au_2	g	393.9340	516.7	515.1	—	10.192	—	36.853
Au_2^{+}	g	393.9340	1435.	1439.	—	—	—	—
AuO_3^{3-}	ao	244.9652	—	—	-51.8	—	—	—
AuH	g	197.9750	296.6	295.0	265.7	8.653	211.155	29.154
$HAuO_3^{2-}$	ao	245.9732	—	—	-142.2	—	—	—
$H_2AuO_3^{-}$	ao	246.9812	—	—	-218.3	—	—	—
$Au(OH)_3$ precipitated	cr	247.9892	—	-424.7	-316.92	—	189.5	—
	ao	247.9892	—	—	-283.37	—	—	—
AuF_3	cr	253.9622	—	-363.6	—	—	—	—
AuCl	cr	232.4200	—	-34.7	—	—	—	—
	g	232.4200	197.	197.	—	—	—	—
$AuCl_2^{-}$	ao	267.8730	—	—	-151.12	—	—	—
$AuCl_3$	cr	303.3260	—	-117.6	—	—	—	—
in 900 H_2O		303.3260	—	-137.24	—	—	—	—
$AuCl_3{\cdot}2H_2O$	cr	339.3568	—	-715.0	—	—	—	—
$AuCl_4^{-}$	ao	338.7790	—	-322.2	-235.14	—	266.9	—
Au_2Cl_6	g	606.6520	—	-97.1	—	—	—	—
$HAuCl_4$	ai	339.7870	—	-322.2	-235.14	—	266.9	—
$HAuCl_4{\cdot}3H_2O$	cr	393.8332	—	-1192.0	—	—	—	—
$HAuCl_4{\cdot}4H_2O$	cr	411.8486	—	-1489.1	—	—	—	—
AuBr	cr	276.8760	—	-13.97	—	—	—	—
$AuBr_2^{-}$	ao	356.7850	—	-128.4	-115.00	—	219.7	—
$AuBr_3$	cr	436.6940	—	-53.26	—	—	—	—
	aq	436.6940	—	-39.29	—	—	—	—
$AuBr_4^{-}$	ao	516.6030	—	-191.6	-167.3	—	336.0	—
$HAuBr_4$	ai	517.6110	—	-191.6	-167.3	—	336.0	—
$HAuBr_4{\cdot}5H_2O$	cr	607.6880	—	-1668.2	—	—	—	—
AuI	cr	323.8714	—	0	—	—	—	—
AuTe	g	324.5670	—	—	—	10.100	—	36.74
$AuCl{\cdot}NH_3$	cr	249.4507	—	-182.8	—	—	—	—
$AuCl{\cdot}2NH_3$	cr	266.4814	—	-291.6	—	—	—	—
$AuBr{\cdot}NH_3$	cr	293.9067	—	-154.4	—	—	—	—
$AuBr{\cdot}2NH_3$	cr	310.9374	—	-254.0	—	—	—	—
$AuBr{\cdot}3NH_3$	cr	327.9681	—	-333.9	—	—	—	—
$AuBr{\cdot}4NH_3$	cr	344.9988	—	-413.0	—	—	—	—
$AuBr{\cdot}6NH_3$	cr	379.0602	—	-569.9	—	—	—	—
$AuI{\cdot}NH_3$	cr	340.9021	—	-109.6	—	—	—	—
$AuI{\cdot}2NH_3$	cr	357.9328	—	-191.6	—	—	—	—
$AuI{\cdot}3NH_3$	cr	374.9635	—	-274.1	—	—	—	—
$AuI{\cdot}6NH_3$	cr	426.0556	—	-506.3	—	—	—	—
Au_2P_3	g	486.8554	—	-99.6	—	—	—	—
$AuI{\cdot}PH_3$	cr	357.8692	—	-40.2	—	—	—	—
$AuSb_2$	cr	440.4670	—	-10.9	—	—	—	—
$Au(CN)_2^{-}$	ao	249.0028	—	242.3	285.8	—	172.	—
$Au(SCN)_2^{-}$	ao	313.1308	—	—	251.9	—	—	—
$Au(SCN)_4^{-}$	ao	429.2946	—	—	561.6	—	—	—

Table 38:**Au** **GOLD** (Prepared 1967) — Continued Table 38:**Au**

Substance Formula and Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H_0^\circ$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H_0^\circ$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
$Au(SCN)_5^{2-}$	ao	487.3765	—	—	654.5	—	—	—
$Au(SCN)_6^{3-}$	ao	545.4584	—	—	747.0	—	—	—
AuSn	cr	315.6570	—	-30.46	-29.92	—	97.15	50.46
$AuSn_2$	cr	434.3470	—	-42.43	-37.95	—	135.6	—
$AuSn_4$	cr	671.7270	—	-38.70	-37.82	—	250.6	—
$AuPb_2$	cr	611.3470	—	-6.3	—	—	—	—
Au_2Pb	cr	601.1240	—	-2.1	—	—	—	—
AuIn	cr	311.7870	—	-45.2	—	—	—	—
$AuIn_2$	cr	426.6070	—	-75.3	—	—	—	—
AuCd	cr	309.3670	—	-38.83	-39.08	—	100.0	—
AuCu	cr	260.5070	—	-18.66	-18.41	—	79.9	49.8
$AuCu_3$	cr	387.5870	—	-28.62	-29.16	—	149.4	100.4
$AgAuF_4$	cr	380.8306	—	-641.4	—	—	—	—

Table 39:Ni — NICKEL (Prepared 1968) — Table 39:Ni

Substance Formula	Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H_0^\circ$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H_0^\circ$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
Ni		cr	58.7100	0	0	0	4.786	29.87	26.07
		g	58.7100	427.659	429.7	384.5	6.824	182.193	23.359
Ni^+		g	58.7100	1164.554	1172.169	—	6.205	—	—
Ni^{2+}		g	58.7100	2917.566	2931.390	—	6.217	—	—
Ni^{3+}		g	58.7100	6325.8	6345.9	—	—	—	—
Ni^{2+}		ao	58.7100	—	-54.0	-45.6	—	-128.9	—
Ni_2		g	117.4200	628.	628.	—	—	—	—
NiO		cr	74.7094	-237.2	-239.7	-211.7	6.7	37.99	44.31
		g	74.7094	314.	314.	—	—	—	—
Ni_2O_3		cr	165.4182	—	-489.5	—	—	—	—
$NiOH^+$		ao	75.7174	—	-287.9	-227.6	—	-71.	—
$Ni(OH)_2$		cr	92.7248	—	-529.7	-447.2	—	88.	—
		ai	92.7248	—	-513.8	-360.2	—	-150.2	—
$Ni(OH)_3$	precipitated	cr	109.7322	—	-669.	—	—	—	—
NiF_2		cr	96.7068	-649.27	-651.4	-604.1	11.418	73.60	64.06
NiF_2		ai	96.7068	—	-719.2	-603.3	—	-156.5	—
	in 1 200 H_2O		96.7068	—	-713.4	—	—	—	—
$NiF_2 \cdot 4H_2O$		cr	168.7684	—	—	-1581.	—	—	—
$NiCl_2$		cr	129.6160	-305.754	-305.332	-259.032	14.385	97.65	71.67
		ai	129.6160	—	-388.3	-307.9	—	-15.1	—
$NiCl_2$	in 20 H_2O		129.6160	—	-376.14	—	—	—	—
	in 25 H_2O		129.6160	—	-378.11	—	—	—	—
	in 30 H_2O		129.6160	—	-379.41	—	—	—	—
	in 40 H_2O		129.6160	—	-380.74	—	—	—	—
	in 50 H_2O		129.6160	—	-381.58	—	—	—	—
$NiCl_2$	in 75 H_2O		129.6160	—	-382.67	—	—	—	—
	in 100 H_2O		129.6160	—	-383.34	—	—	—	—
	in 150 H_2O		129.6160	—	-384.05	—	—	—	—
	in 200 H_2O		129.6160	—	-384.55	—	—	—	—
	in 400 H_2O		129.6160	—	-385.43	—	—	—	—
$NiCl_2$	in 500 H_2O		129.6160	—	-385.68	—	—	—	—
	in 800 H_2O		129.6160	—	-386.10	—	—	—	—
	in 1 000 H_2O		129.6160	—	-386.31	—	—	—	—
	in 1 500 H_2O		129.6160	—	-386.60	—	—	—	—
	in 2 000 H_2O		129.6160	—	-386.81	—	—	—	—
$NiCl_2$	in 3 000 H_2O		129.6160	—	-387.06	—	—	—	—
	in 5 000 H_2O		129.6160	—	-387.31	—	—	—	—
	in 10 000 H_2O		129.6160	—	-387.69	—	—	—	—
	in 50 000 H_2O		129.6160	—	-387.98	—	—	—	—
	in 100 000 H_2O		129.6160	—	-388.07	—	—	—	—
$NiCl_2$	in ∞ H_2O		129.6160	—	-388.3	—	—	—	—
$NiCl_2 \cdot 2H_2O$		cr	165.6468	—	-922.2	-760.1	—	176.	—
$NiCl_2 \cdot 4H_2O$		cr	201.6776	—	-1516.7	-1234.9	—	243.	—
$NiCl_2 \cdot 6H_2O$		cr	237.7084	—	-2103.17	-1713.19	—	344.3	—
$Ni(ClO_4)_2$		ai	257.6112	—	-312.5	-62.6	—	235.1	—
$Ni(ClO_4)_2$	in 10 H_2O		257.6112	—	-307.1	—	—	—	—
	in 20 H_2O		257.6112	—	-310.5	—	—	—	—
	in 1 000 H_2O		257.6112	—	-312.5	—	—	—	—
$Ni(ClO_4)_2 \cdot 6H_2O$		cr	365.7036	—	-2035.9	—	—	—	—
$NiBr_2$		cr	218.5280	—	-212.1	—	—	—	—

Substance Formula	Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
$NiBr_2$		ai	218.5280	—	-297.1	-253.6	—	36.0	—
$NiBr_2{\cdot}3H_2O$		cr	272.5742	—	-1146.4	—	—	—	—
NiI_2		cr	312.5188	—	-78.2	—	—	—	—
		ai	312.5188	—	-164.4	-149.0	—	93.7	—
$Ni(IO_3)_2$		cr	408.5152	—	-489.1	-326.3	—	213.	—
NiS		cr	90.7740	—	-82.0	-79.5	—	52.97	47.11
	precipitated	cr2	90.7740	—	-77.4	—	—	—	—
Ni_3S_2		cr	240.2580	—	-202.9	-197.1	—	133.9	117.65
Ni_6S_5		cr	512.5800	—	-441.8	—	—	—	—
Ni_7S_6		cr	603.3540	—	-558.6	—	—	—	—
$NiSO_4$		cr	154.7716	—	-872.91	-759.7	—	92.	138.
		ai	154.7716	—	-963.2	-790.3	—	-108.8	—
		ao	154.7716	—	-949.3	-803.3	—	-18.0	—
	in 200 H_2O		154.7716	—	-958.504	—	—	—	—
	in 300 H_2O		154.7716	—	-958.672	—	—	—	—
$NiSO_4$	in 400 H_2O		154.7716	—	-958.797	—	—	—	—
	in 500 H_2O		154.7716	—	-958.906	—	—	—	—
	in 800 H_2O		154.7716	—	-959.169	—	—	—	—
	in 1 000 H_2O		154.7716	—	-959.354	—	—	—	—
	in 1 500 H_2O		154.7716	—	-959.596	—	—	—	—
$NiSO_4$	in 2 000 H_2O		154.7716	—	-959.822	—	—	—	—
	in 3 000 H_2O		154.7716	—	-960.148	—	—	—	—
	in 4 000 H_2O		154.7716	—	-960.345	—	—	—	—
	in 5 000 H_2O		154.7716	—	-960.567	—	—	—	—
	in 7 000 H_2O		154.7716	—	-960.814	—	—	—	—
$NiSO_4$	in 10 000 H_2O		154.7716	—	-961.061	—	—	—	—
	in 15 000 H_2O		154.7716	—	-961.337	—	—	—	—
	in 20 000 H_2O		154.7716	—	-961.571	—	—	—	—
	in 50 000 H_2O		154.7716	—	-962.211	—	—	—	—
	in 100 000 H_2O		154.7716	—	-962.538	—	—	—	—
$NiSO_4$	in 200 000 H_2O		154.7716	—	-962.755	—	—	—	—
	in 500 000 H_2O		154.7716	—	-962.906	—	—	—	—
	in ∞ H_2O		154.7716	—	-963.2	—	—	—	—
$NiSO_4{\cdot}4H_2O$		cr	226.8332	—	-2104.1	—	—	—	—
$NiSO_4{\cdot}6H_2O$	α, tetragonal, green	cr	262.8640	-2631.263	-2682.82	-2224.61	51.844	334.47	327.86
$NiSO_4{\cdot}6H_2O$	β, monoclinic, blue	cr2	262.8640	—	-2672.3	—	—	—	—
$NiSO_4{\cdot}7H_2O$		cr	280.8794	-2919.051	-2976.33	-2461.83	58.932	378.94	364.59
NiS_2O_6		aq	218.8344	—	-1252.3	—	—	—	—
$NiS_2O_6{\cdot}6H_2O$		cr	326.9268	—	-2976.9	—	—	—	—
$NiSO_4{\cdot}3Ni(OH)_2$		cr	432.9460	—	-2449.3	-2167.5	—	623.	—
$(NiSO_4)_3{\cdot}4Ni(OH)_2$		cr	835.2140	—	—	-3410.	—	—	—
NiSe		cr	137.6700	—	-59.0	—	—	—	—
$NiSeO_3{\cdot}2H_2O$		cr	221.6990	—	-1134.32	—	—	—	—
	precipitated	am	221.6990	—	-1106.2	—	—	—	—
NiTe		cr	186.3100	—	-53.6	—	—	—	52.3
$NiTe_{1.1}$	x denotes undetermined zero–point entropy	cr	199.0700	-58.37	-58.2	—	11.736	84.1+x	54.35
$NiTe_2$	x denotes undetermined zero–point entropy	cr	313.9100	—	—	—	16.514	120.5+x	75.94
Ni_2Te_3	x denotes undetermined zero–point entropy	cr	500.2200	-144.18	-144.3	—	27.757	200.8+x	127.44

Table 39:Ni | NICKEL (Prepared 1968) — Continued | Table 39:Ni

Substance Formula and Description		State	Molar mass g mol⁻¹	0 K	298.15 K (25°C) and 0.1 MPa (1 bar)				
				$\Delta_f H^\circ_0$ kJ mol⁻¹	$\Delta_f H^\circ$	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$	S° J mol⁻¹ K⁻¹	C_p
$Ni(N_3)_2 \cdot H_2O$		cr	160.7656	—	189.5	—	—	—	—
Ni_3N		cr	190.1367	—	0.8	—	—	—	—
$Ni(NO_3)_2$		cr	182.7198	—	-415.1	—	—	—	—
		ai	182.7198	—	-468.6	-268.5	—	164.0	—
	in 50 H_2O		182.7198	—	-466.5	—	—	—	—
$Ni(NO_3)_2$	in 100 H_2O		182.7198	—	-466.1	—	—	—	—
	in 200 H_2O		182.7198	—	-466.1	—	—	—	—
	in 400 H_2O		182.7198	—	-466.9	—	—	—	—
	in 1 000 H_2O		182.7198	—	-467.4	—	—	—	—
$Ni(NO_3)_2 \cdot 3H_2O$		cr	236.7660	—	-1326.3	—	—	—	—
$Ni(NO_3)_2 \cdot 6H_2O$		cr	290.8122	—	-2211.7	—	—	—	464.
$Ni(N_2H_4)^{2+}$		ao	90.7554	—	—	66.6	—	—	464.
$Ni(NH_3)_2{}^{2+}$		ao	92.7714	—	-246.4	-127.9	—	85.4	—
$Ni(N_2H_4)_2{}^{2+}$		ao	122.8008	—	—	180.9	—	—	—
$Ni(NH_3)_4{}^{2+}$		ao	126.8328	—	-438.9	—	—	258.6	—
$Ni(N_2H_4)_3{}^{2+}$		ao	154.8462	—	—	296.9	—	—	—
$Ni(NH_3)_6{}^{2+}$		ao	160.8942	—	-630.1	-255.7	—	394.6	—
$Ni(N_2H_4)_4{}^{2+}$		ao	186.8916	—	—	414.2	—	—	—
$Ni(N_2H_4)_5{}^{2+}$		ao	218.9370	—	—	533.5	—	—	—
$Ni(N_2H_4)_6{}^{2+}$		ao	250.9824	—	—	654.5	—	—	—
$Ni(NH_3)_6(NO_3)_2$		cr	284.9040	—	—	—	—	—	402.
	in 400 H_2O		284.9040	—	-1026.8	—	—	—	—
$NiCl_2 \cdot NH_3$		cr	146.6467	—	-441.8	—	—	—	—
$NiCl_2 \cdot 2NH_3$		cr	163.6774	—	-567.4	—	—	—	—
$Ni(NH_3)_6Cl_2$		cr	231.8002	—	-994.1	—	—	—	—
$NiBr_2 \cdot NH_3$		cr	235.5587	—	-345.2	—	—	—	—
$NiBr_2 \cdot 2NH_3$		cr	252.5894	—	-479.1	—	—	—	—
$Ni(NH_3)_6Br_2$		cr	320.7122	—	-923.8	—	—	—	—
$NiI_2 \cdot 2NH_3$		cr	346.5802	—	-362.3	—	—	—	—
$Ni(NH_3)_6I_2$		cr	414.7030	—	-808.3	—	—	—	—
$Ni(N_2H_4)_3SO_4$		cr	250.9078	—	—	-480.8	—	—	—
Ni_3P		cr	207.1038	—	-210.0	—	—	—	—
Ni_5P_2		cr	355.4976	—	-408.8	—	—	—	—
$NiP_2O_7{}^{2-}$		ao	232.6534	—	-2342.6	-2004.4	—	-173.6	—
$Ni_2P_2O_7$		cr	291.3634	—	—	-2083.1	—	—	—
$Ni_3(PO_4)_2$		cr	366.0728	—	—	-2353.0	—	—	—
$NiHP_2O_7{}^-$	from $HP_2O_7{}^{3-}$	ao	233.6614	—	—	-2039.6	—	—	—
$Ni_3(AsO_4)_2$		cr	453.9684	—	—	-1579.3	—	—	—
NiSb		cr	180.4600	—	-66.1	—	—	—	—
Ni_3C		cr	188.1412	—	67.4	—	—	—	—
$NiCO_3$		cr	118.7194	—	—	-612.5	—	—	—
NiC_2O_4	oxalate	cr	146.7300	—	-856.9	—	—	—	—
		ai	146.7300	—	-879.1	-719.6	—	-83.3	—
		ao	146.7300	—	-878.2	-748.9	—	18.0	—
$Ni(CO)_4$		l	170.7524	—	-633.0	-588.2	—	313.4	204.6
$Ni(CO)_4$		g	170.7524	-606.165	-602.91	-587.23	29.598	410.6	145.18
$Ni(CO)_4{}^+$		g	170.7524	196.6	205.9	—	—	—	—
$Ni(HCO_2)_2$	formate	cr	148.7460	—	-871.9	—	—	—	—
$Ni(CH_3CO_2)^+$	acetate	ao	117.7552	—	—	-422.9	—	—	—

Table 39:Ni — **NICKEL** (Prepared 1968) — Continued — Table 39:Ni

Substance Formula and Description	State	Molar mass g mol^{-1}	0 K: $\Delta_f H_0^\circ$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar): $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H_0^\circ$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
$Ni(CH_3CO_2)_2$	ai	176.8004	—	-1025.9	-784.3	—	44.4	—
	ao	176.8004	—	—	-801.9	—	—	—
$NiBr_2 \cdot 6CH_3OH$	cr	410.7836	—	-1720.9	—	—	—	—
$Ni(CN)_2$ precipitated	cr	110.7458	—	127.6	—	—	—	—
	ai	110.7458	—	247.3	299.2	—	59.4	—
$Ni(CN)_4^{2-}$	ao	162.7816	—	367.8	472.1	—	218.	—
$Ni(CNO)_2$	cr	142.7446	—	-227.6	—	—	—	—
$Ni(NH_2CH_2CH_2NH_2)^{2+}$ ethylenediamine	aq	118.8098	—	-147.3	—	—	—	—
$Ni(NH_2CH_2CH_2NH_2)_2^{2+}$	aq	178.9096	—	-240.2	—	—	—	—
$Ni(NH_2CH_2CH_2NH_2)_3^{2+}$	aq	239.0094	—	-338.1	—	—	—	—
$Ni(CH_3NH_2)_6^{2+}$ methylamine	ao	245.0574	—	-537.6	28.2	—	569.	—
$Ni(NH_2CH_2COO)_2$ glycinate	cr	206.8298	—	-972.8	—	—	—	—
$Ni(C_2H_3O_2N_2)_2$ glyoximate	cr	232.8272	—	-127.2	—	—	—	—
$Ni(NH_2CH_2CH_2NH_2)_3Cl_2$ ethylenediamine	cr	309.9154	—	-661.1	—	—	—	—
	aq	309.9154	—	-651.66	—	—	—	—
$Ni(NH_2CH_2CH_2NH_2)_3Cl_2 \cdot 2H_2O$	cr	345.9462	—	-1276.1	—	—	—	—
$Ni(NH_2CH_2CH_2NH_2)_3Br_2$	cr	398.8274	—	-597.9	—	—	—	—
	aq	398.8274	—	-560.45	—	—	—	—
$Ni(NH_2CH_2CH_2NH_2)_3Br_2 \cdot 2H_2O$	cr	434.8582	—	-1194.1	—	—	—	—
$Ni(NH_2CH_2CH_2NH_2)_3I_2$	cr	492.8182	—	-475.3	—	—	—	—
$Ni(NH_2CH_2CH_2NH_2)_3I_2$	aq	492.8182	—	-427.73	—	—	—	—
$Ni(NH_2CH_2CH_2NH_2)_3I_2 \cdot 2H_2O$	cr	528.8490	—	-1061.9	—	—	—	—
$NiCNS^+$	ao	116.7919	—	77.4	37.7	—	230.	—
$Ni(CNS)_2$	cr	174.8738	—	95.4	—	—	—	—
NiSi	cr	86.7960	—	-86.2	—	—	—	45.6
Ni_2Si	cr	145.5060	—	-140.6	—	—	—	70.3
Ni_3Sn	cr	294.8200	—	-93.7	—	—	—	99.6
Ni_3Sn_2	cr	413.5100	—	-156.9	—	—	—	—
$(NiI_2)_2 \cdot PbI_2$	cr	1086.0364	—	-330.1	—	—	—	—
$(NiI_2)_2 \cdot PbI_2 \cdot 3H_2O$	cr	1140.0826	—	-1402.5	—	—	—	—
$Ni(BO_2)_2$	cr	144.3296	—	—	-1453.0	—	—	—
$Ni(OH)_2 \cdot 2H_3BO_3$	cr	216.3912	—	—	-2525.6	—	—	—
NiAl	cr	85.6915	—	-117.6	—	—	—	—
$NiAl_2O_4$	cr	176.6706	—	-1915.9	—	—	—	—

Table 40:Co — **COBALT** (Prepared 1968) — Table 40:Co

Substance Formula	Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
Co	α, hexagonal	cr	58.9332	0	0	0	4.766	30.04	24.81
	β, face centered cubic	cr2	58.9332	—	0.46	0.25	—	30.71	—
		g	58.9332	423.082	424.7	380.3	6.360	179.515	23.020
Co^+		g	58.9332	1181.85	1189.59	—	6.293	—	—
Co^{2+}		g	58.9332	2830.27	2844.20	—	6.343	—	—
Co^{3+}		g	58.9332	6062.6	6082.7	—	—	—	—
Co^{2+}		ao	58.9332	—	-58.2	-54.4	—	-113.	—
Co^{3+}		ao	58.9332	—	92.	134.	—	-305.	—
Co_2		g	117.8664	682.	682.8	—	—	—	—
CoO		cr	74.9326	—	-237.94	-214.20	—	52.97	55.23
Co_3O_4		cr	240.7972	—	-891.	-774.	—	102.5	123.4
$HCoO_2^-$		ao	91.9400	—	—	-407.5	—	—	—
$Co(OH)_2$	blue, precipitated	cr	92.9480	—	—	-450.1	—	—	—
	pink, precipitated	cr2	92.9480	—	-539.7	-454.3	—	79.	—
	pink, precipitated, aged	cr3	92.9480	—	—	-458.1	—	—	—
$Co(OH)_2$		ai	92.9480	—	-518.0	-369.0	—	-134.	—
		ao	92.9480	—	—	-421.7	—	—	—
$Co(OH)_3$	precipitated	cr	109.9554	—	-716.7	—	—	—	—
CoF_2		cr	96.9300	-690.90	-692.0	-647.2	12.460	81.96	68.78
	in 2 400 H_2O		96.9300	—	-717.1	—	—	—	—
CoF_3		cr	115.9284	—	-810.9	—	—	—	—
$CoCl_2$		cr	129.8392	-312.71	-312.5	-269.8	14.121	109.16	78.49
		ai	129.8392	—	-392.5	-316.7	—	0	—
	in 15 H_2O		129.8392	—	-375.97	—	—	—	—
	in 20 H_2O		129.8392	—	-380.24	—	—	—	—
$CoCl_2$	in 25 H_2O		129.8392	—	-382.12	—	—	—	—
	in 30 H_2O		129.8392	—	-383.51	—	—	—	—
	in 40 H_2O		129.8392	—	-385.18	—	—	—	—
	in 50 H_2O		129.8392	—	-386.18	—	—	—	—
	in 60 H_2O		129.8392	—	-386.85	—	—	—	—
$CoCl_2$	in 75 H_2O		129.8392	—	-387.44	—	—	—	—
	in 100 H_2O		129.8392	—	-388.02	—	—	—	—
	in 150 H_2O		129.8392	—	-388.57	—	—	—	—
	in 200 H_2O		129.8392	—	-388.86	—	—	—	—
	in 400 H_2O		129.8392	—	-389.53	—	—	—	—
$CoCl_2$	in 500 H_2O		129.8392	—	-389.78	—	—	—	—
	in 800 H_2O		129.8392	—	-390.49	—	—	—	—
	in 1 000 H_2O		129.8392	—	-390.70	—	—	—	—
	in 2 000 H_2O		129.8392	—	-391.37	—	—	—	—
	in 5 000 H_2O		129.8392	—	-391.87	—	—	—	—
$CoCl_2$	in ∞ H_2O		129.8392	—	-392.5	—	—	—	—
	in HCl + 26.66 H_2O:u		129.8392	—	-382.8	—	—	—	—
$CoCl_2 \cdot H_2O$		cr	147.8546	—	-615.	—	—	—	—
$CoCl_2 \cdot 2H_2O$		cr	165.8700	—	-923.0	-764.7	—	188.	—
$CoCl_2 \cdot 6H_2O$		cr	237.9316	—	-2115.4	-1725.2	—	343.	—
$Co(ClO_4)_2$		ai	257.8344	—	-316.7	-71.4	—	251.	—
	in 7.6 H_2O		257.8344	—	-308.90	—	—	—	—
	in 10 H_2O		257.8344	—	-311.04	—	—	—	—
	in 13 H_2O		257.8344	—	-313.01	—	—	—	—
	in 20 H_2O		257.8344	—	-315.22	—	—	—	—

Table 40:Co — COBALT (Prepared 1968) — Continued — Table 40:Co

Substance Formula	Description	State	Molar mass g mol^{-1}	0 K: $\Delta_f H^\circ_0$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar): $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H^\circ_0$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
$Co(ClO_4)_2$	in 30 H_2O		257.8344	—	-316.27	—	—	—	—
	in 50 H_2O		257.8344	—	-316.73	—	—	—	—
	in 100 H_2O		257.8344	—	-316.73	—	—	—	—
	in 500 H_2O		257.8344	—	-316.73	—	—	—	—
	in 1 000 H_2O		257.8344	—	-316.73	—	—	—	—
$Co(ClO_4)_2$	in ∞ H_2O		257.8344	—	-316.7	—	—	—	—
$Co(ClO_4)_2 \cdot 6H_2O$		cr	365.9268	—	-2038.4	—	—	—	—
$CoBr_2$		cr	218.7512	—	-220.9	—	—	—	79.5
		ai	218.7512	—	-301.2	-262.3	—	50.	—
	in 1 000 H_2O		218.7512	—	-299.6	—	—	—	—
$CoBr_2 \cdot 6H_2O$		cr	326.8436	—	-2020.0	—	—	—	—
CoI_2		cr	312.7420	—	-88.7	—	—	—	—
		ai	312.7420	—	-168.6	-157.7	—	109.	—
	in 1 000 H_2O		312.7420	—	-166.9	—	—	—	—
$Co(IO_3)_2$		ai	408.7384	—	-500.8	-310.4	—	126.	—
$Co(IO_3)_2 \cdot 2H_2O$		cr	444.7692	—	-1082.0	-795.6	—	268.	—
CoS		cr	90.9972	—	-82.8	—	—	—	—
Co_2S_3	precipitated	cr	214.0584	—	-147.3	—	—	—	—
$CoSO_4$		cr	154.9948	—	-888.3	-782.3	—	118.0	—
		ai	154.9948	—	-967.3	-799.1	—	-92.	—
$CoSO_4$	in 23.31 H_2O		154.9948	—	-961.5	—	—	—	—
	in 400 H_2O		154.9948	—	-963.6	—	—	—	—
	in 700 H_2O		154.9948	—	-964.0	—	—	—	—
	in 1 000 H_2O		154.9948	—	-964.4	—	—	—	—
	in ∞ H_2O		154.9948	—	-967.3	—	—	—	—
$CoSO_4 \cdot 6H_2O$		cr	263.0872	-2636.995	-2683.6	-2235.36	56.589	367.61	353.38
$CoSO_4 \cdot 7H_2O$		cr	281.1026	-2926.905	-2979.93	-2473.42	63.166	406.06	390.49
$CoSO_4 \cdot 3Co(OH)_2$		cr	433.8388	—	-2477.8	-2195.5	—	623.	—
$CoSe$		cr	137.8932	—	-61.1	—	—	—	—
$CoSeO_3 \cdot 2H_2O$		cr	221.9222	—	-1115.0	—	—	—	—
$CoTe_2$		cr	314.1332	—	-130.	—	—	—	—
Co_3Te_4		cr	687.1996	—	-322.	—	—	—	—
Co_5Te_6		cr	1060.2660	—	-423.	—	—	—	—
$Co(NO_3)_2$		cr	182.9430	—	-420.5	—	—	—	—
		ai	182.9430	—	-472.8	-276.9	—	180.	—
$Co(NO_3)_2$	in 20 H_2O		182.9430	—	-471.79	—	—	—	—
	in 400 H_2O		182.9430	—	-472.4	—	—	—	—
$Co(NO_3)_2 \cdot 2H_2O$		cr	218.9738	—	-1021.7	—	—	—	—
$Co(NO_3)_2 \cdot 3H_2O$		cr	236.9892	—	-1325.9	—	—	—	—
$Co(NO_3)_2 \cdot 4H_2O$		cr	255.0046	—	-1630.5	—	—	—	—
$Co(NO_3)_2 \cdot 6H_2O$		cr	291.0354	—	-2211.20	—	—	—	452.
$(Co(NO_2)_6)^{3-}$		aq	334.9662	—	-627.6	—	—	—	—
$(Co(NH_3))^{2+}$		ao	75.9639	—	-145.2	-92.4	—	13.	—
$(Co(NH_3)_2)^{2+}$		ao	92.9946	—	—	-127.5	—	—	—
$(Co(NH_3)_3)^{2+}$		ao	110.0253	—	—	-159.2	—	—	—
$(Co(NH_3)_4)^{2+}$		ao	127.0560	—	—	-189.3	—	—	—
$(Co(NH_3)_6)^{3+}$		ao	161.1174	—	-584.9	-157.0	—	146.	—
$(Co(NH_3)_6)N_3^{2+}$		ao	203.1375	—	-322.2	179.9	—	251.	—
$(Co(NH_3)_3(N_3)_3)$		cr	236.0856	—	400.8	—	—	—	—
$(Co(NH_3)_4(N_3)_2)N_3$	cis	cr	253.1163	—	380.3	—	—	—	—

Table 40:Co — **COBALT** (Prepared 1968) — Continued — Table 40:Co

Substance Formula and Description	State	Molar mass g mol^{-1}	0 K: $\Delta_f H^\circ_0$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar): $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H^\circ_0$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
$(Co(NH_3)_4(N_3)_2)N_3$ trans	cr2	253.1163	—	378.2	—	—	—	—
$(Co(NH_3)_5N_3)(N_3)_2$	cr	270.1470	—	210.9	—	—	—	—
$(Co(NH_3)_6)(N_3)_3$	cr	287.1777	—	128.4	—	—	—	—
$(Co(NH_3)_4(H_2O)_2)^{3+}$	aq	163.0868	—	-1021.7	—	—	—	—
$(Co(NH_3)_4(NO_3)H_2O)^{2+}$	aq	207.0763	—	-865.3	—	—	—	—
$(Co(NH_3)_5H_2O)^{3+}$	aq	162.1021	—	-760.2	—	—	—	—
$(Co(NH_3)_2(NO_2)_4)^-$	aq	277.0166	—	-659.4	—	—	—	—
$(Co(NH_3)_3(NO_2)_3)$	cr	248.0418	—	-677.8	—	—	—	—
in 24 000 H_2O		248.0418	—	-639.3	—	—	—	—
$(Co(NH_3)_4(NO_2)_2)^+$ cis	aq	219.0670	—	-640.6	—	—	—	—
$(Co(NH_3)_4(NO_2)_2)^+$ trans	aq2	219.0670	—	-638.9	—	—	—	—
$(Co(NH_3)_5NO_2)^{2+}$	ao	190.0922	—	-613.4	-167.4	—	163.	—
$(Co(NH_3)_5NO_3)^{2+}$	aq	206.0916	—	-681.2	—	—	—	—
$(Co(NH_3)_6)OH^{2+}$	ao	178.1248	—	—	-330.	—	—	—
$NH_4(Co(NH_3)_2(NO_2)_4)$	cr	295.0553	—	-837.6	—	—	—	—
$NH_4(Co(NH_3)_2(NO_2)_4)$ in 12 000 H_2O		295.0553	—	-792.0	—	—	—	—
$(Co(NH_3)_4(NO_2)_2)NO_3$ cis	cr	281.0719	—	-898.7	—	—	—	—
in 8 000 H_2O:i		281.0719	—	-848.1	—	—	—	—
trans	cr2	281.0719	—	-896.2	—	—	—	—
in 16 000 H_2O:i2		281.0719	—	-846.4	—	—	—	—
$(Co(NH_3)_4(NO_3)H_2O)(NO_3)_2$	cr	331.0861	—	-1333.0	—	—	—	—
in 13 000 H_2O		331.0861	—	-1279.9	—	—	—	—
$(Co(NH_3)_5NO_2)(NO_3)_2$	cr	314.1020	—	-1088.7	-412.9	—	331.	—
	ai	314.1020	—	-1028.0	-389.9	—	456.	—
$(Co(NH_3)_5NO_3)(NO_3)_2$	cr	330.1014	—	-1157.7	—	—	—	—
$(Co(NH_3)_5NO_3)(NO_3)_2$ in 18 000 H_2O		330.1014	—	-1095.8	—	—	—	—
$(Co(NH_3)_5H_2O)(NO_3)_3$	cr	348.1168	—	-1446.8	—	—	—	—
	aq	348.1168	—	-1382.4	—	—	—	—
$(Co(NH_3)_6)(NO_3)_3$	cr	347.1321	—	-1282.0	-524.5	—	448.	—
	ai	347.1321	—	-1207.1	-490.6	—	586.	—
$(Co(NH_3)_5H_2O)(Co(NO_2)_6)$	cr	497.0683	—	-1483.2	—	—	—	—
$(Co(NH_3)_6)(Co(NO_2)_6)$	cr	496.0836	—	-1302.5	—	—	—	—
$Co(NH_3)_4(NO_2)_2(Co(NH_3)_2(NO_2)_4)$ cis	cr2	496.0836	—	-1384.9	—	—	—	—
cis	aq2	496.0836	—	-1300.0	—	—	—	—
trans	cr3	496.0836	—	-1384.9	—	—	—	—
$Co(NH_3)_4(NO_2)_2(Co(NH_3)_2(NO_2)_4$ trans	aq3	496.0836	—	-1298.3	—	—	—	—
$(Co(NH_3)_5NO_2)(Co(NH_3)_2(NO_2)_4)_2$	cr	744.1254	—	-2021.7	—	—	—	—
	aq	744.1254	—	-1932.2	—	—	—	—
$(Co(NH_3)_6)(Co(NH_3)_2(NO_2)_4)_3$	cr	992.1672	—	-2733.0	—	—	—	—
	aq	992.1672	—	-2563.1	—	—	—	—
$(Co(NH_3)_5NO_2)_3(Co(NO_2)_6)_2$	cr	1240.2089	—	-3293.6	—	—	—	—
$(Co(NH_3)_5H_2O)F_3$	cr	219.0973	—	-1728.	—	—	—	—
	aq	219.0973	—	-1701.2	—	—	—	—
$CoCl_2 \cdot NH_3$	cr	146.8699	—	-450.6	—	—	—	—
$CoCl_2 \cdot 2NH_3$ rose	cr	163.9006	—	-574.9	—	—	—	—
$CoCl_2 \cdot 2N_2H_4$	cr	193.9300	—	-381.2	—	—	—	—
$(Co(NH_3)_4Cl_2)^+$ cis	aq	197.9620	—	-671.5	—	—	—	—
trans	aq2	197.9620	—	-679.1	—	—	—	—
$(Co(NH_3)_4Cl_2)Cl$ cis	cr	233.4150	—	-874.9	—	—	—	—
	aq	233.4150	—	-838.9	—	—	—	—

Table 40:Co — COBALT (Prepared 1968) — Continued — Table 40:Co

Substance Formula and Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
$(Co(NH_3)_4Cl_2)Cl$ trans	cr2	233.4150	—	-877.4	—	—	—	—
	aq2	233.4150	—	-846.4	—	—	—	—
$(Co(NH_3)_5Cl)^{2+}$	ao	179.5397	—	-628.0	-291.7	—	341.4	—
$(Co(NH_3)_5Cl)Cl_2$	cr	250.4457	-959.22	-1017.1	-582.5	45.81	366.1	239.3
	ai	250.4457	—	-962.3	-554.0	—	454.4	—
$(Co(NH_3)_5Cl)Cl_2$ in 5 000 H_2O		250.4457	—	-962.3	—	—	—	—
$(Co(NH_3)_6)Cl^{2+}$	ao	196.5704	—	-770.3	-280.0	—	117.	—
$(Co(NH_3)_6)Cl_2$	cr	232.0234	—	-995.8	—	—	—	—
$(Co(NH_3)_6)Cl_3$	cr	267.4764	—	-1124.2	—	—	—	320.5
	ai	267.4764	—	-1086.6	-550.6	—	314.	—
$(Co(NH_3)_4(H_2O)_2)Cl_3$	cr	269.4458	—	-1535.1	—	—	—	—
in 10 000 H_2O		269.4458	—	-1523.4	—	—	—	—
$(Co(NH_3)_5H_2O)Cl_3$	cr	268.4611	-1221.39	-1287.8	-777.8	50.08	346.0	275.7
	aq	268.4611	—	-1261.9	—	—	—	—
$(Co(NH_3)_4(NO_2)_2)Cl$ trans	cr2	254.5200	—	-850.2	—	—	—	—
$(Co(NH_3)_4(NO_2)_2)Cl$ in 11 000 H_2O:i2		254.5200	—	-806.3	—	—	—	—
cis	cr	254.5200	—	-847.3	—	—	—	—
in 10 000 H_2O:i		254.5200	—	-807.9	—	—	—	—
$(Co(NH_3)_5NO_2)Cl_2$	cr	260.9982	—	-987.8	—	—	—	—
	aq	260.9982	—	-947.7	—	—	—	—
$(Co(NH_3)_5NO_3)Cl_2$	cr	276.9976	—	-1063.6	—	—	—	—
	aq	276.9976	—	-1015.5	—	—	—	—
$(Co(NH_3)_5NO_2)(ClO_4)_2$	cr	388.9934	—	-962.	—	—	—	—
	aq	388.9934	—	-871.9	—	—	—	—
$(Co(NH_3)_6)(ClO_4)_3$	cr	459.4692	—	-1034.7	-221.1	—	615.	—
$(Co(NH_3)_6)(ClO_4)_3$	ai	459.4692	—	-972.8	-182.6	—	695.	—
$(Co(NH_3)_5Cl)(NO_3)_2$	cr	303.5495	—	-1112.9	—	—	—	—
	ai	303.5495	—	-1042.7	-514.2	—	634.3	—
in 25 000 H_2O		303.5495	—	-1042.7	—	—	—	—
$(Co(NH_3)_5Cl)(Co(NH_3)_2(NO_2)_4$	cr	733.5729	—	-2075.	—	—	—	—
$(Co(NH_3)_5Cl)(Co(NH_3)_2(NO_2)_4$	aq	733.5729	—	-1946.8	—	—	—	—
$CoBr_2 \cdot NH_3$	cr	235.7819	—	-356.1	—	—	—	—
$CoBr_2 \cdot 2NH_3$ rose	cr	252.8126	—	-485.3	—	—	—	—
$CoBr_2 \cdot 2N_2H_4$	cr	282.8420	—	-298.3	—	—	—	—
$(Co(NH_3)_5Br)^{2+}$	aq	223.9957	—	-590.4	—	—	—	—
$(Co(NH_3)_5Br)Br_2$	cr	383.8137	—	-886.6	—	—	—	—
in 19 000 H_2O		383.8137	—	-833.5	—	—	—	—
$(Co(NH_3)_6)Br^{2+}$	ao	241.0264	—	-718.4	-252.8	—	163.	—
$(Co(NH_3)_6)Br_2$	cr	320.9354	—	-905.4	—	—	—	—
$(Co(NH_3)_6)Br_3$	cr	400.8444	-910.10	-1002.9	-500.9	50.96	325.1	326.8
$(Co(NH_3)_6)Br_3$	ai	400.8444	—	-949.8	-469.1	—	393.	—
$(Co(NH_3)_5H_2O)Br_3$	cr	401.8291	—	-1163.6	—	—	—	—
in 10 000 H_2O		401.8291	—	-1124.7	—	—	—	—
$(Co(NH_3)_5NO_2)Br_2$	cr	349.9102	—	-909.2	—	—	—	—
	aq	349.9102	—	-856.5	—	—	—	—
$(Co(NH_3)_5Cl)Br_2$	cr	339.3577	—	-929.7	—	—	—	—
	ai	339.3577	—	-871.1	-499.6	—	506.3	—
in 19 000 H_2O		339.3577	—	-871.1	—	—	—	—
$CoI_2 \cdot 2NH_3$ blue	cr	346.8034	—	-347.	—	—	—	—
$(Co(NH_3)_5I)I_2$	cr	524.7999	—	-707.1	—	—	—	—

Substance Formula and Description	State	Molar mass g mol^{-1}	0 K $\Delta_f H^\circ_0$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H^\circ_0$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
$(Co(NH_3)_6)I^{2+}$	ao	288.0218	—	−648.9	−203.0	—	213.	—
$(Co(NH_3)_6)I_2$	cr	414.9262	—	−794.5	—	—	—	289.1
$(Co(NH_3)_6)I_3$	cr	541.8306	—	−815.0	—	—	—	310.9
	ai	541.8306	—	−750.6	−311.7	—	473.	—
$(Co(NH_3)_5H_2O)I_3$	cr	542.8153	—	−978.6	—	—	—	—
$(Co(NH_3)_5H_2O)I_3$	aq	542.8153	—	−925.9	—	—	—	—
$(Co(NH_3)_4(NO_2)_2)I$ cis	cr	345.9714	—	−745.6	—	—	—	—
trans	cr2	345.9714	—	−744.8	—	—	—	—
in 20 000 H_2O:i2		345.9714	—	−693.7	—	—	—	—
$(Co(NH_3)_5NO_2)I_2$	cr	443.9010	—	−775.7	—	—	—	—
$(Co(NH_3)_5NO_2)I_2$	aq	443.9010	—	−723.8	—	—	—	—
$(Co(NH_3)_5NO_3)I_2$	cr	459.9004	—	−850.2	—	—	—	—
	aq	459.9004	—	−791.6	—	—	—	—
$(Co(NH_3)_5I)(NO_3)_2$	cr	395.0009	—	−1017.5	—	—	—	—
$(Co(NH_3)_5I)Cl_2$	cr	341.8971	—	−905.8	—	—	—	—
$(Co(NH_3)_5Cl)I_2$	cr	433.3485	—	−803.7	—	—	—	—
in 12 000 H_2O		433.3485	—	−738.5	—	—	—	—
$(Co(NH_3)_5SO_4)^+$	aq	240.1483	—	−1370.3	—	—	—	—
$(Co(NH_3)_5H_2O)SO_4{}^+$	aq	258.1637	—	−1670.7	—	—	—	—
$(Co(NH_3)_4(NO_2)_2)SO_4$ cis	cr	315.1286	—	−2268.6	—	—	—	—
$(Co(NH_3)_4(NO_2)_2)SO_4$ cis	aq	315.1286	—	−2190.3	—	—	—	—
trans	cr2	315.1286	—	−2255.6	—	—	—	—
	aq2	315.1286	—	−2187.0	—	—	—	—
$(Co(NH_3)_5SO_4)NO_3$	cr	302.1532	—	−1627.2	—	—	—	—
in 17 000 H_2O		302.1532	—	−1577.8	—	—	—	—
$(Co(NH_3)_6)SO_4{}^+$	ao	257.1790	—	−1492.4	−920.9	—	238.	—
$(Co(NH_3)_5SO_4)I$	cr	367.0527	—	−1466.9	—	—	—	—
in 15 000 H_2O		367.0527	—	−1425.5	—	—	—	—
Co_2P	cr	148.8402	—	−188.	—	—	—	—
$Co_3(PO_4)_2$	cr	366.7424	—	—	−2398.6	—	—	—
$CoHPO_4$	cr	154.9126	—	—	−1181.9	—	—	—
CoAs	cr	133.8548	—	−40.6	—	—	—	—
$CoAs_2$	cr	208.7764	—	−61.5	—	—	—	—
Co_2As	cr	192.7880	—	−39.7	—	—	—	—
Co_2As_3	cr	342.6312	—	−97.5	—	—	—	—
Co_3As_2	cr	326.6428	—	−81.2	—	—	—	—
Co_5As_2	cr	444.5092	—	−79.5	—	—	—	—
$Co_3(AsO_4)_2$	cr	454.6380	—	—	−1620.8	—	—	—
CoSb	cr	180.6832	—	−42.	—	—	—	—
$CoSb_2$	cr	302.4332	—	−54.	—	—	—	—
$CoSb_3$	cr	424.1832	—	−67.	—	—	—	—
Co_2C	cr	129.8776	—	42.	—	—	—	—
$CoCO_3$	cr	118.9426	—	−713.0	—	—	—	—
CoC_2O_4 oxalate	cr	146.9532	—	−851.4	—	—	—	—
	ai	146.9532	—	−883.2	−728.4	—	−67.	—
CoC_2O_4	ao	146.9532	—	−880.7	−755.6	—	31.8	—
$Co(C_2O_4)_2{}^{2-}$	ao	234.9732	—	−1709.2	−1442.5	—	109.	—
$(Co(C_2O_4)_3)^{3-}$	aq	322.9932	—	−2390.3	—	—	—	—
$Co(HCO_2)_2$ formate	cr	148.9692	—	−873.2	—	—	—	—
$CoCl_2\cdot 2C_2H_5OH$	cr	221.9788	—	−915.5	—	—	—	—

Table 40:Co **COBALT** (Prepared 1968) — Continued Table 40:Co

Substance Formula and Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
$CoCl_2 \cdot 3C_2H_5OH$	cr	268.0486	—	-1221.7	—	—	—	—
$CoCl_2 \cdot 3C_2H_4(OH)_2$ 1,2–ethanediol	cr	316.0468	—	-1753.1	—	—	—	—
$CoBr_2 \cdot 2CH_3OH$	cr	282.8364	—	-754.0	—	—	—	—
$CoBr_2 \cdot 2C_2H_5OH$	cr	310.8908	—	-824.7	—	—	—	—
$CoBr_2 \cdot 2C_2H_4(OH)_2$	cr	342.8896	—	-1203.3	—	—	—	—
$CoBr_2 \cdot 3C_2H_5OH$	cr	356.9606	—	-1128.0	—	—	—	—
$CoBr_2 \cdot 3C_2H_4(OH)_2$	cr	404.9588	—	-1670.3	—	—	—	—
$Co(C_2H_5OSO_3)_2$ in 1 200 H_2O ethylsulfate		309.1812	—	-1808.3	—	—	—	—
$Co(CN)_6^{3-}$	ao	215.0406	—	—	—	—	232.6	—
$Co(CNO)_2$	cr	142.9678	—	-216.7	—	—	—	—
$(Co(C_2H_4(NH_2)_2))^{2+}$ ethylenediamine	aq	119.0330	—	-142.7	—	—	—	—
$(Co(C_2H_4(NH_2)_2)_2)^{2+}$	aq	179.1328	—	-228.0	—	—	—	—
$(Co(C_2H_4(NH_2)_2)_3)^{2+}$	aq	239.2326	—	-318.0	—	—	—	—
$(Co(C_2H_4(NH_2)_2)_3)^{3+}$	aq	239.2326	—	-303.8	—	—	—	—
$(Co(NH_3)_5CO_3)^{+}$	aq	204.0961	—	-1142.7	—	—	—	—
$(Co(NH_3)_5HCO_2)^{2+}$ formate	aq	189.1047	—	-901.2	—	—	—	—
$(Co(NH_3)_5CO_3)NO_3$ in 11 500 H_2O		266.1010	—	-1349.8	—	—	—	—
$(Co(NH_3)_5CO_3)NO_3 \cdot H_2O$	cr	284.1164	—	-1687.0	—	—	—	—
$(Co(NH_3)_5HCO_2)(NO_3)_2$	cr	313.1145	—	-1384.5	—	—	—	—
in 20 000 H_2O		313.1145	—	-1315.9	—	—	—	—
$CoNH_2CH_2COO^{+}$ glycinate	ao	132.9931	—	-539.7	-398.2	—	63.	—
$(Co(NH_3)_2(NO_2)_2C_2O_4)^{-}$	aq	273.0256	—	-1238.9	—	—	—	—
$(Co(NH_3)_4C_2O_4)^{+}$ oxalate	aq	215.0760	—	-1246.8	—	—	—	—
$NH_4(Co(NH_3)_2(NO_2)_2C_2O_4)$	cr	291.0643	—	-1411.7	—	—	—	—
in 13 000 H_2O		291.0643	—	-1371.5	—	—	—	—
$(Co(C_2H_4(NH_2)_2)(NH_3)(NO_2)_3$ ethylenediamine	cr	274.0802	—	-584.1	—	—	—	—
$(Co(NH_3)_5NO_2)C_2O_4$	cr	278.1122	—	-1477.8	—	—	—	—
$Co(NH_2CH_2COO)_2$ glycinate	ai	207.0530	—	-997.9	-684.3	—	126.	—
	ao	207.0530	—	-1024.2	-735.7	—	209.	—
$(Co(C_2H_4(NH_2)_2)_2(NO_2)_2)^{+}$ cis; ethylenediamine	aq	271.1438	—	-438.9	—	—	—	—
$(Co(C_2H_4(NH_2)_2)_2(NO_2)_2)NO_3$ cis	cr	333.1487	—	-689.5	—	—	—	—
in 13 000 H_2O		333.1487	—	-646.4	—	—	—	—
$(Co(C_2H_4(NH_2)_2)_3)(NO_3)_3$	cr	425.2473	—	-989.5	—	—	—	—
in 16 000 H_2O		425.2473	—	-925.9	—	—	—	—
$(Co(NH_3)_6)(Co(C_2O_4)_3) \cdot 3H_2O$	cr	538.1568	—	-3907.0	—	—	—	—
$(Co(C_2H_4(NH_2)_2))Cl_2$	cr	189.9390	—	-472.8	—	—	—	—
$CoCl_2 \cdot 1.5C_2H_4(NH_2)_2$	cr	219.9889	—	-445.6	—	—	—	—
$(Co(C_2H_4(NH_2)_2)_2Cl_2)^{+}$ cis	aq	250.0388	—	-492.0	—	—	—	—
trans	aq2	250.0388	—	-499.6	—	—	—	—
$(Co(C_2H_4(NH_2)_2)_2Cl_2)Cl$ cis	cr	285.4918	—	-681.2	—	—	—	—
$(Co(C_2H_4(NH_2)_2)_2Cl_2)Cl$ trans	cr2	285.4918	—	-677.4	—	—	—	—
cis	aq	285.4918	—	-659.4	—	—	—	—
trans	aq2	285.4918	—	-666.9	—	—	—	—
$(Co(C_2H_4(NH_2)_2)_2Cl_2)Cl \cdot HCl \cdot 6H_2O$ trans	cr	430.0452	—	-2555.6	—	—	—	—
$(Co(C_2H_4(NH_2)_2)_2Cl_2)Cl \cdot NH_3$ cis	cr	302.5225	—	-795.	—	—	—	—
$(Co(C_2H_4(NH_2)_2)_2Cl_2)Cl \cdot NH_3$ trans	cr2	302.5225	—	-774.	—	—	—	—

Table 40:**Co** **COBALT** (Prepared 1968) — Continued Table 40:**Co**

Substance Formula and Description		State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
$(Co(C_2H_4(NH_2)_2)_2Cl_2)Cl\cdot 2NH_3$	cis	cr	319.5532	—	-891.	—	—	—	—
	trans	cr2	319.5532	—	-870.	—	—	—	—
$(Co(C_2H_4(NH_2)_2)_2Cl_2)Cl\cdot 4NH_3$	cis	cr	353.6146	—	-1071.	—	—	—	—
	trans	cr2	353.6146	—	-1033.	—	—	—	—
$(Co(C_2H_4(NH_2)_2)_2Cl_2)Cl\cdot 6NH_3$	cis	cr	387.6760	—	-1238.	—	—	—	—
$(Co(C_2H_4(NH_2)_2)_3)Cl_2$		cr	310.1386	—	-655.6	—	—	—	—
$(Co(NH_3)_5Cl)C_2O_4$		cr	267.5597	—	-1493.7	—	—	—	—
$(Co(C_2H_4(NH_2)_2)_2Cl_2)NO_3$	trans	cr	312.0437	—	-751.0	—	—	—	—
	in 15 000 H_2O		312.0437	—	-707.1	—	—	—	—
$(Co(C_2H_4(NH_2)_2)_3)(ClO_4)_3$		cr	537.5844	—	-762.7	—	—	—	—
$(Co(C_2H_4(NH_2)_2)_3)Br_2$		cr	399.0506	—	-595.8	—	—	—	—
$(Co(C_2H_4(NH_2)_2)_3)I_2$		cr	493.0414	—	-475.3	—	—	—	—
$(Co(C_2H_4(NH_2)_2)_3)I_3$		cr	619.9458	—	-519.2	—	—	—	—
	in 25 000 H_2O		619.9458	—	-469.4	—	—	—	—
$(Co(NH_3)_5HCO_2)I_2$		cr	442.9135	—	-1073.2	—	—	—	—
$(Co(NH_3)_5HCO_2)I_2$	in 12 500 H_2O		442.9135	—	-1011.7	—	—	—	—
$CoCNS^+$		ao	117.0151	—	—	29.3	—	—	—
$Co(CNS)_2$		cr	175.0970	—	101.3	—	—	—	—
$(Co(NH_3)_5CNS)(NO_3)_2$		cr	326.1784	—	-909.2	—	—	—	—
CoSi		cr	87.0192	-99.87	-100.4	-98.7	7.45	43.1	44.4
$CoSi_2$		cr	115.1052	—	-102.9	—	—	—	—
$CoSi_3$		cr	143.1912	—	-107.1	—	—	—	—
Co_2Si		cr	145.9524	—	-115.5	—	—	—	—
Co_2SiO_4		cr	209.9500	—	-1477.	—	—	—	—
CoSn		cr	177.6232	—	-29.3	—	—	—	—
$Co(BO_2)_2$		cr	144.5528	—	—	-1363.1	—	—	—
CoAl	β′	cr	85.9147	—	-110.5	—	—	—	—
$CoAl_2$		cr	112.8962	—	-133.1	—	—	—	—
$CoAl_4$		cr	166.8592	—	-161.1	—	—	—	—
Co_2Al_5		cr	252.7739	—	-292.9	—	—	—	—

Table 41:Fe — **IRON** (Prepared 1966) — Table 41:Fe

Substance Formula	Description	State	Molar mass g mol⁻¹	0 K: $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K: $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
Fe		cr	55.8470	0	0	0	4.489	27.28	25.10
		g	55.8470	413.96	416.3	370.7	6.849	180.490	25.677
Fe^{+}		g	55.8470	1173.36	1181.98	—	6.937	—	—
Fe^{2+}		g	55.8470	2735.21	2749.93	—	6.812	—	—
Fe^{3+}		g	55.8470	5692.8	5712.8	—	6.197	—	—
Fe^{2+}		ao	55.8470	—	-89.1	-78.90	—	-137.7	—
Fe^{3+}		ao	55.8470	—	-48.5	-4.7	—	-315.9	—
$Fe_{0.947}O$	wustite	cr	68.8865	-267.15	-266.27	-245.12	9.46	57.49	48.12
FeO		cr	71.8464	—	-272.0	—	—	—	—
FeO_2^{2-}		ao	87.8458	—	—	-295.3	—	—	—
Fe_2O_3	hematite	cr	159.6922	-817.80	-824.2	-742.2	15.560	87.40	103.85
Fe_3O_4	magnetite	cr	231.5386	-1112.11	-1118.4	-1015.4	24.56	146.4	143.43
$FeOH^{+}$		ao	72.8544	—	-324.7	-277.4	—	-29.	—
$FeOH^{2+}$		ao	72.8544	—	-290.8	-229.41	—	-142.	—
$FeO(OH)$	geothite	cr	88.8538	—	-559.0	—	—	—	—
$HFeO_2^{-}$		ao	88.8538	—	—	-377.7	—	—	—
$Fe(OH)_2$	precipitated	cr	89.8618	—	-569.0	-486.5	—	88.	—
		g	89.8618	—	-372.	—	—	—	—
$Fe(OH)_2^{+}$		ao	89.8618	—	—	-438.0	—	—	—
$Fe(OH)_3$	precipitated	cr	106.8692	—	-823.0	-696.5	—	106.7	—
$Fe(OH)_3$		ao	106.8692	—	—	-659.3	—	—	—
$Fe(OH)_3^{-}$		ao	106.8692	—	—	-614.9	—	—	—
	equivalent to $HFeO_2^{-}$(ao) + H_2O(l)								
$Fe(OH)_4^{2-}$		ao	123.8766	—	—	-769.7	—	—	—
	equivalent to FeO_2^{2-}(ao) + $2H_2O$(l)								
$Fe_2(OH)_2^{4+}$		ao	145.7088	—	-612.1	-467.27	—	-356.	—
FeF^{2+}		ao	74.8454	—	-371.1	-322.6	—	-163.	—
FeF_2		cr	93.8438	-710.74	-711.3	-668.6	12.757	86.99	68.12
		ai	93.8438	—	-754.4	-636.48	—	-165.3	—
		aq	93.8438	—	-745.2	—	—	—	—
FeF_2^{+}		ao	93.8438	—	-696.2	-628.4	—	-63.	—
FeF_3		ai	112.8422	—	-1046.4	-840.9	—	-357.3	—
FeF_3		aq	112.8422	—	-1016.3	—	—	—	—
	in 1 000 HF + 17 000 H_2O		112.8422	—	-1038.	—	—	—	—
$FeCl^{2+}$		ao	91.3000	—	-180.3	-143.9	—	-113.	—
$FeCl_2$		cr	126.7530	-344.398	-341.79	-302.30	16.272	117.95	76.65
		g	126.7530	—	-148.5	—	—	—	—
$FeCl_2$		ai	126.7530	—	-423.4	-341.34	—	-24.7	—
		ao	126.7530	—	—	-279.1	—	—	—
	in 25 H_2O		126.7530	—	-412.46	—	—	—	—
	in 50 H_2O		126.7530	—	-416.02	—	—	—	—
	in 100 H_2O		126.7530	—	-417.90	—	—	—	—
$FeCl_2$	in 250 H_2O		126.7530	—	-419.2	—	—	—	—
	in 500 H_2O		126.7530	—	-419.74	—	—	—	—
	in 1 000 H_2O		126.7530	—	-419.99	—	—	—	—
	in 8 000 H_2O		126.7530	—	-423.4	—	—	—	—
$FeCl_2^{+}$		g	126.7530	—	854.	—	—	—	—
$FeCl_2·2H_2O$		cr	162.7838	—	-953.1	—	—	—	—
$FeCl_2·4H_2O$		cr	198.8146	—	-1549.3	—	—	—	—
$FeCl_3$		cr	162.2060	-400.944	-399.49	-334.00	19.707	142.3	96.65

Table 41:**Fe** | **IRON** (Prepared 1966) — Continued | Table 41:**Fe**

Substance Formula and Description		State	Molar mass g mol^{-1}	0 K $\Delta_f H^\circ_0$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H^\circ_0$	S° J mol^{-1} K^{-1}	C_p
$FeCl_3$		g	162.2060	—	-254.0	—	—	—	—
		ai	162.2060	—	-550.2	-398.3	—	-146.4	—
		ao	162.2060	—	—	-404.5	—	—	—
	in 600 H_2O		162.2060	—	-530.9	—	—	—	—
	in 1 500 H_2O		162.2060	—	-533.0	—	—	—	—
$FeCl_3$	in 2 000 H_2O		162.2060	—	-533.5	—	—	—	—
	in 15 000 H_2O		162.2060	—	-531.4	—	—	—	—
	in 25 000 H_2O		162.2060	—	-523.8	—	—	—	—
	in 50 000 H_2O		162.2060	—	-518.8	—	—	—	—
	in 70 000 H_2O		162.2060	—	-516.7	—	—	—	—
$FeCl_3$	in 13.5 HCl + 1 500 H_2O		162.2060	—	-528.9	—	—	—	—
	in 27.0 HCl + 1 500 H_2O		162.2060	—	-524.7	—	—	—	—
	in 54.0 HCl + 1 500 H_2O		162.2060	—	-517.1	—	—	—	—
	in 81.0 HCl + 1 500 H_2O		162.2060	—	-510.0	—	—	—	—
	in 108 HCl + 1 500 H_2O		162.2060	—	-503.8	—	—	—	—
$FeCl_3$	in 135 HCl + 1 500 H_2O		162.2060	—	-497.5	—	—	—	—
	in 215 HCl + 1 500 H_2O		162.2060	—	-481.2	—	—	—	—
	in 270 HCl + 1 500 H_2O		162.2060	—	-467.8	—	—	—	—
	in 325 HCl + 1 500 H_2O		162.2060	—	-457.3	—	—	—	—
	in 380 HCl + 1 500 H_2O		162.2060	—	-448.1	—	—	—	—
$FeCl_3$	in 430 HCl + 1 500 H_2O		162.2060	—	-440.2	—	—	—	—
	in $SiCl_4$:x		162.2060	—	-372.8	-302.29	—	125.5	—
	in C_2H_5OH:u		162.2060	—	-472.4	—	—	—	—
$FeCl_3 \cdot 6H_2O$		cr	270.2984	—	-2223.8	—	—	—	—
$(FeCl_2)_2$		g	253.5060	—	-439.	—	—	—	—
Fe_2Cl_6		g	324.4120	—	-654.8	—	—	—	—
FeOCl		cr	107.2994	—	-377.0	—	—	—	—
$FeClO_4^{2+}$		ao	155.2976	—	—	-17.	—	—	—
$Fe(ClO_4)_2$		ai	254.7482	—	-347.7	-95.94	—	226.4	—
	in 200 H_2O		254.7482	—	-346.0	—	—	—	—
$Fe(ClO_4)_2$	in 500 H_2O		254.7482	—	-347.3	—	—	—	—
	in 1 000 H_2O		254.7482	—	-347.7	—	—	—	—
$Fe(ClO_4)_2 \cdot 6H_2O$		cr	362.8406	—	-2068.6	—	—	—	—
$FeBr^{2+}$		ao	135.7560	—	-144.8	-112.2	—	-138.	—
$FeBr_2$		cr	215.6650	—	-249.8	-238.1	—	140.6	—
$FeBr_2$		g	215.6650	—	-46.	—	—	—	—
		ai	215.6650	—	-332.2	-286.81	—	27.2	—
	in 1 650 H_2O		215.6650	—	-336.4	—	—	—	—
	in 11 500 H_2O		215.6650	—	-333.9	—	—	—	—
	in HCl + 26.66 H_2O:u		215.6650	—	-330.1	—	—	—	—
$FeBr_3$		cr	295.5740	—	-268.2	—	—	—	—
		g	295.5740	—	-123.8	—	—	—	—
		ai	295.5740	—	-413.4	-316.7	—	-68.6	—
	in 10 000 H_2O		295.5740	—	-390.4	—	—	—	—
	in 20 000 H_2O		295.5740	—	-387.9	—	—	—	—
$FeBr_3$	in 40 000 H_2O		295.5740	—	-372.4	—	—	—	—
$(FeBr_2)_2$		g	431.3300	—	-264.	—	—	—	—
Fe_2Br_6		g	591.1480	—	-394.6	—	—	—	—
$FeBrCl_2$		cr	206.6620	—	-348.9	—	—	—	—
		ai	206.6620	—	-504.6	-371.1	—	-120.5	—

Table 41:Fe — **IRON** (Prepared 1966) — Continued — Table 41:Fe

Substance Formula	Description	State	Molar mass g mol^{-1}	0 K $\Delta_f H_0^\circ$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H_0^\circ$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p° J mol^{-1} K^{-1}
$FeBrCl_2$	in 10 000 H_2O		206.6620	—	-481.2	—	—	—	—
	in 15 000 H_2O		206.6620	—	-477.4	—	—	—	—
	in 20 000 H_2O		206.6620	—	-474.9	—	—	—	—
	in 40 000 H_2O		206.6620	—	-469.9	—	—	—	—
	in 50 000 H_2O		206.6620	—	-467.8	—	—	—	—
FeI^{2+}		ao	182.7514	—	—	-67.0	—	—	—
FeI_2		cr	309.6558	—	-113.0	—	—	—	—
		g	309.6558	—	60.7	—	—	—	—
		ai	309.6558	—	-199.6	-182.05	—	84.9	—
	in HCl + 26.66 H_2O:u		309.6558	—	-192.5	—	—	—	—
FeI_3		g	436.5602	—	71.	—	—	—	—
		ai	436.5602	—	-214.2	-159.4	—	18.0	—
$(FeI_2)_2$		g	619.3116	—	29.	—	—	—	—
Fe_2I_6		g	873.1204	—	17.	—	—	—	—
$Fe_{1.000}S$	iron–rich pyrrhotite, α	cr	87.9110	-100.46	-100.0	-100.4	9.351	60.29	50.54
FeS_2	pyrite	cr	119.9750	-174.56	-178.2	-166.9	9.632	52.93	62.17
	markasite	cr2	119.9750	—	-154.8	—	—	—	—
Fe_7S_8	sulphur–rich pyrrhotite	cr	647.4410	-743.41	-736.4	-748.5	73.72	485.8	398.57
$FeSO_4$		cr	151.9086	—	-928.4	-820.8	—	107.5	100.58
		ai	151.9086	—	-998.3	-823.43	—	-117.6	—
$FeSO_4^{+}$		ao	151.9086	—	-931.8	-772.7	—	-130.	—
	in 200 H_2O		151.9086	—	-992.0	—	—	—	—
	in 40 000 H_2O		151.9086	—	-995.0	—	—	—	—
$FeSO_4 \cdot H_2O$		cr	169.9240	—	-1243.69	—	—	—	—
$FeSO_4 \cdot 4H_2O$		cr	223.9702	—	-2129.2	—	—	—	—
$FeSO_4 \cdot 7H_2O$		cr	278.0164	—	-3014.57	-2509.87	—	409.2	394.47
$Fe(SO_4)_2^{-}$		ao	247.9702	—	—	-1524.5	—	—	—
$Fe_2(SO_4)_3$		cr	399.8788	—	-2581.5	—	—	—	—
		ai	399.8788	—	-2825.0	-2242.8	—	-571.5	—
	in 400 H_2O		399.8788	—	-2732.2	—	—	—	—
$Fe_2(SO_4)_3$	in 1 000 H_2O		399.8788	—	-2733.0	—	—	—	—
	in 2 000 H_2O		399.8788	—	-2733.8	—	—	—	—
	in 3 000 H_2O		399.8788	—	-2734.7	—	—	—	—
	in $HClO_4$ + 53.7 H_2O:u		399.8788	—	-2799.	—	—	—	—
	in H_2SO_4 + 220 H_2O:u		399.8788	—	-2791.	—	—	—	—
$Fe(HSO_4)_3$	in 600 H_2O		347.0558	—	-2705.0	—	—	—	—
FeSe		cr	134.8070	—	-75.3	—	—	—	—
		am	134.8070	—	-63.6	—	—	—	—
$Fe_{1.042}Se$	x denotes undetermined zero–point entropy	cr	137.1526	—	—	—	10.824	72.09+x	57.11
$FeSe_2$		cr	213.7670	—	—	—	13.728	86.82	72.89
Fe_3Se_4		cr	483.3810	—	—	—	41.602	279.78	220.08
Fe_7Se_8		cr	1022.6090	—	—	—	87.57	613.8	442.2
FeTe		cr	183.4470	—	-62.8	—	—	—	—
$Fe_{1.111}Te$	x denotes undetermined zero–point entropy	cr	189.6460	—	—	—	11.945	88.99+x	55.02
$FeTe_2$	ε phase	cr	311.0470	—	—	—	14.924	100.16	73.64
FeN_3^{2+}		ao	97.8671	—	220.1	315.9	—	-137.2	—

Table 41:Fe — **IRON** (Prepared 1966) — Continued — Table 41:**Fe**

Substance Formula and Description		State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
Fe_4N		cr	237.3947	—	-10.5	3.8	—	155.	—
$FeNO^{2+}$		ao	85.8531	—	-9.2	82.8	—	-213.	—
$FeNO_3{}^{2+}$		ao	117.8519	—	—	-121.7	—	—	—
$Fe(NO_3)_3$		ai	241.8617	—	-670.7	-338.3	—	123.4	—
		aq	241.8617	—	-674.9	—	—	—	—
$Fe(NO_3)_3 \cdot 9H_2O$		cr	404.0003	—	-3285.3	—	—	—	—
$FeNOCl_2$		aq	156.7591	—	-374.9	—	—	—	—
$FeCl_2 \cdot NH_3$		cr	143.7837	—	-480.3	—	—	—	—
$FeCl_2 \cdot 2NH_3$		cr	160.8144	—	-605.0	—	—	—	—
$FeCl_2 \cdot 6NH_3$		cr	228.9372	—	-993.7	—	—	—	—
$FeCl_3 \cdot 6NH_3$		cr	264.3902	—	-894.1	—	—	—	—
$FeCl_2 \cdot 10NH_3$		cr	297.0600	—	-1292.4	—	—	—	—
$FeBr_2 \cdot NH_3$		cr	232.6957	—	-381.2	—	—	—	—
$FeBr_2 \cdot 2NH_3$		cr	249.7264	—	-508.4	—	—	—	—
$FeBr_2 \cdot 6NH_3$		cr	317.8492	—	-915.5	—	—	—	—
$FeBr_3 \cdot 6NH_3$		cr	397.7582	—	-824.7	—	—	—	—
$FeI_2 \cdot 2NH_3$		cr	343.7172	—	-385.3	—	—	—	—
$FeI_2 \cdot 6NH_3$		cr	411.8400	—	-808.3	—	—	—	—
$Fe(NO)SO_4$		aq	181.9147	—	-944.7	—	—	—	—
$FeSO_4 \cdot NH_3$		cr	168.9393	—	-1060.2	—	—	—	—
$FeSO_4 \cdot 2NH_3$		cr	185.9700	—	-1181.1	—	—	—	—
$FeSO_4 \cdot 3NH_3$		cr	203.0007	—	-1286.2	—	—	—	—
$FeSO_4 \cdot 4NH_3$		cr	220.0314	—	-1389.1	—	—	—	—
$FeSO_4 \cdot 6NH_3$		cr	254.0928	—	-1587.8	—	—	—	—
FeP		cr	86.8208	—	-126.	—	—	—	—
FeP_2		cr	117.7946	—	-192.	—	—	—	—
Fe_2P		cr	142.6678	—	-163.	—	—	—	—
Fe_3P		cr	198.5148	—	-163.	—	—	—	—
$FePO_4$		cr	150.8184	—	-1297.5	—	—	—	—
$FePO_4 \cdot 2H_2O$	strengite	cr	186.8492	-1863.05	-1888.2	-1657.5	27.644	171.25	180.54
$FeAsS$		cr	162.8326	—	-42.	-50.	—	121.	—
$FeSb$		cr	177.5970	—	-10.0	—	—	—	—
$FeSb_2$		cr	299.3470	—	-15.1	—	—	—	—
Fe_3C	α, cementite	cr	179.5522	—	25.1	20.1	—	104.6	105.9
$FeCO_3$	siderite	cr	115.8564	—	-740.57	-666.67	—	92.9	82.13
$FeC_2O_4 \cdot 2H_2O$	oxalate	cr	179.8978	—	-1482.4	—	—	—	—
$Fe(CO)_5$		l	195.9000	—	-774.0	-705.3	—	338.1	240.6
		g	195.9000	—	-733.9	-697.21	—	445.3	—
$Fe(CO)_5{}^+$		g	195.9000	—	40.2	—	—	—	—
$Fe_2(C_2O_4)_3$		ai	375.7540	—	-2572.3	-2031.1	—	-495.0	—
$Fe_2(C_2O_4)_3$	in 100 H_2O		375.7540	—	-2559.8	—	—	—	—
$Fe(HC_2O_4)_3$		aq	322.9310	—	-2512.9	—	—	—	—
$Fe(CH_3COO)_3$	acetate	ai	232.9826	—	-1506.7	-1112.7	—	-56.1	—
	in 300 H_2O		232.9826	—	-1473.6	—	—	—	—
	in 600 H_2O		232.9826	—	-1472.3	—	—	—	—
$Fe(CH_3COO)_3$	in 1 200 H_2O		232.9826	—	-1470.3	—	—	—	—
	in 2 000 H_2O		232.9826	—	-1466.9	—	—	—	—
$Fe(CO)_4Br_2$		cr	327.7074	—	-807.1	—	—	—	—
	in 1 700 H_2O		327.7074	—	-774.9	—	—	—	—
$Fe(CO)_4I_2$		cr	421.6982	—	-735.1	—	—	—	—

Table 41:**Fe** **IRON** (Prepared 1966) — Continued Table 41:**Fe**

Substance Formula and Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
$Fe(CN)_6^{3-}$	ao	211.9544	—	561.9	729.4	—	270.3	—
$Fe(CN)_6^{4-}$	ao	211.9544	—	455.6	695.08	—	95.0	—
$Fe_4(Fe(CN)_6)_3$	cr	859.2512	—	1184.	—	—	—	—
$FeCO(CN)_5^{3-}$	ao	213.9471	—	192.9	—	—	—	—
$Fe_2CO(CN)_5$	cr	269.7941	—	414.	—	—	—	—
$Fe(NH_2CH_2CH_2NH_2)^{2+}$ ethylenediamine	in KCl + 55 H_2O:u	115.9468	—	-166.1	—	—	—	—
$HFe(CN)_6^{3-}$	ao	212.9624	—	455.6	671.28	—	176.	—
$H_2Fe(CN)_6^{2-}$	ao	213.9704	—	455.6	658.60	—	218.	—
$H_3Fe(CN)_6$	aq	214.9784	—	568.6	—	—	—	—
$H_3Fe(CN)_6^-$	ao	214.9784	—	455.6	—	—	—	—
$H_4Fe(CN)_6$	cr	215.9864	—	462.8	—	—	—	—
	aq	215.9864	—	461.1	—	—	—	—
$(NH_4)_4Fe(CN)_6$	aq	284.1092	—	-61.9	—	—	—	—
$(NH_4)_4Fe(CN)_6\cdot 6H_2O$	cr	392.2016	—	-1802.9	—	—	—	—
$HFeCO(CN)_5^{2-}$	ao	214.9551	—	192.5	—	—	—	—
$H_2FeCO(CN)_5^-$	ao	215.9631	—	193.7	—	—	—	—
$H_3FeCO(CN)_5$	aq	216.9711	—	197.	—	—	—	—
$H_3FeCO(CN)_5\cdot H_2O$	cr	234.9865	—	-67.	—	—	—	—
$FeSCN^{2+}$	ao	113.9289	—	23.4	71.1	—	-130.	—
FeSi	cr	83.9330	-73.93	-73.6	-73.6	7.99	46.0	47.7
$FeSi_2$ β– lebeanite	cr	112.0190	-80.29	-81.2	-78.2	10.04	55.6	66.07
$FeSi_{2.33}$ α– lebeanite	cr	121.2874	-58.70	-59.	-59.	12.09	69.5	73.72
Fe_3Si	cr	195.6270	-94.35	-93.7	-94.6	17.32	103.8	98.32
Fe_5Si_3	cr	363.4930	—	—	—	34.56	209.6	199.6
$FeSiO_3$	cr	131.9312	—	-1205.	—	—	—	—
Fe_2SiO_4 fayalite	cr	203.7776	—	-1479.9	-1379.0	—	145.2	132.88
$(FeI_2)_2\cdot PbI_2$	cr	1080.3104	—	-425.1	—	—	—	—
$Pb_2Fe(CN)_6\cdot 3H_2O$	cr	680.3806	—	—	-168.0	—	—	—
FeAl	cr	82.8285	—	-50.2	—	—	—	—
$FeAl_2$	cr	109.8100	—	-79.1	—	—	—	—
$FeAl_3$	cr	136.7915	—	-111.3	—	—	—	—
$FeAl_2O_4$	cr	173.8076	—	-1995.3	-1879.8	—	106.3	123.55
$TlFe(CN)_6^{3-}$	ao	416.3244	—	464.8	644.9	—	292.9	—
$Tl_4Fe(CN)_6\cdot 2H_2O$	cr	1065.4652	—	—	26.6	—	—	—
$ZnFe_2O_4$	cr	241.0616	-1161.27	-1169.4	-1063.5	23.811	151.67	142.97
$Zn_2Fe(CN)_6\cdot 2H_2O$	cr	378.7252	—	—	-163.0	—	—	—
$CdFe_2O_4$	cr	288.0916	—	-1069.8	—	—	—	—
$Cd_2Fe(CN)_6\cdot 7H_2O$	cr	562.8622	—	—	-1219.6	—	—	—
$CuFeO_2$	cr	151.3858	—	-532.6	-479.9	—	88.7	80.04
$CuFe_2O_4$	cr	239.2316	—	-965.21	-858.74	—	141.0	148.62
$Cu_{0.75}Fe_{2.25}O_4$	cr	237.3083	—	—	—	—	151.5	151.17
$Cu_2Fe(CN)_6$	cr	339.0344	—	—	736.5	—	—	—
$Ag_4Fe(CN)_6\cdot H_2O$	cr	661.4498	—	—	514.8	—	—	—
$NiFe_2O_4$	cr	234.4016	-1072.07	-1081.1	-973.1	22.066	131.8	145.60
$Ni_{0.4}Zn_{0.6}Fe_2O_4N_{0.1}$	cr	238.3976	—	—	—	24.016	149.8	150.21
$Ni_{0.3}Zn_{0.7}Fe_2O_4N_{0.2}$	cr	239.0636	—	—	—	24.150	153.1	148.70
$Ni_{0.2}Zn_{0.8}Fe_2O_4N_{0.3}$	cr	239.7296	—	—	—	24.037	154.4	145.27
$Ni_{0.1}Zn_{0.9}Fe_2O_4N_{0.4}$	cr	240.3956	—	—	—	23.489	154.0	141.80
$FeCo_2O_4$	cr	237.7110	—	—	—	21.874	125.5	143.26

Table 41:**Fe** **IRON** (Prepared 1966) — Continued Table 41:**Fe**

Substance Formula and Description	State	Molar mass g mol^{-1}	0 K $\Delta_f H_0^\circ$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H_0^\circ$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
$CoFe_2O_4$	cr	234.6248	-1132.11	-1139.7	-1032.5	23.476	134.7	152.84

Table 42:**Pd** | **PALLADIUM** (Prepared 1968) | Table 42:**Pd**

Substance Formula	Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
Pd		cr	106.4000	0	0	0	5.435	37.57	25.98
		g	106.4000	377.4	378.2	339.7	6.197	167.05	20.786
Pd^+		g	106.4000	1181.712	1188.746	—	6.197	—	—
Pd^{2+}		g	106.4000	3056.4	3069.4	—	6.197	—	—
Pd^{3+}		g	106.4000	6234.	6251.	—	—	—	—
Pd^{2+}		ao	106.4000	—	149.0	176.5	—	-184.	—
PdO		cr	122.3994	—	-85.4	—	—	—	31.4
		g	122.3994	—	348.9	325.9	—	218.	—
Pd_2H		cr	213.8080	—	-19.7	—	—	—	—
$Pd(OH)_2$	precipitated	cr	140.4148	—	-395.0	—	—	—	—
$Pd(OH)_4$	precipitated	cr	174.4296	—	-715.9	—	—	—	—
$PdCl^+$		ao	141.8530	—	-38.	22.6	—	-117.	—
$PdCl_2$		cr	177.3060	—	-198.7	—	—	—	—
		ao	177.3060	—	—	-128.8	—	—	—
$PdCl_3^-$		ao	212.7590	—	—	-276.1	—	—	—
$PdCl_4^{2-}$	in HCl + 54.3 H_2O:ao		248.2120	—	-550.2	-417.1	—	167.	—
$PdCl_6^{2-}$	in HCl + 54.3 H_2O:ao		319.1180	—	-598.	-430.0	—	272.	—
H_2PdCl_4		aq	250.2280	—	-551.9	—	—	—	—
$PdBr_2$		cr	266.2180	—	-104.2	—	—	—	—
$PdBr_3^-$		ao	346.1270	—	—	-204.2	—	—	—
$PdBr_4^{2-}$		ao	426.0360	—	-384.9	-318.0	—	247.	—
$PdBr_6^{2-}$		ao	585.8540	—	—	-335.1	—	—	—
PdI_2		cr	360.2088	—	-63.2	-71.5	—	180.	—
PdI_4^{2-}		ao	614.0176	—	—	-159.0	—	—	—
PdI_6^{2-}		ao	867.8264	—	—	-170.3	—	—	—
PdS		cr	138.4640	—	-75.	-67.	—	46.	—
PdS_2		cr	170.5280	—	-81.2	-74.5	—	79.	—
Pd_4S		cr	457.6640	—	-67.	-67.	—	180.	—
PdTe		cr	234.0000	—	—	—	11.744	89.62	51.17
$PdTe_2$		cr	361.6000	—	—	—	17.096	126.57	76.61
$Pd(NO_2)_4^{2-}$		ao	290.4220	—	—	-68.0	—	—	—
$Pd(NH_3)_4^{2+}$		ao	174.5228	—	—	-75.	—	—	—
$Pd(N_3)_2Cl_2^{2-}$		ao	261.3462	—	—	557.	—	—	—
$PdCl_2{\cdot}2NH_3$		cr	211.3674	—	-460.	—	—	—	—
$PdCl_2{\cdot}4NH_3$		cr	245.4288	—	-686.	—	—	—	218.8
$PdI_2{\cdot}2NH_3$		cr	394.2702	—	-297.	—	—	—	—
$PdI_2{\cdot}4NH_3$		cr	428.3316	—	-498.7	—	—	—	—
PdSb		cr	228.1500	—	—	—	—	—	49.8
$PdSb_2$		cr	349.9000	—	—	—	—	—	72.0
Pd_3Sb		cr	440.9500	—	—	—	—	—	97.1
$PdCl_3(C_2H_4)^-$	ethylene	ao	240.8134	—	-370.3	-210.3	—	176.	—
$PdCN^+$		ao	132.4179	—	—	289.	—	—	—
$Pd(CN)_2$		cr	158.4358	—	205.4	—	—	—	—
$Pd(CN)_4^{2-}$		ao	210.4716	—	—	628.	—	—	—
$Pd(CNS)_2$		cr	222.5638	—	—	234.3	—	—	—
$Pd(CNS)_2$		ao	222.5638	—	—	314.3	—	—	—
$Pd(CNS)_4^{2-}$		ao	338.7276	—	—	410.5	—	—	—
$PdI_2(CNS)^-$		ao	418.2907	—	—	23.9	—	—	—
AuPd		g	303.3670	611.	607.10	—	7.66	—	36.8

Table 43:**Rh** **RHODIUM** (Prepared 1968) Table 43:**Rh**

Substance Formula and Description	State	Molar mass g mol^{-1}	0 K $\Delta_f H_0^\circ$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H_0^\circ$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
Rh	cr	102.9050	0	0	0	4.912	31.51	24.98
	g	102.9050	555.59	556.9	510.8	6.205	185.808	21.012
Rh^{+}	g	102.9050	1283.11	1290.60	—	6.197	—	—
Rh^{2+}	g	102.9050	3027.1	3040.9	—	6.197	—	—
Rh^{3+}	g	102.9050	6025.	6042.	—	—	—	—
RhO	g	118.9044	—	385.	—	—	—	—
RhO^{+}	g	118.9044	—	1289.	—	—	—	—
RhO_2	g	134.9038	—	184.	—	—	—	—
RhO_2^{+}	g	134.9038	—	1155.	—	—	—	—
Rh_2O_3	cr	253.8082	—	-343.	—	—	—	103.8
$RhCl_2$	g	173.8110	—	126.8	—	—	—	—
$RhCl_3$	cr	209.2640	—	-299.2	—	—	—	—
	g	209.2640	—	66.9	—	—	—	—
$RhCl_6^{3-}$	ao	315.6230	—	-848.5	—	—	—	—
$RhCl_3 \cdot 3(C_2H_5)_2S$	cr	415.7024	—	-695.	—	—	—	—

Table 44:**Ru** **RUTHENIUM** (Prepared 1968) Table 44:**Ru**

Substance Formula and Description		State	Molar mass g mol^{-1}	0 K $\Delta_f H_0^\circ$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H_0^\circ$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
Ru		cr	101.0700	0	0	0	4.602	28.53	24.06
		g	101.0700	641.031	642.7	595.8	6.234	186.507	21.522
Ru^{+}		g	101.0700	1342.48	1350.30	—	6.205	—	—
Ru^{2+}		g	101.0700	2959.8	2974.0	—	6.238	—	—
Ru^{3+}		g	101.0700	5707.	5728.	—	—	—	—
RuO_2		cr	133.0688	—	-305.0	—	—	—	—
	hydrated	am	133.0688	—	—	-214.6	—	—	—
RuO_3		g	149.0682	—	-78.2	—	—	—	—
RuO_4		cr	165.0676	—	-239.3	-152.2	—	146.4	—
		l	165.0676	—	-228.4	-152.2	—	183.3	—
RuO_4		g	165.0676	-177.86	-184.1	-139.7	15.73	290.1	75.90
		ao	165.0676	—	-239.7	-147.2	—	130.	—
RuO_4^{-}		ao	165.0676	—	—	-245.5	—	—	—
RuO_4^{2-}		ao	165.0676	—	—	-303.7	—	—	—
$Ru(OH)_2^{2+}$		ao	135.0848	—	—	-213.	—	—	—
RuF_5		cr	196.0620	—	-892.9	—	—	—	—
		g	196.0620	—	-791.	—	—	—	—
$RuCl_3$	black	cr	207.4290	—	-205.	—	—	—	—
		g	207.4290	—	-1.3	—	—	—	—
$RuCl_4$		g	242.8820	—	-51.9	—	—	—	—
$RuCl_5(OH)^{2-}$		ao	295.3424	—	—	-705.7	—	—	—
$RuBr_3$		cr	340.7970	—	-138.	—	—	—	—
RuI_3		cr	481.7832	—	-65.7	—	—	—	—
RuS_2		cr	165.1980	—	-197.	—	—	—	—
$RuCl_3·3(C_2H_5)_2S$		cr	413.8674	—	-632.	—	—	—	—
$(RuCl_3·2(C_2H_5)_2S)_2$		cr	711.4852	—	-1088.	—	—	—	—

Table 45:**Pt** **PLATINUM** (Prepared 1968) Table 45:**Pt**

Substance Formula and Description		State	Molar mass g mol^{-1}	0 K $\Delta_f H^\circ_0$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H^\circ_0$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
Pt		cr	195.0900	0	0	0	5.740	41.63	25.86
		g	195.0900	564.42	565.3	520.5	6.577	192.406	25.531
Pt^+		g	195.0900	1395.4	1402.1	—	6.197	—	—
Pt^{2+}		g	195.0900	3186.5	3199.1	—	—	—	—
		ao	195.0900	—	—	254.8	—	—	—
PtO_2		g	227.0888	—	171.5	167.8	259.	—	—
Pt_3O_4		cr	649.2676	—	-163.	—	—	—	—
$Pt(OH)_2$		cr	229.1048	—	-351.9	—	—	—	—
PtF_6	cubic	cr	309.0804	—	—	—	—	235.6	—
		g	309.0804	—	—	—	23.757	348.34	122.80
PtCl		cr	230.5430	—	-56.5	—	—	—	—
$PtCl_2$		cr	265.9960	—	-123.4	—	—	—	—
		ao	265.9960	—	—	-73.2	—	—	—
$PtCl_3$		cr	301.4490	—	-182.0	—	—	—	—
$PtCl_3^-$		ao	301.4490	—	—	-221.7	—	—	—
$PtCl_4$		cr	336.9020	—	-231.8	—	—	—	—
		aq	336.9020	—	-314.2	—	—	—	—
$PtCl_4{\cdot}5H_2O$		cr	426.9790	—	-1752.7	—	—	—	—
$PtCl_4^{2-}$		ao	336.9020	—	-499.2	-361.4	—	155.	—
$PtCl_6^{2-}$		ao	407.8080	—	-668.2	-482.7	—	219.7	—
$HPtCl_5{\cdot}2H_2O$		cr	409.3938	—	-1012.5	—	—	—	—
H_2PtCl_6		ai	409.8240	—	-668.2	-482.7	—	219.7	—
	in 600 H_2O		409.8240	—	-676.1	—	—	—	—
$H_2PtCl_6{\cdot}6H_2O$		cr	517.9164	—	-2371.1	—	—	—	—
$(PtCl_2(OH)_2)^{2-}$		ao	300.0108	—	—	-470.6	—	—	—
$(PtCl_2(OH)(H_2O))^-$		ao	301.0188	—	—	-517.8	—	—	—
$(PtCl_2(H_2O)_2)$		ao	302.0268	—	—	-547.6	—	—	—
$(PtCl_3(OH))^{2-}$		ao	318.4564	—	—	-418.3	—	—	—
$(PtCl_3(H_2O))^-$		ao	319.4644	—	—	-458.5	—	—	—
PtBr		cr	274.9990	—	-38.5	—	—	—	—
$PtBr_2$		cr	354.9080	—	-82.0	—	—	—	—
$PtBr_3$		cr	434.8170	—	-120.9	—	—	—	—
$PtBr_3^-$		ao	434.8170	—	—	-144.8	—	—	—
$PtBr_4$		cr	514.7260	—	-156.5	—	—	—	—
	in 7 000 H_2O		514.7260	—	-197.9	—	—	—	—
$PtBr_4^{2-}$		ao	514.7260	—	-368.2	-262.7	—	121.	—
$PtBr_6^{2-}$		ao	674.5440	—	-470.7	-332.2	—	121.	—
H_2PtBr_6		aq	676.5600	—	-470.7	—	—	—	—
$H_2PtBr_6{\cdot}9H_2O$		cr	838.6986	—	-3054.7	—	—	—	—
PtI_4		cr	702.7076	—	-72.8	—	—	—	—
PtI_6^{2-}		ao	956.5164	—	-213.4	-108.8	—	167.	—
PtS		cr	227.1540	-79.580	-81.6	-76.1	8.142	55.06	43.39
PtS_2		cr	259.2180	-105.993	-108.8	-99.6	11.770	74.68	65.90
PtTe		cr	322.6900	—	—	—	11.054	81.21	49.92
$PtTe_2$		cr	450.2900	—	—	—	16.669	121.00	75.44
$(Pt(NH_3)_3)^{2+}$		ao	246.1821	—	—	8.9	—	—	—
$(Pt(NH_3)_4)^{2+}$		ao	263.2128	—	-361.9	-52.9	—	42.	—
$(Pt(NH_3)_2(OH)_2)$	cis	ao	263.1662	—	—	-334.1	—	—	—
$(Pt(NH_3)_2(OH)H_2O)^+$	cis	ao	264.1742	—	—	-375.9	—	—	—
$(Pt(NH_3)_2(H_2O)_2)^{2+}$	cis	ao	265.1822	—	—	-407.3	—	—	—

Table 45:Pt — PLATINUM (Prepared 1968) — Continued — Table 45:Pt

Substance Formula and Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H_0^\circ$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H_0^\circ$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
$(Pt(NH_3)_3(OH)_2)$ cis	ao	280.1969	—	—	-337.8	—	—	—
$(Pt(NH_3)_4(OH)_2)$ in 400 H_2O		297.2276	—	-824.7	—	—	—	—
$(Pt(NH_3)_4(NO_3)_2)$	cr	387.2226	—	-836.8	—	—	—	—
$(Pt(NH_3)Cl_3)^-$	ao	318.4797	—	-464.0	-303.2	—	197.	—
$(Pt(NH_3)Cl_5)^-$	ao	389.3857	—	—	-432.5	—	—	—
$(Pt(NH_3)_2Cl_2)$ cis	cr	300.0574	—	-467.4	—	—	—	148.5
cis	ao	300.0574	—	—	-228.7	—	—	—
trans	cr2	300.0574	—	-480.3	—	—	—	148.5
trans	ao2	300.0574	—	—	-222.8	—	—	—
$NH_4(Pt(NH_3)Cl_3))$	cr	336.5184	—	-625.1	—	—	—	186.2
$NH_4(Pt(NH_3)Cl_3$ in 13 500 H_2O		336.5184	—	-596.6	—	—	—	—
$(Pt(NH_3)_2Cl_4)$ cis	ao	370.9634	—	—	-359.6	—	—	—
trans	ao2	370.9634	—	—	-353.8	—	—	—
$(NH_4)_2PtCl_4$	cr	372.9794	—	-803.3	—	—	—	237.7
	ai	372.9794	—	-764.0	—	—	—	—
$(NH_4)_2PtCl_4$ in 600 H_2O		372.9794	—	-769.9	—	—	—	—
$(Pt(NH_3)_3Cl)^+$	ao	281.6351	—	-396.2	-142.9	—	113.	—
$(Pt(NH_3)_3Cl)Cl$	cr	317.0881	—	-603.8	—	—	—	183.3
in 13 000 H_2O		317.0881	—	-563.6	—	—	—	—
$(Pt(NH_3)_3Cl_3)^+$	ao	352.5411	—	—	-282.6	—	—	—
$(Pt(NH_3)_4)Cl_2$	cr	334.1188	—	-725.5	—	—	—	223.4
	aq	334.1188	—	-696.2	—	—	—	—
$(Pt(NH_3)_4Cl_2)^{2+}$	ao	334.1188	—	—	-200.6	—	—	—
$(Pt(NH_3)_4)Cl_2 \cdot H_2O$	cr	352.1342	—	-1016.7	—	—	—	—
$PtCl_2 \cdot 5NH_3$	cr	351.1495	—	-814.6	—	—	—	—
$(Pt(NH_3)_4)(PtCl_4)$ rose	cr	600.1148	—	—	—	—	—	279.1
green	cr2	600.1148	—	—	—	—	—	302.5
$(Pt(NH_3)_3Cl)(Pt(NH_3)Cl_3)$	cr3	600.1148	—	-959.8	—	—	—	280.3
$(Pt(NH_3)_4)(Pt(NH_3)Cl_3)_2$	cr	900.1722	—	-1412.5	—	—	—	—
$(Pt(NH_3)_3Cl)_2(PtCl_4)$	cr2	900.1722	—	-1429.3	—	—	—	423.
$(Pt(NH_3)Cl(H_2O)_2)^+$	ao	283.6045	—	—	-473.5	—	—	—
$(Pt(NH_3)Cl_2(H_2O))$ cis	ao	301.0421	—	-574.0	-392.7	—	180.	—
trans	ao2	301.0421	—	—	-398.2	—	—	—
$(Pt(NH_3)_2Cl(H_2O))^+$ cis	ao	282.6198	—	—	-320.7	—	—	—
trans	ao2	282.6198	—	—	-311.3	—	—	—
$(Pt(NH_3)_3Cl)ClO_4$	cr	381.0857	—	-577.4	—	—	—	—
$(Pt(NH_3)_4Br_2)^{2+}$	ao	423.0308	—	—	-149.1	—	—	—
$(Pt(NH_3)_2I_2)$ cis	ao	482.9602	—	—	-91.1	—	—	—
trans	ao2	482.9602	—	—	-88.2	—	—	—
$(Pt(NH_3)_4)I_2$	cr	517.0216	—	-534.7	—	—	—	—
$(Pt(NH_3)_4I_2)^{2+}$	ao	517.0216	—	—	-73.0	—	—	—
$(Pt(NH_3)_4)SO_4$ in 800 H_2O		359.2744	—	-1269.4	—	—	—	—
$(Pt(CN)_4)^{2-}$	ao	299.1616	—	—	710.5	—	—	—
$(Pt(CH_3NH_2)_2Cl)^+$ methylamine cis	ao	292.6588	—	—	4.8	—	—	—
trans	ao2	292.6588	—	—	10.5	—	—	—
$(Pt(CH_3NH_2)_2Cl_2)$ cis	ao	328.1118	—	—	-140.4	—	—	—
trans	ao2	328.1118	—	—	-141.6	—	—	—
$(Pt(CH_3NH_2)_2I_2)$ cis	ao	511.0146	—	—	-4.8	—	—	—
trans	ao2	511.0146	—	—	-2.3	—	—	—

Table 45:**Pt** **PLATINUM** (Prepared 1968) — Continued Table 45:**Pt**

Substance Formula and Description	State	Molar mass g mol^{-1}	0 K $\Delta_f H^\circ_0$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H^\circ_0$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
Ag_2PtCl_6	cr	623.5480	—	-523.4	—	—	—	—
Ag_2PtBr_6	cr	890.2840	—	-402.1	—	—	—	—

Table 46:**Ir** **IRIDIUM** (Prepared 1968) Table 46:**Ir**

Substance Formula and Description	State	Molar mass g mol^{-1}	0 K $\Delta_f H^\circ_0$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H^\circ_0$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
Ir	cr	192.2000	0	0	0	5.272	35.48	25.10
	g	192.2000	664.34	665.3	617.9	6.197	193.578	20.786
Ir^+	g	192.2000	1536.	1540.	—	—	—	—
IrO_2	cr	224.1988	—	-274.1	—	—	—	57.3
IrO_3	g	240.1982	—	7.9	—	—	—	—
IrO_3^+	g	240.1982	—	1163.	—	—	—	—
IrF_6	cr	306.1904	—	-579.65	-461.56	—	247.7	—
	g	306.1904	-535.6	-544.	-460.	23.39	357.8	121.08
$IrCl$	cr	227.6530	—	-81.6	—	—	—	—
$IrCl_3$	cr	298.5590	—	-245.6	—	—	—	—
$IrCl_6^{2-}$	aq	404.9180	—	-573.	—	—	—	—
$IrCl_6^{3-}$	aq	404.9180	—	-736.	—	—	—	—
IrS_2	cr	256.3280	—	-138.	—	—	—	—
Ir_2S_3	cr	480.5920	—	-234.	—	—	—	—
$IrCl_3 \cdot 3(C_2H_5)_2S$	cr	504.9974	—	-649.	—	—	—	—

Table 47:Os — **OSMIUM** (Prepared 1969) — Table 47:Os

Substance Formula	Description	State	Molar mass g mol^{-1}	0 K: $\Delta_f H_0^\circ$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar): $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H_0^\circ$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
Os		cr	190.2000	0	0	0	—	32.6	24.7
		g	190.2000	—	791.	745.	6.197	192.573	20.786
Os^+		g	190.2000	—	1595.86	—	6.197	—	—
Os^{2+}		g	190.2000	—	3243.	—	—	—	—
OsO_3		g	238.1982	—	-283.7	—	—	—	—
OsO_3^+		g	238.1982	—	908.	—	—	—	—
OsO_4	yellow	cr	254.1976	—	-394.1	-304.9	—	143.9	—
	white	cr2	254.1976	—	-385.8	-303.7	—	167.8	—
		g	254.1976	—	-337.2	-292.8	15.48	293.8	74.1
		ao	254.1976	—	-378.2	-301.85	—	186.6	—
OsO_4^+		g	254.1976	—	860.6	—	—	—	—
	in CCl_4:x		254.1976	—	—	-302.65	—	—	—
$HOsO_5^-$		ao	271.2050	—	—	-470.2	—	—	—
H_2OsO_5		ao	272.2130	—	—	-538.95	—	—	—
$Os(OH)_4$		am	258.2296	—	—	-673.5	—	—	—
OsF_6	cubic	cr	304.1904	—	—	—	—	246.0	—
		g	304.1904	—	—	—	23.259	358.09	120.83
$OsCl_3$		cr	296.5590	—	-190.4	—	—	—	—
$OsCl_4$		cr	332.0120	—	-254.8	—	—	—	—
		g	332.0120	—	-79.	—	—	—	—
OsS_2		cr	254.3280	—	-146.0	—	—	—	—

Table 48:**Mn** **MANGANESE** (Prepared 1967) Table 48:**Mn**

Substance Formula	Description	State	Molar mass g mol^{-1}	0 K $\Delta_f H^\circ_0$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H^\circ_0$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
Mn	α	cr	54.9380	0	0	0	4.996	32.01	26.32
	β	cr2	54.9380	—	—	—	5.163	34.39	26.53
	γ	cr3	54.9380	1.435	1.55	1.42	5.109	32.43	27.57
		g	54.9380	279.37	280.7	238.5	6.197	173.70	20.79
Mn^+		g	54.9380	996.892	1004.470	—	6.197	—	—
Mn^{2+}		g	54.9380	2505.92	2519.69	—	6.197	—	—
Mn^{3+}		g	54.9380	5754.3	5776.4	—	8.481	—	—
Mn^{2+}		ao	54.9380	—	-220.75	-228.1	—	-73.6	50.
MnO		cr	70.9374	—	-385.22	-362.90	—	59.71	45.44
		g	70.9374	125.	124.22	—	8.87	—	—
MnO_2		cr	86.9368	—	-520.03	-465.14	—	53.05	54.14
	precipitated	am	86.9368	—	-502.5	—	—	—	—
MnO_4^-		ao	118.9356	—	-541.4	-447.2	—	191.2	-82.0
MnO_4^{2-}		ao	118.9356	—	-653.	-500.7	—	59.	—
Mn_2O_3		cr	157.8742	—	-959.0	-881.1	—	110.5	107.65
Mn_3O_4		cr	228.8116	—	-1387.8	-1283.2	—	155.6	139.66
MnH		g	55.9460	—	—	—	8.690	213.62	29.434
MnD		g	56.9521	8.749	—	—	—	219.64	30.393
MnOH		g	71.9454	12.6	—	—	—	—	—
$MnOH^+$		ao	71.9454	—	-450.6	-405.0	—	-17.	—
$Mn(OH)_2$	precipitated	am	88.9528	—	-695.4	-615.0	—	99.2	—
$Mn(OH)_3^-$		ao	105.9602	—	—	-744.2	—	—	—
MnF		g	73.9364	-21.	-21.8	—	—	—	—
MnF^+		g	73.9364	799.	808.	—	—	—	—
		aq	73.9364	—	—	-511.7	—	—	—
MnF_2		cr	92.9348	—	—	—	13.01	92.26	66.78
	in 1 200 H_2O		92.9348	—	-877.4	—	—	—	—
MnCl		g	90.3910	42.30	42.3	—	9.54	—	33.68
$MnCl^+$		aq	90.3910	—	—	-362.8	—	—	—
$MnCl_2$		cr	125.8440	-482.185	-481.29	-440.50	15.071	118.24	72.93
$MnCl_2$		g	125.8440	—	-263.6	—	—	—	—
		ai	125.8440	—	-555.05	-490.8	—	38.9	-222.
		ao	125.8440	—	—	-492.0	—	—	—
	in 40 H_2O		125.8440	—	-545.80	—	—	—	—
	in 100 H_2O		125.8440	—	-549.07	—	—	—	—
$MnCl_2$	in 200 H_2O		125.8440	—	-550.78	—	—	—	—
	in 500 H_2O		125.8440	—	-552.29	—	—	—	—
	in 1 000 H_2O		125.8440	—	-552.96	—	—	—	—
	in 2 000 H_2O		125.8440	—	-553.42	—	—	—	—
	in 5 000 H_2O		125.8440	—	-553.92	—	—	—	—
$MnCl_2$	in ∞ H_2O		125.8440	—	-555.05	—	—	—	—
$MnCl_2 \cdot H_2O$		cr	143.8594	—	-789.9	-696.1	—	174.1	—
$MnCl_2 \cdot 2H_2O$		cr	161.8748	—	-1092.0	-942.1	—	218.8	—
$MnCl_2 \cdot 4H_2O$		cr	197.9056	—	-1687.4	-1423.6	—	303.3	—
$MnCl_3^-$		ao	161.2970	—	—	-620.0	—	—	—
MnBr		g	134.8470	87.0	79.9	—	—	—	—
$MnBr_2$		cr	214.7560	—	-384.9	—	—	—	—
		ai	214.7560	—	-464.0	—	—	—	—
$MnBr_2 \cdot H_2O$		cr	232.7714	—	-705.0	—	—	—	—
$MnBr_2 \cdot 4H_2O$		cr	286.8176	—	-1590.3	—	—	—	—

Table 48:**Mn** **MANGANESE** (Prepared 1967) — Continued Table 48:**Mn**

Substance Formula	Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H_0^\circ$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H_0^\circ$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
MnI		g	181.8424	107.5	106.7	—	—	—	—
MnI_2		ai	308.7468	—	-331.0	—	—	—	—
$MnI_2 \cdot 2H_2O$		cr	344.7776	—	-842.7	—	—	—	—
$MnI_2 \cdot 4H_2O$		cr	380.8084	—	-1438.9	—	—	—	—
$Mn(IO_3)_2$		cr	404.7432	—	-669.	-520.4	—	264.	—
MnS	green	cr	87.0020	—	-214.2	-218.4	—	78.2	49.96
	precipitated, pink	am	87.0020	—	-213.8	—	—	—	—
$MnSO_4$		cr	150.9996	—	-1065.25	-957.36	—	112.1	100.50
		ai	150.9996	—	-1130.1	-972.7	—	-53.6	-243.
		ao	150.9996	—	-1115.9	-985.7	—	36.4	—
$MnSO_4$	in 20 H_2O		150.9996	—	-1119.55	—	—	—	—
	in 30 H_2O		150.9996	—	-1121.40	—	—	—	—
	in 50 H_2O		150.9996	—	-1122.07	—	—	—	—
	in 100 H_2O		150.9996	—	-1122.69	—	—	—	—
	in 200 H_2O		150.9996	—	-1123.36	—	—	—	—
$MnSO_4$	in 400 H_2O		150.9996	—	-1123.99	—	—	—	—
	in 1 000 H_2O		150.9996	—	-1124.87	—	—	—	—
	in 2 000 H_2O		150.9996	—	-1125.79	—	—	—	—
	in 3 000 H_2O		150.9996	—	-1126.08	—	—	—	—
	in 5 000 H_2O		150.9996	—	-1126.58	—	—	—	—
$MnSO_4$	in 10 000 H_2O		150.9996	—	-1127.17	—	—	—	—
	in 20 000 H_2O		150.9996	—	-1127.71	—	—	—	—
	in 50 000 H_2O		150.9996	—	-1128.34	—	—	—	—
	in 100 000 H_2O		150.9996	—	-1128.72	—	—	—	—
	in ∞ H_2O		150.9996	—	-1130.1	—	—	—	—
$MnSO_4 \cdot H_2O$	α	cr	169.0150	—	-1376.5	—	—	—	—
	β	cr2	169.0150	—	-1348.1	—	—	—	—
$MnSO_4 \cdot 4H_2O$		cr	223.0612	—	-2258.1	—	—	—	—
$MnSO_4 \cdot 5H_2O$		cr	241.0766	—	-2553.1	—	—	—	326.
$MnSO_4 \cdot 7H_2O$		cr	277.1074	—	-3139.3	—	—	—	—
$MnS_2O_6 \cdot 2H_2O$		cr	251.0932	—	—	—	—	279.1	241.33
$MnS_2O_6 \cdot 6H_2O$		cr	323.1548	—	-3142.2	—	—	—	—
MnSe		cr	133.8980	—	-106.7	-111.7	—	90.8	51.04
MnTe		cr	182.5380	—	—	—	—	93.7	73.18
$Mn(N_3)_2$	manganese azide	cr	138.9782	—	-576.26	—	—	—	—
Mn_5N_2		cr	302.7034	—	-204.2	—	—	—	—
Mn_8N_2		cr	467.5174	—	-257.3	—	—	—	—
$Mn(NO_3)_2$		cr	178.9478	—	-576.26	—	—	—	—
		ai	178.9478	—	-635.5	-450.9	—	218.	-121.
	in 2.5 H_2O		178.9478	—	-598.02	—	—	—	—
$Mn(NO_3)_2$	in 3 H_2O		178.9478	—	-602.45	—	—	—	—
	in 4 H_2O		178.9478	—	-608.90	—	—	—	—
	in 5 H_2O		178.9478	—	-613.42	—	—	—	—
	in 6 H_2O		178.9478	—	-616.64	—	—	—	—
	in 8 H_2O		178.9478	—	-620.99	—	—	—	—
$Mn(NO_3)_2$	in 10 H_2O		178.9478	—	-623.75	—	—	—	—
	in 15 H_2O		178.9478	—	-627.81	—	—	—	—
	in 25 H_2O		178.9478	—	-631.20	—	—	—	—
	in 50 H_2O		178.9478	—	-633.71	—	—	—	—
	in 100 H_2O		178.9478	—	-635.13	—	—	—	—

Table 48:**Mn** | **MANGANESE** (Prepared 1967) — Continued | Table 48:**Mn**

Substance Formula and Description		State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
$Mn(NO_3)_2$	in 200 H_2O		178.9478	—	-635.72	—	—	—	—
	in 400 H_2O		178.9478	—	-636.01	—	—	—	—
	in 1 000 H_2O		178.9478	—	-636.22	—	—	—	—
	in 2 000 H_2O		178.9478	—	-636.30	—	—	—	—
	in 5 000 H_2O		178.9478	—	-636.39	—	—	—	—
$Mn(NO_3)_2{\cdot}6H_2O$		vit	287.0402	—	-2371.9	—	—	—	—
		l	287.0402	—	-2331.62	—	—	—	—
$MnCl_2{\cdot}2NH_4Cl{\cdot}2H_2O$		cr	268.8582	—	-1724.6	—	—	—	—
$MnBr_2{\cdot}NH_3$		cr	231.7867	—	-519.2	—	—	—	—
$MnBr_2{\cdot}2NH_3$		cr	248.8174	—	-647.3	—	—	—	—
$MnBr_2{\cdot}6NH_3$		cr	316.9402	—	-1046.	—	—	—	—
$(NH_4)_2Mn(SO_4)_2{\cdot}6H_2O$		cr	391.2310	—	4047.2	—	—	—	—
MnP		cr	85.9118	—	-113.	—	—	—	—
MnP_3		cr	147.8594	—	-213.	—	—	—	—
$Mn_3(PO_4)_2$		cr	354.7568	—	-3116.7	—	—	—	—
$MnHPO_4$		cr	150.9174	—	—	-1391.1	—	—	—
$MnAs$		cr	129.8596	—	-59.	—	—	—	—
$Mn_3(AsO_4)_2$		cr	442.6524	—	-2145.6	—	—	—	—
$MnHAsO_4$		cr	194.8652	—	-1102.5	—	—	—	—
$MnSb$		cr	176.6880	—	-50.	—	—	—	—
$MnBi$		cr	263.9180	—	-21.	—	—	—	—
Mn_3C		cr	176.8252	—	4.6	5.4	—	98.7	93.43
Mn_7C_3		cr	420.5996	—	-42.	—	—	—	—
$MnCO_3$	natural	cr	114.9474	—	-894.1	-816.7	—	85.8	81.50
	precipitated	cr2	114.9474	—	-883.2	—	—	—	—
MnC_2O_4	oxalate	cr	142.9580	—	-1028.8	—	—	—	—
		ao	142.9580	—	-1039.7	-924.6	—	67.4	—
$MnC_2O_4{\cdot}2H_2O$		cr	178.9888	—	-1628.4	-1414.9	—	201.	—
$MnC_2O_4{\cdot}3H_2O$		cr	197.0042	—	-1920.9	—	—	—	—
$Mn(C_2O_4)_2^{2-}$		ao	230.9780	—	-1871.9	-1606.9	—	117.	—
$Mn_2(CO)_{10}$		cr	389.9820	—	-1677.8	—	—	—	—
		g	389.9820	—	-1615.0	—	—	—	—
$MnHCO_3^+$		ao	115.9554	—	—	-820.	—	—	—
$Mn(CHO_2)_2$	formate	cr	144.9740	—	-1044.7	—	—	—	—
		aq	144.9740	—	-1063.6	—	—	—	—
$Mn(CHO_2)_2{\cdot}2H_2O$		cr	181.0048	—	-1645.1	—	—	—	—
$MnCH_3CO_2^+$	acetate	ao	113.9832	—	—	-605.4	—	—	—
$Mn(CH_3CO_2)_2$		cr	173.0284	—	-1148.1	—	—	—	—
		aq	173.0284	—	-1199.1	—	—	—	—
$Mn(CH_3CO_2)_2{\cdot}4H_2O$		cr	245.0900	—	-2338.0	—	—	—	—
$MnCl_2{\cdot}CH_3OH$		cr	157.8866	—	-741.8	—	—	—	—
$MnCl_2{\cdot}2CH_3OH$		cr	189.9292	—	-995.0	—	—	—	—
$MnCl_2{\cdot}3CH_3OH$		cr	221.9718	—	-1233.0	—	—	—	—
$MnBr_2{\cdot}C_2H_5OH$		cr	260.8258	—	-664.8	—	—	—	—
$Mn(CN)_6^{4-}$		aq	211.0454	—	556.	—	—	—	—
$Mn(NH_2CH_2CH_2NH_2)^{2+}$	ethylenediamine	aq	115.0378	—	-288.3	—	—	—	—
$Mn(NH_2CH_2CH_2NH_2)_2^{2+}$		aq	175.1376	—	-357.3	—	—	—	—
$Mn(NH_2CH_2CH_2NH_2)_3^{2+}$		aq	235.2374	—	-434.3	—	—	—	—
$MnCNS^+$		ao	113.0199	—	—	-141.4	—	—	—
$Mn(CNS)_2$		ao	171.1018	—	—	-50.2	—	—	—

Table 48:**Mn** **MANGANESE** (Prepared 1967) — Continued Table 48:**Mn**

Substance Formula and Description	State	Molar mass g mol^{-1}	0 K $\Delta_f H^\circ_0$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H^\circ_0$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
$MnSiO_3$	cr	131.0222	—	-1320.9	-1240.5	—	89.1	86.44
	vit	131.0222	—	-1285.3	—	—	—	—
Mn_2SiO_4	cr	201.9596	—	-1730.5	-1632.1	—	163.2	129.87
$Pb(MnO_4)_2 \cdot 3PbO$	cr	1114.6294	—	—	-1644.	—	—	—
$Zn(MnO_4)_2$	ai	303.2412	—	—	—	—	—	-251.
$MnFe_2O_4$	cr	230.6296	—	-1226.	—	—	—	—
$Mn_2Fe(CN)_6$	cr	321.8304	—	—	162.4	—	—	—

Table 49:Tc **TECHNETIUM** (Prepared 1967) Table 49:Tc

Substance Formula and Description	State	Molar mass g mol^{-1}	0 K $\Delta_f H^\circ_0$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H^\circ_0$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
Tc	cr	98.9060	0	0	0	—	—	—
	g	98.9060	—	678.	—	6.197	181.07	20.79
Tc^+	g	98.9060	—	1386.2	—	6.197	—	—
Tc_2O_7	cr	309.8078	—	-1113.	—	—	—	—
$HTcO_4$	cr	163.9116	—	-699.	—	—	—	—
$HTcO_4$	ai	163.9116	—	-724.	—	—	—	—

Table 50:**Re** **RHENIUM** (Prepared 1968) Table 50:**Re**

Substance Formula and Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H_0^\circ$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H_0^\circ$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
Re	cr	186.2000	0	0	0	5.422	36.86	25.48
	g	186.2000	769.0	769.9	724.6	6.197	188.938	20.786
Re^+	g	186.2000	1518.0	1524.6	—	6.197	—	—
	ao	186.2000	—	—	-33.	—	—	—
Re^-	ao	186.2000	—	46.	10.1	—	230.	—
ReO_2	cr	218.1988	—	—	-368.	—	—	—
$ReO_2·2H_2O$ precipitated	cr	254.2296	—	-987.	—	—	—	—
ReO_3	cr	234.1982	—	-605.0	—	—	—	—
ReO_4^-	ao	250.1976	—	-787.4	-694.5	—	201.3	-13.4
Re_2O_7	cr	484.3958	-1229.3	-1240.1	-1066.0	30.317	207.1	166.1
Re_2O_7	g	484.3958	—	-1100.	-994.0	—	452.	—
$HReO_4$	cr	251.2056	—	-762.3	-656.4	—	158.2	—
	g	251.2056	—	-665.	—	—	—	—
	ai	251.2056	—	-787.4	-694.5	—	201.3	-13.4
in 2 000 H_2O		251.2056	—	-787.199	—	—	—	—
$HReO_4$ in 3 000 H_2O		251.2056	—	-787.186	—	—	—	—
in 5 000 H_2O		251.2056	—	-787.186	—	—	—	—
in 10 000 H_2O		251.2056	—	-787.199	—	—	—	—
in 50 000 H_2O		251.2056	—	-787.245	—	—	—	—
in ∞ H_2O		251.2056	—	-787.4	—	—	—	—
$ReCl_3$	cr	292.5590	-262.46	-264.	-188.	18.071	123.8	92.38
$ReCl_5$	cr	363.4650	—	-372.	—	—	—	—
	g	363.4650	—	-318.	—	—	—	—
$ReCl_5^+$	g	363.4650	—	607.	—	—	—	—
$ReCl_6^{2-}$	ao	398.9180	—	-762.3	-589.4	—	255.	—
Re_3Cl_9	g	877.6770	—	-573.	—	—	—	—
H_2ReCl_4	cr	330.0280	—	-636.	—	—	—	—
$ReBr_3$	cr	425.9270	—	-167.	—	—	—	—
Re_3Br_9	g	1277.7810	—	-289.	—	—	—	—
ReS_2	cr	250.3280	—	-180.	—	—	—	—
Re_2S_7	cr	596.8480	—	-448.	—	—	—	—
NH_4ReO_4	cr	268.2363	—	-945.6	-774.7	—	232.6	—
$ReAs_2$	cr	336.0432	—	5.4	—	—	—	—
Re_3Si	cr	586.6860	—	0	—	—	—	—
$Pb(ReO_4)_2·2H_2O$	cr	743.6160	—	-2234.	-1903.	—	310.	—
$AgReO_4$	cr	358.0676	—	-736.	-635.5	—	153.1	—

Table 51:**Cr** **CHROMIUM** (Prepared 1966) Table 51:**Cr**

Substance Formula	Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
Cr		cr	51.9960	0	0	0	4.058	23.77	23.35
		g	51.9960	394.51	396.6	351.8	6.197	174.50	20.79
Cr^{+}		g	51.9960	1047.30	1055.62	—	6.197	—	—
Cr^{2+}		g	51.9960	2639.06	2655.71	—	8.347	—	—
Cr^{3+}		g	51.9960	5626.2	5648.4	—	7.757	—	—
Cr^{4+}		g	51.9960	10364.	10389.	—	6.929	—	—
Cr^{5+}		g	51.9960	17067.	17100.	—	6.364	—	—
Cr^{6+}		g	51.9960	25811.	25849.	—	6.197	—	—
Cr^{7+}		g	51.9960	41263.	41309.	—	6.197	—	—
Cr^{8+}		g	51.9960	59086.	59141.	—	—	—	—
Cr^{2+}		ao	51.9960	—	-143.5	—	—	—	—
CrO		g	67.9954	222.	—	—	—	—	—
CrO_2		cr	83.9948	—	-598.	—	—	—	—
		g	83.9948	-59.	—	—	—	—	—
CrO_3		cr	99.9942	—	-589.5	—	—	—	—
CrO_3		g	99.9942	—	-385.8	—	—	—	—
	in 2 H_2O		99.9942	—	-594.84	—	—	—	—
	in 3 H_2O		99.9942	—	-596.05	—	—	—	—
	in 4 H_2O		99.9942	—	-596.93	—	—	—	—
	in 5 H_2O		99.9942	—	-597.60	—	—	—	—
CrO_3	in 6 H_2O		99.9942	—	-598.06	—	—	—	—
	in 8 H_2O		99.9942	—	-598.81	—	—	—	—
	in 10 H_2O		99.9942	—	-599.27	—	—	—	—
	in 15 H_2O		99.9942	—	-599.99	—	—	—	—
	in 25 H_2O		99.9942	—	-600.74	—	—	—	—
CrO_3	in 50 H_2O		99.9942	—	-601.16	—	—	—	—
	in 80 H_2O		99.9942	—	-601.2	—	—	—	—
CrO_4^{2-}		ao	115.9936	—	-881.15	-727.75	—	50.21	—
Cr_2O_3		cr	151.9902	—	-1139.7	-1058.1	—	81.2	118.74
$Cr_2O_3{\cdot}H_2O$		cr	170.0056	—	-1506.	—	—	—	—
$Cr_2O_3{\cdot}2H_2O$		cr	188.0210	—	-1845.	—	—	—	—
$Cr_2O_3{\cdot}3H_2O$		cr	206.0364	—	-2171.	—	—	—	—
$Cr_2O_7^{2-}$		ao	215.9878	—	-1490.3	-1301.1	—	261.9	—
Cr_3O_4		cr	219.9856	—	-1531.	—	—	—	—
Cr_7H_2		cr	365.9880	—	-15.9	—	—	—	—
$HCrO_4^-$		ao	117.0016	—	-878.2	-764.7	—	184.1	—
$CrO_2(OH)_2$		g	118.0096	—	-728.	—	—	—	—
H_2CrO_4	in 1 H_2O		118.0096	—	-880.69	—	—	—	—
	in 2 H_2O		118.0096	—	-881.90	—	—	—	—
	in 3 H_2O		118.0096	—	-882.78	—	—	—	—
H_2CrO_4	in 4 H_2O		118.0096	—	-883.45	—	—	—	—
	in 5 H_2O		118.0096	—	-883.91	—	—	—	—
	in 7 H_2O		118.0096	—	-884.66	—	—	—	—
	in 9 H_2O		118.0096	—	-885.13	—	—	—	—
	in 25 H_2O		118.0096	—	-886.59	—	—	—	—
H_2CrO_4	in 80 H_2O		118.0096	—	-887.0	—	—	—	—
$Cr(OH)_3$	precipitated	cr	103.0182	—	-1064.0	—	—	—	—
$(Cr(H_2O)_4(OH)_2)^+$		aq	158.0724	—	-1907.1	—	—	—	—
$(Cr(H_2O)_5OH)^{2+}$		aq	159.0804	—	-1939.7	—	—	—	—
$(Cr(H_2O)_4(OH)_2)OH$		cr	175.0798	—	-2152.2	—	—	—	—

Substance Formula and Description	State	Molar mass	0 K	298.15 K (25°C) and 0.1 MPa (1 bar)				
			$\Delta_f H_0^\circ$	$\Delta_f H^\circ$	$\Delta_f G^\circ$	$H^\circ - H_0^\circ$	S°	C_p°
		g mol⁻¹ → $g\ mol^{-1}$	$kJ\ mol^{-1}$		$kJ\ mol^{-1}$		$J\ mol^{-1}\ K^{-1}$	
$(Cr(H_2O)_6)^{3+}$	aq	160.0884	—	-1999.1	—	—	—	—
$(Cr(H_2O)_5OH)(OH)_2$	cr	193.0952	—	-2454.8	—	—	—	—
CrF_2	cr	89.9928	—	-778.	—	—	—	—
	g	89.9928	—	-414.	—	—	—	—
CrF_3	cr	108.9912	-1155.70	-1159.	-1088.	14.046	93.89	78.74
CrF_4	cr	127.9896	—	-1247.	—	—	—	—
$(Cr(H_2O)_6)F_3$	aq	217.0836	—	-2988.2	—	—	—	—
$(Cr(H_2O)_6)(HF_2)_3$	aq	277.1028	—	-3948.4	—	—	—	—
$CrCl_2$	cr	122.9020	-397.19	-395.4	-356.0	15.033	115.31	71.17
	g	122.9020	—	-128.4	—	—	—	—
$CrCl_2$	aq	122.9020	—	-477.8	—	—	—	—
$CrCl_2 \cdot 2H_2O$ light green	cr	158.9328	—	-992.0	—	—	—	—
$CrCl_2 \cdot 3H_2O$ pale blue	cr	176.9482	—	-1292.4	—	—	—	—
$CrCl_2 \cdot 4H_2O$ dark blue	cr	194.9636	—	-1608.3	—	—	—	—
$CrCl_3$	cr	158.3550	-556.30	-556.5	-486.1	17.66	123.0	91.80
$CrCl_4$	g	193.8080	—	-427.	—	—	—	—
$(CrCl_2)_2$	g	245.8040	—	-464.	—	—	—	—
CrO_2Cl_2	l	154.9008	—	-579.5	-510.8	—	221.8	—
	g	154.9008	-534.21	-538.1	-501.6	18.07	329.8	84.5
$(Cr(H_2O)_5Cl)^{2+}$ blue green	aq	177.5260	—	-1859.8	—	—	—	—
$(Cr(H_2O)_4(OH)_2)Cl$	aq	193.5254	—	-2074.0	—	—	—	—
$(Cr(H_2O)_4Cl_2)^{2+}$	aq	194.9636	—	-1720.5	—	—	—	—
$(Cr(H_2O)_5OH)Cl_2$	aq	229.9864	—	-2274.0	—	—	—	—
$(Cr(H_2O)_4Cl_2)Cl$ green	cr	230.4166	—	-1852.3	—	—	—	—
	aq	230.4166	—	-1887.4	—	—	—	—
$(Cr(H_2O)_4Cl_2)Cl \cdot 2H_2O$ green	cr	266.4474	—	-2458.9	—	—	—	—
$(Cr(H_2O)_4Cl_2)Cl \cdot 6H_2O$ green	cr	338.5090	—	-3602.4	—	—	—	—
$(Cr(H_2O)_5Cl)Cl_2$	aq	248.4320	—	-2194.1	—	—	—	—
$(Cr(H_2O)_6)Cl_3$ violet	cr2	266.4474	—	-2452.7	—	—	—	—
violet	aq2	266.4474	—	-2501.2	—	—	—	—
$CrBr_2$	cr	211.8140	—	-302.1	—	—	—	—
	g	211.8140	—	-71.	—	—	—	—
$(CrBr_2)_2$	g	423.6280	—	-351.	—	—	—	—
$(Cr(H_2O)_4Br_2)^+$ green	aq	283.8756	—	-1621.7	—	—	—	—
$(Cr(H_2O)_4Br_2)Br$ green	aq	363.7846	—	-1743.5	—	—	—	—
$(Cr(H_2O)_4Br_2)Br \cdot 2H_2O$ green	cr	399.8154	—	-2312.1	—	—	—	—
$(Cr(H_2O)_6)Br_3$ purple	cr2	399.8154	—	-2302.9	—	—	—	—
violet	aq2	399.8154	—	-2363.1	—	—	—	—
CrI_2	cr	305.8048	—	-156.9	—	—	—	—
	g	305.8048	—	100.	—	—	—	—
CrI_2	aq	305.8048	—	-251.5	—	—	—	—
CrI_3	cr	432.7092	—	-205.0	—	—	—	—
in KCl + 55 H_2O:u		432.7092	—	-377.8	—	—	—	—
$CrICl_2$	cr	249.8064	—	-418.	—	—	—	—
$CrIBr_2$	cr	338.7184	—	-331.	—	—	—	—
$Cr_2(SO_4)_3$	cr	392.1768	—	—	—	—	—	282.4
$Cr_2(SO_4)_3 \cdot 18H_2O$	cr	716.4540	—	—	—	—	—	933.
$(Cr_2(H_2O)_6(SO_4)_3)$ green	aq	500.2692	—	-4935.0	—	—	—	—
$(Cr_2(H_2O)_6(SO_4)_3) \cdot 2H_2O$ green	cr	536.3000	—	-5449.7	—	—	—	—
$(Cr_2(H_2O)_8(SO_4)_2)SO_4$	aq2	536.3000	—	-5521.6	—	—	—	—

Table 51:**Cr** — **CHROMIUM** (Prepared 1966) — Continued — Table 51:**Cr**

Substance Formula and Description	State	Molar mass g mol^{-1}	0 K $\Delta_f H^\circ_0$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H^\circ_0$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
$(Cr_2(H_2O)_{10}SO_4)(SO_4)_2$	aq	572.3308	—	-6123.3	—	—	—	—
$(Cr(H_2O)_6)_2(SO_4)_3$ violet	aq	608.3616	—	-6717.4	—	—	—	—
$(Cr(H_2O)_6)_2(SO_4)_3\cdot 2H_2O$	cr	644.3924	—	-7246.7	—	—	—	—
$(Cr(H_2O)_6)_2(SO_4)_3\cdot 3H_2O$	cr	662.4078	—	-7540.0	—	—	—	—
$(Cr(H_2O)_6)_2(SO_4)_3\cdot 4H_2O$	cr	680.4232	—	-7829.5	—	—	—	—
$(Cr(H_2O)_6)_2(SO_4)_3\cdot 5H_2O$	cr	698.4386	—	-8119.9	—	—	—	—
Cr_2Te_3 x denotes undetermined zero-point entropy	cr	486.7920	—	—	—	28.957	208.61+x	128.91
Cr_3Te_4 x denotes undetermined zero-point entropy	cr	666.3880	—	—	—	41.250	293.09+x	198.15
Cr_5Te_6 x denotes undetermined zero-point entropy	cr	1025.5800	—	—	—	65.839	470.66+x	320.29
CrN	cr	66.0027	—	-124.7	—	—	—	46.0
Cr_2N	cr	117.9987	—	-127.6	—	—	—	72.4
$Cr(NO_3)_3\cdot 9H_2O$	cr	400.1493	—	—	—	—	—	456.9
NH_4HCrO_4 from $HCrO_4^-$	ai	135.0403	—	-1010.9	-844.2	—	297.5	—
$(NH_4)_2CrO_4$	cr	152.0710	—	-1167.3	—	—	—	—
	ai	152.0710	—	-1146.16	-886.36	—	277.0	—
$(NH_4)_2CrO_4$ in 300 H_2O		152.0710	—	-1144.3	—	—	—	—
$(NH_4)_2Cr_2O_7$	cr	252.0652	—	-1806.7	—	—	—	—
	ai	252.0652	—	-1755.2	-1459.5	—	488.7	—
in 50 H_2O		252.0652	—	-1759.0	—	—	—	—
in 75 H_2O		252.0652	—	-1758.5	—	—	—	—
$(NH_4)_2Cr_2O_7$ in 100 H_2O		252.0652	—	-1757.7	—	—	—	—
in 200 H_2O		252.0652	—	-1756.0	—	—	—	—
in 300 H_2O		252.0652	—	-1755.6	—	—	—	—
in 400 H_2O		252.0652	—	-1754.8	—	—	—	—
in 500 H_2O		252.0652	—	-1754.4	—	—	—	—
$(NH_4)_2Cr_2O_7$ in 600 H_2O		252.0652	—	-1753.9	—	—	—	—
in 800 H_2O		252.0652	—	-1753.5	—	—	—	—
in 1 000 H_2O		252.0652	—	-1753.1	—	—	—	—
in 5 $HClO_4$ + 5 000 H_2O		252.0652	—	-1745.6	—	—	—	—
in 20 $HClO_4$ + 10 000 H_2O		252.0652	—	-1743.9	—	—	—	—
$(NH_4)_2Cr_3O_{10}$	cr	352.0594	—	-2444.7	—	—	—	—
$CrCl_2\cdot 3NH_3$	cr	173.9941	—	-698.3	—	—	—	—
$CrCl_2\cdot 6NH_3$	cr	225.0862	—	-975.7	—	—	—	—
$NH_4Cr(SO_4)_2\cdot 12H_2O$	cr	478.3427	—	—	—	111.25	715.0	705.0
CrSb	cr	173.7460	—	—	—	—	—	53.1
$CrSb_2$	cr	295.4960	—	—	—	—	—	82.4
Cr_3C_2	cr	180.0104	-81.63	-80.8	-81.6	15.150	85.44	98.45
Cr_7C_3	cr	400.0056	—	-161.9	-166.9	—	200.8	208.87
$Cr_{23}C_6$	cr	1267.9752	—	-364.8	-373.6	—	610.0	624.3
$Cr(CO)_6$	cr	220.0596	—	-1077.0	—	—	—	—
$Cr(CO)_6$	g	220.0596	—	-1005.8	—	—	—	—
$Cr(CO)_6^+$	g	220.0596	—	-214.2	—	—	—	—
CrSi	cr	80.0820	—	-63.	—	—	—	38.5
$CrSi_2$	cr	108.1680	—	-96.	—	—	—	53.1
Cr_3Si	cr	184.0740	—	-126.	—	—	—	80.8
Cr_5Si_3	cr	344.2380	—	-268.	—	—	—	146.0

Table 51:**Cr** **CHROMIUM** (Prepared 1966) — Continued Table 51:**Cr**

Substance Formula and Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
$PbCrO_4$	cr	323.1836	—	-930.9	—	—	—	—
$PbI_2 \cdot 2CrI_3$	cr	1326.4172	—	-592.9	—	—	—	—
$PbI_2 \cdot 2CrI_3 \cdot 3H_2O$	cr	1380.4634	—	-1545.6	—	—	—	—
Tl_2CrO_4	cr	524.7336	—	-944.7	-861.4	—	282.4	—
Ag_2CrO_4	cr	331.7336	—	-731.74	-641.76	—	217.6	142.26
Ag_2CrO_4	ai	331.7336	—	-669.98	-573.52	—	195.8	—
CrAu	g	248.9630	548.	—	—	—	—	—
$FeCr_2O_4$	cr	223.8366	—	-1444.7	-1343.8	—	146.0	133.64

Table 52:**Mo** **MOLYBDENUM** (Prepared 1966) Table 52:**Mo**

Substance Formula and Description		State	Molar mass g mol^{-1}	0 K $\Delta_fH_0^\circ$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) Δ_fH° kJ mol^{-1}	Δ_fG° kJ mol^{-1}	$H^\circ-H_0^\circ$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
Mo		cr	95.9400	0	0	0	4.594	28.66	24.06
		g	95.9400	656.55	658.1	612.5	6.197	181.950	20.786
Mo^+		g	95.9400	1341.52	1349.30	—	6.197	—	—
Mo^{2+}		g	95.9400	2900.27	2914.24	—	—	—	—
Mo^{3+}		g	95.9400	5521.2	5541.7	—	6.519	—	—
Mo^{4+}		g	95.9400	9996.	10025.	—	6.209	—	—
Mo^{5+}		g	95.9400	15899.	15933.	—	6.197	—	—
Mo^{6+}		g	95.9400	22468.	22506.	—	6.197	—	—
Mo^{7+}		g	95.9400	34593.	34635.	—	6.197	—	—
Mo^{8+}		g	95.9400	48493.	48543.	—	—	—	—
MoO		g	111.9394	—	423.	—	—	—	—
MoO_2		cr	127.9388	—	-588.94	-533.01	—	46.28	55.98
		g	127.9388	—	13.	—	—	—	—
MoO_3		cr	143.9382	—	-745.09	-667.97	—	77.74	74.98
		g	143.9382	—	-326.	—	—	—	—
MoO_3		aq	143.9382	—	-721.7	—	—	—	—
MoO_3^+		g	143.9382	—	837.	—	—	—	—
MoO_4		aq	159.9376	—	-661.1	—	—	—	—
MoO_4^{2-}		ao	159.9376	—	-997.9	-836.3	—	27.2	—
MoO_5		aq	175.9370	—	-584.1	—	—	—	—
$(MoO_3)_2$		g	287.8764	—	-1134.	—	—	—	—
$(MoO_3)_3$		g	431.8146	—	-1887.	—	—	—	—
$(MoO_3)_4$		g	575.7528	—	-2586.	—	—	—	—
$(MoO_3)_5$		g	719.6910	—	-3276.	—	—	—	—
H_2MoO_4	white	cr	161.9536	—	-1046.0	—	—	—	—
H_2MoO_4		g	161.9536	—	-887.	—	—	—	—
	equivalent to MoO_3(aq) + H_2O(l)	aq	161.9536	—	-1007.5	—	—	—	—
$H_2MoO_4 \cdot H_2O$	yellow	cr	179.9690	—	-1360.	—	—	—	—
MoF_6		l	209.9304	-1597.171	-1585.53	-1473.00	42.698	259.66	169.79
		g	209.9304	-1550.624	-1557.66	-1472.20	24.02	350.52	120.58
$MoCl_2$		cr	166.8460	—	-282.0	—	—	—	—
$MoCl_3$		cr	202.2990	—	-387.0	—	—	—	—
$MoCl_4$		cr	237.7520	—	-480.3	—	—	—	—
		g	237.7520	—	-377.	—	—	—	—
$MoCl_5$		cr	273.2050	—	-527.2	—	—	—	—
$MoCl_5$		g	273.2050	—	-431.	—	—	—	—
MoO_2Cl_2		cr	198.8448	—	-717.1	—	—	—	—
		g	198.8448	—	-634.3	—	—	—	—
		aq	198.8448	—	-796.6	—	—	—	—
$MoO_2Cl_2 \cdot H_2O$		cr	216.8602	—	-1026.8	—	—	—	—
$MoOCl_4$		cr	253.7514	—	-640.2	—	—	—	—
$MoBr_2$		cr	255.7580	—	-261.1	—	—	—	76.6
$MoBr_4$		cr	415.5760	—	-321.3	—	—	—	—
MoO_2Br_2		cr	287.7568	—	-629.3	—	—	—	—
		aq	287.7568	—	-698.3	—	—	—	—
MoI_2		g	349.7488	—	134.	—	—	—	—
MoS_2		cr	160.0680	-232.30	-235.1	-225.9	10.577	62.59	63.55
Mo_2S_3		cr	288.0720	—	-364.	—	—	—	—
Mo_2N		cr	205.8867	—	-81.59	—	—	—	—

Substance Formula and Description	State	Molar mass g mol⁻¹	0 K	298.15 K (25°C) and 0.1 MPa (1 bar)				
			$\Delta_f H_0^\circ$ kJ mol^{-1}	$\Delta_f H^\circ$	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H_0^\circ$	S° J mol^{-1} K^{-1}	C_p
MoC	cr	107.9512	—	-10.0	—	—	—	—
Mo_2C	cr	203.8912	—	-45.6	—	—	—	—
$Mo(CO)_6$	cr	264.0036	—	-982.8	-877.7	—	325.9	242.25
	g	264.0036	-914.6	-912.1	-856.0	39.3	490.	205.
$Mo(CO)_6^+$	g	264.0036	-120.9	-112.1	—	—	—	—
$MoSi_2$	cr	152.1120	—	-117.	—	—	—	—
Mo_3Si	cr	315.9060	—	-96.	-96.	—	106.3	93.43
Mo_5Si_3	cr	563.9580	—	-285.	—	—	—	—
Mo_3Ge	cr	360.4100	—	-21.	—	—	—	—
$PbMoO_4$	cr	367.1276	—	-1051.9	-951.4	—	166.1	119.70
MoB	cr	106.7510	—	-88.	—	—	—	—
Mo_2B	cr	202.6910	—	-121.	—	—	—	—
$CuMoO_4$	cr	223.4776	—	-941.	—	—	—	—
Ag_2MoO_4	cr	375.6776	—	-840.6	-748.0	—	213.	—
	ai	375.6776	—	-786.6	-681.9	—	172.8	—
$FeMoO_4$	cr	215.7846	—	-1075.	-975.	—	129.3	118.45
$Fe_2(MoO_4)_3$	cr	591.5068	—	-2937.	—	—	—	—
$MnMoO_4$	cr	214.8756	—	-1191.31	—	—	—	—

Table 53:W — **TUNGSTEN** (Prepared 1966) — Table 53:W

Substance Formula	Description	State	Molar mass g mol^{-1}	0 K: $\Delta_f H^\circ_0$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar): $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H^\circ_0$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
W		cr	183.8500	0	0	0	4.979	32.64	24.27
		g	183.8500	848.10	849.4	807.1	6.217	173.950	21.309
W^+		g	183.8500	1581.6	1588.7	—	6.222	—	—
WO		g	199.8494	—	452.	—	—	—	—
WO_2		cr	215.8488	−584.764	−589.69	−533.89	8.732	50.54	56.11
WO_2		g	215.8488	—	46.	—	—	—	—
WO_2^+		g	215.8488	—	979.	—	—	—	—
WO_3		cr	231.8482	−837.218	−842.87	−764.03	12.351	75.90	73.76
		g	231.8482	—	−297.	—	—	—	—
WO_3^+		g	231.8482	—	858.	—	—	—	—
WO_4^{2-}		ao	247.8476	—	−1075.7	—	—	—	—
$(WO_3)_2$		g	463.6964	—	−1159.	—	—	—	—
$(WO_3)_3$		g	695.5446	—	−1958.	—	—	—	—
$(WO_3)_4$		g	927.3928	—	−2715.	—	—	—	—
$W_{18}O_{49}$		cr	4093.2705	—	−13933.	—	—	—	—
$W_{20}O_{58}$		cr	4604.9651	—	−16401.	—	—	—	—
H_2WO_4		cr	249.8636	—	−1131.8	—	—	—	—
		g	249.8636	—	−958.	—	—	—	—
$HW_6O_{21}^{5-}$		aq	1440.0954	—	−5839.2	—	—	—	—
WF_6		l	297.8404	—	−1747.7	−1631.37	—	251.5	—
WF_6		g	297.8404	−1713.01	−1721.7	−1632.1	22.740	341.06	119.03
WCl_2		cr	254.7560	—	−255.	—	—	—	—
WCl_4		cr	325.6620	—	−469.	—	—	—	—
		g	325.6620	—	−305.	—	—	—	—
WCl_5		cr	361.1150	—	−496.2	—	—	—	—
WCl_5		g	361.1150	—	−421.7	—	—	—	—
WCl_6	α	cr	396.5680	—	−602.5	—	—	—	—
		g	396.5680	—	−513.8	—	—	—	—
W_2Cl_{10}		g	722.2300	—	−879.	—	—	—	—
WO_2Cl_2		cr	286.7548	—	−783.2	—	—	—	—
WO_2Cl_2		g	286.7548	—	−686.	—	—	—	—
$WOCl_4$		cr	341.6614	—	−676.6	—	—	—	—
		g	341.6614	—	−586.	—	—	—	—
WBr_5		cr	583.3950	—	−316.3	—	—	—	—
		g	583.3950	—	−231.8	—	—	—	—
WBr_6		cr	663.3040	—	−348.5	—	—	—	—
WO_2Br_2		cr	375.6668	—	−712.5	—	—	—	—
$WOBr_4$		cr	519.4854	—	−544.3	—	—	—	—
WS_2		cr	247.9780	—	−209.	—	—	—	—
WC		cr	195.8612	—	−40.54	—	—	—	—
W_2C		cr	379.7112	—	−26.4	—	—	—	—
$W(CO)_6$		cr	351.9136	—	−953.5	—	—	—	—
		g	351.9136	—	−871.5	—	—	—	—
$W(CO)_6^+$		g	351.9136	—	−70.08	—	—	—	—
WSi_2		cr	240.0220	—	−92.	—	—	—	—
$SnWO_4$		g	366.5376	−870.	—	—	—	—	—
Sn_2WO_5		g	501.2270	−1125.	—	—	—	—	—
$PbWO_4$		cr	455.0376	—	—	—	—	168.2	119.79
$ZnWO_4$		cr	313.2176	—	−1226.	—	—	—	125.5
$CuWO_4$		cr	311.3876	—	−1105.	—	—	—	—

Substance Formula and Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H_0^\circ$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H_0^\circ$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
$CuWO_4{\cdot}2H_2O$	cr	347.4184	—	-1707.	—	—	—	—
Ag_2WO_4	cr	463.5876	—	-925.5	—	—	—	—
	ai	463.5876	—	-864.4	—	—	—	—
Ni_4W	cr	418.6900	—	-180.	—	—	—	121.3
$NiWO_4$	cr	306.5576	—	-1133.4	—	—	—	121.8
Co_3W	cr	360.6496	—	-37.7	-31.4	—	100.	—
$CoWO_4$	cr	306.7808	—	—	—	—	—	130.1
Fe_7W_6	cr	1494.0290	—	—	—	—	—	325.1
$FeWO_4$	cr	303.6946	—	-1155.	-1054.	—	131.8	114.60
$FeWO_4{\cdot}3H_2O$	cr	357.7408	—	-2046.	—	—	—	—
$Fe_2(WO_4)_3{\cdot}8H_2O$	cr	999.3600	—	-5669.	—	—	—	—
$MnWO_4$	cr	302.7856	—	-1305.0	—	—	—	124.3

Table 54:V — **VANADIUM** (Prepared 1970) — Table 54:V

Substance Formula	Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
V		cr	50.9420	0	0	0	4.640	28.91	24.89
		g	50.9420	510.95	514.21	754.43	7.907	182.298	26.012
V^{+}		g	50.9420	1161.23	1170.68	—	7.899	—	—
V^{2+}		g	50.9420	2575.21	2590.86	—	7.912	—	—
V^{3+}		g	50.9420	5403.26	5424.60	—	7.381	—	—
V^{4+}		g	50.9420	9909.8	9936.6	—	6.715	—	—
V^{5+}		g	50.9420	16208.4	16241.0	—	6.197	—	—
V^{6+}		g	50.9420	28573.	28610.	—	6.197	—	—
V^{7+}		g	50.9420	43104.	43150.	—	6.197	—	—
V^{8+}		g	50.9420	59840.	59894.	—	6.197	—	—
V^{9+}		g	50.9420	79697.	79755.	—	6.197	—	—
V^{10+}		g	50.9420	101939.	102002.	—	—	—	—
VO		cr	66.9414	—	-431.8	-404.2	—	38.9	45.44
		g	66.9414	105.	105.	75.	8.79	233.6	30.5
VO^{2+}		ao	66.9414	—	-486.6	-446.4	—	-133.9	—
VO_2		g	82.9408	—	-238.	—	—	—	—
VO_2^{+}		ao	82.9408	—	-649.8	-587.0	—	-42.3	—
VO_3^{-}		ao	98.9402	—	-888.3	-783.6	—	50.	—
VO_4^{3-}		ao	114.9396	—	—	-899.0	—	—	—
V_2O_3		cr	149.8822	—	-1218.8	-1139.3	—	98.3	103.22
V_2O_4	α	cr	165.8816	—	-1427.2	-1318.3	—	102.5	116.98
V_2O_5		cr	181.8810	—	-1550.6	-1419.5	—	131.0	127.65
$V_2O_7^{4-}$		ao	213.8798	—	—	-1719.	—	—	—
V_3O_5		cr	232.8230	—	-1933.	-1803.	—	163.	—
V_4O_7		cr	315.7638	—	-2640.	-2456.	—	218.	—
V_6O_{13}		cr	513.6442	—	-4443.	—	—	—	—
VO_2HO_2	vanadyl hydroperoxide	ao	115.9476	—	—	-745.1	—	—	—
HVO_4^{2-}		ao	115.9476	—	-1159.0	-974.8	—	17.	—
$(VO \cdot H_2O_2)^{3+}$		ao	100.9562	—	—	-523.4	—	—	—
$(VO_2H_2O_2)^{+}$		ao	116.9556	—	—	-746.3	—	—	—
$H_2VO_4^{-}$	equivalent to VO_3^{-}(ao) + H_2O(l)	ao	116.9556	—	-1174.0	-1020.8	—	121.	—
$HV_2O_7^{3-}$		ao	214.8878	—	—	-1792.2	—	—	—
$H_3V_2O_7^{-}$		ao	216.9038	—	—	-1863.8	—	—	—
$V_2O_3(OH)_4$		g	217.9118	—	-2048.9	—	—	—	—
$HV_{10}O_{28}^{5-}$		ao	958.4112	—	-8694.	-7702.	—	222.	—
$H_2V_{10}O_{28}^{4-}$		ao	959.4192	—	—	-7723.	—	—	—
VF_3		cr	107.9372	—	—	—	—	96.99	90.46
VF_4		cr	126.9356	—	-1403.3	—	—	—	—
VF_5		l	145.9340	—	-1480.3	-1373.1	—	175.7	—
		g	145.9340	-1426.58	-1433.9	-1369.8	19.389	320.90	98.58
VCl_2		cr	121.8480	—	-452.	-406.	—	97.1	72.22
		g	121.8480	—	-256.5	—	—	—	—
VCl_3		cr	157.3010	—	-580.7	-511.2	—	131.0	93.18
VCl_4		l	192.7540	—	-569.4	-503.7	—	255.	—
		g	192.7540	-524.34	-525.5	-492.0	21.80	362.4	96.2
VOCl		cr	102.3944	—	-607.	-556.	—	75.	—
VO_2Cl		cr	118.3938	—	-776.6	-702.0	—	96.	—
$VOCl_2$		cr	137.8474	—	-703.	-636.	—	130.	—
$VOCl_3$		l	173.3004	—	-734.7	-668.5	—	244.3	—

Table 54:V — **VANADIUM** (Prepared 1970) — Continued — Table 54:V

Substance Formula and Description		State	Molar mass g mol⁻¹	0 K	298.15 K (25°C) and 0.1 MPa (1 bar)				
				$\Delta_f H_0^\circ$ kJ mol^{-1}	$\Delta_f H^\circ$	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H_0^\circ$	S° J mol^{-1} K^{-1}	C_p
$VOCl_3$		g	173.3004	-692.58	-695.59	-659.28	19.71	344.29	89.91
$VOCl_3^+$		g	173.3004	449.8	453.1	—	—	—	—
VBr_2		cr	210.7600	—	-365.3	—	—	—	—
		g	210.7600	—	-155.2	—	—	—	—
VBr_3		cr	290.6690	—	-433.5	—	—	—	—
VBr_3		g	290.6690	—	-237.7	—	—	—	—
VBr_4		g	370.5780	—	-336.8	—	—	—	—
$VBrCl_3$		g	237.2100	—	-502.	—	—	—	—
VI_2		cr	304.7508	—	-251.5	—	—	—	—
		g	304.7508	—	-4.	—	—	—	—
VI_3		cr	431.6552	—	-270.7	—	—	—	—
VI_4		g	558.5596	—	-122.6	—	—	—	—
$VOSO_4$		cr	163.0030	—	-1309.2	-1169.8	—	108.8	—
		ao	163.0030	—	—	-1204.9	—	—	—
VN		cr	64.9487	—	-217.1	-191.2	—	37.28	37.99
NH_4VO_3		cr	116.9789	—	-1053.1	-888.1	—	140.6	129.33
$NOVF_6$		cr	194.9385	—	-1657.7	-1458.4	—	167.	—
$(VO)_3(PO_4)_2$		cr	390.7670	—	—	-3239.1	—	—	—
$VC_{0.88}$		cr	61.5119	—	-101.7	-99.2	—	25.9	32.05
V_2C		cr	113.8952	—	—	—	—	51.0	55.6
$VO(C_2O_4)_2^{2-}$	oxalate	ao	242.9814	—	—	-1738.7	—	—	—
$V(CO)_6$		g	219.0056	—	-987.	—	—	—	—
$VOSCN^+$	from VO^{2+}	ao	125.0233	—	-410.	-360.	—	33.	—
VSi_2		cr	107.1140	—	-305.	—	—	—	—
V_2Si		cr	129.9700	—	-155.	—	—	—	—
V_3Si		cr	180.9120	—	-109.	—	—	—	—
V_5Si_3		cr	338.9680	—	-393.	—	—	—	—
$Pb_2V_2O_7$		cr	628.2598	—	-2132.6	—	—	—	—
$Pb_3(VO_4)_2$		cr	851.4492	—	-2374.0	—	—	—	—
VAl_3		cr	131.8865	—	-109.	—	—	—	—
V_5Al_8		cr	470.5620	—	-293.	—	—	—	—
$TlVO_3$		cr	303.3102	—	—	-863.1	—	—	—
$Tl_4V_2O_7$		cr	1031.3598	—	—	-1955.1	—	—	—
$AgVO_3$		cr	206.8102	—	—	-742.6	—	—	—
Ag_2HVO_4		cr	331.6876	—	—	-898.6	—	—	—
$Ag_2HVO_4 \cdot AgOH$		cr	456.5650	—	—	-1037.5	—	—	—
$Fe(VO_3)_2$		cr	253.7274	—	-1898.7	—	—	—	—
$Mn(VO_3)_2$		cr	252.8184	—	-1999.5	—	—	—	—

Table 55:Nb — **NIOBIUM** (Prepared 1970) — Table 55:Nb

Substance Formula	Description	State	Molar mass g mol^{-1}	0 K: $\Delta_f H^\circ_0$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar): $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H^\circ_0$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
Nb		cr	92.9060	0	0	0	5.251	36.40	24.60
		g	92.9060	722.819	725.9	681.1	8.355	186.256	30.158
Nb^+		g	92.9060	1358.67	1368.21	—	8.590	—	—
Nb^{2+}		g	92.9060	2740.35	2754.45	—	6.962	—	—
Nb^{3+}		g	92.9060	5156.8	5176.4	—	6.293	—	—
Nb^{4+}		g	92.9060	8848.3	8874.3	—	6.201	—	—
Nb^{5+}		g	92.9060	13724.	13757.	—	6.197	—	—
Nb^{6+}		g	92.9060	23573.	23610.	—	6.197	—	—
Nb^{7+}		g	92.9060	35045.	35091.	—	—	—	—
NbO		cr	108.9054	—	-405.8	-378.6	—	48.1	41.25
NbO		g	108.9054	214.2	213.	184.	8.782	238.97	30.79
NbO_2		cr	124.9048	-791.57	-796.2	-740.5	9.297	54.52	57.49
		g	124.9048	—	-214.6	-218.8	—	255.3	—
NbO_3^-	ionic strength = 1	ao	140.9042	—	—	-932.1	—	—	—
Nb_2O_5	high temp. form	cr	265.8090	-1889.62	-1899.5	-1766.0	22.280	137.24	132.09
Nb_2O_5		aq	265.8090	—	-1919.6	—	—	—	—
$Nb(OH)_4^+$	ionic strength = 1	ao	160.9356	—	—	-1208.6	—	—	—
$Nb(OH)_5$	ionic strength = 1	ao	177.9430	—	—	-1448.3	—	—	—
NbF_5		cr	187.8980	-1810.33	-1813.8	-1699.0	23.878	160.2	134.7
		g	187.8980	-1731.17	-1739.7	-1673.6	18.79	321.9	97.1
$NbCl_{2.33}$		cr	175.5115	—	-474.5	—	—	—	—
$NbCl_{2.67}$		cr	187.5655	—	-538.1	—	—	—	—
$NbCl_3$		g	199.2650	—	-360.	—	—	—	—
$NbCl_{3.13}$		cr	203.8739	—	-605.4	—	—	—	—
$NbCl_4$		cr	234.7180	—	-694.5	—	—	—	—
$NbCl_4$		g	234.7180	—	-561.	—	—	—	—
$NbCl_5$		cr	270.1710	—	-797.5	-683.2	—	210.5	148.1
		g	270.1710	-702.20	-703.7	-646.0	26.652	400.56	120.83
$NbOCl_2$		cr	179.8114	—	-774.5	—	—	—	—
$NbOCl_3$		cr	215.2644	—	-879.5	-782.	—	142.	—
$NbOCl_3$		g	215.2644	-749.61	-752.3	-717.9	20.631	358.3	92.0
$NbBr_5$		cr	492.4510	—	-556.1	—	—	—	—
		g	492.4510	—	-438.5	—	—	—	—
$NbOBr_3$		cr	348.6324	—	-750.2	—	—	—	—
NbI_5		cr	727.4280	—	-268.6	—	—	—	—
$Nb_{1.136}S_2$		cr	169.6692	—	-388.3	—	—	—	84.
NbN		cr	106.9127	-231.58	-235.1	-205.8	6.021	34.52	38.99
Nb_2N		cr	199.8187	—	-250.6	—	—	—	—
NbC		cr	104.9172	-138.57	-138.9	-136.8	5.950	35.40	36.86
Nb_2C		cr	197.8232	—	-190.0	-185.8	—	64.0	60.58
$NbGe_{0.15}$		cr	103.7945	—	-16.7	—	—	—	—
$NbGe_{0.54}$		cr	132.1046	—	-61.1	—	—	—	—
$NbGe_{0.67}$		cr	141.5413	—	-64.4	—	—	—	—
$NbGe_2$		cr	238.0860	—	-87.0	—	—	—	—
$NbB_{1.875}$		cr	113.1766	—	-246.0	—	—	—	—
$NbB_{1.963}$		cr	114.1280	—	—	—	6.778	37.28	47.78
$NbCo_2$		cr	210.7724	—	-57.3	-55.2	—	92.	—
$NbCo_3$		cr	269.7056	—	-59.0	-57.3	—	121.	—
$NbFe_2$		cr	204.6000	—	-46.4	-49.4	—	100.	54.4
$NbCr_2$		cr	196.8980	—	-20.9	-20.9	13.519	83.55	73.01

Table 56:**Ta** **TANTALUM** (Prepared 1970) Table 56:**Ta**

Substance Formula and Description		State	Molar mass g mol⁻¹	0 K	298.15 K (25°C) and 0.1 MPa (1 bar)				
				$\Delta_f H^\circ_0$ kJ mol^{-1}	$\Delta_f H^\circ$	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H^\circ_0$	S° J mol^{-1} K^{-1}	C_p
Ta		cr	180.9480	0	0	0	5.636	41.51	25.36
		g	180.9480	781.425	782.0	739.3	6.201	185.214	20.857
Ta^+		g	180.9480	1495.40	1502.31	—	6.335	—	—
TaO		g	196.9474	252.3	251.	222.	8.79	241.1	30.59
TaO_2		g	212.9468	-170.3	-172.	-180.	13.0	268.	52.3
TaO_2^+		ao	212.9468	—	—	-842.6	—	—	—
Ta_2O_5	β	cr	441.8930	—	-2046.0	-1911.2	—	143.1	135.14
		aq	441.8930	—	-2078.2	—	—	—	—
Ta_2H		cr	362.9040	-29.00	-32.6	-69.0	11.88	79.1	90.8
TaF_5		cr	275.9400	—	-1903.59	—	—	—	—
TaF_5		ao	275.9400	—	—	-1131.7	—	—	—
TaF_6^-		ao	294.9384	—	—	-1431.7	—	—	—
TaF_7^{2-}		ao	313.9368	—	—	-1729.5	—	—	—
$TaCl_{2.5}$		cr	269.5805	—	-479.1	—	—	—	—
$TaCl_3$		cr	287.3070	—	-553.1	—	—	—	—
$TaCl_4$		cr	322.7600	—	-701.7	—	—	—	—
		g	322.7600	—	-560.7	—	—	—	—
$TaCl_5$		cr	358.2130	—	-859.0	—	—	—	—
		g	358.2130	—	-758.6	—	—	—	—
$TaOCl_3$		g	303.3064	—	-780.7	—	—	—	—
$TaBr_5$		cr	580.4930	—	-598.3	—	—	—	—
		g	580.4930	—	-483.7	—	—	—	—
TaS_2		cr	245.0760	—	-464.	—	—	—	—
TaN		cr	194.9547	—	-251.5	—	—	—	40.6
Ta_2N		cr	375.9027	—	-272.	—	—	—	—
NH_4TaCl_6		cr	411.7047	—	-1133.0	—	—	—	—
TaC		cr	192.9592	-146.27	-146.4	-144.8	6.53	42.30	36.78
Ta_2C		cr	373.9072	—	-213.4	-212.5	—	86.6	—
$TaSi_2$		cr	237.1200	—	-117.	—	—	—	—
Ta_5Si_3		cr	988.9980	—	-318.	—	—	—	—
TaB_2		cr	202.5700	—	-192.	—	—	—	—

Table 57:Ti — TITANIUM (Prepared 1970) — Table 57:Ti

Substance Formula	Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H_0^\circ$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H_0^\circ$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
Ti		cr	47.9000	0	0	0	4.807	30.63	25.02
		g	47.9000	467.14	469.9	425.1	7.540	180.298	24.430
Ti^+		g	47.9000	1125.20	1134.49	—	7.899	—	—
Ti^{2+}		g	47.9000	2435.09	2450.23	—	7.548	—	—
Ti^{3+}		g	47.9000	5087.62	5108.45	—	7.071	—	—
Ti^{4+}		g	47.9000	9262.1	9288.5	—	6.197	—	—
Ti^{5+}		g	47.9000	18843.1	18875.3	—	6.197	—	—
Ti^{6+}		g	47.9000	30376.3	30414.8	—	6.197	—	—
Ti^{7+}		g	47.9000	43965.	44011.	—	6.197	—	—
Ti^{8+}		g	47.9000	60400.	60455.	—	6.197	—	—
Ti_2		g	95.8000	—	711.	—	—	—	—
TiO	α	cr	63.8994	–516.68	–519.7	–495.0	6.19	50.	39.96
		g	63.8994	17.	17.	–13.	9.58	234.4	32.68
TiO^{2+}	in aq $HClO_4$	aq	63.8994	—	–689.9	—	—	—	—
TiO_2	anatase	cr	79.8988	–934.87	–939.7	–884.5	8.627	49.92	55.48
TiO_2	brookite	cr2	79.8988	—	–941.8	—	—	—	—
	rutile	cr3	79.8988	–939.7	–944.7	–889.5	8.640	50.33	55.02
	hydrated ppt.	cr4	79.8988	—	–919.6	—	—	—	—
		am	79.8988	—	–879.	—	—	—	—
		g	79.8988	—	–251.	—	—	—	—
Ti_2O_3		cr	143.7982	–1512.60	–1520.9	–1434.2	14.355	78.78	97.36
Ti_3O_5		cr	223.6970	–2446.34	–2459.4	–2317.4	23.10	129.3	154.81
TiH_2		cr	49.9160	–111.34	–119.7	–80.3	4.94	29.7	30.1
TiF_4		am	123.8936	–1647.16	–1649.3	–1559.3	20.255	133.97	114.27
		g	123.8936	—	–1552.3	—	—	—	—
H_2TiF_6		aq	163.9064	—	–2400.4	—	—	—	—
$TiCl_2$		cr	118.8060	–513.13	–513.8	–464.4	13.31	87.4	69.83
$TiCl_3$		cr	154.2590	–723.25	–720.9	–653.5	20.92	139.7	97.15
		g	154.2590	—	–541.8	—	—	—	—
$TiCl_4$		cr	189.7120	–819.02	—	—	—	—	—
$TiCl_4$		l	189.7120	—	–804.2	–737.2	—	252.34	145.18
		g	189.7120	–761.66	–763.2	–726.7	21.63	354.9	95.4
	in 1 600 H_2O		189.7120	—	–1047.3	—	—	—	—
	in 250 $HClO_4$ + 7 200 H_2O		189.7120	—	–1045.41	—	—	—	—
	in 16 000 $HClO_4$ + 400 000 H_2O		189.7120	—	–1046.67	—	—	—	—
$TiCl_4$	in 270 $HClO_4$ + 4 300 H_2O		189.7120	—	–1033.45	—	—	—	—
	in 400 $HClO_4$ + 4 600 H_2O		189.7120	—	–1022.2	—	—	—	—
	in 530 $HClO_4$ + 4 600 H_2O		189.7120	—	–1006.3	—	—	—	—
	in 29 900 $HClO_4$ + 250 000 H_2O		189.7120	—	–1012.19	—	—	—	—
	in $HClO_4$ + 8.7 H_2O:ao		189.7120	—	–1012.32	—	—	—	—
$TiCl_4$	in $HClO_4$ + 11.5 H_2O:ao		189.7120	—	–1024.24	—	—	—	—
	in $HClO_4$ + 16 H_2O:ao		189.7120	—	–1034.70	—	—	—	—
	in $HClO_4$ + 25 H_2O:ao		189.7120	—	–1046.84	—	—	—	—
$TiCl_4^+$		g	189.7120	364.	368.	—	—	—	—
TiOCl		cr	99.3524	—	–753.	—	—	—	—
$TiBr_2$		cr	207.7180	—	–402.	—	—	—	—
$TiBr_3$		cr	287.6270	–529.90	–548.5	–523.8	22.97	176.6	101.71
$TiBr_4$		cr	367.5360	–591.45	–616.7	–589.5	28.556	243.5	131.50
		g	367.5360	–519.40	–549.4	–568.2	23.89	398.4	100.8
$TiCl_3Br$		g	234.1680	—	—	—	21.97	374.6	96.7

Substance Formula and Description		State	Molar mass g mol⁻¹	0 K	298.15 K (25°C) and 0.1 MPa (1 bar)				
				$\Delta_f H_0^\circ$ kJ mol⁻¹	$\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H_0^\circ$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
$TiClBr_3$		g	323.0800	—	—	—	22.97	396.3	99.2
TiI_2		cr	301.7088	—	-264.	—	—	—	—
		g	301.7088	—	-54.	—	—	—	—
TiI_4		cr	555.5176	—	-375.7	-371.5	—	249.4	125.65
		g	555.5176	—	-277.8	—	—	—	—
TiI_4	in C_6H_6:x		555.5176	—	-345.2	-359.0	—	310.	—
TiS		cr	79.9640	—	-238.	—	—	—	—
		g	79.9640	—	305.	—	—	—	—
TiS_2		cr	112.0280	—	—	—	—	78.37	67.91
$TiCl_4{\cdot}H_2S$		cr	223.7920	—	-861.5	—	—	—	—
$TiCl_4{\cdot}2H_2S$		cr	257.8720	—	-912.1	—	—	—	—
$TiBr_4{\cdot}H_2S$		cr	401.6160	—	-672.8	—	—	—	—
$TiBr_4{\cdot}2H_2S$		cr	435.6960	—	-722.2	—	—	—	—
TiN		cr	61.9067	-334.43	-338.1	-309.6	5.485	30.25	37.07
TiP		cr	78.8738	—	-282.8	—	—	—	—
$TiCl_4{\cdot}POCl_3$		cr	343.0442	—	-1460.	—	—	—	—
$TiCl_4{\cdot}2POCl_3$		cr	496.3764	—	-2025.1	—	—	—	—
$TiCl_4{\cdot}PH_3$		cr	223.7098	—	-876.5	—	—	—	—
$TiCl_4{\cdot}2PH_3$		cr	257.7076	—	-916.3	—	—	—	—
$TiBr_4{\cdot}PH_3$		cr	401.5338	—	-678.2	—	—	—	—
$TiBr_4{\cdot}2PH_3$		cr	435.5316	—	-722.2	—	—	—	—
$TiAs$		cr	122.8216	—	-149.8	—	—	—	—
$TiSb$		cr	169.6500	—	-281.2	—	—	—	—
TiC		cr	59.9112	-183.26	-184.5	-180.7	4.607	24.23	33.64
$TiF_4{\cdot}CH_3CN$	acetonitrile	cr	164.9467	—	-1594.5	—	—	—	—
$TiCl_4{\cdot}2CH_3CN$		cr	271.8182	—	-748.1	—	—	—	—
$TiBr_4{\cdot}2CH_3CN$		cr	449.6422	—	-506.7	—	—	—	—
$TiSi$	γ	cr	75.9860	—	-130.	—	—	—	—
$TiSi_2$	β	cr	104.0720	—	-134.	—	—	—	—
Ti_5Si_3	ϵ	cr	323.7580	—	-577.	—	—	—	—
TiB_2		cr	69.5220	-322.2	-323.8	-319.7	5.577	28.49	44.27
$TiAl$		cr	74.8815	—	-75.3	—	—	—	—
$TiAl_3$		cr	128.8445	—	-146.4	—	—	—	—
Ti_3Al		cr	170.6815	—	-98.3	—	—	—	—
Al_2TiO_5		cr	181.8600	—	—	—	—	109.6	136.40
Tl_2TiCl_6		cr	669.3580	—	-1331.	—	—	—	—
$ZnTiO_3$		cr	161.2682	—	-1302.5	—	—	—	—
Zn_2TiO_4		cr	242.6376	—	-1647.7	-1534.2	—	143.1	137.32
Ni_3Ti	γ	cr	224.0300	—	-138.9	—	—	—	—
$NiTi_2$	ϵ	cr	154.5100	—	-80.3	—	—	—	—

Table 58:**Zr** **ZIRCONIUM** (Prepared 1970) Table 58:**Zr**

Substance Formula	Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
Zr		cr	91.2200	0	0	0	5.531	38.99	25.36
		g	91.2200	607.47	608.8	566.5	6.816	181.36	26.65
Zr^+		g	91.2200	1243.5	1251.4	—	7.473	—	—
Zr^{2+}		g	91.2200	1369.8	1383.6	—	6.623	—	—
Zr^{3+}		g	91.2200	3587.8	3607.0	—	6.251	—	—
Zr^{4+}		g	91.2200	6908.6	6934.1	—	6.197	—	—
Zr^{5+}		g	91.2200	14661.	14694.	—	—	—	—
ZrO		g	107.2194	—	63.	—	—	—	—
ZrO^+		g	107.2194	—	649.	—	—	—	—
ZrO_2	α, monoclinic	cr	123.2188	-1095.095	-1100.56	-1042.79	8.749	50.38	56.19
ZrO_2	hydrated precipitate	cr2	123.2188	—	-1089.5	—	—	—	—
		g	123.2188	—	-314.	—	—	—	—
ZrO_2^+		g	123.2188	—	611.	—	—	—	—
ZrO_3	precipitated	cr	139.2182	—	-1008.	—	—	—	—
ZrH_2		cr	93.2360	-160.41	-169.0	-128.8	5.372	35.02	30.96
$ZrOOH^+$		aq	124.2268	—	-1130.1	—	—	—	—
ZrF_2		g	129.2168	—	-565.	—	—	—	—
ZrF_3		g	148.2152	—	-1109.	—	—	—	—
ZrF_4	β, monoclinic	cr	167.2136	-1905.56	-1911.3	-1809.9	17.502	104.60	103.72
		g	167.2136	-1669.37	-1673.6	-1636.3	18.95	319.3	87.4
$ZrF_4 \cdot H_2O$		cr	185.2290	—	-2207.5	—	—	—	—
$ZrF_4 \cdot 3H_2O$		cr	221.2598	—	-2802.9	—	—	—	—
ZrCl		cr	126.6730	—	-264.	—	—	—	—
		g	126.6730	—	251.	—	—	—	—
$ZrCl_2$		cr	162.1260	—	-502.	—	—	—	—
$ZrCl_2$		g	162.1260	—	-167.	—	—	—	—
$ZrCl_3$		cr	197.5790	—	-749.	—	—	—	—
		g	197.5790	—	-506.	—	—	—	—
$ZrCl_4$		cr	233.0320	-981.57	-980.52	-889.9	24.924	181.6	119.79
		g	233.0320	-868.97	-870.3	-835.5	22.598	368.3	98.28
$ZrCl_4$		aq	233.0320	—	-1227.2	—	—	—	—
	in 55 $HCOOC_2H_5$ in ethyl formate		233.0320	—	-1091.2	—	—	—	—
	in 50 $CH_3COOC_2H_5$ in ethyl acetate		233.0320	—	-1088.7	—	—	—	—
	in 35 $C_3H_7COOC_2H_5$ in ethyl butyrate		233.0320	—	-1085.3	—	—	—	—
	in 80 $C_6H_5NO_2$		233.0320	—	-1024.2	—	—	—	—
$ZrOCl_2$		aq	178.1254	—	-1172.8	—	—	—	—
$ZrOCl_2 \cdot 2H_2O$		cr	214.1562	—	-1677.4	—	—	—	—
$ZrOCl_2 \cdot 3.5H_2O$		cr	241.1793	—	-2135.5	—	—	—	—
$ZrOCl_2 \cdot 6H_2O$		cr	286.2178	—	-2884.9	—	—	—	—
$ZrOCl_2 \cdot 8H_2O$		cr	322.2486	—	-3471.9	—	—	—	—
$ZrBr_4$		cr	410.8560	—	-760.7	—	—	—	—
		g	410.8560	—	-643.5	—	—	—	—
	in 100 $HCOOC_2H_5$ in ethyl formate		410.8560	—	-874.5	—	—	—	—
	in 85 $CH_3COOC_2H_5$ in ethyl acetate		410.8560	—	-868.2	—	—	—	—
	in 65 $C_3H_7COOC_2H_5$ ethyl butyrate		410.8560	—	-867.8	—	—	—	—

Table 58:**Zr** | **ZIRCONIUM** (Prepared 1970) — Continued | Table 58:**Zr**

Substance Formula and Description		State	Molar mass g mol⁻¹	0 K	298.15 K (25°C) and 0.1 MPa (1 bar)				
				$\Delta_f H_0^\circ$ kJ mol^{-1}	$\Delta_f H^\circ$	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H_0^\circ$	S° J mol^{-1} K^{-1}	C_p
$ZrOBr_2$		aq	267.0374	—	-1087.4	—	—	—	—
$ZrOBr_2 \cdot 3.5H_2O$		cr	330.0913	—	-2050.2	—	—	—	—
$ZrOBr_2 \cdot 8H_2O$		cr	411.1606	—	-3382.3	—	—	—	—
ZrI_4		cr	598.8376	—	-481.6	—	—	—	—
		g	598.8376	—	-351.9	—	—	—	—
ZrI_4	in 250 $CH_3COOC_2H_5$ in ethyl acetate		598.8376	—	-584.9	—	—	—	—
ZrS_2		cr	155.3480	—	-566.1	—	—	—	—
$Zr(SO_4)_2$		cr	283.3432	—	-2217.1	—	—	—	172.
$Zr(SO_4)_2^{2-}$		aq	283.3432	—	-2636.3	—	—	—	—
$Zr(SO_4)_2 \cdot H_2O$		cr	301.3586	—	-2553.9	—	—	—	—
$Zr(SO_4)_2 \cdot 4H_2O$		cr	355.4048	—	-3454.3	—	—	—	—
ZrN		cr	105.2267	-361.58	-364.8	-336.4	6.590	38.87	40.42
		g	105.2267	—	561.	—	—	—	—
$ZrF_4 \cdot NH_4F$		cr	204.2507	—	-2412.5	—	—	—	—
$ZrF_4 \cdot NH_4F \cdot H_2O$		cr	222.2661	—	-2708.3	—	—	—	—
$ZrF_4 \cdot 2NH_4F$		cr	241.2878	—	-2898.7	—	—	—	—
$ZrF_4 \cdot 3NH_4F$		cr	278.3249	—	-3366.4	—	—	—	—
ZrC		cr	103.2312	-202.21	-202.9	-199.6	5.862	33.30	37.91
$ZrCl_4 \cdot 2CH_3CN$	acetonitrile	cr	315.1382	—	-839.3	—	—	—	—
$ZrBr_4 \cdot 2CH_3CN$		cr	492.9622	—	-631.8	—	—	—	—
$ZrSi$		cr	119.3060	—	-155.	—	—	—	—
$ZrSi_2$		cr	147.3920	—	-159.	—	—	—	—
Zr_2Si		cr	210.5260	—	-209.	—	—	—	—
Zr_3Si		cr	301.7460	—	-218.	—	—	—	—
Zr_3Si_2		cr	329.8320	—	-385.	—	—	—	—
Zr_5Si_3		cr	540.3580	—	-577.	—	—	—	—
Zr_6Si_5		cr	687.7500	—	-858.	—	—	—	—
$ZrSiO_4$		cr	183.3036	-2022.21	-2033.4	-1919.1	14.903	84.1	98.66
ZrB_2		cr	112.8420	-325.05	-326.4	-322.2	6.653	35.94	48.24

Table 59:**Hf** **HAFNIUM** (Prepared 1970) Table 59:**Hf**

Substance Formula and Description		State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
Hf		cr	178.4900	0	0	0	5.845	43.56	25.73
		g	178.4900	618.90	619.2	576.5	6.197	186.892	20.803
Hf^{+}		g	178.4900	1273.2	1279.9	—	6.197	—	—
Hf^{2+}		g	178.4900	2707.	2720.	—	6.197	—	—
Hf^{3+}		g	178.4900	4954.	4975.	—	6.197	—	—
Hf^{4+}		g	178.4900	8167.	8192.	—	—	—	—
HfO		g	194.4894	—	50.	—	—	—	—
HfO_2		cr	210.4888	—	-1144.7	-1088.2	—	59.33	60.25
	hydrous precipitate	cr2	210.4888	—	-1125.5	—	—	—	—
$HfOOH^{+}$		aq	211.4968	—	-1169.4	—	—	—	—
HfF_4	monoclinic	cr	254.4836	—	-1930.5	-1830.4	—	113.	—
		g	254.4836	—	-1669.8	—	—	—	—
$HfCl_4$		cr	320.3020	—	-990.35	-901.25	—	190.8	120.50
		g	320.3020	—	-884.5	—	—	—	—
		aq	320.3020	—	-1266.5	—	—	—	—
$HfCl_4$	in 80 $C_6H_5NO_2$		320.3020	—	-1037.2	—	—	—	—
HfN		cr	192.4967	—	-369.4	—	—	—	—
HfC		cr	190.5012	—	-251.5	—	—	—	—
HfB		cr	189.3010	—	-197.	—	—	—	—
HfB_2		cr	200.1120	-335.10	-336.0	-332.2	7.41	42.7	49.75

Table 60:Sc — **SCANDIUM** (Prepared 1970) — Table 60:Sc

Substance Formula and Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
Sc	cr	44.9560	0	0	0	5.217	34.64	25.52
	g	44.9560	376.02	377.8	336.03	7.004	174.79	22.09
Sc^+	g	44.9560	1009.097	1017.252	—	7.163	—	—
Sc^{2+}	g	44.9560	2244.080	2258.331	—	7.063	—	—
Sc^{3+}	g	44.9560	4632.730	4652.311	—	6.197	—	—
Sc^{4+}	g	44.9560	11723.1	11749.1	—	6.197	—	—
Sc^{5+}	g	44.9560	20587.4	20619.6	—	6.197	—	—
Sc^{6+}	g	44.9560	31267.	31305.	—	6.197	—	—
Sc^{7+}	g	44.9560	44581.	44627.	—	6.197	—	—
Sc^{8+}	g	44.9560	59831.	59886.	—	6.197	—	—
Sc^{9+}	g	44.9560	77203.	77258.	—	6.197	—	—
Sc^{10+}	g	44.9560	98922.	98985.	—	6.197	—	—
Sc^{11+}	g	44.9560	123026.	123097.	—	6.197	—	—
Sc^{12+}	g	44.9560	189347.	189422.	—	6.197	—	—
Sc^{13+}	g	44.9560	262354.	262437.	—	6.197	—	—
Sc^{14+}	g	44.9560	342515.	342603.	—	6.197	—	—
Sc^{15+}	g	44.9560	432006.	432103.	—	—	—	—
Sc^{3+}	ao	44.9560	—	-614.2	-586.6	—	-255.	—
Sc_2	g	89.9120	649.	648.1	592.4	10.0	255.	36.4
ScO	g	60.9554	-56.5	-57.24	-83.28	8.786	224.58	30.88
Sc_2O	g	105.9114	-25.	-28.9	—	11.3	—	46.9
Sc_2O_3	cr	137.9102	-1899.33	-1908.82	-1819.36	13.97	77.0	94.22
$ScH_{1.97}$	cr	46.9418	—	-134.7	—	—	—	—
ScH_2	cr	46.9720	—	-191.6	—	—	—	—
$ScOH^{2+}$	ao	61.9634	—	-861.5	-801.2	—	-134.	—
$Sc(OH)_3$	cr	95.9782	—	-1363.6	-1233.3	—	100.	—
ScF	g	63.9544	-138.	-138.9	-164.4	8.945	222.32	32.38
ScF_2	g	82.9528	-640.	-642.2	-655.2	11.88	280.4	48.1
ScF_3	cr	101.9512	—	-1629.2	-1555.6	—	92.	—
	g	101.9512	-1244.3	-1247.	-1234.	16.02	300.5	67.8
ScCl	g	80.4090	113.	112.5	86.2	9.397	234.41	35.15
$ScCl^{2+}$	ao	80.4090	—	-793.3	-722.6	—	-226.	—
$ScCl_2$	g	115.8620	—	—	—	13.0	303.4	52.7
$ScCl_2^+$	ao	115.8620	—	-977.4	-862.	—	-192.	—
$ScCl_3$	cr	151.3150	—	-925.1	—	—	—	—
$ScCl_3$ in 5 500 H_2O		151.3150	—	-1124.7	—	—	—	—
$ScCl_3 \cdot 6H_2O$	cr	259.4074	—	-2789.1	—	—	—	—
$Sc(OH)_2Cl$	cr	114.4238	—	-1268.	-1156.0	—	109.	—
$Sc_2(OH)_5Cl$	cr	210.4020	—	—	-2239.9	—	—	—
$ScBr^{2+}$	ao	124.8650	—	-740.6	-695.4	—	-172.	—
$ScBr_2$	g	204.7740	—	—	—	13.8	324.8	54.4
$ScBr_2^+$	ao	204.7740	—	-868.2	-800.8	—	-105.	—
$ScBr_3$	cr	284.6830	—	-743.1	—	—	—	—
ScI_2	g	298.7648	—	—	—	14.2	341.5	55.6
ScS	g	77.0200	175.3	174.9	124.2	9.2	235.7	33.5
$Sc(SO_4)^+$	ao	141.0176	—	—	-1345.9	—	—	—
$Sc(SO_4)_2^-$	ao	237.0792	—	—	-2098.1	—	—	—
$Sc_2(SO_4)_3$	cr	378.0968	—	—	—	—	—	259.4
$ScSeO_4^+$	ao	187.9136	—	-1229.7	-1038.4	—	-222.	—
$Sc(SeO_4)_2^-$	ao	330.8712	—	-1711.	-1483.9	—	238.	—

Table 60:Sc SCANDIUM (Prepared 1970) — Continued Table 60:Sc

Substance Formula and Description	State	Molar mass g mol^{-1}	0 K $\Delta_f H^\circ_0$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H^\circ_0$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
$Sc_2(SeO_3)_3 \cdot 10H_2O$	cr	650.9406	—	−5550.1	—	—	—	—
$ScNO_3^{2+}$	ao	106.9609	—	—	−704.6	—	—	—
ScAs	cr	119.8776	—	−268.	—	—	—	—
ScC_2	g	68.9784	598.	600.8	—	—	—	—
$Sc_2(C_2O_4)_3$ oxalate	cr	353.9720	—	—	—	—	—	519.
$Sc(HCO_2)_3$ formate	cr	180.0100	—	—	—	—	—	226.
$ScCNS^{2+}$	ao	103.0379	—	—	−500.4	—	—	—

Table 61:Y — **YTTRIUM** (Prepared 1970) — Table 61:Y

Substance Formula and Description	State	Molar mass g mol^{-1}	0 K: $\Delta_f H_0^\circ$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar): $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H_0^\circ$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
Y	cr	88.9050	0	0	0	5.966	44.43	26.53
	g	88.9050	420.45	421.3	381.1	6.858	179.48	25.86
Y^+	g	88.9050	1020.31	1027.67	—	7.150	—	—
Y^{2+}	g	88.9050	2200.87	2213.88	—	6.573	—	—
Y^{3+}	g	88.9050	4180.69	4199.86	—	—	—	—
Y^{4+}	g	88.9050	10029.	10054.	—	6.197	—	—
Y^{5+}	g	88.9050	17460.	17489.	—	—	—	—
Y^{6+}	g	88.9050	26435.	26472.	—	—	—	—
Y^{3+}	ao	88.9050	—	-723.4	-693.8	—	-251.	—
Y_2	g	177.8100	686.	684.1	630.5	10.0	268.	36.4
YO	g	104.9044	-38.	-38.9	-64.9	8.849	233.91	31.51
Y_2O	g	193.8094	8.	4.2	—	12.1	—	49.0
Y_2O_2	g	209.8088	-527.	-533.0	—	14.6	—	66.1
Y_2O_3	cr	225.8082	-1897.03	-1905.31	-1816.60	16.665	99.08	102.51
YH_2	cr	90.9210	-217.36	-225.9	-185.3	5.870	38.41	34.48
YD_2	cr	92.9332	-220.62	-228.0	-184.5	6.941	43.05	45.06
$YH_{2.6}$	cr	91.5258	—	-252.7	—	—	—	—
YH_3	cr	91.9290	-255.85	-267.8	-208.7	6.749	41.92	43.35
YD_3	cr	94.9473	-259.95	-270.3	-207.1	8.473	50.33	57.40
$Y(OH)^{2+}$	ao	105.9124	—	—	-879.1	—	—	—
$Y(OH)_3$	cr	139.9272	—	—	-1291.1	—	—	—
$Y_2(OH)_2{}^{4+}$	ao	211.8248	—	—	-1780.3	—	—	—
YF	g	107.9034	-136.8	-138.	-163.	9.050	231.82	33.14
YF_2	g	126.9018	—	—	—	12.1	290.1	49.0
YF_3	cr	145.9002	—	-1718.8	-1644.7	—	100.	—
YF_3	g	145.9002	-1286.2	-1288.7	-1277.8	16.65	311.8	70.3
YCl	g	124.3580	201.	200.0	173.6	9.565	244.16	35.82
YCl^{2+}	ao	124.3580	—	-895.4	-831.4	—	-192.	—
YCl_2	g	159.8110	—	—	—	13.4	313.9	54.0
$YCl_2{}^+$	g	159.8110	531.	536.0	—	—	—	—
YCl_3	cr	195.2640	—	-1000.0	—	—	—	—
	g	195.2640	-749.	-750.2	—	18.4	—	75.
$YCl_3{}^+$	g	195.2640	485.	490.4	—	—	—	—
in 4 000 H_2O		195.2640	—	-1221.56	—	—	—	—
$YCl_3 \cdot 6H_2O$	cr	303.3564	—	-2892.4	-2477.0	—	385.	—
$Y_2Cl_5{}^+$	g	355.0750	—	-397.	—	—	—	—
$(YCl_3)_2$	g	390.5280	—	-1607.	—	—	—	—
$Y(OH)_2Cl$	cr	158.3728	—	—	-1246.3	—	—	—
$Y_2(OH)_5Cl$	cr	298.3000	—	—	-2549.1	—	—	—
YBr^{2+}	ao	168.8140	—	-852.7	-801.7	—	-180.	—
YBr_2	g	248.7230	—	—	—	14.2	334.8	55.2
YI_2	g	342.7138	—	—	—	14.6	351.6	56.5
YI_3	cr	469.6182	—	-616.7	—	—	—	—
$Y(IO_3)_3$	cr	613.6128	—	—	-1134.6	—	—	—
YS	g	120.9690	176.	174.5	124.2	9.2	243.	34.3
$YSO_4{}^+$	ao	184.9666	—	-1615.4	-1452.2	—	-121.	—
$Y(SO_4)_2{}^-$	ao	281.0282	—	-2518.8	-2201.5	—	-71.	—
$Y_2(SO_4)_3$	cr	465.9948	—	—	-3626.5	—	—	577.
$Y_2(SO_4)_3 \cdot 8H_2O$	cr	610.1180	—	—	-5572.9	—	—	—
$Y_2(SeO_3)_3$	cr	558.6846	—	-3020.0	—	—	—	—

Substance Formula and Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H_0^\circ$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H_0^\circ$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
YNO_3^{2+}	ao	150.9099	—	—	-805.0	—	—	—
YAs	cr	163.8266	—	-323.8	—	—	—	—
YC_2	cr	112.9274	—	-109.	-109.	—	54.	—
	g	112.9274	594.	596.6	537.2	10.5	255.	44.8
YC_2^+	g	112.9274	1243.	1251.	—	—	—	—
$YC_2O_4^+$ oxalate	ao	176.9250	—	—	-1404.9	—	—	—
$Y(C_2O_4)_2^-$	ao	264.9450	—	—	-2099.4	—	—	—
$Y(C_2O_4)_3^{3-}$	ao	352.9650	—	—	-2780.9	—	—	—
$Y_2(CO_3)_3$	cr	357.8382	—	—	-3147.9	—	—	—
$Y_2(C_2O_4)_3 \cdot 9H_2O$	cr	604.0086	—	—	-5705.5	—	—	—
$YCH_3CO_2^{2+}$ acetate	ao	147.9502	—	-1195.8	—	—	—	—
$Y(CH_3CO_2)_2^+$	ao	206.9954	—	-1672.8	—	—	—	—
$Y(CH_3COO)_3$	ai	266.0406	—	-2159.4	—	—	—	—
$YCl_3 \cdot CH_3NH_2$ methylamine	cr	226.3219	—	-1108.3	—	—	—	—
$YCl_3 \cdot 2CH_3NH_2$	cr	257.3798	—	-1197.	—	—	—	—
$YCl_3 \cdot 3CH_3NH_2$	cr	288.4377	—	-1276.	—	—	—	—
$YCl_3 \cdot 4CH_3NH_2$	cr	319.4956	—	-1343.	—	—	—	—
$YCNS^{2+}$	ao	146.9869	—	—	-605.4	—	—	—
YZn	cr	154.2750	—	-84.1	-77.0	—	63.	—
YZn_2 α	cr	219.6450	—	-143.1	-131.4	—	88.	—
YZn_3	cr	285.0150	—	-164.4	-149.0	—	117.	—
YZn_4	cr	350.3850	—	-186.2	-168.2	—	151.	—
YZn_5	cr	415.7550	—	-218.0	-194.1	—	172.	—
YZn_{11}	cr	807.9750	—	-313.4	-283.3	—	402.	—
Y_2Zn_{17}	cr	1289.1000	—	-605.8	-549.4	—	607.	—
$Y(ReO_4)_3$	cr	839.4978	—	-2936.7	-2633.2	—	368.	—
$YNbO_4$	cr	245.8086	—	—	—	—	—	115.5

Table 62:**Lu** **LUTETIUM** (Prepared 1972) Table 62:**Lu**

Substance Formula and Description		State	Molar mass	0 K	298.15 K (25°C) and 0.1 MPa (1 bar)				
				$\Delta_f H_0^\circ$	$\Delta_f H^\circ$	$\Delta_f G^\circ$	$H^\circ - H_0^\circ$	S°	C_p
			g mol^{-1}	kJ mol^{-1}		kJ mol^{-1}		J mol^{-1} K^{-1}	
Lu		cr	174.9700	0	0	0	6.376	50.96	26.86
		g	174.9700	427.77	427.6	387.8	6.201	184.800	20.861
Lu^+		g	174.9700	951.27	957.30	—	6.197	—	—
Lu^{2+}		g	174.9700	2291.2	2303.3	—	6.197	—	—
Lu^{3+}		g	174.9700	4314.	4330.	—	6.197	—	—
Lu^{4+}		g	174.9700	8678.	8703.	—	6.197	—	—
Lu^{3+}		ao	174.9700	—	-665.	-628.	—	-264.	25.
LuO	doublet Σ	g	190.9694	-13.	-14.6	-41.0	8.853	242.07	31.581
Lu_2O_3		cr	397.9382	-1869.96	-1878.2	-1789.0	17.539	109.96	101.75
LuH	singlet Σ	g	175.9780	—	—	—	8.678	213.49	29.455
LuF^{2+}		ao	193.9684	—	—	-931.4	—	—	—
$LuCl_3$		cr	281.3290	—	-945.6	—	—	—	—
		g	281.3290	—	-649.	—	—	—	—
		ai	281.3290	—	-1167.	-1021.	—	-96.	-385.
$LuCl_3 \cdot 6H_2O$		cr	389.4214	-2792.44	-2830.9	-2410.9	58.41	376.1	343.1
LuOCl		cr	226.4224	—	-950.	—	—	—	—
$Lu(BrO_3)_3$	in 24.0 H_2O, saturated		558.6916	—	-870.7	—	—	—	—
	in 5 500 H_2O		558.6916	—	-864.00	—	—	—	—
$Lu(BrO_3)_3 \cdot 9H_2O$		cr	720.8302	—	-3488.6	—	—	—	—
LuI_3		cr	555.6832	—	-548.	—	—	—	—
$Lu(IO_3)_3$		cr	699.6778	—	1339.	—	—	—	—
LuS		g	207.0340	201.	—	—	—	—	—
$LuSO_4^+$		ao	271.0316	—	-1561.	-1393.	—	-130.	—
$Lu(SO_4)_2^-$		ao	367.0932	—	-2464.	-2146.	—	-59.	—
$Lu(NO_3)_3$	in 900 H_2O		360.9847	—	-1284.70	—	—	—	—
$Lu(NO_3)_3 \cdot 5H_2O$		cr	451.0617	—	-2703.95	—	—	—	—
$Lu_2P_2O_7^{2-}$		ao	523.8834	—	—	-3301.	—	—	—
LuAs		cr	249.8916	—	-314.	—	—	—	—
$LuC_2O_4^+$	oxalate	ao	262.9900	—	—	-1359.8	—	—	—
$LuHCOO^{2+}$	formate	ao	219.9880	—	—	-984.1	—	—	—
$Lu(HCOO)_2^+$		ao	265.0060	—	—	-1341.3	—	—	—
$LuCH_2OHCOO^{2+}$	glycolate	ao	250.0146	—	-1320.5	—	—	—	—
$Lu(CH_2OHCOO)_2^+$		ao	325.0592	—	-1975.3	—	—	—	—
LuAu		g	371.9370	485.	—	—	—	—	—
LuPt		g	370.0600	577.	—	—	—	—	—
$LuMoO_4^+$		ao	334.9076	—	—	-1488.2	—	—	—

Table 63:**Yb** **YTTERBIUM** (Prepared 1972) Table 63:**Yb**

Substance Formula and Description		State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
Yb		cr	173.0400	0	0	0	6.711	59.87	26.74
		g	173.0400	152.80	152.3	118.4	6.197	173.126	20.786
Yb^+		g	173.0400	756.05	761.91	—	6.197	—	—
Yb^{2+}		g	173.0400	1931.59	1943.64	—	6.197	—	—
Yb^{3+}		g	173.0400	4348.8	4367.3	—	6.197	—	—
Yb^{2+}		ao	173.0400	—	—	-527.	—	—	—
Yb^{3+}		ao	173.0400	—	-674.5	-644.0	—	-238.	25.
Yb_2O_3		cr	394.0782	-1807.82	-1814.6	-1726.7	19.62	133.1	115.35
YbH		g	174.0480	—	—	—	8.715	220.44	30.033
YbD		g	175.0541	—	—	—	8.845	226.71	31.522
YbH_2		cr	175.0560	—	-176.1	—	—	—	—
YbF^{2+}		ao	192.0384	—	—	-948.1	—	—	—
$YbCl_2$		cr	243.9460	—	-799.6	—	—	—	—
$YbCl_3$		cr	279.3990	—	-959.8	—	—	—	—
		ai	279.3990	—	-1176.1	-1037.6	—	-71.	-385.
$YbCl_3$	in 13.86 H_2O, saturated		279.3990	—	-1141.060	—	—	—	—
	in 15 H_2O		279.3990	—	-1143.805	—	—	—	—
	in 20 H_2O		279.3990	—	-1151.826	—	—	—	—
	in 25 H_2O		279.3990	—	-1156.165	—	—	—	—
	in 30 H_2O		279.3990	—	-1158.842	—	—	—	—
$YbCl_3$	in 40 H_2O		279.3990	—	-1161.905	—	—	—	—
	in 50 H_2O		279.3990	—	-1163.662	—	—	—	—
	in 75 H_2O		279.3990	—	-1165.959	—	—	—	—
	in 100 H_2O		279.3990	—	-1167.144	—	—	—	—
	in 150 H_2O		279.3990	—	-1168.428	—	—	—	—
$YbCl_3$	in 200 H_2O		279.3990	—	-1169.189	—	—	—	—
	in 300 H_2O		279.3990	—	-1170.014	—	—	—	—
	in 400 H_2O		279.3990	—	-1170.537	—	—	—	—
	in 500 H_2O		279.3990	—	-1170.909	—	—	—	—
	in 600 H_2O		279.3990	—	-1171.198	—	—	—	—
$YbCl_3$	in 700 H_2O		279.3990	—	-1171.424	—	—	—	—
	in 800 H_2O		279.3990	—	-1171.616	—	—	—	—
	in 900 H_2O		279.3990	—	-1171.775	—	—	—	—
	in 1 000 H_2O		279.3990	—	-1171.909	—	—	—	—
	in 1 500 H_2O		279.3990	—	-1172.407	—	—	—	—
$YbCl_3$	in 2 000 H_2O		279.3990	—	-1172.758	—	—	—	—
	in 3 000 H_2O		279.3990	—	-1173.214	—	—	—	—
	in 4 000 H_2O		279.3990	—	-1173.516	—	—	—	—
	in 5 000 H_2O		279.3990	—	-1173.729	—	—	—	—
	in 7 000 H_2O		279.3990	—	-1174.026	—	—	—	—
$YbCl_3$	in 10 000 H_2O		279.3990	—	-1174.311	—	—	—	—
	in 15 000 H_2O		279.3990	—	-1174.595	—	—	—	—
	in 20 000 H_2O		279.3990	—	-1174.771	—	—	—	—
	in 50 000 H_2O		279.3990	—	-1175.227	—	—	—	—
	in 100 000 H_2O		279.3990	—	-1175.474	—	—	—	—
$YbCl_3$	in ∞ H_2O		279.3990	—	-1176.1	—	—	—	—
	in 40 000 $(CH_3)_2SO$ in dimethylsulfoxide		279.3990	—	-1197.	—	—	—	—
$YbCl_3{\cdot}6H_2O$		cr	387.4914	—	-2846.0	-2428.9	—	395.8	341.4
YbOCl		cr	224.4924	—	-961.9	—	—	—	—

Table 63:**Yb** **YTTERBIUM** (Prepared 1972) — Continued Table 63:**Yb**

Substance Formula and Description		State	Molar mass g mol^{-1}	0 K $\Delta_f H^\circ_0$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H^\circ_0$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
$Yb(BrO_3)_3$	in 25.9 H_2O, saturated		556.7616	—	–877.8	—	—	—	—
	in 5 500 H_2O		556.7616	—	–873.2	—	—	—	—
$Yb(BrO_3)_3 \cdot 9H_2O$		cr	718.9002	—	–3499.1	—	—	—	—
$Yb(IO_3)_3$		cr	697.7478	—	–1347.	—	—	—	—
$YbSO_4^+$		ao	269.1016	—	–1568.6	–1407.4	—	–105.	—
$Yb(SO_4)_2^-$		ao	365.1632	—	–2474.0	–2161.7	—	–38.	—
$Yb(NO_3)_3$	in 200 H_2O		359.0547	—	–1292.843	—	—	—	—
	in 500 H_2O		359.0547	—	–1293.530	—	—	—	—
	in 1 000 H_2O		359.0547	—	–1294.086	—	—	—	—
	in 2 000 H_2O		359.0547	—	–1294.626	—	—	—	—
$Yb(NO_3)_3$	in 5 000 H_2O		359.0547	—	–1295.237	—	—	—	—
	in 10 000 H_2O		359.0547	—	–1295.592	—	—	—	—
	in 20 000 H_2O		359.0547	—	–1295.981	—	—	—	—
	in 50 000 H_2O		359.0547	—	–1296.350	—	—	—	—
	in 100 000 H_2O		359.0547	—	–1296.504	—	—	—	—
$Yb(NO_3)_3$	in 200 000 H_2O		359.0547	—	–1296.58	—	—	—	—
	in 250 000 H_2O		359.0547	—	–1296.58	—	—	—	—
	in ∞ H_2O		359.0547	—	–1296.6	—	—	—	—
YbC_2		cr	197.0624	—	–74.9	–77.4	—	79.	—
$Yb(C_2O_4)_2^-$	oxalate	ao	349.0800	—	—	–2058.	—	—	—
Yb_2OC		cr	374.0906	—	–707.	–682.	—	146.	—
$Yb_2(C_2O_4)_3 \cdot 5H_2O$		cr	700.2170	—	—	–4656.	—	—	—
$YbCH_3CO_2^{2+}$	acetate	ao	232.0852	—	–1145.79	–1022.90	—	–70.3	—
$YbCH_2OHCOO^{2+}$	glycolate	ao	248.0846	—	–1328.00	—	—	—	—
$Yb(CH_3CO_2)_2^+$		ao	291.1304	—	–1621.13	–1399.19	—	75.7	—
$Yb(CH_2OHCOO)_2^+$		ao	323.1292	—	–1982.80	—	—	—	—
$Yb(CH_3CO_2)_3$		ao	350.1756	—	–2105.0	–1772.60	—	183.3	—
$Yb(CH_2OHCOO)_3$		ao	398.1738	—	–2638.4	—	—	—	—
$Yb(CH_2OHCOO)_4^-$		ao	473.2184	—	–3286.1	—	—	—	—

Table 64:**Tm** **THULIUM** (Prepared 1972) Table 64:**Tm**

Substance Formula and Description		State	Molar mass g mol⁻¹	0 K $\Delta_f H_0^\circ$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H_0^\circ$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
Tm		cr	168.9340	0	0	0	7.393	74.01	27.03
		g	168.9340	233.43	232.2	197.5	6.197	190.113	20.786
Tm^+		g	168.9340	830.1	835.5	—	6.761	—	—
Tm^{2+}		g	168.9340	1992.8	2004.6	—	6.761	—	—
Tm^{3+}		g	168.9340	4276.	4297.	—	—	—	—
Tm^{3+}		ao	168.9340	—	-697.9	-662.0	—	-243.	25.
TmO		g	184.9334	-79.	—	—	—	—	—
TmO^+		g	184.9334	544.	—	—	—	—	—
Tm_2O_3		cr	385.8662	-1881.75	-1888.7	-1794.5	20.88	139.7	116.7
$TmCl_3$		cr	275.2930	—	-986.6	—	—	—	—
$TmCl_3$		g	275.2930	—	-695.	—	—	—	—
		ai	275.2930	—	-1199.1	-1055.6	—	-75.	-385.
	in 200 H_2O		275.2930	—	-1192.218	—	—	—	—
	in 300 H_2O		275.2930	—	-1193.047	—	—	—	—
	in 400 H_2O		275.2930	—	-1193.565	—	—	—	—
$TmCl_3$	in 500 H_2O		275.2930	—	-1193.938	—	—	—	—
	in 600 H_2O		275.2930	—	-1194.231	—	—	—	—
	in 700 H_2O		275.2930	—	-1194.469	—	—	—	—
	in 800 H_2O		275.2930	—	-1194.658	—	—	—	—
	in 900 H_2O		275.2930	—	-1194.808	—	—	—	—
$TmCl_3$	in 1 000 H_2O		275.2930	—	-1194.942	—	—	—	—
	in 1 500 H_2O		275.2930	—	-1195.440	—	—	—	—
	in 2 000 H_2O		275.2930	—	-1195.779	—	—	—	—
	in 3 000 H_2O		275.2930	—	-1196.239	—	—	—	—
	in 4 000 H_2O		275.2930	—	-1196.549	—	—	—	—
$TmCl_3$	in 5 000 H_2O		275.2930	—	-1196.758	—	—	—	—
	in 7 000 H_2O		275.2930	—	-1197.059	—	—	—	—
	in 10 000 H_2O		275.2930	—	-1197.344	—	—	—	—
	in 15 000 H_2O		275.2930	—	-1197.620	—	—	—	—
	in 20 000 H_2O		275.2930	—	-1197.791	—	—	—	—
$TmCl_3$	in 50 000 H_2O		275.2930	—	-1198.243	—	—	—	—
	in 100 000 H_2O		275.2930	—	-1198.490	—	—	—	—
	in ∞ H_2O		275.2930	—	-1199.1	—	—	—	—
$TmCl_3 \cdot 6H_2O$		cr	383.3854	—	—	—	—	399.6	—
TmOCl		cr	220.3864	—	-987.4	—	—	—	—
TmI_3		cr	549.6472	—	-601.7	—	—	—	—
$Tm(IO_3)_3$		cr	693.6418	—	-1372.	—	—	—	—
$TmSO_4^+$		ao	264.9956	—	-1592.0	-1425.9	—	-109.	—
$Tm(SO_4)_2^-$		ao	361.0572	—	-2497.4	-2180.6	—	-42.	—
TmC_2		cr	192.9564	—	-92.	—	—	—	—
TmC_2		g	192.9564	561.	561.5	508.3	10.33	264.	43.9
$TmCH_2OHCOO^{2+}$	glycolate	ao	243.9786	—	-1351.39	—	—	—	—
$Tm(CH_2OHCOO)_2^+$		ao	319.0232	—	-2006.06	—	—	—	—
$Tm(CH_2OHCOO)_3$		ao	394.0678	—	-2661.9	—	—	—	—

Table 65:Er — **ERBIUM** (Prepared 1972) — Table 65:Er

Substance Formula and Description		State	Molar mass g mol⁻¹	0 K	298.15 K (25°C) and 0.1 MPa (1 bar)				
				$\Delta_f H^\circ_0$ kJ mol⁻¹	$\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
Er		cr	167.2600	0	0	0	7.385	73.18	28.12
		g	167.2600	318.32	317.1	280.7	6.19	195.59	20.79
Er^+		g	167.2600	907.5	912.9	—	6.686	—	—
Er^{2+}		g	167.2600	2059.	2071.	—	6.197	—	—
Er^{3+}		g	167.2600	4251.	4268.	—	6.197	—	—
Er^{3+}		ao	167.2600	—	−705.4	−669.1	—	−244.3	21.
ErO		g	183.2594	−54.	—	—	—	—	—
ErO^+		g	183.2594	552.	—	—	—	—	—
Er_2O_3		cr	382.5182	−1889.87	−1897.9	−1808.7	20.00	155.6	108.49
ErH_2		cr	169.2760	—	−205.0	—	—	—	—
ErD_2		cr	171.2882	—	−206.3	—	—	—	—
ErH_3		cr	170.2840	—	−243.	—	—	—	—
ErF		g	186.2584	—	−188.	—	—	—	—
ErF^{2+}		ao	186.2584	—	—	−973.2	—	—	—
ErF_2		g	205.2568	—	−686.	—	—	—	—
ErF_3		cr	224.2552	—	−1711.	—	—	—	—
		g	224.2552	—	−1230.	—	—	—	—
$ErCl_3$		cr	273.6190	—	−998.7	—	—	—	100.
		g	273.6190	—	−699.	—	—	—	—
		ai	273.6190	—	−1207.1	−1062.7	—	−75.3	−389.
$ErCl_3$	in 300 H_2O		273.6190	—	−1201.10	—	—	—	—
	in 400 H_2O		273.6190	—	−1201.56	—	—	—	—
	in 500 H_2O		273.6190	—	−1201.94	—	—	—	—
	in 600 H_2O		273.6190	—	−1202.23	—	—	—	—
	in 700 H_2O		273.6190	—	−1202.44	—	—	—	—
$ErCl_3$	in 800 H_2O		273.6190	—	−1202.65	—	—	—	—
	in 900 H_2O		273.6190	—	−1202.82	—	—	—	—
	in 1 000 H_2O		273.6190	—	−1202.94	—	—	—	—
	in 1 500 H_2O		273.6190	—	−1203.49	—	—	—	—
	in 40 000 $(CH_3)_2SO$ in dimethylsulfoxide		273.6190	—	−1230.	—	—	—	—
$ErCl_3{\cdot}6H_2O$		cr	381.7114	−2836.42	−2874.4	−2454.0	60.21	398.7	343.1
$ErOCl$		cr	218.7124	—	−995.4	—	—	—	—
$Er(BrO_3)_3$	in 27.2 H_2O, saturated		550.9816	—	−910.0	—	—	—	—
	in 5 500 H_2O		550.9816	—	−904.2	—	—	—	—
$Er(BrO_3)_3{\cdot}9H_2O$		cr	713.1202	—	−3535.1	—	—	—	—
ErI_3		cr	547.9732	—	−613.0	—	—	—	—
$Er(IO_3)_3$		cr	691.9678	—	−1381.	—	—	—	—
$ErSO_4^+$		ao	263.3216	—	−1599.5	−1433.4	—	−109.	—
$Er(SO_4)_2^-$		ao	359.3832	—	−2503.3	−2188.1	—	−33.	—
ErC_2		g	191.2824	577.	578.2	524.6	10.33	264.	43.9
$ErC_2O_4^+$	oxalate	ao	255.2800	—	—	−1370.6	—	—	—
$Er(C_2O_4)_3^{3-}$		ao	431.3200	—	—	−2749.	—	—	—
$Er_2(C_2O_4)_3{\cdot}6H_2O$		cr	706.6724	—	—	−4949.	—	—	—
$ErCH_3CO_2^{2+}$	acetate	ao	226.3052	—	−1177.71	−1047.75	—	−80.3	—
$ErCH_2OHCOO^{2+}$	glycolate	ao	242.3046	—	−1358.34	—	—	—	—
$Er(CH_3CO_2)_2^+$		ao	285.3504	—	−1654.40	−1424.25	—	61.9	—
$Er(CH_2OHCOO)_2^+$		ao	317.3492	—	−2012.29	—	—	—	—
$Er(CH_3CO_2)_3$		ao	344.3956	—	−2141.83	−1798.21	—	159.0	—
$Er(CH_2OHCOO)_3$		ao	392.3938	—	−2667.7	—	—	—	—

Table 65:**Er** **ERBIUM** (Prepared 1972) — Continued Table 65:**Er**

Substance Formula and Description	State	Molar mass g mol^{-1}	0 K $\Delta_f H_0^\circ$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H_0^\circ$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
$Er(CH_2OHCOO)_4^-$	ao	467.4384	—	-3320.4	—	—	—	—

Table 66:**Ho** **HOLMIUM** (Prepared 1972) Table 66:**Ho**

Substance Formula and Description		State	Molar mass	0 K	298.15 K (25°C) and 0.1 MPa (1 bar)				
				$\Delta_f H_0^\circ$	$\Delta_f H^\circ$	$\Delta_f G^\circ$	$H^\circ - H_0^\circ$	S°	C_p
			g mol^{-1}	kJ mol^{-1}		kJ mol^{-1}		J mol^{-1} K^{-1}	
Ho		cr	164.9300	0	0	0	7.99	75.3	27.15
		g	164.9300	302.63	300.8	264.8	6.19	195.59	20.79
Ho^+		g	164.9300	883.7	888.3	—	6.494	—	—
Ho^{2+}		g	164.9300	2021.	2033.	—	6.197	—	—
Ho^{3+}		g	164.9300	4226.	4243.	—	6.197	—	—
Ho^{3+}		ao	164.9300	—	-705.0	-673.7	—	-226.8	17.
Ho_2		g	329.8600	527.	521.62	—	10.42	—	37.11
HoO		g	180.9294	-92.	—	—	—	—	—
HoO^+		g	180.9294	502.	—	—	—	—	—
Ho_2O_3		cr	377.8582	-1872.72	-1880.7	-1791.1	21.00	158.2	114.98
HoH_2		cr	166.9460	—	-216.3	—	—	—	—
HoD_2		cr	168.9582	—	-207.1	—	—	—	—
HoF		g	183.9284	—	-180.	—	—	—	—
HoF_2		g	202.9268	—	-682.	—	—	—	—
HoF_3		cr	221.9252	—	-1707.	—	—	—	—
HoF_3		g	221.9252	—	-1230.	—	—	—	—
$HoCl_3$		cr	271.2890	—	-1005.4	—	—	—	88.
		g	271.2890	—	-703.	—	—	—	—
		ai	271.2890	—	-1206.7	-1067.3	—	-57.7	-393.
	in 14.84 H_2O, saturated		271.2890	—	-1172.48	—	—	—	—
$HoCl_3$	in 15 H_2O		271.2890	—	-1172.821	—	—	—	—
	in 20 H_2O		271.2890	—	-1181.311	—	—	—	—
	in 25 H_2O		271.2890	—	-1185.946	—	—	—	—
	in 30 H_2O		271.2890	—	-1188.771	—	—	—	—
	in 40 H_2O		271.2890	—	-1192.013	—	—	—	—
$HoCl_3$	in 50 H_2O		271.2890	—	-1193.871	—	—	—	—
	in 75 H_2O		271.2890	—	-1196.285	—	—	—	—
	in 100 H_2O		271.2890	—	-1197.549	—	—	—	—
	in 150 H_2O		271.2890	—	-1198.892	—	—	—	—
	in 200 H_2O		271.2890	—	-1199.632	—	—	—	—
$HoCl_3$	in 300 H_2O		271.2890	—	-1200.490	—	—	—	—
	in 400 H_2O		271.2890	—	-1201.017	—	—	—	—
	in 500 H_2O		271.2890	—	-1201.390	—	—	—	—
	in 600 H_2O		271.2890	—	-1201.687	—	—	—	—
	in 700 H_2O		271.2890	—	-1201.921	—	—	—	—
$HoCl_3$	in 800 H_2O		271.2890	—	-1202.122	—	—	—	—
	in 900 H_2O		271.2890	—	-1202.289	—	—	—	—
	in 1 000 H_2O		271.2890	—	-1202.436	—	—	—	—
	in 2 000 H_2O		271.2890	—	-1203.310	—	—	—	—
	in 3 000 H_2O		271.2890	—	-1203.741	—	—	—	—
$HoCl_3$	in 4 000 H_2O		271.2890	—	-1204.017	—	—	—	—
	in 5 000 H_2O		271.2890	—	-1204.222	—	—	—	—
	in 7 000 H_2O		271.2890	—	-1204.519	—	—	—	—
	in 10 000 H_2O		271.2890	—	-1204.808	—	—	—	—
	in 15 000 H_2O		271.2890	—	-1205.105	—	—	—	—
$HoCl_3$	in 20 000 H_2O		271.2890	—	-1205.289	—	—	—	—
	in 50 000 H_2O		271.2890	—	-1205.762	—	—	—	—
	in 100 000 H_2O		271.2890	—	-1206.013	—	—	—	—
	in ∞ H_2O		271.2890	—	-1206.7	—	—	—	—
	in 40 000 $(CH_3)_2SO$ in dimethylsulfoxide		271.2890	—	-1226.	—	—	—	—

Table 66:**Ho** **HOLMIUM** (Prepared 1972) — Continued Table 66:**Ho**

Substance Formula and Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H_0^\circ$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H_0^\circ$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
$HoCl_3 \cdot 6H_2O$	cr	379.3814	-2840.10	-2878.2	-2459.8	60.63	406.18	347.3
HoOCl	cr	216.3824	—	-1000.8	—	—	—	—
$Ho(BrO_3)_3$ in 5 500 H_2O		548.6516	—	-903.7	—	—	—	—
$Ho(BrO_3)_3 \cdot 9H_2O$	cr	710.7902	—	-3538.0	—	—	—	—
HoI_3	cr	545.6432	—	-623.4	—	—	—	—
$Ho(IO_3)_3$	cr	689.6378	—	-1381.	—	—	—	—
HoS	g	196.9940	180.	—	—	—	—	—
$HoSO_4^+$	ao	260.9916	—	-1599.1	-1437.2	—	-92.	—
$Ho(SO_4)_2^-$	ao	357.0532	—	-2501.6	-2191.0	—	-17.	—
$Ho_2P_2O_7^{2+}$	ao	503.8034	—	—	-3385.6	—	—	—
HoAs	cr	239.8516	—	-301.	—	—	—	—
HoC_2	cr	188.9524	—	-109.	-111.7	—	96.	—
	g	188.9524	565.	565.3	—	10.33	—	43.9
HoC_4	g	212.9748	690.	—	—	—	—	—
Ho_2C_3	cr	365.8936	—	-234.	—	—	—	—
$HoHCOO^{2+}$ formate	ao	209.9480	—	—	-1030.9	—	—	—
$Ho(HCOO)_2^+$	ao	254.9660	—	—	-1386.9	—	—	—
$HoCH_3CO_2^{2+}$ acetate	ao	223.9752	—	-1177.75	-1052.52	—	-63.6	—
$HoCH_2OHCOO^{2+}$ glycolate	ao	239.9746	—	-1357.62	—	—	—	—
$Ho(CH_3CO_2)_2^+$	ao	283.0204	—	-1656.07	-1428.98	—	72.8	—
$Ho(CH_2OHCOO)_2^+$	ao	315.0192	—	-2011.58	—	—	—	—
$Ho(CH_3CO_2)_3$	ao	342.0656	—	-2144.09	-1803.31	—	169.5	—
$Ho(CH_2OHCOO)_3$	ao	390.0638	—	-2674.0	—	—	—	—
HoAg	g	272.8000	469.	465.01	—	10.13	—	36.78
HoAu	g	361.8970	418.	414.47	—	10.08	—	36.69
$HoMoO_4^+$	ao	324.8676	—	—	-1534.6	—	—	—

Table 67:**Dy** **DYSPROSIUM** (Prepared 1972) Table 67:**Dy**

Substance Formula	Description	State	Molar mass g mol^{-1}	0 K $\Delta_f H_0^\circ$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H_0^\circ$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
Dy		cr	162.5000	0	0	0	8.866	74.77	28.16
		g	162.5000	293.05	290.4	254.4	6.197	196.63	20.79
Dy^{+}		g	162.5000	866.1	869.9	—	6.355	—	—
Dy^{2+}		g	162.5000	1991.6	2001.6	—	—	—	—
Dy^{3+}		g	162.5000	4192.	4205.	—	—	—	—
Dy^{3+}		ao	162.5000	—	-699.	-665.	—	-231.0	21.
DyO		g	178.4994	-79.	—	—	—	—	—
DyO^{+}		g	178.4994	506.	—	—	—	—	—
Dy_2O_3		cr	372.9982	-1853.60	-1863.1	-1771.5	21.09	149.8	116.27
DyF		g	181.4984	—	-180.	—	—	—	—
DyF^{2+}		ao	181.4984	—	—	-969.4	—	—	—
$DyCl_3$	β	cr	268.8590	—	-1000.	—	—	—	—
	γ	cr2	268.8590	—	-987.	—	—	—	—
		ai	268.8590	—	-1197.	-1059.	—	-61.9	-389.
	in 300 H_2O		268.8590	—	-1190.419	—	—	—	—
$DyCl_3$	in 400 H_2O		268.8590	—	-1190.921	—	—	—	—
	in 500 H_2O		268.8590	—	-1191.289	—	—	—	—
	in 600 H_2O		268.8590	—	-1191.578	—	—	—	—
	in 700 H_2O		268.8590	—	-1191.812	—	—	—	—
	in 800 H_2O		268.8590	—	-1192.013	—	—	—	—
$DyCl_3$	in 900 H_2O		268.8590	—	-1192.185	—	—	—	—
	in 1 000 H_2O		268.8590	—	-1192.331	—	—	—	—
	in 1 500 H_2O		268.8590	—	-1192.879	—	—	—	—
	in 2 000 H_2O		268.8590	—	-1193.247	—	—	—	—
	in 3 000 H_2O		268.8590	—	-1193.724	—	—	—	—
$DyCl_3$	in 4 000 H_2O		268.8590	—	-1194.030	—	—	—	—
	in 5 000 H_2O		268.8590	—	-1194.247	—	—	—	—
	in 7 000 H_2O		268.8590	—	-1194.553	—	—	—	—
	in 10 000 H_2O		268.8590	—	-1194.837	—	—	—	—
	in 15 000 H_2O		268.8590	—	-1195.114	—	—	—	—
$DyCl_3$	in 20 000 H_2O		268.8590	—	-1195.285	—	—	—	—
	in 50 000 H_2O		268.8590	—	-1195.733	—	—	—	—
	in 100 000 H_2O		268.8590	—	-1195.980	—	—	—	—
	in ∞ H_2O		268.8590	—	-1197.	—	—	—	—
	in 40 000 $(CH_3)_2SO$ in dimethylsulfoxide		268.8590	—	-1209.	—	—	—	—
$DyCl_3 \cdot 6H_2O$		cr	376.9514	-2831.86	-2870.	-2451.	60.33	401.66	346.0
DyOCl		cr	213.9524	—	-987.	—	—	—	—
$Dy(BrO_3)_3$	in 36.0 H_2O, saturated		546.2216	—	-902.1	—	—	—	—
	in 5 500 H_2O		546.2216	—	-897.47	—	—	—	—
$Dy(BrO_3)_3 \cdot 9H_2O$		cr	708.3602	—	-3531.7	—	—	—	—
DyI_3		cr	543.2132	—	-607.	—	—	—	—
$Dy(IO_3)_3$		cr	687.2078	—	-1377.	—	—	—	—
$DySO_4^{+}$		ao	258.5616	—	-1590.	-1427.	—	-92.	—
$Dy(SO_4)_2^{-}$		ao	354.6232	—	-2494.	-2184.	—	-21.	—
$Dy_2P_2O_7^{2+}$		ao	498.9434	—	—	-3367.2	—	—	—
DyAs		cr	237.4216	—	-326.	—	—	—	—
DyC_2		g	186.5224	862.	862.3	808.3	10.33	268.	43.9
$Dy_2O_3 \cdot CO_2$		cr	417.0082	—	-2314.	—	—	—	—
$Dy_2(C_2O_4)_3 \cdot 10H_2O$	oxalate	cr	769.2140	—	—	-5890.	—	—	—

Substance Formula and Description	State	Molar mass g mol^{-1}	0 K $\Delta_f H^\circ_0$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H^\circ_0$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
$DyCH_3CO_2^{2+}$ acetate	ao	221.5452	—	-1172.48	-1044.36	—	-70.7	—
$DyCH_2OHCOO^{2+}$ glycolate	ao	237.5446	—	-1351.52	—	—	—	—
$Dy(CH_3CO_2)_2^+$	ao	280.5904	—	-1652.18	-1421.20	—	62.3	—
$Dy(CH_2OHCOO)_2^+$	ao	312.5892	—	-2005.85	—	—	—	—
$Dy(CH_3CO_2)_3$	cr	339.6356	—	-1992.	—	—	—	—
$Dy(CH_3CO_2)_3$	ao	339.6356	—	-2138.74	-1795.15	—	162.8	—
$Dy(CH_2OHCOO)_3$	ao	387.6338	—	-2662.86	—	—	—	—
$Dy(CH_2OHCOO)_4^-$	ao	462.6784	—	-3318.7	—	—	—	—
$DyCo_5$	cr	457.1660	—	—	—	33.514	232.76	161.25

Table 68:**Tb** **TERBIUM** (Prepared 1972) Table 68:**Tb**

Substance Formula and Description		State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$	S° J mol⁻¹ K⁻¹	C_p
Tb		cr	158.9240	0	0	0	9.427	73.22	28.91
		g	158.9240	390.62	388.7	349.7	7.49	203.58	24.56
Tb^{+}		g	158.9240	956.5	959.4	—	6.276	—	—
Tb^{2+}		g	158.9240	2067.	2075.	—	6.197	—	—
Tb^{3+}		g	158.9240	4180.	4197.	—	6.197	—	—
Tb^{3+}		ao	158.9240	—	-682.8	-651.9	—	-226.	17.
TbO		g	174.9234	-79.	—	—	—	—	—
TbO^{+}		g	174.9234	464.	—	—	—	—	—
TbO_2		cr	190.9228	—	-971.5	—	—	—	—
Tb_2O_3		cr	365.8462	—	-1865.2	—	—	—	115.9
Tb_7O_{12}		cr	1304.4608	—	-6677.7	—	—	—	413.0
$Tb_{11}O_{20}$		cr	2068.1520	—	-10562.5	—	—	—	640.
$TbCl_3$		cr	265.2830	—	-997.0	—	—	—	—
		ai	265.2830	—	-1184.1	-1045.5	—	-59.	-393.
	in 15.50 H_2O, saturated		265.2830	—	-1151.10	—	—	—	—
$TbCl_3$	in 20 H_2O		265.2830	—	-1158.516	—	—	—	—
	in 25 H_2O		265.2830	—	-1163.165	—	—	—	—
	in 30 H_2O		265.2830	—	-1166.018	—	—	—	—
	in 40 H_2O		265.2830	—	-1169.319	—	—	—	—
	in 50 H_2O		265.2830	—	-1171.173	—	—	—	—
$TbCl_3$	in 75 H_2O		265.2830	—	-1173.629	—	—	—	—
	in 100 H_2O		265.2830	—	-1174.913	—	—	—	—
	in 150 H_2O		265.2830	—	-1176.240	—	—	—	—
	in 200 H_2O		265.2830	—	-1176.980	—	—	—	—
	in 300 H_2O		265.2830	—	-1177.846	—	—	—	—
$TbCl_3$	in 400 H_2O		265.2830	—	-1178.382	—	—	—	—
	in 500 H_2O		265.2830	—	-1178.767	—	—	—	—
	in 600 H_2O		265.2830	—	-1179.051	—	—	—	—
	in 700 H_2O		265.2830	—	-1179.285	—	—	—	—
	in 800 H_2O		265.2830	—	-1179.478	—	—	—	—
$TbCl_3$	in 900 H_2O		265.2830	—	-1179.649	—	—	—	—
	in 1 000 H_2O		265.2830	—	-1179.788	—	—	—	—
	in 1 500 H_2O		265.2830	—	-1180.298	—	—	—	—
	in 2 000 H_2O		265.2830	—	-1180.649	—	—	—	—
	in 3 000 H_2O		265.2830	—	-1181.114	—	—	—	—
$TbCl_3$	in 4 000 H_2O		265.2830	—	-1181.424	—	—	—	—
	in 5 000 H_2O		265.2830	—	-1181.645	—	—	—	—
	in 7 000 H_2O		265.2830	—	-1181.959	—	—	—	—
	in 10 000 H_2O		265.2830	—	-1182.244	—	—	—	—
	in 15 000 H_2O		265.2830	—	-1182.536	—	—	—	—
$TbCl_3$	in 20 000 H_2O		265.2830	—	-1182.716	—	—	—	—
	in 50 000 H_2O		265.2830	—	-1183.172	—	—	—	—
	in 100 000 H_2O		265.2830	—	-1183.423	—	—	—	—
	in ∞ H_2O		265.2830	—	-1184.1	—	—	—	—
$TbCl_3 \cdot 6H_2O$		cr	373.3754	—	-2859.3	-2440.6	—	403.3	—
TbOCl		cr	210.3764	—	-975.	—	—	—	—
$Tb(BrO_3)_3$	in 39.1 H_2O, saturated		542.6456	—	-895.8	—	—	—	—
	in 5 500 H_2O		542.6456	—	-881.65	—	—	—	—
$Tb(BrO_3)_3 \cdot 9H_2O$		cr	704.7842	—	-3520.4	—	—	—	—
$Tb(IO_3)_3$		cr	683.6318	—	-1364.	—	—	—	—

Table 68:**Tb** **TERBIUM** (Prepared 1972) — Continued Table 68:**Tb**

Substance Formula and Description	State	Molar mass g mol^{-1}	0 K $\Delta_f H_0^\circ$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H_0^\circ$	S° J mol^{-1} K^{-1}	C_p
$TbSO_4^+$	ao	254.9856	—	-1576.9	-1416.2	—	-88.	—
$Tb(SO_4)_2^-$	ao	351.0472	—	-2482.8	-2171.8	—	-21.	—
$TbNO_3^{2+}$	ao	220.9289	—	—	-768.6	—	—	—
$Tb_2P_2O_7^{2+}$	ao	491.7914	—	—	-3340.0	—	—	—
TbAs	cr	233.8456	—	-314.	—	—	—	—
TbC_2	g	182.9464	887.	885.8	831.3	10.33	268.	43.9
$Tb_2(CO_3)_3$	cr	497.8762	—	-3329.2	—	—	—	—
$Tb_2(C_2O_4)_3 \cdot 10H_2O$ oxalate	cr	762.0620	—	—	-5865.	—	—	—
$TbCH_2OHCOO^{2+}$ glycolate	ao	233.9686	—	-1335.49	—	—	—	—
$Tb(CH_2OHCOO)_2^+$	ao	309.0132	—	-1991.25	—	—	—	—
$TbMoO_4^+$	ao	318.8616	—	—	-1513.7	—	—	—

Table 69:**Gd** **GADOLINIUM** (Prepared 1972) Table 69:**Gd**

Substance Formula	Description	State	Molar mass g mol^{-1}	0 K: $\Delta_f H_0^\circ$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar): $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H_0^\circ$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
Gd		cr	157.2500	0	0	0	9.088	68.07	37.03
		g	157.2500	398.94	397.5	359.8	7.636	194.314	27.547
Gd^{+}		g	157.2500	984.1	997.0	—	7.485	—	—
Gd^{2+}		g	157.2500	2151.	2167.	—	7.456	—	—
Gd^{3+}		g	157.2500	4142.	4163.	—	6.197	—	—
Gd^{3+}		ao	157.2500	—	-686.	-661.	—	-205.9	0
GdO		g	173.2494	-71.	—	—	—	—	—
GdO^{+}		g	173.2494	485.	—	—	—	—	—
Gd_2O_3	monoclinic	cr	362.4982	—	-1819.6	—	—	—	106.7
	cubic	cr2	362.4982	—	—	—	18.62	150.6	105.52
GdH_2		cr	159.2660	—	-190.4	—	—	—	—
GdF		g	176.2484	—	-172.	—	—	—	—
GdF^{2+}		ao	176.2484	—	—	-964.0	—	—	—
GdF_2		g	195.2468	—	-707.	—	—	—	—
GdF_3		g	214.2452	—	-1297.	—	—	—	—
$GdF_3 \cdot H_2O$		cr	232.2606	—	-1954.	—	—	—	—
$GdCl_3$		cr	263.6090	—	-1008.	—	—	—	88.
		ai	263.6090	—	-1188.	-1059.	—	-36.8	-410.
	in 300 H_2O		263.6090	—	-1182.097	—	—	—	—
	in 400 H_2O		263.6090	—	-1182.624	—	—	—	—
$GdCl_3$	in 500 H_2O		263.6090	—	-1183.001	—	—	—	—
	in 600 H_2O		263.6090	—	-1183.290	—	—	—	—
	in 700 H_2O		263.6090	—	-1183.528	—	—	—	—
	in 800 H_2O		263.6090	—	-1183.725	—	—	—	—
	in 900 H_2O		263.6090	—	-1183.892	—	—	—	—
$GdCl_3$	in 1 000 H_2O		263.6090	—	-1184.030	—	—	—	—
	in 1 500 H_2O		263.6090	—	-1184.528	—	—	—	—
	in 2 000 H_2O		263.6090	—	-1184.867	—	—	—	—
	in 3 000 H_2O		263.6090	—	-1185.319	—	—	—	—
	in 4 000 H_2O		263.6090	—	-1185.624	—	—	—	—
$GdCl_3$	in 5 000 H_2O		263.6090	—	-1185.838	—	—	—	—
	in 7 000 H_2O		263.6090	—	-1186.139	—	—	—	—
	in 10 000 H_2O		263.6090	—	-1186.465	—	—	—	—
	in 15 000 H_2O		263.6090	—	-1186.712	—	—	—	—
	in 20 000 H_2O		263.6090	—	-1186.892	—	—	—	—
$GdCl_3$	in 50 000 H_2O		263.6090	—	-1187.356	—	—	—	—
	in 100 000 H_2O		263.6090	—	-1187.607	—	—	—	—
	in ∞ H_2O		263.6090	—	-1188.	—	—	—	—
	in 5 000 $HCON(CH_3)_2$ in N,N-dimethylformamide		263.6090	—	-1163.	—	—	—	—
	in 50 000 $HCON(CH_3)_2$		263.6090	—	-1202.5	—	—	—	—
$GdCl_3$	in 40 000 $(CH_3)_2SO$ in dimethylsulfoxide		263.6090	—	-1226.	—	—	—	—
$GdCl_3 \cdot 6H_2O$		cr	371.7014	-2826.96	-2866.	-2451.	60.38	408.19	347.3
GdOCl		cr	208.7024	—	-979.	—	—	—	—
$Gd(OH)_{2.5}Cl_{0.5}$		cr	217.4950	—	—	-1251.8	—	—	—
$Gd(BrO_3)_3$	in 44.3 H_2O		540.9716	—	-898.7	—	—	—	—
$Gd(BrO_3)_3$	in 5 500 H_2O		540.9716	—	-885.08	—	—	—	—
$Gd(BrO_3)_3 \cdot 9H_2O$		cr	703.1102	—	-3526.7	—	—	—	—
GdI_3		cr	537.9632	—	-594.	—	—	—	—

Table 69:**Gd** **GADOLINIUM** (Prepared 1972) — Continued Table 69:**Gd**

Substance Formula and Description	State	Molar mass g mol^{-1}	0 K $\Delta_f H_0^\circ$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H_0^\circ$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
$Gd(IO_3)_3$	cr	681.9578	—	-1368.	—	—	—	—
GdS	g	189.3140	159.	—	—	—	—	—
$GdSO_4^+$	ao	253.3116	—	-1577.	-1427.	—	-67.	—
$Gd(SO_4)_2^-$	ao	349.3732	—	-2481.	-2180.	—	4.	—
$Gd_2(SO_4)_3 \cdot 8H_2O$	cr	746.8080	—	-6330.	-5531.	—	651.9	587.9
$Gd(NO_3)_3 \cdot 6H_2O$	cr	451.3571	—	—	—	80.17	557.3	444.3
$GdPO_4 \cdot H_2O$	cr	270.2368	—	—	-2050.	—	—	—
GdAs	cr	232.1716	—	-310.	—	—	—	—
GdC_2	cr	181.2724	—	-105.	—	—	—	—
	g	181.2724	536.4	536.4	—	10.5	—	—
$Gd_2(C_2O_4)_3 \cdot 10H_2O$ oxalate	cr	758.7140	—	—	-5886.	—	—	—
$GdCH_3CO_2^{2+}$ acetate	ao	216.2952	—	-1164.37	-1038.	—	-57.3	—
$GdCH_2OHCOO^{2+}$ glycolate	ao	232.2946	—	-1341.06	—	—	—	—
$Gd(CH_3CO_2)_2^+$	ao	275.3404	—	-1644.65	-1417.8	—	73.2	—
$Gd(CH_2OHCOO)_2^+$	ao	307.3392	—	-1998.15	—	—	—	—
$Gd(CH_3CO_2)_3$	ao	334.3856	—	-2129.40	-1790.5	—	175.7	—
$Gd(CH_2OHCOO)_3$	ao	382.3838	—	-2657.7	—	—	—	—
$Gd(CH_2OHCOO)_4^-$	ao	457.4284	—	-3313.3	—	—	—	—
$GdAl_2$	cr	211.2130	—	—	—	15.782	111.38	74.10
$GdMoO_4^+$	ao	317.1876	—	—	-1522.5	—	—	—

Table 70:Eu **EUROPIUM** (Prepared 1972) Table 70:Eu

Substance Formula	Description	State	Molar mass g mol^{-1}	0 K: $\Delta_f H^\circ_0$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar): $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H^\circ_0$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
Eu		cr	151.9600	0	0	0	8.004	77.78	27.66
		g	151.9600	177.11	175.3	142.2	6.197	188.795	20.786
Eu^{+}		g	151.9600	723.79	728.60	—	6.197	—	—
Eu^{2+}		g	151.9600	1807.	1820.	—	6.197	—	—
Eu^{3+}		g	151.9600	4213.	4230.	—	7.924	—	—
Eu^{4+}		g	151.9600	8322.	8343.	—	—	—	—
Eu^{2+}		ao	151.9600	—	-527.	-540.2	—	-8.	—
Eu^{3+}		ao	151.9600	—	-605.0	-574.1	—	-222.	8.
EuO		cr	167.9594	—	-592.0	-556.9	—	63.	—
		g	167.9594	-130.	—	—	—	—	—
EuO^{+}		g	167.9594	494.	—	—	—	—	—
Eu_2O_3	cubic	cr	351.9182	—	-1662.7	—	—	—	123.8
	monoclinic	cr2	351.9182	—	-1651.4	-1556.8	—	146.	122.2
Eu_3O_4		cr	519.8776	—	-2272.	-2142.	—	205.	—
$Eu(OH)_3$		cr	202.9822	—	—	-1194.4	—	—	—
EuF		g	170.9584	—	-293.	—	—	—	—
$EuF_3 \cdot H_2O$		cr	226.9706	—	-1873.6	—	—	—	—
$EuCl^{2+}$		ao	187.4130	—	-772.4	-710.5	—	-151.	—
$EuCl_2$		cr	222.8660	—	-824.	—	—	—	—
		g	222.8660	—	-460.	—	—	—	—
$EuCl_2$		ai	222.8660	—	-862.	—	—	—	—
$EuCl_2^{+}$		ao	222.8660	—	—	-837.6	—	—	—
$EuCl_3$		cr	258.3190	—	-936.0	—	—	—	—
		ai	258.3190	—	-1106.2	-967.7	—	-54.	-402.
	in 10 000 H_2O		258.3190	—	-1104.45	—	—	—	—
$EuCl_3$	in 360 HCl + 10000 H_2O		258.3190	—	-1092.9	—	—	—	—
	in 720 HCl + 10000 H_2O		258.3190	—	-1079.9	—	—	—	—
	in 1080 HCl + 10000 H_2O		258.3190	—	-1065.7	—	—	—	—
$EuCl_3 \cdot 6H_2O$		cr	366.4114	—	-2784.9	-2365.7	—	407.1	366.9
$EuBr^{2+}$		ao	231.8690	—	—	-676.6	—	—	—
$EuBr_2^{+}$		ao	311.7780	—	—	-777.8	—	—	—
$Eu(BrO_3)_3$	in 45.9 H_2O		535.6816	—	-809.6	—	—	—	—
	in 5 500 H_2O		535.6816	—	-804.00	—	—	—	—
$Eu(BrO_3)_3 \cdot 9H_2O$		cr	697.8202	—	-3445.1	—	—	—	—
EuI^{2+}		ao	278.8644	—	—	-623.9	—	—	—
$Eu(IO_3)_3$		cr	676.6678	—	-1290.3	—	—	—	—
EuS		g	184.0240	113.	—	—	—	—	—
$EuSO_4^{+}$		ao	248.0216	—	-1499.1	-1338.8	—	-84.	—
$Eu(SO_4)_2^{-}$		ao	344.0832	—	-2402.0	-2093.5	—	-8.	—
$Eu_2(SO_4)_3 \cdot 8H_2O$		cr	736.2280	—	—	—	—	672.0	610.9
EuSe		g	230.9200	130.	—	—	—	—	—
EuTe		g	279.5600	172.	—	—	—	—	—
$EuNO_3^{2+}$		ao	213.9649	—	—	-687.11	—	—	—
$Eu(NO_3)_3 \cdot 6H_2O$		cr	446.0671	—	-2957.7	—	—	—	—
$Eu_2P_2O_7^{2+}$		ao	477.8634	—	—	-3182.7	—	—	—
EuC_2		cr	175.9824	—	-63.	-67.	—	100.	—
$EuHCOO^{2+}$	formate	ao	196.9780	—	—	-932.6	—	—	—
$Eu(HCOO)_2^{+}$		ao	241.9960	—	—	-1295.3	—	—	—
$EuCH_2OHCOO^{2+}$	glycolate	ao	227.0046	—	-1260.81	—	—	—	—
$Eu(CH_2OHCOO)_2^{+}$		ao	302.0492	—	-1913.3	—	—	—	—

Table 70:**Eu** **EUROPIUM** (Prepared 1972) — Continued Table 70:**Eu**

Substance Formula and Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
$EuCNS^{2+}$	ao	210.0419	—	—	−485.4	—	—	—

Table 71:**Sm** | **SAMARIUM** (Prepared 1972) | Table 71:**Sm**

Substance Formula	Description	State	Molar mass g mol^{-1}	0 K: $\Delta_f H^\circ_0$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar): $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H^\circ_0$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
Sm		cr	150.3500	0	0	0	7.57	69.58	29.54
		g	150.3500	206.10	206.7	172.8	8.171	183.042	30.355
Sm^+		g	150.3500	750.6	759.0	—	7.703	—	—
Sm^{2+}		g	150.3500	1820.	1833.	—	8.167	—	—
Sm^{3+}		g	150.3500	4079.	4100.	—	6.293	—	—
Sm^{2+}		lo	150.3500	—	—	−497.5	—	—	—
Sm^{3+}		lo	150.3500	—	−691.6	−666.6	—	−211.7	−21.
SmO		g	166.3494	−130.	—	—	—	—	—
SmO^+		g	166.3494	406.	—	—	—	—	—
Sm_2O_3	monoclinic	cr	348.6982	−1815.40	−1823.0	−1734.6	21.00	151.0	114.52
Sm_2O_3	cubic	cr2	348.6982	—	—	—	20.9	—	112.38
SmF		g	169.3484	—	−264.	—	—	—	—
SmF_3		cr	207.3452	—	−1778.	—	—	—	—
		g	207.3452	—	−1372.	—	—	—	—
$SmF_3{\cdot}H_2O$		cr	225.3606	—	−1967.7	—	—	—	—
$SmCl^+$		ao	185.8030	—	—	−799.6	—	—	—
$SmCl_2$		cr	221.2560	—	−815.5	—	—	—	—
$SmCl_3$		cr	256.7090	—	−1025.9	—	—	—	—
		ai	256.7090	—	−1193.3	−1060.2	—	−42.7	−431.
	in 300 H_2O		256.7090	—	−1187.340	—	—	—	—
$SmCl_3$	in 400 H_2O		256.7090	—	−1187.817	—	—	—	—
	in 500 H_2O		256.7090	—	−1188.156	—	—	—	—
	in 600 H_2O		256.7090	—	−1188.428	—	—	—	—
	in 700 H_2O		256.7090	—	−1188.641	—	—	—	—
	in 800 H_2O		256.7090	—	−1188.817	—	—	—	—
$SmCl_3$	in 900 H_2O		256.7090	—	−1188.967	—	—	—	—
	in 1 000 H_2O		256.7090	—	−1189.101	—	—	—	—
	in 2 000 H_2O		256.7090	—	−1189.942	—	—	—	—
	in 3 000 H_2O		256.7090	—	−1190.381	—	—	—	—
	in 4 000 H_2O		256.7090	—	−1190.687	—	—	—	—
$SmCl_3$	in 5 000 H_2O		256.7090	—	−1190.900	—	—	—	—
	in 7 000 H_2O		256.7090	—	−1191.202	—	—	—	—
	in 10 000 H_2O		256.7090	—	−1191.482	—	—	—	—
	in 15 000 H_2O		256.7090	—	−1191.762	—	—	—	—
	in 20 000 H_2O		256.7090	—	−1191.934	—	—	—	—
$SmCl_3$	in 50 000 H_2O		256.7090	—	−1192.386	—	—	—	—
	in 100 000 H_2O		256.7090	—	−1192.632	—	—	—	—
	in ∞ H_2O		256.7090	—	−1193.3	—	—	—	—
	in 40 000 $(CH_3)_2SO$ in dimethylsulfoxide		256.7090	—	−1238.	—	—	—	—
$SmCl_3{\cdot}6H_2O$		cr	364.8014	—	−2870.2	−2456.1	—	414.	361.5
SmOCl		cr	201.8024	—	−992.	—	—	—	—
$Sm(BrO_3)_3$	in 5 500 H_2O		534.0716	—	−890.4	—	—	—	—
$Sm(BrO_3)_3{\cdot}9H_2O$		cr	696.2102	—	−3532.1	—	—	—	—
SmI_3		cr	531.0632	—	−620.1	—	—	—	—
$Sm(IO_3)_3$		cr	675.0578	—	−1381.	—	—	—	—
$SmSO_4^+$		ao	246.4116	—	−1585.3	−1430.9	—	−71.	—
$Sm(SO_4)_2^-$		ao	342.4732	—	−2490.3	−2188.9	—	8.	—
$Sm_2(SO_3)_3$		cr	540.8866	—	—	−2917.8	—	—	—
$Sm_2(SO_4)_3$		cr	588.8848	—	−3899.1	—	—	—	—

Table 71:Sm — SAMARIUM (Prepared 1972) — Continued — Table 71:Sm

Substance Formula and Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
$Sm_2(SO_4)_3 \cdot 8H_2O$	cr	733.0080	-6231.78	-6330.8	-5538.2	100.58	672.4	606.7
$Sm_2(SeO_4)_3 \cdot 8H_2O$	cr	873.6960	—	-5464.3	—	—	—	—
$Sm(NO_3)_3$	cr	336.3647	—	-1212.1	—	—	—	—
$Sm(NO_3)_3 \cdot 6H_2O$	cr	444.4571	—	-3042.98	—	—	—	—
$Sm_2P_2O_7^{2+}$	ao	474.6434	—	—	-3367.2	—	—	—
SmAs	cr	225.2716	—	-301.	—	—	—	—
SmC_2	cr	174.3724	—	-71.	-75.7	—	96.	—
$Sm_2(C_2O_3) \cdot 10H_2O$ oxalate	cr	744.9136	—	—	-5899.	—	—	—
$Sm_2(CO_3)_3$	cr	480.7282	—	—	-3101.9	—	—	—
$SmCH_3CO_2^{2+}$ acetate	ao	209.3952	—	-1171.56	-1047.46	—	-65.7	—
$SmCH_2OHCOO^{2+}$ glycolate	ao	225.3946	—	-1348.00	—	—	—	—
$Sm(CH_3CO_2)_2^+$	ao	268.4404	—	-1651.59	-1423.96	—	64.9	—
$Sm(CH_2OHCOO)_2^+$	ao	300.4392	—	-2006.2	—	—	—	—
$Sm(CH_3CO_2)_3$	ao	327.4856	—	-2133.88	-1796.74	—	175.7	—
$Sm(CH_2OHCOO)_3$	ao	375.4838	—	-2664.8	—	—	—	—
$Sm(CH_2OHCOO)_4^-$	ao	450.5284	—	-3321.3	—	—	—	—
$SmMoO_4^+$	ao	310.2876	—	—	-1530.5	—	—	—

Table 72:**Pm** **PROMETHIUM** (Prepared 1972) Table 72:**Pm**

Substance Formula and Description	State	Molar mass g mol^{-1}	0 K $\Delta_f H_0^\circ$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H_0^\circ$	S° J mol^{-1} K^{-1}	C_p
Pm	cr	146.9150	0	0	0	—	—	—
	g	146.9150	—	—	—	6.464	187.101	24.255

Table 73:**Nd** | **NEODYMIUM** (Prepared 1972) | Table 73:**Nd**

Substance Formula	Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
Nd		cr	144.2400	0	0	0	7.24	71.5	27.45
		g	144.2400	328.57	327.6	292.4	6.268	189.406	22.092
Nd^+		g	144.2400	861.5	867.3	—	6.799	—	—
Nd^{2+}		g	144.2400	1895.	1908.	—	6.268	—	—
Nd^{3+}		g	144.2400	4033.	4050.	—	6.201	—	—
Nd^{3+}		ao	144.2400	—	-696.2	-671.6	—	-206.7	-21.
NdO		g	160.2394	-126.4	—	—	—	—	—
NdO^+		g	160.2394	351.	—	—	—	—	—
Nd_2O_3	hexagonal	cr	336.4782	-1801.21	-1807.9	-1720.8	20.92	158.6	111.29
NdH_2		cr	146.2560	—	-192.	—	—	—	—
NdF		g	163.2384	—	-159.	—	—	—	—
NdF_2		g	182.2368	—	-690.	—	—	—	—
NdF_3		cr	201.2352	—	-1657.	—	—	—	—
		g	201.2352	—	-1280.	—	—	—	—
$NdF_3{\cdot}H_2O$		cr	219.2506	—	-1972.8	—	—	—	—
$NdCl_2$		cr	215.1460	—	-682.	—	—	—	—
$NdCl_3$		cr	250.5990	—	-1041.0	—	—	—	113.
		g	250.5990	—	-724.	—	—	—	—
		ai	250.5990	—	-1197.9	-1065.6	—	-37.7	-431.
	in 300 H_2O		250.5990	—	-1192.034	—	—	—	—
$NdCl_3$	in 400 H_2O		250.5990	—	-1192.524	—	—	—	—
	in 500 H_2O		250.5990	—	-1192.879	—	—	—	—
	in 600 H_2O		250.5990	—	-1193.151	—	—	—	—
	in 700 H_2O		250.5990	—	-1193.373	—	—	—	—
	in 800 H_2O		250.5990	—	-1193.557	—	—	—	—
$NdCl_3$	in 900 H_2O		250.5990	—	-1193.708	—	—	—	—
	in 1 000 H_2O		250.5990	—	-1193.833	—	—	—	—
	in 1 500 H_2O		250.5990	—	-1194.302	—	—	—	—
	in 2 000 H_2O		250.5990	—	-1194.599	—	—	—	—
	in 3 000 H_2O		250.5990	—	-1195.013	—	—	—	—
$NdCl_3$	in 4 000 H_2O		250.5990	—	-1195.298	—	—	—	—
	in 5 000 H_2O		250.5990	—	-1195.494	—	—	—	—
	in 7 000 H_2O		250.5990	—	-1195.787	—	—	—	—
	in 10 000 H_2O		250.5990	—	-1196.059	—	—	—	—
	in 15 000 H_2O		250.5990	—	-1196.335	—	—	—	—
$NdCl_3$	in 20 000 H_2O		250.5990	—	-1196.519	—	—	—	—
	in 50 000 H_2O		250.5990	—	-1196.980	—	—	—	—
	in 100 000 H_2O		250.5990	—	-1197.231	—	—	—	—
	in ∞ H_2O		250.5990	—	-1197.9	—	—	—	—
	in 40 000 $(CH_3)_2SO$ in dimethylsulfoxide		250.5990	—	-1230.	—	—	—	—
$NdCl_3{\cdot}6H_2O$		cr	358.6914	-2839.76	-2874.4	-2460.3	63.35	417.1	360.87
NdOCl		cr	195.6924	—	-1000.	—	—	—	—
$Nd(BrO_3)_3$	in 5 500 H_2O		527.9616	—	-895.4	—	—	—	—
$Nd(BrO_3)_3{\cdot}9H_2O$		cr	690.1002	—	-3534.6	—	—	—	—
NdI_3		cr	524.9532	—	-639.3	—	—	—	—
$Nd(IO_3)_3$		cr	668.9478	—	-1389.	—	—	—	—
NdS		g	176.3040	138.	—	—	—	—	—
Nd_2S_3		cr	384.6720	—	-1188.	-1172.4	25.773	185.27	122.51
$NdSO_4^+$		ao	240.3016	—	-1590.3	-1435.9	—	-71.	—

Table 73:Nd — **NEODYMIUM** (Prepared 1972) — Continued — Table 73:Nd

Substance Formula and Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
$Nd(SO_4)_2^-$	ao	336.3632	—	-2492.8	-2190.2	—	4.	—
$Nd_2(SO_4)_3 \cdot 8H_2O$	cr	720.7880	—	-6330.8	—	—	673.2	606.3
Nd_2Se_3	cr	525.3600	—	—	—	29.83	224.3	130.1
$Nd_2(SeO_3)_3 \cdot 8H_2O$	am	813.4778	—	-5147.6	—	—	—	—
$Nd_2(SeO_4)_3 \cdot 5H_2O$	cr	807.4298	—	-4604.1	—	—	—	—
$Nd(NO_3)_3$	cr	330.2547	—	-1230.9	—	—	—	—
$Nd(NO_3)_3 \cdot 3H_2O$	cr	384.3009	—	-2155.	—	—	—	—
$Nd(NO_3)_3 \cdot 4H_2O$	cr	402.3163	—	-2462.7	—	—	—	—
$Nd(NO_3)_3 \cdot 6H_2O$	cr	438.3471	—	-3047.58	—	—	—	—
NdC_2	g	168.2624	546.0	547.06	493.3	10.38	26.5	44.4
NdC_2^+	g	168.2624	1180.	1184.	—	—	—	—
$NdC_2O_4^+$ oxalate	ao	232.2600	—	—	-1402.	—	—	—
$Nd(C_2O_4)_2^-$	ao	320.2800	—	—	-2088.	—	—	—
$Nd_2(CO_3)_3$	cr	468.5082	—	—	-3114.8	—	—	—
$Nd_2(C_2O_4)_3 \cdot 10H_2O$	cr	732.6940	—	-6782.	-5907.	—	-799.	—
$NdCH_3CO_2^{2+}$ acetate	ao	203.2852	—	-1175.08	-1051.89	—	-59.0	—
$NdCH_2OHCOO^{2+}$ glycolate	ao	219.2846	—	-1353.11	—	—	—	—
$Nd(CH_3CO_2)_2^+$	ao	262.3304	—	-1653.64	-1427.64	—	74.1	—
$Nd(CH_2OHCOO)_2^+$	ao	294.3292	—	-2009.58	—	—	—	—
$Nd(CH_3CO_2)_3$	ao	321.3756	—	-2136.02	-1799.59	—	181.6	—
$Nd(CH_2OHCOO)_3$	ao	369.3738	—	-2667.63	—	—	—	—
$Nd(CH_2OHCOO)_4^-$	ao	444.4184	—	-3322.1	—	—	—	—
$NdAl_2$	cr	198.2030	—	—	—	15.640	115.77	73.01
NdAu	g	341.2070	397.	394.6	343.9	10.29	289.	36.8

Table 74:**Pr** **PRASEODYMIUM** (Prepared 1972) Table 74:**Pr**

Substance Formula	and Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
Pr		cr	140.9070	0	0	0	7.28	73.2	27.20
		g	140.9070	356.69	355.6	320.9	6.222	189.808	21.359
Pr^{+}		g	140.9070	884.1	889.5	—	6.878	—	—
Pr^{2+}		g	140.9070	1902.0	1913.3	—	6.222	—	—
Pr^{3+}		g	140.9070	3988.2	4005.8	—	6.197	—	—
Pr^{4+}		g	140.9070	7749.	7774.	—	6.197	—	—
Pr^{5+}		g	140.9070	13301.	13330.	—	—	—	—
Pr^{3+}		ao	140.9070	—	-704.6	-679.1	—	-209.	-29.
PrO		g	156.9064	-159.	—	—	—	—	—
PrO^{+}		g	156.9064	314.	—	—	—	—	—
PrO_2		cr	172.9058	—	-949.3	—	—	—	—
Pr_2O_3	hexagonal	cr	329.8122	—	-1809.6	—	—	—	117.40
	cubic	cr2	329.8122	—	-1809.6	—	—	—	—
Pr_7O_{12}		cr	1178.3418	—	-6510.	—	—	—	—
Pr_9O_{16}		cr	1524.1534	—	-8439.	—	—	—	—
$Pr_{10}O_{18}$		cr	1697.0592	—	-9406.	—	—	—	—
$Pr_{11}O_{20}$		cr	1869.9650	—	-10372.	—	—	—	—
$Pr_{12}O_{22}$		cr	2042.8707	—	-11322.	—	—	—	—
PrH_2		cr	142.9230	-190.25	-198.3	-154.4	7.66	56.9	41.0
$PrOH^{2+}$		ao	157.9144	—	—	-862.	—	—	—
$Pr(OH)_2^{+}$		ao	174.9218	—	—	-1075.	—	—	—
$Pr(OH)_3$		cr	191.9292	—	—	-1284.8	—	—	—
$PrF_3 \cdot H_2O$		cr	215.9176	—	-1983.	—	—	—	—
$PrCl^{2+}$		ao	176.3600	—	—	-815.5	—	—	—
$PrCl_3$		cr	247.2660	—	-1056.9	—	—	—	100.
$PrCl_3$		g	247.2660	—	-782.	—	—	—	—
		ai	247.2660	—	-1206.2	-1072.7	—	-42.	-439.
	in 13.96 H_2O, saturated		247.2660	—	-1174.16	—	—	—	—
	in 20 H_2O		247.2660	—	-1184.700	—	—	—	—
	in 25 H_2O		247.2660	—	-1188.737	—	—	—	—
$PrCl_3$	in 30 H_2O		247.2660	—	-1191.101	—	—	—	—
	in 40 H_2O		247.2660	—	-1193.741	—	—	—	—
	in 50 H_2O		247.2660	—	-1195.147	—	—	—	—
	in 75 H_2O		247.2660	—	-1197.051	—	—	—	—
	in 100 H_2O		247.2660	—	-1198.000	—	—	—	—
$PrCl_3$	in 150 H_2O		247.2660	—	-1199.063	—	—	—	—
	in 200 H_2O		247.2660	—	-1199.712	—	—	—	—
	in 300 H_2O		247.2660	—	-1200.440	—	—	—	—
	in 400 H_2O		247.2660	—	-1200.892	—	—	—	—
	in 500 H_2O		247.2660	—	-1201.222	—	—	—	—
$PrCl_3$	in 600 H_2O		247.2660	—	-1201.486	—	—	—	—
	in 700 H_2O		247.2660	—	-1201.699	—	—	—	—
	in 800 H_2O		247.2660	—	-1201.879	—	—	—	—
	in 1 000 H_2O		247.2660	—	-1202.168	—	—	—	—
	in 1 500 H_2O		247.2660	—	-1202.661	—	—	—	—
$PrCl_3$	in 2 000 H_2O		247.2660	—	-1202.996	—	—	—	—
	in 3 000 H_2O		247.2660	—	-1203.427	—	—	—	—
	in 4 000 H_2O		247.2660	—	-1203.703	—	—	—	—
	in 5 000 H_2O		247.2660	—	-1203.908	—	—	—	—
	in 7 000 H_2O		247.2660	—	-1204.193	—	—	—	—

Table 74:Pr **PRASEODYMIUM** (Prepared 1972) — Continued Table 74:Pr

Substance Formula and Description		State	Molar mass g mol⁻¹	0 K	298.15 K (25°C) and 0.1 MPa (1 bar)				
				$\Delta_f H^\circ_0$ kJ mol^{-1}	$\Delta_f H^\circ$	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H^\circ_0$	S° J mol^{-1} K^{-1}	C_p
$PrCl_3$	in 10 000 H_2O		247.2660	—	−1204.461	—	—	—	—
	in 15 000 H_2O		247.2660	—	−1204.733	—	—	—	—
	in 20 000 H_2O		247.2660	—	−1204.908	—	—	—	—
	in 50 000 H_2O		247.2660	—	−1205.356	—	—	—	—
	in 100 000 H_2O		247.2660	—	−1205.603	—	—	—	—
$PrCl_3$	in ∞ H_2O		247.2660	—	−1206.2	—	—	—	—
$PrCl_3 \cdot 6H_2O$		cr	355.3584	—	−2880.7	—	—	—	—
$PrCl_3 \cdot 7H_2O$		cr	373.3738	—	−3177.7	—	—	—	—
$PrOCl$		cr	192.3594	—	−1013.	—	—	—	—
$Pr(BrO_3)_3$	in 29.1 H_2O, saturated		524.6286	—	−910.9	—	—	—	—
$Pr(BrO_3)_3$	in 5 500 H_2O		524.6286	—	−903.70	—	—	—	—
$Pr(BrO_3)_3 \cdot 9H_2O$		cr	686.7672	—	−3542.2	—	—	—	—
PrI_3		cr	521.6202	—	−654.4	—	—	—	—
$Pr(IO_3)_3$		cr	665.6148	—	−1396.6	—	—	—	—
$PrSO_4^+$		ao	236.9686	—	−1599.5	−1443.8	—	−71.	—
$Pr(SO_4)_2^-$		ao	333.0302	—	−2503.7	−2199.0	—	0.1	—
$Pr_2(SeO_3)_3 \cdot 5H_2O$		am	752.7656	—	−4314.1	—	—	—	—
$Pr_2(SeO_4)_3 \cdot 5H_2O$		cr	800.7638	—	−4625.4	—	—	—	—
$Pr_2(SeO_3)_3 \cdot H_2SeO_3$		cr	791.6628	—	−3382.64	—	—	—	—
$Pr_2(SeO_3)_3 \cdot H_2SeO_3 \cdot 5H_2O$		cr	881.7398	—	−4880.13	—	—	—	—
$PrNO_3^{2+}$		ao	202.9119	—	—	−797.0	—	—	—
$Pr(NO_3)_3$		cr	326.9217	—	−1229.3	—	—	—	—
	in HNO_3	aq	326.9217	—	−1325.1	—	—	—	—
$Pr(NO_3)_3 \cdot 6H_2O$		cr	435.0141	—	−3058.71	—	—	—	—
$PrAs$		cr	215.8286	—	−305.	—	—	—	—
$PrSb$		cr	262.6570	—	—	—	12.728	105.06	53.18
$PrBi$		cr	349.8870	—	—	—	13.397	113.72	54.39
PrC		cr	152.9182	—	−54.4	—	—	—	—
PrC_2		g	164.9294	548.	549.4	496.6	10.38	262.0	44.4
$Pr_2(CO_3)_3$		cr	461.8422	—	−3213.	—	—	—	—
$Pr_2(C_2O_4)_3 \cdot 10H_2O$	oxalate	cr	726.0280	—	−5920.	—	—	—	—
$PrCH_3CO_2^{2+}$	acetate	ao	199.9522	—	−1183.40	−1058.88	—	−63.2	—
$Pr(CH_3CO_2)_2^+$		ao	258.9974	—	−1659.12	−1434.09	—	77.0	—
$Pr(CH_3CO_2)_3$		ao	318.0426	—	—	−1806.03	—	—	—
$PrAl_2$		cr	194.8700	—	—	—	15.184	114.73	73.81
$PrAl_4$		cr	248.8330	—	−218.0	—	—	—	—
$PrAu$		g	337.8740	418.	415.5	365.2	10.29	289.	36.8
$PrMoO_4^+$		ao	300.8446	—	—	−1540.5	—	—	—

Table 75:Ce — CERIUM (Prepared 1972) — Table 75:Ce

Substance Formula and Description	State	Molar mass g mol^{-1}	0 K: $\Delta_f H^\circ_0$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar): $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H^\circ_0$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
Ce	cr	140.1200	0	0	0	7.5	72.0	26.94
	g	140.1200	423.4	423.	385.	6.669	191.766	23.075
Ce^{+}	g	140.1200	957.7	962.7	—	6.347	—	—
Ce^{2+}	g	140.1200	2004.6	2015.4	—	6.213	—	—
Ce^{3+}	g	140.1200	3953.5	3970.6	—	6.197	—	—
Ce^{4+}	g	140.1200	7498.	7523.	—	6.197	—	—
Ce^{3+}	ao	140.1200	—	-696.2	-672.0	—	-205.	—
Ce^{4+}	ao	140.1200	—	-537.2	-503.8	—	-301.	—
Ce_2	g	280.2400	607.	602.1	561.5	10.33	280.	37.03
CeO	g	156.1194	-126.	-128.4	-149.0	8.87	243.2	31.71
CeO^{+}	g	156.1194	347.	351.	—	—	—	—
CeO_2	cr	172.1188	-1082.82	-1088.7	-1024.6	10.368	62.30	61.63
Ce_2O_3	cr	328.2382	-1789.25	-1796.2	-1706.2	21.46	150.6	114.6
CeH_2	cr	142.1360	-200.12	-205.	-163.	7.431	55.6	40.92
CeD_2	cr	144.1482	—	-192.	—	—	—	—
CeF^{2+}	ao	159.1184	—	—	-973.6	—	—	—
CeF_3	cr	197.1152	—	—	—	17.728	115.1	93.3
$CeF_3 \cdot H_2O$	cr	215.1306	—	-1976.5	—	—	—	—
$CeCl^{2+}$	ao	175.5730	—	-840.6	-798.7	—	-88.3	—
$CeCl_3$	cr	246.4790	—	-1053.5	-977.8	—	151.	87.4
$CeCl_3$	g	246.4790	—	-728.	—	—	—	—
	ai	246.4790	—	-1197.5	-1065.6	—	-38.	—
in 200 H_2O		246.4790	—	-1190.85	—	—	—	—
in 300 H_2O		246.4790	—	-1191.60	—	—	—	—
in 400 H_2O		246.4790	—	-1192.11	—	—	—	—
$CeCl_3$ in 500 H_2O		246.4790	—	-1192.40	—	—	—	—
in 600 H_2O		246.4790	—	-1192.65	—	—	—	—
in 700 H_2O		246.4790	—	-1192.86	—	—	—	—
in 800 H_2O		246.4790	—	-1193.03	—	—	—	—
in 900 H_2O		246.4790	—	-1193.19	—	—	—	—
$CeCl_3$ in 1 000 H_2O		246.4790	—	-1193.32	—	—	—	—
in 1 500 H_2O		246.4790	—	-1193.78	—	—	—	—
in 2 000 H_2O		246.4790	—	-1194.16	—	—	—	—
in 3 000 H_2O		246.4790	—	-1194.57	—	—	—	—
in 4 000 H_2O		246.4790	—	-1194.87	—	—	—	—
$CeCl_3$ in 5 000 H_2O		246.4790	—	-1195.08	—	—	—	—
in 7 000 H_2O		246.4790	—	-1195.37	—	—	—	—
in 10 000 H_2O		246.4790	—	-1195.66	—	—	—	—
in 15 000 H_2O		246.4790	—	-1195.95	—	—	—	—
in 20 000 H_2O		246.4790	—	-1196.12	—	—	—	—
$CeCl_3$ in 50 000 H_2O		246.4790	—	-1196.58	—	—	—	—
in 100 000 H_2O		246.4790	—	-1196.83	—	—	—	—
in ∞ H_2O		246.4790	—	-1197.5	—	—	—	—
$CeCl_3 \cdot 7H_2O$	cr	372.5868	—	-3169.4	—	—	—	—
CeOCl	cr	191.5724	—	-1000.	—	—	—	—
$CeClO_4^{2+}$	ao	239.5706	—	-874.9	-691.1	—	-155.	—
$CeBr^{2+}$	ao	220.0290	—	—	-779.5	—	—	—
CeI_3	cr	520.8332	—	-649.8	—	—	—	—
$Ce(IO_3)_3$	cr	664.8278	—	-1389.	—	—	—	—
$Ce(IO_3)_3 \cdot 2H_2O$	cr	700.8586	—	—	-1582.6	—	—	—

Table 75:Ce **CERIUM** (Prepared 1972) — Continued Table 75:Ce

Substance Formula and Description	State	Molar mass g mol⁻¹	0 K: $\Delta_f H^\circ_0$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar): $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H^\circ_0$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
CeS	cr	172.1840	-460.49	-459.4	-451.5	10.837	78.2	49.96
	g	172.1840	134.	131.4	84.5	9.37	260.4	34.7
CeS_2	cr	204.2480	—	-612.1	—	—	—	—
	g	204.2480	13.	10.0	-36.9	13.72	293.	57.7
Ce_2S	g	312.3040	305.	299.6	251.0	13.60	339.	54.0
Ce_2S_3	cr	376.4320	—	-1188.	—	—	—	—
Ce_3S_4	cr	548.6160	—	-1661.	—	—	—	—
$CeSO_4^+$	ao	236.1816	—	-1590.8	-1436.3	—	-71.	—
$Ce(SO_4)_2^-$	ao	332.2432	—	-2493.2	-2190.6	—	8.	—
$Ce_2(SO_4)_3$	cr	568.4248	—	-3954.3	—	—	—	—
$Ce_2(SO_4)_3 \cdot 5H_2O$	cr	658.5018	—	—	—	—	—	552.
$Ce_2(SO_4)_3 \cdot 8H_2O$	cr	712.5480	—	—	-5524.8	—	—	—
$Ce_2(SeO_3)_3 \cdot 10H_2O$	cr	841.2686	—	-5722.0	—	—	—	—
CeN	cr	154.1267	—	-331.	—	—	—	—
	g	154.1267	377.	373.6	—	9.00	—	32.22
$CeNO_3^{2+}$	ao	202.1249	—	—	-789.5	—	—	—
$Ce(NO_3)_3$	cr	326.1347	—	-1225.9	—	—	—	—
in 2 600 H_2O		326.1347	—	-1316.7	—	—	—	—
$Ce(NO_3)_3 \cdot 3H_2O$	cr	380.1809	—	-2159.	—	—	—	—
$Ce(NO_3)_3 \cdot 4H_2O$	cr	398.1963	—	-2464.0	—	—	—	—
$Ce(NO_3)_3 \cdot 6H_2O$	cr	434.2271	—	-3050.72	—	—	—	—
$CeCl_3 \cdot 2NH_3$	cr	280.5404	—	-1301.6	—	—	—	—
$CeCl_3 \cdot 4NH_3$	cr	314.6018	—	-1523.0	—	—	—	—
$CeCl_3 \cdot 8NH_3$	cr	382.7246	—	-1850.2	—	—	—	—
$CeCl_3 \cdot 12NH_3$	cr	450.8474	—	-2148.1	—	—	—	—
$CeCl_3 \cdot 20NH_3$	cr	587.0930	—	-2717.9	—	—	—	—
$CeAs$	cr	215.0416	—	-289.	—	—	—	—
CeC	g	152.1312	—	682.	—	—	—	—
CeC_2	cr	164.1424	—	-63.	-63.6	—	84.	—
	g	164.1424	569.	569.9	514.2	10.33	268.	43.9
CeC_4	g	188.1648	699.1	703.	636.	15.40	306.	72.4
$CeC_2O_4^+$ oxalate	ao	228.1400	—	—	-1383.6	—	—	—
$Ce(C_2O_4)_2^-$	ao	316.1600	—	—	-2079.	—	—	—
$Ce_2(C_2O_4)_3 \cdot 10H_2O$	cr	724.4540	—	-6782.	-5903.	—	799.	—
$CeCH_3CO_2^{2+}$ acetate	ao	199.1652	—	-1173.49	-1051.06	—	-56.5	—
$CeCH_2OHCOO^{2+}$ glycolate	ao	215.1646	—	-1351.89	—	—	—	—
$Ce(CH_3CO_2)_2^+$	ao	258.2104	—	-1652.93	-1426.22	—	72.0	—
$Ce(CH_2OHCOO)_2^+$	ao	290.2092	—	-2007.48	—	—	—	—
$Ce(CH_3CO_2)_3$	ao	317.2556	—	-2130.79	-1798.16	—	187.9	—
$Ce(CH_2OHCOO)_3$	ao	365.2538	—	-2662.57	—	—	—	—
$Ce(CH_2OHCOO)_4^-$	ao	440.2984	—	-3317.9	—	—	—	—
CeB_6	cr	204.9860	—	-339.	—	—	—	—
$CeAl_2$	cr	194.0830	—	—	—	15.293	108.24	74.68
$CeAl_4$	cr	248.0460	—	-163.	—	—	—	—
Ce_3Al	cr	447.3415	—	-92.	—	—	—	—
$CeZn$	cr	205.4900	—	-88.	—	—	—	—
$CeHg_4$	cr	942.4800	—	-88.	—	—	—	—
$CeAu$	g	337.0870	460.	456.9	407.5	10.21	285.	36.8
$CeCrO_3$	cr	240.1142	—	-1540.	-1452.	—	105.	—

Table 76:**La** **LANTHANUM** (Prepared 1972) Table 76:**La**

Substance Formula and Description		State	Molar mass g mol^{-1}	0 K $\Delta_f H^\circ_0$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H^\circ_0$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
La		cr	138.9100	0	0	0	6.665	56.9	27.11
		g	138.9100	431.29	431.0	393.56	6.314	182.377	22.753
La^{+}		g	138.9100	969.391	975.269	—	6.347	—	—
La^{2+}		g	138.9100	2038.	2050.	—	6.209	—	—
La^{3+}		g	138.9100	3886.9	3904.9	—	6.197	—	—
La^{4+}		g	138.9100	8707.	8732.	—	6.197	—	—
La^{3+}		ao	138.9100	—	-707.1	-683.7	—	-217.6	-13.
La_2		g	277.8200	618.4	615.0	566.5	10.0	276.3	36.4
LaO		g	154.9094	-119.2	-121.38	-145.28	8.874	239.73	31.76
LaO^{+}		g	154.9094	356.1	359.8	—	—	—	—
La_2O		g	293.8194	-8.	-13.4	—	12.55	—	50.2
La_2O_2		g	309.8188	-607.	-613.4	—	15.36	—	67.8
La_2O_3		cr	325.8182	-1787.36	-1793.7	-1705.8	19.841	127.32	108.78
LaH_2		cr	140.9260	—	-202.1	—	—	—	—
LaD_2		cr	142.9382	—	-189.1	—	—	—	—
$La(OH)_3$		cr	189.9322	—	-1410.0	—	—	—	—
LaF		g	157.9084	—	—	—	9.092	238.2	33.39
LaF^{2+}		ao	157.9084	—	—	-979.5	—	—	—
LaF_3		g	195.9052	—	—	—	17.32	329.4	72.8
$LaF_3 \cdot H_2O$		cr	213.9206	—	-1987.4	—	—	—	—
$LaCl_3$		cr	245.2690	—	-1071.1	—	—	—	108.8
		g	245.2690	—	-741.	—	—	—	—
		ai	245.2690	—	-1208.8	-1077.3	—	-50.	-423.
	in 14.18 H_2O, saturated		245.2690	—	-1176.88	—	—	—	—
	in 15 H_2O		245.2690	—	-1178.696	—	—	—	—
$LaCl_3$	in 20 H_2O		245.2690	—	-1186.327	—	—	—	—
	in 25 H_2O		245.2690	—	-1190.465	—	—	—	—
	in 30 H_2O		245.2690	—	-1192.971	—	—	—	—
	in 40 H_2O		245.2690	—	-1195.783	—	—	—	—
	in 50 H_2O		245.2690	—	-1197.344	—	—	—	—
$LaCl_3$	in 75 H_2O		245.2690	—	-1199.352	—	—	—	—
	in 100 H_2O		245.2690	—	-1200.339	—	—	—	—
	in 150 H_2O		245.2690	—	-1201.423	—	—	—	—
	in 200 H_2O		245.2690	—	-1202.101	—	—	—	—
	in 300 H_2O		245.2690	—	-1202.879	—	—	—	—
$LaCl_3$	in 400 H_2O		245.2690	—	-1203.323	—	—	—	—
	in 500 H_2O		245.2690	—	-1203.657	—	—	—	—
	in 600 H_2O		245.2690	—	-1203.887	—	—	—	—
	in 700 H_2O		245.2690	—	-1204.092	—	—	—	—
	in 800 H_2O		245.2690	—	-1204.264	—	—	—	—
$LaCl_3$	in 1 000 H_2O		245.2690	—	-1204.540	—	—	—	—
	in 1 500 H_2O		245.2690	—	-1205.017	—	—	—	—
	in 2 000 H_2O		245.2690	—	-1205.356	—	—	—	—
	in 3 000 H_2O		245.2690	—	-1205.816	—	—	—	—
	in 4 000 H_2O		245.2690	—	-1206.126	—	—	—	—
$LaCl_3$	in 5 000 H_2O		245.2690	—	-1206.348	—	—	—	—
	in 7 000 H_2O		245.2690	—	-1206.653	—	—	—	—
	in 10 000 H_2O		245.2690	—	-1206.946	—	—	—	—
	in 15 000 H_2O		245.2690	—	-1207.230	—	—	—	—
	in 20 000 H_2O		245.2690	—	-1207.410	—	—	—	—

Table 76:**La** — **LANTHANUM** (Prepared 1972) — Continued — Table 76:**La**

Substance Formula and Description		State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
$LaCl_3$	in 50 000 H_2O		245.2690	—	-1207.862	—	—	—	—
	in 100 000 H_2O		245.2690	—	-1208.109	—	—	—	—
	in ∞ H_2O		245.2690	—	-1208.8	—	—	—	—
	in 40 000 $(CH_3)_2SO$ in dimethylsulfoxide		245.2690	—	-1234.	—	—	—	—
$LaCl_3{\cdot}7H_2O$		cr	371.3768	—	-3178.6	-2712.9	71.63	462.8	431.0
$LaOCl$		cr	190.3624	—	-1010.9	—	—	—	—
$La(BrO_3)_3$	in 5 500 H_2O		522.6316	—	-905.8	—	—	—	—
$La(BrO_3)_3{\cdot}9H_2O$		cr	684.7702	—	-3539.7	—	—	—	—
LaI_3		cr	519.6232	—	-666.9	—	—	—	—
$La(IO_3)_3$		cr	663.6178	—	-1397.	-1131.2	—	259.	—
LaS		cr	170.9740	-455.6	-456.	-451.5	10.9	73.2	59.
		g	170.9740	137.7	136.0	184.5	9.29	251.	34.39
La_2S_3		cr	374.0120	—	-1209.	—	—	—	—
$LaSO_4^+$		ao	234.9716	—	-1602.9	-1448.5	—	-84.	—
$La(SO_4)_2^-$		ao	331.0332	—	-2507.1	-2203.6	—	-13.	—
$La_2(SO_4)_3$		cr	566.0048	—	-3941.3	—	—	—	280.
	in 2 400 H_2O		566.0048	—	-4104.00	—	—	—	—
	in 3 000 H_2O		566.0048	—	-4104.55	—	—	—	—
	in 4 000 H_2O		566.0048	—	-4105.09	—	—	—	—
	in 5 000 H_2O		566.0048	—	-4105.55	—	—	—	—
$La_2(SO_4)_3$	in 7 000 H_2O		566.0048	—	-4106.39	—	—	—	—
	in 10 000 H_2O		566.0048	—	-4107.52	—	—	—	—
$La_2(SO_4)_3{\cdot}9H_2O$		cr	728.1434	—	-6648.	—	—	—	636.
$La_2(SeO_3)_3$		cr	658.6946	—	-2879.43	-2633.7	—	339.	—
La_2Te_3		cr	660.6200	-722.20	-724.	-714.6	30.08	231.63	132.13
LaN		cr	152.9167	—	-303.3	—	—	—	—
$La(NO_3)_3$		cr	324.9247	—	-1254.4	—	—	—	—
	in 250 H_2O		324.9247	—	-1325.110	—	—	—	—
	in 300 H_2O		324.9247	—	-1325.265	—	—	—	—
	in 500 H_2O		324.9247	—	-1325.529	—	—	—	—
$La(NO_3)_3$	in 700 H_2O		324.9247	—	-1325.696	—	—	—	—
	in 1 000 H_2O		324.9247	—	-1325.914	—	—	—	—
	in 2 000 H_2O		324.9247	—	-1326.428	—	—	—	—
	in 5 000 H_2O		324.9247	—	-1327.161	—	—	—	—
	in 10 000 H_2O		324.9247	—	-1327.650	—	—	—	—
$La(NO_3)_3$	in 20 000 H_2O		324.9247	—	-1328.056	—	—	—	—
	in 50 000 H_2O		324.9247	—	-1328.462	—	—	—	—
	in 100 000 H_2O		324.9247	—	-1328.679	—	—	—	—
	in 200 000 H_2O		324.9247	—	-1328.843	—	—	—	—
	in 500 000 H_2O		324.9247	—	-1328.989	—	—	—	—
$La(NO_3)_3$	in 1 000 000 H_2O		324.9247	—	-1329.068	—	—	—	—
	in ∞ H_2O		324.9247	—	-1329.3	—	—	—	—
	in 400 CH_3OH		324.9247	—	-1359.8	—	—	—	—
	in 400 C_2H_5OH		324.9247	—	-1344.3	—	—	—	—
	in 400 $(CH_3)_2CO$ in acetone		324.9247	—	-1353.1	—	—	—	—
$La(NO_3)_3{\cdot}3H_2O$		cr	378.9709	—	-2175.7	—	—	—	—
$La(NO_3)_3{\cdot}4H_2O$		cr	396.9863	—	-2478.2	—	—	—	—
$La(NO_3)_3{\cdot}6H_2O$		cr	433.0171	—	-3063.65	—	—	—	—
$LaSb$		cr	260.6600	—	—	—	11.707	88.78	50.71

Table 76:**La** **LANTHANUM** (Prepared 1972) — Continued Table 76:**La**

Substance Formula and Description	State	Molar mass g mol^{-1}	0 K $\Delta_f H^\circ_0$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H^\circ_0$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
LaBi	cr	347.8900	—	—	—	12.887	100.83	55.94
LaC_2	cr	162.9324	—	-71.	-72.4	—	71.	—
	g	162.9324	586.	587.4	531.8	10.38	255.	44.4
$La_2(CO_3)_3$	cr	457.8482	—	—	-3141.6	—	—	—
$La_2(C_2O_4)_3 \cdot 10H_2O$ oxalate	cr	722.0340	—	—	-5915.	—	—	—
$LaC_2H_3O_2^{2+}$ acetate	ao	197.9552	—	-1183.99	-1062.06	—	-69.9	—
$LaCH_2OHCOO^{2+}$ glycolate	ao	213.9546	—	-1362.31	—	—	—	—
$La(HCO_2)_3$ formate	cr	273.9640	—	—	—	—	—	333.5
$La(CH_3CO_2)_2^+$	ao	257.0004	—	-1663.27	-1436.72	—	56.9	—
$La(CH_2OHCOO)_2^+$	ao	288.9992	—	-2016.10	—	—	—	—
$La(CH_3CO_2)_3$	ao	316.0456	—	-2145.81	-1808.96	—	164.4	—
$La(CH_2OHCOO)_3$	ao	364.0438	—	-2670.98	—	—	—	—
$La(CH_2OHCOO)_4^-$	ao	439.0884	—	-3325.4	—	—	—	—
$La_2(CN_2)_3$ cyanamide	cr	397.8938	—	-833.	—	—	—	—
LaB_6	cr	203.7760	—	-130.	—	—	—	—
$LaAl_2$	cr	192.8730	—	—	—	14.765	98.74	73.72
$LaInTe_3$	cr	636.5300	—	-548.	—	—	—	—
LaAu	g	335.8770	466.1	463.6	410.8	10.29	280.	36.8
LaY	g	227.8150	659.4	657.	—	10.0	—	36.4

Table 88:U **URANIUM** (Prepared 1979) Table 88:U

Substance Formula	Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H_0^\circ$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H_0^\circ$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
U		cr	238.0290	0	0	0	6.364	50.21	27.665
		g	238.0290	535.43	535.6	491.2	6.498	199.77	23.694
U^+		g	238.0290	1133.07	1139.97	—	7.088	—	—
U^{2+}		g	238.0290	2176.	—	—	—	—	—
U^{3+}		g	238.0290	4017.	—	—	—	—	—
U^{3+}		ao	238.0290	—	-489.1	-475.4	—	-192.	—
U^{4+}	unhydrolyzed	ao	238.0290	—	-591.2	-531.0	—	-410.	—
UO		g	254.0284	—	21.	—	—	—	—
UO_2		cr	270.0278	-1081.15	-1084.9	-1031.7	11.280	77.03	63.60
		g	270.0278	-463.80	-465.7	-471.5	13.18	274.6	51.38
UO_2^{+}		ao	270.0278	—	—	-962.7	—	—	—
UO_2^{2+}		ao	270.0278	—	-1019.6	-953.5	—	-97.5	—
$UO_{2.86}\cdot 0.5H_2O$		cr	292.7950	—	-1366.5	—	—	—	—
$UO_{2.86}\cdot 1.5H_2O$		cr	310.8104	—	-1665.7	—	—	—	—
UO_3	γ, orthorhombic	cr	286.0272	-1219.01	-1223.8	-1145.9	14.585	96.11	81.67
UO_3	ϵ, triclinic, red	cr2	286.0272	—	-1217.5	—	—	—	—
		cr3	286.0272	-1213.19	-1217.5	-1140.5	15.046	99.41	81.88
	α, orthorhombic, prev. described as hexagonal								
	β, orthorhombic, orange-red	cr4	286.0272	-1215.561	-1220.26	-1142.27	14.682	96.32	81.34
	δ, cubic, dark red	cr5	286.0272	—	-1219.6	—	—	—	—
	amorphous, orange	am	286.0272	—	-1208.3	—	—	—	—
UO_3		g	286.0272	-816.	—	—	—	—	—
$UO_3\cdot H_2O$	β, orthorhombic	cr	304.0426	—	-1533.9	-1394.8	—	126.	—
	ϵ, monoclinic	cr2	304.0426	—	-1531.3	—	—	—	—
	α, transition to β 278.3K	cr3	304.0426	—	-1528.0	—	—	—	—
$UO_3\cdot 2H_2O$		cr	322.0580	—	-1826.7	-1630.8	—	167.	—
$UO_4\cdot 2H_2O$		cr	338.0574	—	-1786.6	—	—	—	—
$UO_4\cdot 4H_2O$		cr	374.0882	—	-2385.3	—	—	—	—
U_3O_7	β, tetragonal	cr	826.0828	-3415.73	-3427.1	-3242.9	38.108	250.54	215.52
	α, tetragonal	cr2	826.0828	—	—	—	37.694	247.65	213.76
U_3O_8	α, orthorhombic	cr	842.0822	-3563.72	-3574.8	-3369.7	42.744	282.59	238.36
U_4O_9		cr	1096.1106	-4496.59	-4510.4	-4275.1	50.752	334.13	293.34
UH_3	β	cr	241.0530	-117.15	-127.2	-72.8	9.017	63.68	49.29
$UO_2(OH)_2$	from UO_2^{2+}	ai	304.0426	—	-1479.5	-1267.7	—	-118.8	—
UF		g	257.0274	-40.6	-42.	-71.	9.54	251.	37.82
UF_2		g	276.0258	-529.7	-531.	-544.	13.72	297.	66.9
UF_3		cr	295.0242	-1500.8	-1502.1	-1433.4	18.376	123.43	95.10
		g	295.0242	-1056.0	-1059.	-1050.	16.90	331.	74.5
UF_4	monoclinic	cr	314.0226	-1912.72	-1914.2	-1823.3	22.552	151.67	116.02
		g	314.0226	-1594.61	-1598.7	-1572.7	19.92	368.	91.2
$UF_{4.25}$		cr	318.7722	—	-1962.3	-1865.6	—	157.7	—
$UF_4\cdot 2.5H_2O$	orthorhombic	cr	359.0611	—	-2671.5	-2436.6	—	251.0	—
$UF_{4.5}$		cr	323.5218	—	-2007.9	-1905.7	—	164.8	—
UF_5	α	cr	333.0210	—	-2075.3	-1968.5	—	199.6	—
	β	cr2	333.0210	—	-2083.2	-1970.6	—	179.5	—
		g	333.0210	-1932.2	-1937.	-1887.	23.4	389.	109.6
UF_6		cr	352.0194	-2195.8	-2197.0	-2068.5	31.568	227.6	166.77

Table 88:U — **URANIUM** (Prepared 1979) — Continued — Table 88:U

Substance Formula and Description		State	Molar mass g mol^{-1}	0 K $\Delta_f H_0^\circ$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H_0^\circ$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
UF_6		g	352.0194	-2141.3	-2147.4	-2063.7	26.711	377.9	129.62
UOF_2		cr	292.0252	—	-1499.1	-1428.8	—	119.2	—
$UOF_2 \cdot H_2O$		cr	310.0406	—	-1796.6	-1668.9	—	161.1	—
UO_2F_2		cr	308.0246	-1643.94	-1648.1	-1551.8	19.707	135.56	103.22
	from UO_2^{2+}	ai	308.0246	—	-1684.9	-1511.2	—	-125.1	—
UO_2F_2	in 570 H_2O		308.0246	—	-1677.87	—	—	—	—
	in 4 HF + 1 600 H_2O		308.0246	—	-1680.92	—	—	—	—
	in 47 HF + 12 970 H_2O		308.0246	—	-1682.39	—	—	—	—
	in 25 HF + 3 110 H_2O		308.0246	—	-1683.01	—	—	—	—
	in 17 HF + 380.8 H_2O		308.0246	—	-1683.98	—	—	—	—
$UO_2F_2 \cdot 3H_2O$		cr	362.0708	—	-2529.2	—	—	—	—
UOF(OH)		cr	290.0342	—	-1427.	—	—	—	—
$UOF(OH) \cdot 0.5H_2O$		cr	299.0419	—	-1573.6	—	—	—	—
$UO_2(OH)F \cdot H_2O$		cr	324.0490	—	-1892.0	-1719.1	—	180.	—
$UO_2(OH)F \cdot 2H_2O$		cr	342.0644	—	-2188.	-1958.4	—	222.	—
UCl_3		cr	344.3880	-868.64	-866.5	-799.1	22.251	159.0	102.5
UCl_4		cr	379.8410	-1020.77	-1019.2	-930.0	26.28	197.1	122.01
		g	379.8410	—	-809.6	-786.6	—	419.	—
		ai	379.8410	—	-1259.8	-1056.0	—	-184.	—
		aq	379.8410	—	-1207.5	—	—	—	—
UCl_4	in $HClO_4$ + ∞ H_2O:u		379.8410	—	-1207.5	—	—	—	—
	hydrolyzed								
	in HCl + 7.93 H_2O:u		379.8410	—	-1183.2	—	—	—	—
	in HCl + 9.25 H_2O:u		379.8410	—	-1192.0	—	—	—	—
	in HCl + 11.10 H_2O:u		379.8410	—	-1202.1	—	—	—	—
	in HCl + 13.88 H_2O:u		379.8410	—	-1212.5	—	—	—	—
UCl_4	in HCl + 18.50 H_2O:u		379.8410	—	-1223.4	—	—	—	—
	in HCl + 27.75 H_2O:u		379.8410	—	-1234.7	—	—	—	—
	in HCl + 55.5 H_2O:u		379.8410	—	-1247.7	—	—	—	—
	in $HClO_4$ + 27.75 H_2O:u		379.8410	—	-1243.5	—	—	—	—
	in $HClO_4$ + 55.5 H_2O:u		379.8410	—	-1249.8	—	—	—	—
UCl_4	in $HClO_4$ + 111 H_2O:u		379.8410	—	-1252.3	—	—	—	—
	in $HClO_4$ + 555 H_2O:u		379.8410	—	-1239.7	—	—	—	—
UCl_5		cr	415.2940	—	-1059.	-950.	—	242.7	—
UCl_6		cr	450.7470	-1095.	-1092.	-962.	37.24	285.8	175.7
		g	450.7470	—	-1013.	-928.	—	431.	—
$UOCl_2$		cr	324.9344	-1066.21	-1066.9	-996.2	19.188	138.32	95.06
UO_2Cl_2		cr	340.9338	-1241.27	-1243.9	-1146.4	21.577	150.54	107.86
		g	340.9338	—	-979.	—	—	—	—
	from UO_2^{2+}	ai	340.9338	—	-1353.9	-1215.8	—	15.5	—
	in 0.90 HCl + 50 H_2O		340.9338	—	-1343.5	—	—	—	—
UO_2Cl_2	in 1.802 HCl + 50 H_2O		340.9338	—	-1336.4	—	—	—	—
	in 2.703 HCl + 50 H_2O		340.9338	—	-1329.3	—	—	—	—
	in 3.604 HCl + 50 H_2O		340.9338	—	-1322.6	—	—	—	—
	in 4.505 HCl + 50 H_2O		340.9338	—	-1316.3	—	—	—	—
	in 5.405 HCl + 50 H_2O		340.9338	—	-1310.4	—	—	—	—
UO_2Cl_2	in HCl + 7.93 H_2O:u		340.9338	—	-1307.1	—	—	—	—
	in HCl + 9.25 H_2O:u		340.9338	—	-1312.5	—	—	—	—
	in HCl + 11.10 H_2O:u		340.9338	—	-1318.4	—	—	—	—
	in HCl + 13.88 H_2O:u		340.9338	—	-1324.7	—	—	—	—

Substance Formula	and Description	State	Molar mass g mol^{-1}	0 K $\Delta_f H^\circ_0$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H^\circ_0$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
UO_2Cl_2	in HCl + 18.50 H_2O:u		340.9338	—	-1331.3	—	—	—	—
	in HCl + 27.75 H_2O:u		340.9338	—	-1338.5	—	—	—	—
	in HCl + 55.5 H_2O:u		340.9338	—	-1345.6	—	—	—	—
	in HCl + 111.0 H_2O:u		340.9338	—	-1349.3	—	—	—	—
	in HCl + 50 000 H_2O:u		340.9338	—	-1352.7	—	—	—	—
$UO_2Cl_2 \cdot H_2O$		cr	358.9492	—	-1560.2	-1405.3	—	192.5	—
$UO_2Cl_2 \cdot 3H_2O$		cr	394.9800	—	-2165.2	-1895.6	—	272.	—
$UOCl_3$		cr	360.3874	—	-1163.	-1071.	—	171.5	—
$(UO_2)_2Cl_3$		cr	646.4146	—	-2405.0	—	—	—	—
$UO_2(OH)Cl \cdot 2H_2O$		cr	358.5190	—	-2010.8	—	—	—	—
UF_3Cl		cr	330.4772	—	—	—	23.60	162.8	118.8
UF_2Cl_2		cr	346.9318	—	—	—	24.48	174.1	119.7
$UFCl_3$		cr	363.3864	—	—	—	25.40	185.4	120.9
UBr_3		cr	477.7560	—	-699.1	-673.6	—	192.5	108.8
		g	477.7560	—	-392.0	-431.0	—	410.	—
UBr_4		cr	557.6650	—	-802.5	-767.8	—	238.5	128.0
		g	557.6650	—	-603.3	-634.3	—	460.	—
UBr_5		cr	637.5740	—	-810.9	-769.9	—	293.	160.7
$UOBr_2$		cr	413.8464	-959.27	-973.6	-929.7	20.874	157.57	97.99
UO_2Br_2		cr	429.8458	—	-1137.6	-1066.5	—	169.5	—
$UO_2Br_2 \cdot H_2O$		cr	447.8612	—	-1456.0	-1327.5	—	209.2	—
$UO_2Br_2 \cdot 3H_2O$		cr	483.8920	—	-2058.15	-1814.0	—	289.	—
$UOBr_3$		cr	493.7554	—	-954.	-900.	—	205.	—
$UO_2(OH)Br \cdot 2H_2O$		cr	402.9750	—	-1958.3	—	—	—	—
UCl_2Br		cr	388.8440	—	-812.5	-760.6	—	176.	—
UCl_3Br		cr	424.2970	—	-967.8	-894.1	—	213.	—
$UClBr_2$		cr	433.3000	—	-751.0	-715.0	—	192.	—
UCl_2Br_2		cr	468.7530	—	-908.3	-851.4	—	234.	—
$UClBr_3$		cr	513.2090	—	-852.7	-807.5	—	238.	—
UI_3		cr	618.7422	—	-460.7	-459.8	—	222.	112.1
UI_4		cr	745.6466	—	-512.1	-506.7	—	263.6	134.3
		g	745.6466	—	-301.7	-364.9	—	494.	—
UCl_3I		cr	471.2924	—	-898.7	-830.5	—	213.4	—
UBr_3I		cr	604.6604	—	-728.0	—	—	—	—
US		cr	270.0930	-318.4	-318.	-318.	11.150	77.99	50.54
US		g	270.0930	—	305.	—	—	—	—
$US_{1.5}$		cr	286.1250	-428.0	-427.	-427.	14.14	99.6	70.7
$US_{1.9}$	α, hypostoichiometric disulfide	cr	298.9506	—	—	—	15.083	109.66	73.97
US_2	β	cr	302.1570	-527.6	-527.	-526.	15.472	110.42	74.64
		g	302.1570	—	79.	—	—	—	—
US_3		cr	334.2210	-549.28	-549.4	-547.3	19.510	138.49	95.60
UO_2SO_3		cr	350.0900	—	-1661.0	—	—	—	—
$UO_2SO_3 \cdot 4.5H_2O$		cr	431.1593	—	-3009.6	—	—	—	—
UO_2SO_4	β	cr	366.0894	—	-1845.1	-1683.5	—	154.8	145.2
	from UO_2^{2+}	ai	366.0894	—	-1928.8	-1698.2	—	-77.4	—
UO_2SO_4	in 50 H_2O		366.0894	—	-1908.3	—	—	—	—
	in 75 H_2O		366.0894	—	-1910.8	—	—	—	—
	in 100 H_2O		366.0894	—	-1912.5	—	—	—	—
	in 200 H_2O		366.0894	—	-1919.6	—	—	—	—

Table 88:U **URANIUM** (Prepared 1979) — Continued Table 88:U

Substance Formula	Description	State	Molar mass g mol^{-1}	0 K $\Delta_f H^\circ_0$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H^\circ_0$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
UO_2SO_4	in 300 H_2O		366.0894	—	-1925.1	—	—	—	—
	in 400 H_2O		366.0894	—	-1930.1	—	—	—	—
	in H_2SO_4 + 34.7 H_2O:u		366.0894	—	-1907.53	—	—	—	—
	in H_2SO_4 + 55 H_2O:u		366.0894	—	-1908.28	—	—	—	—
$UO_2SO_4 \cdot H_2O$		cr	384.1048	—	-2146.4	-1929.	—	197.	—
$UO_2SO_4 \cdot 2.5H_2O$		cr	411.1279	—	-2607.1	-2300.06	—	249.8	—
$UO_2SO_4 \cdot 3H_2O$		cr	420.1356	—	-2754.3	-2417.7	—	268.	282.8
$UO_2SO_4 \cdot 3.5H_2O$		cr	429.1433	—	-2900.8	-2537.20	—	292.9	—
$U(SO_4)_2$		cr	430.1522	—	-2318.	—	—	—	—
$U(SO_4)_2 \cdot 4H_2O$		cr	502.2138	—	-3483.2	—	—	—	—
$U(SO_4)_2 \cdot 8H_2O$		cr	574.2754	—	-4661.8	—	—	—	—
USe		cr	316.9890	-277.4	-276.	-276.	12.958	96.52	54.81
$USe_{1.33}$		cr	343.0458	—	-326.	—	—	—	—
$USe_{1.5}$		cr	356.4690	—	—	—	17.66	130.54	84.1
USe_2	α	cr	395.9490	—	—	—	17.610	134.98	79.16
UO_2SeO_3		cr	396.9860	—	-1520.0	—	—	—	—
UO_2SeO_4	α	cr	412.9854	—	-1535.9	—	—	—	—
	in H_2SO_4 + 34.7 H_2O:u		412.9854	—	-1598.20	—	—	—	—
UTe		cr	365.6290	—	-184.	—	—	—	—
$UTe_{1.33}$		cr	407.7370	—	-228.0	—	—	—	—
UTe_3		cr	620.8290	—	—	—	26.69	214.2	117.2
UO_2TeO_3		cr	445.6260	—	-1605.4	—	—	—	—
$UN_{0.997}$		cr	251.9937	—	-290.4	—	—	—	—
		cr	252.0357	-289.20	-290.8	-265.7	9.092	62.43	47.57
$UN_{1.466}$	β, sesquinitride	cr	258.5628	—	-362.8	—	—	—	—
$UN_{1.5}$		cr	259.0390	—	-368.2	—	—	—	—
$UN_{1.51}$	α, sesquinitride	cr	259.1791	—	-369.4	—	—	—	—
$UN_{1.59}$	α, sesquinitride	cr	260.2996	-376.94	-380.3	-339.3	9.849	65.02	54.18
$UN_{1.606}$	α, sesquinitride	cr	260.5238	—	-382.4	—	—	—	—
$UN_{1.674}$	α, sesquinitride	cr	261.4762	—	-391.6	—	—	—	—
$UN_{1.73}$	α, sesquinitride	cr	262.2606	-395.39	-399.2	-354.4	10.083	65.86	57.61
$UO_2(NO_3)_2$		cr	394.0376	—	-1349.3	-1104.8	—	243.	—
	from UO_2^{2+}	ai	394.0376	—	-1434.3	-1176.0	—	195.4	—
	in 50 H_2O		394.0376	—	-1431.39	—	—	—	—
	in 100 H_2O		394.0376	—	-1430.76	—	—	—	—
$UO_2(NO_3)_2$	in 200 H_2O		394.0376	—	-1430.59	—	—	—	—
	in 500 H_2O		394.0376	—	-1431.01	—	—	—	—
	in 1 000 H_2O		394.0376	—	-1431.35	—	—	—	—
	in 5 000 H_2O		394.0376	—	-1431.64	—	—	—	—
	in 10 000 H_2O		394.0376	—	-1431.97	—	—	—	—
$UO_2(NO_3)_2$	in 20 000 H_2O		394.0376	—	-1432.02	—	—	—	—
	in 50 000 H_2O		394.0376	—	-1431.22	—	—	—	—
	in 100 000 H_2O		394.0376	—	-1429.51	—	—	—	—
	in 500 000 H_2O		394.0376	—	-1424.94	—	—	—	—
	in 1 000 000 H_2O		394.0376	—	-1423.69	—	—	—	—
$UO_2(NO_3)_2$	in 0.07 HNO_3 + 9 940 H_2O		394.0376	—	-1433.73	—	—	—	—
	in 0.45 HNO_3 + 50 H_2O		394.0376	—	-1431.3	—	—	—	—
	in 0.9 HNO_3 + 50 H_2O		394.0376	—	-1430.5	—	—	—	—
	in 1.6 HNO_3 + 50 H_2O		394.0376	—	-1429.3	—	—	—	—
	in CH_3OH:u		394.0376	—	-1422.1	—	—	—	—

Table 88:U — **URANIUM** (Prepared 1979) — Continued — Table 88:U

Substance Formula and Description		State	Molar mass g mol⁻¹	0 K $\Delta_f H_0^\circ$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H_0^\circ$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
$UO_2(NO_3)_2$	in CH_3CN:u in acetonitrile		394.0376	—	−1408.3	—	—	—	—
	in $HCONH_2$:u in formamide		394.0376	—	−1456.0	—	—	—	—
	in C_2H_5OH:u		394.0376	—	−1441.4	—	—	—	—
	in $(CH_3)_2CO$:u in acetone		394.0376	—	−1435.9	—	—	—	—
	in C_3H_7OH:u in 1-propanol		394.0376	—	−1433.9	—	—	—	—
$UO_2(NO_3)_2$	in $HCON(CH_3)_2$:u in N,N-dimethylformamide		394.0376	—	−1471.5	—	—	—	—
	in $(C_2H_5)_2O$:u in diethyl ether		394.0376	—	−1469.4	—	—	—	—
	in $(CH_3)_2SO$:u in dimethylsulfoxide		394.0376	—	−1491.2	—	—	—	—
	in $HNO_3 + 4.5\ H_2O$:u		394.0376	—	−1398.13	—	—	—	—
	in $HNO_3 + 5.0\ H_2O$:u		394.0376	—	−1400.38	—	—	—	—
$UO_2(NO_3)_2$	in $HNO_3 + 6.0\ H_2O$:u		394.0376	—	−1404.78	—	—	—	—
	in $HNO_3 + 7.0\ H_2O$:u		394.0376	—	−1408.75	—	—	—	—
	in $HNO_3 + 7.50\ H_2O$:u		394.0376	—	−1410.47	—	—	—	—
	in $HNO_3 + 8.0\ H_2O$:u		394.0376	—	−1412.18	—	—	—	—
	in $HNO_3 + 8.5\ H_2O$:u		394.0376	—	−1413.77	—	—	—	—
$UO_2(NO_3)_2$	in $HNO_3 + 9.0\ H_2O$:u		394.0376	—	−1415.24	—	—	—	—
	in $HNO_3 + 9.5\ H_2O$:u		394.0376	—	−1416.49	—	—	—	—
	in $HNO_3 + 10.0\ H_2O$:u		394.0376	—	−1417.46	—	—	—	—
	in $HNO_3 + 11.0\ H_2O$:u		394.0376	—	−1419.63	—	—	—	—
	in $HNO_3 + 12.5\ H_2O$:u		394.0376	—	−1421.93	—	—	—	—
$UO_2(NO_3)_2$	in $HNO_3 + 15.0\ H_2O$:u		394.0376	—	−1424.57	—	—	—	—
	in $HNO_3 + 25.0\ H_2O$:u		394.0376	—	−1431.8	—	—	—	—
$UO_2(NO_3)_2{\cdot}H_2O$		cr	412.0530	—	−1664.0	−1362.5	—	285.	—
$UO_2(NO_3)_2{\cdot}2H_2O$		cr	430.0684	—	−1979.91	−1622.21	—	328.9	278.2
$UO_2(NO_3)_2{\cdot}3H_2O$		cr	448.0838	—	−2281.03	−1866.21	—	370.7	—
$UO_2(NO_3)_2{\cdot}6H_2O$		cr	502.1300	—	−3168.5	−2585.3	—	505.64	466.9
$NH_3(UO_3)_2{\cdot}3H_2O$		cr	643.1313	—	−3480.3	—	—	—	—
$NH_3(UO_3)_3{\cdot}5H_2O$		cr	965.1893	—	−5310.8	—	—	—	—
$(NH_3)_2(UO_3)_3{\cdot}4H_2O$		cr	964.2046	—	−5113.7	—	—	—	—
$(NH_4)_3UO_2F_5$		cr	419.1359	—	−3114.2	−2679.5	—	377.	—
$NH_4(UO_2)_2F_5$		cr	653.0863	—	−3814.6	−3511.8	—	360.	—
$NH_4(UO_2)_2F_5{\cdot}3H_2O$		cr	707.1325	—	−4703.	−4230.	—	485.	—
$NH_4(UO_2)_2F_5{\cdot}4H_2O$		cr	725.1479	—	−5000.	−4468.	—	527.	—
UP		cr	269.0028	−266.9	−268.	−264.	10.79	78.2	49.8
UP_2		cr	299.9766	−303.8	−305.	−297.	15.393	101.7	80.00
U_3P_4		cr	837.9822	−833.5	−837.	−820.	37.11	258.6	174.9
UAs		cr	312.9506	—	−234.	—	—	—	—
UAs_2		cr	387.8722	—	—	—	17.916	123.05	79.96
U_3As_4		cr	1013.7734	−723.4	−720.	−724.	43.535	309.07	187.53
USb		cr	359.7790	—	−138.	—	—	—	—
USb_2		cr	481.5290	−176.82	−176.	−176.	19.230	141.46	80.17
U_3Sb_4		cr	1201.0870	−454.8	−452.	−456.	45.786	349.78	188.20
UBi		cr	447.0090	—	−117.	—	—	—	—
UBi_2		cr	655.9890	—	−109.	—	—	—	—
U_3Bi_4		cr	1550.0070	—	−385.	—	—	—	—
UC		cr	250.0402	−100.00	−98.3	−99.2	9.104	59.20	50.12
		g	250.0402	—	774.	—	—	—	—
$UC_{1.94}$ randomization entropy of 0.65 included		cr	261.3307	−89.16	−87.0	−90.0	10.552	71.04	60.75

Table 88:U — **URANIUM** (Prepared 1979) — Continued — Table 88:U

Substance Formula and Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H_0^\circ$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H_0^\circ$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
UC_2	g	262.0514	—	661.	—	—	—	—
U_2C_3	cr	512.0916	-185.90	-181.6	-187.4	20.205	137.78	107.36
UO_2CO_3	cr	330.0372	—	-1691.2	-1562.6	—	138.1	—
from UO_2^{2+}	ai	330.0372	—	-1696.6	-1481.5	—	-154.4	—
$UO_2C_2O_4$ oxalate	cr	358.0478	—	-1796.9	—	—	—	—
$UO_2C_2O_4 \cdot H_2O$	cr	376.0632	—	-2112.0	—	—	—	—
$UO_2C_2O_4 \cdot 3H_2O$	cr	412.0940	—	-2715.4	—	—	—	—
$UO_2(HCO_2)_2$ formate	cr	360.0638	—	-1849.7	—	—	—	—
$UO_2(HCO_2)_2 \cdot H_2O$	cr	378.0792	—	-2157.10	—	—	—	—
$UO_2(CH_3CO_2)_2$ acetate	cr	388.1182	—	-1963.55	—	—	—	—
$UO_2(CH_3CO_2)_2 \cdot 2H_2O$	cr	424.1490	—	-2558.9	—	—	—	—
USi	cr	266.1150	—	-80.3	—	—	—	—
USi_2	cr	294.2010	—	-130.5	—	—	—	—
USi_3	cr	322.2870	—	-132.2	—	—	—	—
U_3Si	cr	742.1730	-134.7	-134.	-134.	23.297	174.01	107.91
U_3Si_2	cr	770.2590	—	-169.5	—	—	—	—
USn_3	cr	594.0990	—	-90.4	-90.4	—	205.0	—
UPb_3	cr	859.5990	—	-67.	—	—	—	—
UB	g	248.8400	—	761.	—	—	—	—
$UB_{1.98}$	cr	259.4348	-160.29	-160.2	-158.2	8.820	55.10	55.35
UB_2	cr	259.6510	-161.59	-161.5	-159.4	8.878	55.52	55.77
	g	259.6510	—	678.	—	—	—	—
UB_4	cr	281.2730	—	-243.	—	—	—	—
UB_{12}	cr	367.7610	—	-397.	—	—	—	—
UAl_2	cr	291.9920	—	-92.	—	—	—	—
UAl_3	cr	318.9735	—	-104.6	—	—	—	—
UAl_4	cr	345.9550	—	-130.	—	—	—	—
UGa	cr	307.7490	—	-35.6	-37.7	—	96.2	—
UGa_2	cr	377.4690	—	-72.8	-74.5	—	138.	—
UGa_3	cr	447.1890	—	-102.1	-103.3	—	175.7	—
UIn_3	cr	582.4890	—	-63.6	—	—	—	—
UTl_3	cr	851.1390	—	-59.	—	—	—	—
UFe_2	cr	349.7230	—	-32.2	—	—	—	—
$UO_2CrO_4 \cdot 5.5H_2O$	cr	485.1061	—	-3498.	—	—	—	—

Substance Formula	Description	State	Molar mass g mol^{-1}	0 K $\Delta_f H^\circ_0$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H^\circ_0$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
Pa		cr	231.0359	0	0	0	—	51.9	—
		g	231.0359	—	607.	563.	6.351	198.05	22.93
Pa^{4+}		ao	231.0359	—	-619.	—	—	—	—
	in HCl + 3.43 H_2O:u		231.0359	—	-667.8	—	—	—	—
	in HCl + 8.16 H_2O:u		231.0359	—	-605.8	—	—	—	—
Pa^{4+}	in HCl + 54.4 H_2O:u		231.0359	—	-618.0	—	—	—	—
Pa^{5+}	in HCl + 3.43 H_2O:u		231.0359	—	-677.0	—	—	—	—
PaO_2		cr	263.0347	—	—	—	—	74.5	—
$PaCl_4$		cr	372.8479	—	-1043.	-953.	—	192.	—
	in HCl + 3.43 H_2O:u		372.8479	—	-1213.8	—	—	—	—
$PaCl_4$	in HCl + 8.16 H_2O:u		372.8479	—	-1220.1	—	—	—	—
	in HCl + 54.4 H_2O:u		372.8479	—	-1275.7	—	—	—	—
$PaCl_5$		cr	408.3009	—	-1144.7	-1034.2	—	238.	—
		g	408.3009	—	-1050.	-987.	—	393.	—
	in HCl + 3.43 H_2O:u		408.3009	—	-1348.1	—	—	—	—
$PaBr_4$		cr	550.6719	—	-824.2	-787.8	—	234.	—
	in HCl + 8.16 H_2O:u		550.6719	—	-1040.56	—	—	—	—
	in HCl + 54.4 H_2O:u		550.6719	—	-1098.05	—	—	—	—
$PaBr_5$		cr	630.5809	—	-862.	-820.	—	289.	—
		g	630.5809	—	-753.	-762.	—	465.	—
$PaBr_5$	in HCl + 3.43 H_2O:u		630.5809	—	-1107.9	—	—	—	—
$PaOBr_2$		cr	406.8533	—	-1000.	—	—	—	—
PaI_4		cr	738.6535	—	-515.5	—	—	—	—
	in HCl + 54.4 H_2O:u		738.6535	—	-833.0	—	—	—	—

Table 90:Th — THORIUM (Prepared 1980) — Table 90:Th

Substance Formula and Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
Th	cr	232.0381	0	0	0	6.510	53.39	27.32
	g	232.0381	598.65	598.3	557.53	6.197	190.15	20.79
Th^{+}	g	232.0381	1180.3	1186.2	—	—	—	—
Th^{2+}	g	232.0381	2292.8	2305.0	—	—	—	—
Th^{3+}	g	232.0381	4219.1	4237.1	—	—	—	—
Th^{4+}	g	232.0381	6996.	7021.	—	—	—	—
	ao	232.0381	—	-769.0	-705.1	—	-422.6	—
Th_2	g	464.0762	910.4	908.	851.8	10.63	295.1	37.32
ThO	g	248.0375	-23.0	-25.1	-50.2	8.824	240.06	31.25
ThO^{+}	g	248.0375	565.	569.	—	—	—	—
ThO_2	cr	264.0369	-1221.77	-1226.4	-1168.77	10.556	65.23	61.76
	g	264.0369	-495.0	-497.9	-506.7	12.22	287.6	47.3
ThO_2^{+}	g	264.0369	343.	347.	—	—	—	—
ThH_2	cr	234.0541	-131.4	-139.7	-100.0	6.761	50.71	36.69
$ThH_{3.75}$	cr	235.8181	-196.6	-210.9	-138.0	8.029	54.43	51.30
$Th(OH)^{3+}$	ao	249.0455	—	-1030.1	-920.5	—	-343.	—
$Th(OH)_2^{2+}$	ao	266.0529	—	-1282.4	-1140.9	—	-218.	—
$Th_2(OH)_2^{6+}$	ao	498.0910	—	—	-1861.9	—	—	—
ThF	g	251.0365	—	—	—	9.33	257.4	34.64
ThF^{3+}	ao	251.0365	—	-1106.7	-1029.7	—	-300.0	—
ThF_2	g	270.0349	-652.7	-655.	-667.	13.01	295.1	52.43
ThF_2^{2+}	ao	270.0349	—	-1442.6	-1343.9	—	-205.	—
ThF_3	g	289.0333	-1179.1	-1182.0	-1176.5	16.86	339.4	73.2
ThF_3^{+}	g	289.0333	-427.	-423.	—	—	—	—
	ao	289.0333	—	-1778.6	-1649.3	—	-142.	—
ThF_4	cr	308.0317	-2088.82	-2091.6	-1997.0	21.397	142.05	110.54
	g	308.0317	-1745.1	-1748.9	-1714.2	20.50	341.9	92.9
	ao	308.0317	—	-2115.0	-1947.2	—	-105.	—
$ThF_4 \cdot 2.5H_2O$	cr	353.0702	—	-2848.0	-2607.3	—	234.3	—
$ThOF_2$	cr	286.0343	—	-1665.2	-1589.5	—	104.6	—
ThCl	g	267.4911	—	—	—	9.83	269.1	36.44
$ThCl^{3+}$	ao	267.4911	—	-936.0	-842.7	—	-343.	—
$ThCl_2$	g	302.9441	—	—	—	14.06	317.	55.2
$ThCl_2^{2+}$	ao	302.9441	—	—	-971.9	—	—	—
$ThCl_3$	g	338.3971	—	—	—	18.70	370.	77.8
$ThCl_3^{+}$	ao	338.3971	—	—	-1108.3	—	—	—
$ThCl_4$	cr	373.8501	—	-1186.6	-1094.5	—	190.4	—
	g	373.8501	-965.58	-966.1	-935.5	24.35	397.5	101.7
$ThCl_4 \cdot 2H_2O$	cr	409.8809	—	-1824.2	—	—	—	—
$ThCl_4 \cdot 4H_2O$	cr	445.9117	—	-2459.4	—	—	—	—
$ThCl_4 \cdot 7H_2O$	cr	499.9579	—	-3365.6	—	—	—	—
$ThCl_4 \cdot 8H_2O$	cr	517.9733	—	-3665.6	—	—	—	—
$ThClO_3^{+}$	ao	315.4893	—	—	-718.3	—	—	—
$ThOCl_2$	cr	318.9435	—	-1232.2	-1156.0	—	123.4	—
ThBr	g	311.9471	—	—	—	10.25	280.9	37.45
$ThBr_2$	g	391.8561	—	—	—	14.90	339.0	56.9
$ThBr_3$	g	471.7651	—	—	—	20.46	406.0	80.8
$ThBr_4$	cr	551.6741	—	-965.2	-927.2	—	230.1	—
	g	551.6741	-733.29	-762.7	-784.5	26.07	431.1	105.0
$ThBr_4 \cdot 7H_2O$	cr	677.7819	—	-3168.1	—	—	—	—

Table 90:**Th** **THORIUM** (Prepared 1980) — Continued Table 90:**Th**

Substance Formula and Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H_0^\circ$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H_0^\circ$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
$ThBr_4 \cdot 10H_2O$	cr	731.8281	—	−4079.8	—	—	—	—
$ThBr_4 \cdot 12H_2O$	cr	767.8589	—	−4684.0	—	—	—	—
$Th(BrO_3)^{3+}$	ao	359.9453	—	—	−695.0	—	—	—
$ThOBr_2$	cr	407.8555	—	−1187.4	—	—	—	—
$Th(BrO_3)_2^{2+}$	ao	487.8525	—	—	−679.4	—	—	—
ThI	g	358.9425	—	—	—	10.42	288.4	37.57
ThI_2	g	485.8469	—	—	—	15.44	355.7	57.3
ThI_3	g	612.7513	—	—	—	21.42	429.8	82.0
ThI_4	cr	739.6557	—	−664.8	−655.2	—	255.2	—
	g	739.6557	−455.60	−460.7	−515.1	27.82	468.7	106.3
$Th(IO_3)^{3+}$	ao	406.9407	—	—	−853.1	—	—	—
$ThOI_2$	cr	501.8463	—	−1000.8	−967.3	—	159.0	—
$ThOI_2 \cdot 3.5H_2O$	cr	564.9002	—	−2051.0	—	—	—	—
$Th(IO_3)_2^{2+}$	ao	581.8433	—	—	−995.7	—	—	—
$Th(IO_3)_3^{+}$	ao	756.7459	—	—	−1140.	—	—	—
$Th(OH)I_3 \cdot 10H_2O$	cr	809.9127	—	−3968.5	—	—	—	—
ThS	cr	264.1021	—	−395.4	−390.8	—	69.79	—
ThS_2	cr	296.1661	—	−626.	−620.	—	96.23	—
Th_2S_3	cr	560.2682	—	−1084.	−1077.	—	180.	—
Th_3S_7	cr	920.5623	—	−1900.	—	—	—	—
Th_7S_{12}	cr	2009.0347	—	−4138.	−4121.	—	695.	—
$Th(SO_4)^{2+}$	ao	328.0997	—	−1658.5	−1480.7	—	−230.	—
$Th(SO_4)_2$	cr	424.1613	—	−2542.6	−2310.3	—	159.0	—
$Th(SO_4)_3^{2-}$	ao	520.2229	—	—	−2998.4	—	—	—
$Th(SO_4)_4^{4-}$	ao	616.2845	—	—	−3731.4	—	—	—
ThN	cr	246.0448	−388.82	−391.2	−363.6	8.452	56.07	45.2
	g	246.0448	—	494.	—	—	—	—
Th_3N_4	cr	752.1411	—	−1315.0	−1212.9	—	201.	—
$Th(NO_3)^{3+}$	ao	294.0430	—	—	−823.0	—	—	—
$Th(NO_3)_2^{2+}$	ao	356.0479	—	—	−938.8	—	—	—
$Th(NO_3)_4$	cr	480.0577	—	−1441.4	—	—	—	—
in 350 H_2O		480.0577	—	−1593.48	—	—	—	—
$Th(NO_3)_4 \cdot 4H_2O$	cr	552.1193	—	−2704.8	—	—	—	—
$Th(NO_3)_4 \cdot 5H_2O$	cr	570.1347	—	−3007.79	−2324.88	—	543.2	—
Th_2N_2O	cr	508.0890	—	−1347.	—	—	—	—
$ThCl_4 \cdot NH_4Cl$	cr	427.3418	—	−1555.2	—	—	—	—
$ThCl_4 \cdot 2NH_4Cl \cdot 10H_2O$	cr	660.9875	—	−4894.0	—	—	—	—
$ThCl_4 \cdot 4NH_3$	cr	441.9729	—	−1702.5	—	—	—	—
$Th(NH_3)_4Cl_4$	cr2	441.9729	—	−1804.6	—	—	—	—
$ThCl_4 \cdot 6NH_3$	cr	476.0343	—	−1923.4	—	—	—	—
$Th(NH_3)_4Cl_4 \cdot 2NH_3$	cr2	476.0343	—	−2080.7	—	—	—	—
$ThCl_4 \cdot 7NH_3$	cr	493.0650	—	−2016.7	—	—	—	—
$Th(NH_3)_4Cl_4 \cdot 3NH_3$	cr2	493.0650	—	−2212.5	—	—	—	—
$ThCl_4 \cdot 12NH_3$	cr	578.2185	—	−2447.2	—	—	—	—
$Th(NH_3)_6Cl_4 \cdot 6NH_3$	cr2	578.2185	—	−2642.6	—	—	—	—
$ThCl_4 \cdot 18NH_3$	cr	680.4027	—	−2925.9	—	—	—	—
$Th(NH_3)_6Cl_4 \cdot 12NH_3$	cr2	680.4027	—	−3122.1	—	—	—	—
ThP	cr	263.0119	—	−348.1	−341.16	—	71.1	—
	g	263.0119	537.6	536.	485.	9.58	267.5	35.6
Th_3P_4	cr	820.0095	—	−1142.	−1113.	—	222.	—

Table 90:**Th** **THORIUM** (Prepared 1980) — Continued Table 90:**Th**

Substance Formula and Description	State	Molar mass g mol^{-1}	0 K $\Delta_f H^\circ_0$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H^\circ_0$	S° J mol^{-1} K^{-1}	C_p
$Th(H_2PO_4)^{3+}$	ao	329.0255	—	—	-1861.8	—	—	—
$Th(H_2PO_4)_2{}^{2+}$	ao	426.0129	—	—	-3016.5	—	—	—
ThC	cr	244.0493	—	-123.8	—	—	—	—
$ThC_{1.94}$	cr	255.3398	-148.1	-146.	-147.7	10.238	68.49	56.69
ThC_2	g	256.0605	—	724.	—	—	—	—
$ThC_2{}^+$	g	256.0605	—	1351.	—	—	—	—
$Th(C_2O_4)^{2+}$ oxalate	ao	320.0581	—	—	-1432.2	—	—	—
$Th(C_2O_4)_2 \cdot 6H_2O$	cr	516.1705	—	—	-3617.9	—	—	—
$Th(C_2O_4)_3{}^{2-}$	ao	496.0981	—	—	-2873.8	—	—	—
$Th(CH_3CO_2)^{3+}$ acetate	ao	291.0833	—	—	-1084.9	—	—	—
$Th(SCN)^{3+}$	ao	290.1200	—	—	-621.8	—	—	—
$Th(SCN)_2{}^{2+}$	ao	348.2019	—	—	-537.6	—	—	—
$Th(SCN)_3{}^+$	ao	406.2838	—	—	-447.2	—	—	—
$Th(SCN)_4$	ao	464.3657	—	—	-360.2	—	—	—
ThSi	cr	260.1241	—	-121.	—	—	—	—
$ThSi_2$	cr	288.2101	—	-165.	—	—	—	—
Th_3Si_2	cr	752.2863	—	-271.	—	—	—	—
Th_3Si_5	cr	836.5443	—	-463.	—	—	—	—
ThGe	cr	304.6281	—	-79.	—	—	—	—
$ThGe_2$	cr	377.2181	—	-117.	—	—	—	—
$ThGe_3$	cr	449.8081	—	-141.	—	—	—	—
Th_3Ge	cr	768.7043	—	-109.	—	—	—	—
Th_3Ge_2	cr	841.2943	—	-199.	—	—	—	—
Th_3Ge_5	cr	1059.0643	—	-318.	—	—	—	—
$ThSn_3$	cr	588.1081	—	-162.3	—	—	—	—
$ThPb_3$	cr	853.6081	—	-117.2	—	—	—	—
ThB	g	242.8491	864.4	866.	807.	9.41	255.3	35.1
ThB_6	cr	296.9041	—	—	—	—	117.	—
$ThIn_3$	cr	576.4981	—	-150.6	—	—	—	—
$ThTl_3$	cr	845.1481	—	-103.8	—	—	—	—
$ThNi_2$	cr	349.4581	—	-133.9	-131.4	—	104.6	—
$ThNi_5$	cr	525.5881	—	-259.4	-246.9	—	159.	—
Th_2Ni_{17}	cr	1462.1462	—	-471.1	-460.2	—	577.	—
ThCo	cr	290.9713	—	-93.7	-85.4	—	54.8	—
$ThCo_5$	cr	526.7041	—	-179.1	-166.5	—	150.6	—
Th_2Co_7	cr	876.6086	—	-375.7	-337.6	—	188.3	—
Th_2Co_{17}	cr	1465.9406	—	-313.	-294.	—	552.	—
Th_7Co_3	cr	1801.0663	—	-301.	-293.	—	431.	—
$ThFe_3$	cr	399.5791	—	-98.7	-83.7	—	85.4	—
$ThFe_5$	cr	511.2731	—	-115.	-99.6	—	138.1	—
Th_2Fe_7	cr	855.0052	—	-205.	-174.9	—	197.	—
Th_2Fe_{17}	cr	1413.4752	—	-236.	-207.9	—	477.	—
Th_7Fe_3	cr	1791.8077	—	-51.	-56.1	—	473.	—
ThRu	g	333.1081	670.7	669.	613.8	9.92	267.9	36.4
ThPt	g	427.1281	615.17	613.0	555.2	10.04	289.2	36.8
ThIr	g	424.2381	692.03	690.4	630.5	10.08	289.2	36.8
$ThRe_2$	cr	604.4381	—	-174.1	-173.2	—	124.3	—

Table 91:**Ac** **ACTINIUM** (Prepared 1980) Table 91:**Ac**

Substance Formula and Description	State	Molar mass g mol^{-1}	0 K $\Delta_f H_0^\circ$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H_0^\circ$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
Ac	cr	227.0280	0	0	0	—	56.5	27.2
	g	227.0280	—	406.	366.	6.197	188.1	20.84
Ac^+	g	227.0280	—	870.	—	—	—	—

Table 92:**Be** **BERYLLIUM** (Prepared 1967) Table 92:**Be**

Substance Formula	and Description	State	Molar mass g mol^{-1}	0 K $\Delta_f H_0^\circ$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H_0^\circ$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
Be		cr	9.0122	0	0	0	1.950	9.50	16.44
		g	9.0122	320.03	324.3	286.6	6.197	136.269	20.786
Be^{+}		g	9.0122	1219.51	1229.93	—	6.197	—	—
Be^{2+}		g	9.0122	2976.62	2993.23	—	6.197	—	—
Be^{3+}		g	9.0122	17825.26	17848.07	—	6.197	—	—
Be^{4+}		g	9.0122	38831.74	38860.74	—	6.197	—	—
Be^{2+}		ao	9.0122	—	-382.8	-379.73	—	-129.7	—
BeO		cr	25.0116	-606.09	-609.6	-580.3	2.799	14.14	25.52
		g	25.0116	—	117.	—	—	—	—
BeO_2^{2-}		ao	41.0110	—	-790.8	-640.1	—	-159.	—
Be_2O		g	34.0238	—	-84.	—	—	—	—
$(BeO)_2$		g	50.0232	—	-431.	—	—	—	—
$(BeO)_3$		g	75.0348	—	-1088.	—	—	—	—
$(BeO)_4$		g	100.0464	—	-1636.	—	—	—	—
$(BeO)_5$		g	125.0580	—	-2167.	—	—	—	—
$(BeO)_6$		g	150.0696	—	-2724.	—	—	—	—
BeH		g	10.0202	314.	316.3	285.8	8.627	176.72	29.08
BeH_2		cr	11.0282	—	-19.25	—	—	—	—
$Be(OH)_2$	α	cr	43.0270	—	-902.5	-815.0	—	51.9	—
	β	cr2	43.0270	—	-905.8	-817.5	—	50.	—
$Be(OH)_2$	freshly precipitated	am	43.0270	—	-897.9	—	—	—	—
		g	43.0270	—	-661.	—	—	—	—
$Be(OH)_2 \cdot 0.75H_2O$		am	56.5385	—	-1116.7	—	—	—	—
$Be_3(OH)_3^{3+}$		ao	78.0588	—	—	-1801.6	—	—	—
BeF		g	28.0106	-177.44	-174.9	-203.4	8.711	205.75	29.87
BeF_2	α, quartz	cr	47.0090	-1024.45	-1026.8	-979.4	8.468	53.35	51.84
	β, cristobalite	cr2	47.0090	—	-1023.8	—	—	—	—
		vit	47.0090	—	-1022.2	—	—	—	—
		g	47.0090	—	-793.7	—	—	—	—
		aq	47.0090	—	-1046.0	—	—	—	—
BeF_2	in 100 (HF + 8.0 H_2O)		47.0090	—	-1060.48	—	—	—	—
	in 100 (HF + 7.0 H_2O)		47.0090	—	-1060.23	—	—	—	—
	in 100 (HF + 6.0 H_2O)		47.0090	—	-1059.89	—	—	—	—
	in 100 (HF + 5.0 H_2O)		47.0090	—	-1059.18	—	—	—	—
	in 100 (HF + 4.0 H_2O)		47.0090	—	-1057.88	—	—	—	—
BeF_2	in 100 (HF + 3.0 H_2O)		47.0090	—	-1055.96	—	—	—	—
	in 100 (HF + 2.0 H_2O)		47.0090	—	-1053.45	—	—	—	—
	in 100 (HF + 1.5 H_2O)		47.0090	—	-1051.86	—	—	—	—
Be_2OF_2		g	72.0206	—	-1222.	—	—	—	—
BeCl		g	44.4652	56.1	59.	29.	8.87	217.7	31.63
$BeCl_2$	α	cr	79.9182	-491.20	-490.4	-445.6	11.979	82.68	64.85
	β	cr2	79.9182	-496.10	-495.8	-448.9	11.418	75.81	62.43
		g	79.9182	—	-358.6	—	—	—	—
		aq	79.9182	—	-715.9	—	—	—	—
$BeCl_2 \cdot 4H_2O$		cr	151.9798	—	-1808.3	—	—	—	—
$BeCl_2$	in 6.3 (HCl + 10.65 H_2O)		79.9182	—	-684.5	—	—	—	—
	in 38.3 (HCl + 9.72 H_2O)		79.9182	—	-687.4	—	—	—	—
	in 45.8 (HCl + 7.25 H_2O)		79.9182	—	-677.8	—	—	—	—
	in C_2H_5OH:u		79.9182	—	-649.	—	—	—	—
Be_2Cl_4		g	159.8364	—	-845.	—	—	—	—

Table 92:**Be** **BERYLLIUM** (Prepared 1967) — Continued Table 92:**Be**

Substance Formula	Substance Description	State	Molar mass g mol⁻¹	0 K: $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar): $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
$BeBr_2$		cr	168.8302	—	-353.5	—	—	—	—
	in HCl + 8.8 H_2O:u		168.8302	—	-586.6	—	—	—	—
BeI_2		cr	262.8210	—	-192.5	—	—	—	—
	in HCl + 8.8 H_2O:u		262.8210	—	-454.0	—	—	—	—
BeS		cr	41.0762	—	-234.3	—	—	—	—
$BeSO_4$	α, tetragonal	cr	105.0738	-1194.553	-1205.20	-1093.80	13.075	77.91	85.69
		ai	105.0738	—	-1292.0	-1124.26	—	-109.6	—
	in 15 H_2O		105.0738	—	-1275.16	—	—	—	—
	in 20 H_2O		105.0738	—	-1277.50	—	—	—	—
	in 25 H_2O		105.0738	—	-1278.97	—	—	—	—
$BeSO_4$	in 50 H_2O		105.0738	—	-1281.81	—	—	—	—
	in 75 H_2O		105.0738	—	-1282.86	—	—	—	—
	in 100 H_2O		105.0738	—	-1283.48	—	—	—	—
	in 200 H_2O		105.0738	—	-1284.74	—	—	—	—
	in 400 H_2O		105.0738	—	-1285.91	—	—	—	—
$BeSO_4$	in 500 H_2O		105.0738	—	-1286.29	—	—	—	—
	in 1 000 H_2O		105.0738	—	-1287.54	—	—	—	—
	in 2 000 H_2O		105.0738	—	-1288.67	—	—	—	—
	in 3 000 H_2O		105.0738	—	-1289.51	—	—	—	—
	in 4 000 H_2O		105.0738	—	-1289.76	—	—	—	—
$BeSO_4$	in 5 000 H_2O		105.0738	—	-1290.22	—	—	—	—
	in 100 (HCl + 55.5 H_2O)		105.0738	—	-1234.3	—	—	—	—
	in 200 (HCl + 27.75 H_2O)		105.0738	—	-1232.6	—	—	—	—
	in 300 (HCl + 18.5 H_2O)		105.0738	—	-1230.5	—	—	—	—
	in 400 (HCl + 13.88 H_2O)		105.0738	—	-1229.3	—	—	—	—
$BeSO_4 \cdot H_2O$		cr	123.0892	—	-1523.8	—	—	—	—
$BeSO_4 \cdot 2H_2O$		cr	141.1046	-1798.342	-1823.14	-1598.08	24.539	163.22	153.26
$BeSO_4 \cdot 4H_2O$	tetragonal	cr	177.1354	-2383.549	-2423.75	-2080.40	34.752	232.97	216.61
$BeBr_2 \cdot 2H_2S$		cr	236.9902	—	-469.0	—	—	—	—
$BeI_2 \cdot 2H_2S$		cr	330.9810	—	-292.0	—	—	—	—
$BeSeO_4$		cr	151.9698	—	-890.4	—	—	—	—
		ai	151.9698	—	-982.0	-820.8	—	-75.7	—
	in 800 H_2O		151.9698	—	-979.5	—	—	—	—
$BeSeO_4 \cdot 2H_2O$		cr	188.0006	—	-1507.5	—	—	—	—
$BeSeO_4 \cdot 4H_2O$		cr	224.0314	—	-2112.9	—	—	—	—
Be_3N_2	α, cubic	cr	55.0500	—	-588.3	—	—	—	—
	β, hexagonal	cr2	55.0500	—	-571.1	—	—	—	—
$Be(NO_3)_2$		aq	133.0220	—	-799.1	—	—	—	—
$BeCl_2 \cdot 2NH_3$		cr	113.9796	—	-843.9	—	—	—	—
$BeCl_2 \cdot 4NH_3$		cr	148.0410	—	-1089.5	—	—	—	—
$BeCl_2 \cdot 6NH_3$		cr	182.1024	—	-1247.7	—	—	—	—
$BeCl_2 \cdot 12NH_3$		cr	284.2866	—	-1715.0	—	—	—	—
$BeBr_2 \cdot 4NH_3$		cr	236.9530	—	-983.7	—	—	—	—
$BeBr_2 \cdot 6NH_3$		cr	271.0144	—	-1148.1	—	—	—	—
$BeBr_2 \cdot 10NH_3$		cr	339.1372	—	-1461.1	—	—	—	—
$BeI_2 \cdot 4NH_3$		cr	330.9438	—	-868.6	—	—	—	—
$BeI_2 \cdot 6NH_3$		cr	365.0052	—	-1034.3	—	—	—	—
$BeI_2 \cdot 13NH_3$		cr	484.2201	—	-1583.2	—	—	—	—
Be_2C		cr	30.0356	—	-117.2	—	—	—	—
$BeCO_3$		cr	69.0216	—	-1025.	—	—	—	—

Table 92:**Be** **BERYLLIUM** (Prepared 1967) — Continued Table 92:**Be**

Substance Formula and Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
Be_2SiO_4	cr	110.1080	-2137.06	-2149.3	-2032.5	12.226	64.31	95.56
$Be(BO_2)_2$	g	94.6318	—	-1360.	—	—	—	—
$Be_3B_2O_6$	cr	144.6550	—	-3139.3	—	—	—	—
BeOAl	g	51.9931	—	-21.	—	—	—	—
$BeO \cdot Al_2O_3$ chrysoberyl	cr	126.9728	-2285.80	-2300.8	-2178.5	13.088	66.27	105.39
$BeO \cdot 3Al_2O_3$	cr	330.8952	-5588.36	-5627.1	-5320.2	34.112	175.7	265.18
$BeMoO_4$	cr	168.9498	—	-1372.	—	—	—	—
$NbBe_2$	cr	110.9304	—	-61.1	—	—	—	—
$NbBe_8$	cr	165.0036	—	-84.	—	—	—	—
$NbBe_{12}$	cr	201.0524	—	-126.	—	—	—	—
$PuBe_{13}$	cr	356.2086	—	-151.	—	—	—	—
UBe_{13}	cr	355.1876	-163.93	-163.	-163.	32.47	180.3	242.09

Table 93:**Mg** **MAGNESIUM** (Prepared 1967) Table 93:**Mg**

Substance Formula	Substance Description	State	Molar mass g mol^{-1}	0 K $\Delta_f H^\circ_0$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H^\circ_0$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p° J mol^{-1} K^{-1}
Mg		cr	24.3120	0	0	0	5.000	32.68	24.89
		g	24.3120	146.499	147.70	113.10	6.197	148.650	20.786
Mg^{+}		g	24.3120	884.242	891.635	—	6.197	—	—
Mg^{2+}		g	24.3120	2334.915	2348.504	—	6.197	—	—
Mg^{3+}		g	24.3120	10067.54	10087.33	—	6.197	—	—
Mg^{4+}		g	24.3120	20609.97	20635.95	—	6.201	—	—
Mg^{5+}		g	24.3120	34240.35	34272.52	—	6.197	—	—
Mg^{6+}		g	24.3120	52235.6	52274.1	—	6.372	—	—
Mg^{7+}		g	24.3120	73939.2	73984.0	—	6.197	—	—
Mg^{8+}		g	24.3120	99600.1	99650.7	—	6.197	—	—
Mg^{9+}		g	24.3120	131237.4	131294.3	—	6.197	—	—
Mg^{10+}		g	24.3120	166694.3	166757.5	—	6.197	—	—
Mg^{11+}		g	24.3120	336684.4	336753.4	—	—	—	—
Mg^{2+}		ao	24.3120	—	–466.85	–454.8	—	–138.1	—
Mg_2		g	48.6240	288.15	287.73	—	9.54	—	—
MgO	macrocrystal (periclase)	cr	40.3114	–597.530	–601.70	–569.43	5.167	26.94	37.15
	microcrystal	cr2	40.3114	–593.936	–597.98	–565.95	5.297	27.91	37.66
		g	40.3114	—	17.	—	—	—	—
MgH_2		cr	26.3280	–67.15	–75.3	–35.9	5.314	31.09	35.35
$MgOH^{+}$		ao	41.3194	—	—	–626.7	—	—	—
$Mg(OH)_2$		cr	58.3268	–913.794	–924.54	–833.51	11.401	63.18	77.03
	precipitated	am	58.3268	—	–920.5	—	—	—	—
		g	58.3268	—	–561.	—	—	—	—
		ai	58.3268	—	–926.84	–769.4	—	–159.4	—
MgF		g	43.3104	–221.29	–221.8	–247.7	8.966	220.98	32.55
MgF^{+}		g	43.3104	519.	527.	—	—	—	—
MgF_2		cr	62.3088	–1119.51	–1123.4	–1070.2	9.916	57.24	61.59
		g	62.3088	–722.07	–723.8	–730.5	12.042	258.39	48.62
MgCl		g	59.7650	–41.4	–42.	–67.	9.37	233.6	34.81
$MgCl_2$		cr	95.2180	–640.905	–641.32	–591.79	13.757	89.62	71.38
$MgCl_2$		g	95.2180	—	–400.4	—	—	—	—
		ai	95.2180	—	–801.15	–717.1	—	–25.1	—
	in 10 H_2O		95.2180	—	–781.65	—	—	—	—
	in 12 H_2O		95.2180	—	–784.83	—	—	—	—
	in 15 H_2O		95.2180	—	–788.47	—	—	—	—
$MgCl_2$	in 20 H_2O		95.2180	—	–791.49	—	—	—	—
	in 25 H_2O		95.2180	—	–793.16	—	—	—	—
	in 50 H_2O		95.2180	—	–795.92	—	—	—	—
	in 75 H_2O		95.2180	—	–796.88	—	—	—	—
	in 100 H_2O		95.2180	—	–797.43	—	—	—	—
$MgCl_2$	in 200 H_2O		95.2180	—	–798.35	—	—	—	—
	in 300 H_2O		95.2180	—	–798.68	—	—	—	—
	in 400 H_2O		95.2180	—	–798.89	—	—	—	—
	in 500 H_2O		95.2180	—	–799.06	—	—	—	—
	in 600 H_2O		95.2180	—	–799.157	—	—	—	—
$MgCl_2$	in 800 H_2O		95.2180	—	–799.345	—	—	—	—
	in 1 000 H_2O		95.2180	—	–799.479	—	—	—	—
	in 2 000 H_2O		95.2180	—	–799.880	—	—	—	—
	in 5 000 H_2O		95.2180	—	–800.269	—	—	—	—
	in 10 000 H_2O		95.2180	—	–800.495	—	—	—	—

Substance Formula and Description		State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
$MgCl_2$	in 20 000 H_2O		95.2180	—	-800.667	—	—	—	—
	in 50 000 H_2O		95.2180	—	-800.834	—	—	—	—
	in 100 000 H_2O		95.2180	—	-800.922	—	—	—	—
	in ∞ H_2O		95.2180	—	-801.15	—	—	—	—
	in 75.2 HCl + 4 190 H_2O		95.2180	—	-794.29	—	—	—	—
$MgCl_2 \cdot H_2O$		cr	113.2334	—	-966.63	-861.74	—	137.2	115.27
$MgCl_2 \cdot 2H_2O$		cr	131.2488	—	-1279.72	-1118.00	—	179.9	159.20
$MgCl_2 \cdot 4H_2O$		cr	167.2796	—	-1898.99	-1623.29	—	264.0	241.42
$MgCl_2 \cdot 6H_2O$		cr	203.3104	—	-2499.02	-2114.64	—	366.1	315.06
$Mg(ClO_4)_2$		cr	223.2132	—	-568.90	—	—	—	—
$Mg(ClO_4)_2$		ai	223.2132	—	-725.51	-471.8	—	225.9	—
	in 18 H_2O		223.2132	—	-717.761	—	—	—	—
	in 20 H_2O		223.2132	—	-719.008	—	—	—	—
	in 25 H_2O		223.2132	—	-720.610	—	—	—	—
	in 30 H_2O		223.2132	—	-721.430	—	—	—	—
$Mg(ClO_4)_2$	in 40 H_2O		223.2132	—	-722.296	—	—	—	—
	in 50 H_2O		223.2132	—	-722.660	—	—	—	—
	in 75 H_2O		223.2132	—	-723.058	—	—	—	—
	in 100 H_2O		223.2132	—	-723.238	—	—	—	—
	in 200 H_2O		223.2132	—	-723.514	—	—	—	—
$Mg(ClO_4)_2$	in 300 H_2O		223.2132	—	-723.648	—	—	—	—
	in 400 H_2O		223.2132	—	-723.757	—	—	—	—
	in 500 H_2O		223.2132	—	-723.845	—	—	—	—
	in 600 H_2O		223.2132	—	-723.928	—	—	—	—
	in 800 H_2O		223.2132	—	-724.050	—	—	—	—
$Mg(ClO_4)_2$	in 1 000 H_2O		223.2132	—	-724.137	—	—	—	—
	in 2 000 H_2O		223.2132	—	-724.401	—	—	—	—
	in 5 000 H_2O		223.2132	—	-724.702	—	—	—	—
	in 10 000 H_2O		223.2132	—	-724.895	—	—	—	—
	in 20 000 H_2O		223.2132	—	-725.045	—	—	—	—
$Mg(ClO_4)_2$	in 50 000 H_2O		223.2132	—	-725.188	—	—	—	—
	in 100 000 H_2O		223.2132	—	-725.280	—	—	—	—
	in ∞ H_2O		223.2132	—	-725.51	—	—	—	—
	in 2 000 CH_3OH		223.2132	—	-760.94	—	—	—	—
	in 4 000 C_2H_5OH		223.2132	—	-758.1	—	—	—	—
$Mg(ClO_4)_2$	in ∞ C_2H_5OH		223.2132	—	-759.4	—	—	—	—
	in 4 000 C_3H_7OH:i in 1–propanol		223.2132	—	-734.3	—	—	—	—
	in ∞ C_3H_7OH:i		223.2132	—	-738.9	—	—	—	—
	in 4 000 C_3H_7OH:i2 in 2–propanol		223.2132	—	-751.0	—	—	—	—
	in ∞ C_3H_7OH:i2		223.2132	—	-757.7	—	—	—	—
$Mg(ClO_4)_2$	in 4 000 C_4H_9OH in 1–butanol		223.2132	—	-725.1	—	—	—	—
	in ∞ C_4H_9OH		223.2132	—	-730.1	—	—	—	—
$Mg(ClO_4)_2 \cdot 2H_2O$		cr	259.2440	—	-1218.8	—	—	—	—
$Mg(ClO_4)_2 \cdot 4H_2O$		cr	295.2748	—	-1837.2	—	—	—	—
$Mg(ClO_4)_2 \cdot 6H_2O$		cr	331.3056	—	-2445.5	-1862.7	—	520.9	—
$MgO \cdot MgCl_2$		cr	135.5294	—	-1307.5	—	—	—	—
$MgO \cdot MgCl_2 \cdot 6H_2O$		cr	243.6218	—	-3114.6	—	—	—	—
$MgO \cdot MgCl_2 \cdot 16H_2O$		cr	423.7758	—	-6037.1	—	—	—	—

Substance Formula and Description		State	Molar mass g mol^{-1}	0 K $\Delta_fH^\circ_0$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) Δ_fH°	Δ_fG° kJ mol^{-1}	$H^\circ - H^\circ_0$	S° J mol^{-1} K^{-1}	C_p
MgOHCl		cr	76.7724	—	−799.6	−731.7	—	83.7	—
$(Mg(OH)_2)_3 \cdot MgCl_2$		cr	270.1984	—	−3463.9	—	—	—	—
$(Mg(OH)_2)_3 \cdot MgCl_2 \cdot 4H_2O$		cr	342.2600	—	−4701.6	—	—	—	—
$(Mg(OH)_2)_3 \cdot MgCl_2 \cdot 7H_2O$		cr	396.3062	—	−5596.5	—	—	—	—
$(Mg(OH)_2)_3 \cdot MgCl_2 \cdot 8H_2O$		cr	414.3216	—	−5894.4	—	—	—	—
$(Mg(OH)_2)_5 \cdot MgCl_2 \cdot 8H_2O$		cr	530.9752	—	−7730.8	—	—	—	—
$MgBr_2$		cr	184.1300	—	−524.3	−503.8	—	117.2	—
		g	184.1300	—	−309.6	—	—	—	—
		ai	184.1300	—	−709.94	−662.7	—	26.8	—
	in 100 H_2O		184.1300	—	−707.01	—	—	—	—
$MgBr_2$	in 200 H_2O		184.1300	—	−707.47	—	—	—	—
	in 300 H_2O		184.1300	—	−707.68	—	—	—	—
	in 400 H_2O		184.1300	—	−707.85	—	—	—	—
	in 500 H_2O		184.1300	—	−707.97	—	—	—	—
	in 600 H_2O		184.1300	—	−708.088	—	—	—	—
$MgBr_2$	in 800 H_2O		184.1300	—	−708.251	—	—	—	—
	in 1 000 H_2O		184.1300	—	−708.368	—	—	—	—
	in 2 000 H_2O		184.1300	—	−708.707	—	—	—	—
	in 5 000 H_2O		184.1300	—	−709.088	—	—	—	—
	in 10 000 H_2O		184.1300	—	−709.305	—	—	—	—
$MgBr_2$	in 20 000 H_2O		184.1300	—	−709.472	—	—	—	—
	in 50 000 H_2O		184.1300	—	−709.631	—	—	—	—
	in 100 000 H_2O		184.1300	—	−709.715	—	—	—	—
	in ∞ H_2O		184.1300	—	−709.94	—	—	—	—
	in 81 HBr + 9 000 H_2O		184.1300	—	−704.6	—	—	—	—
$MgBr_2 \cdot 6H_2O$		cr	292.2224	—	−2410.0	−2055.7	—	397.	—
MgI_2		cr	278.1208	—	−364.0	−358.2	—	129.7	—
		g	278.1208	—	−172.	—	—	—	—
		ai	278.1208	—	−577.22	−558.1	—	84.5	—
	in 400 H_2O		278.1208	—	−575.26	—	—	—	—
MgI_2	in 800 H_2O		278.1208	—	−575.59	—	—	—	—
	in 1 000 H_2O		278.1208	—	−575.68	—	—	—	—
	in 2 000 H_2O		278.1208	—	−576.01	—	—	—	—
	in 5 000 H_2O		278.1208	—	−576.39	—	—	—	—
	in ∞ H_2O		278.1208	—	−577.22	—	—	—	—
MgI_2	in 81 HI + 9 000 H_2O		278.1208	—	−572.4	—	—	—	—
$MgIO_3^+$		ao	199.2146	—	—	−587.0	—	—	—
MgS		cr	56.3760	−344.93	−346.0	−341.8	8.335	50.33	45.56
$MgSO_3$		cr	104.3742	—	−1008.3	−923.8	—	87.9	—
$MgSO_3 \cdot 3H_2O$		cr	158.4204	—	−1931.8	−1674.7	—	209.2	—
$MgSO_3 \cdot 6H_2O$		cr	212.4666	—	−2817.5	−2385.4	—	322.2	—
$MgSO_4$		cr	120.3736	—	−1284.9	−1170.6	—	91.6	96.48
		ai	120.3736	—	−1376.12	−1199.5	—	−118.0	—
		ao	120.3736	—	−1356.0	−1212.21	—	−7.1	—
	in 20 H_2O		120.3736	—	−1368.67	—	—	—	—
$MgSO_4$	in 25 H_2O		120.3736	—	−1369.00	—	—	—	—
	in 50 H_2O		120.3736	—	−1369.88	—	—	—	—
	in 75 H_2O		120.3736	—	−1370.34	—	—	—	—
	in 100 H_2O		120.3736	—	−1370.64	—	—	—	—
	in 200 H_2O		120.3736	—	−1371.26	—	—	—	—

Substance Formula and Description		State	Molar mass g mol⁻¹	0 K $\Delta_f H_0^\circ$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H_0^\circ$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
$MgSO_4$	in 300 H_2O		120.3736	—	-1371.60	—	—	—	—
	in 400 H_2O		120.3736	—	-1371.85	—	—	—	—
	in 500 H_2O		120.3736	—	-1372.06	—	—	—	—
	in 600 H_2O		120.3736	—	-1372.23	—	—	—	—
	in 800 H_2O		120.3736	—	-1372.52	—	—	—	—
$MgSO_4$	in 1 000 H_2O		120.3736	—	-1372.69	—	—	—	—
	in 2 000 H_2O		120.3736	—	-1373.197	—	—	—	—
	in 5 000 H_2O		120.3736	—	-1373.850	—	—	—	—
	in 10 000 H_2O		120.3736	—	-1374.306	—	—	—	—
	in 20 000 H_2O		120.3736	—	-1374.783	—	—	—	—
$MgSO_4$	in 50 000 H_2O		120.3736	—	-1375.310	—	—	—	—
	in 100 000 H_2O		120.3736	—	-1375.590	—	—	—	—
	in ∞ H_2O		120.3736	—	-1376.12	—	—	—	—
	in CH_3OH:s		120.3736	—	-1300.8	-1160.6	—	4.	—
	in C_2H_5OH:s		120.3736	—	-1294.1	-1155.1	—	8.	—
$MgSO_4 \cdot H_2O$		cr	138.3890	—	-1602.1	-1428.7	—	126.4	—
		am	138.3890	—	-1574.9	-1404.9	—	138.1	—
$MgSO_4 \cdot 2H_2O$		cr	156.4044	—	-1896.2	—	—	—	—
$MgSO_4 \cdot 4H_2O$		cr	192.4352	—	-2496.6	—	—	—	—
$MgSO_4 \cdot 6H_2O$		cr	228.4660	—	-3087.0	-2631.8	—	348.1	348.11
$MgSO_4 \cdot 7H_2O$		cr	246.4814	—	-3388.71	-2871.5	—	372.	—
$MgS_2O_3 \cdot 3H_2O$		cr	190.4844	—	-1948.1	—	—	—	—
$MgS_2O_3 \cdot 6H_2O$		cr	244.5306	—	-2848.5	—	—	—	—
$(Mg(OH)_2)_3 \cdot MgSO_4 \cdot 8H_2O$		cr	439.4772	—	-6457.2	—	—	—	—
$MgSeO_3$		cr	151.2702	—	-900.19	—	—	—	—
$MgSeO_3$		am	151.2702	—	-892.66	—	—	—	—
$MgSeO_3 \cdot 6H_2O$		cr	259.3626	—	-2707.05	—	—	—	—
$MgSeO_4$		cr	167.2696	—	-968.51	—	—	—	—
		ai	167.2696	—	-1066.1	-896.1	—	-84.1	—
	in 1 500 H_2O		167.2696	—	-1064.03	—	—	—	—
$MgSeO_4 \cdot H_2O$		cr	185.2850	—	-1295.45	—	—	—	—
$MgSeO_4 \cdot 4H_2O$		cr	239.3312	—	-2189.91	—	—	—	—
$MgSeO_4 \cdot 6H_2O$		cr	275.3620	—	-2779.0	—	—	—	—
MgTe		cr	151.9120	—	-209.	—	—	—	—
Mg_3N_2		cr	100.9494	—	-460.7	—	—	—	—
$Mg(NO_3)_2$		cr	148.3218	—	-790.65	-589.4	—	164.0	141.92
		ai	148.3218	—	-881.57	-677.3	—	154.8	—
	in 12 H_2O		148.3218	—	-877.05	—	—	—	—
	in 15 H_2O		148.3218	—	-878.18	—	—	—	—
	in 20 H_2O		148.3218	—	-878.93	—	—	—	—
$Mg(NO_3)_2$	in 25 H_2O		148.3218	—	-879.10	—	—	—	—
	in 50 H_2O		148.3218	—	-879.23	—	—	—	—
	in 75 H_2O		148.3218	—	-879.27	—	—	—	—
	in 100 H_2O		148.3218	—	-879.31	—	—	—	—
	in 200 H_2O		148.3218	—	-879.52	—	—	—	—
$Mg(NO_3)_2$	in 300 H_2O		148.3218	—	-879.69	—	—	—	—
	in 400 H_2O		148.3218	—	-879.81	—	—	—	—
	in 500 H_2O		148.3218	—	-879.90	—	—	—	—
	in 600 H_2O		148.3218	—	-879.966	—	—	—	—
	in 800 H_2O		148.3218	—	-880.079	—	—	—	—

Substance Formula and Description		State	Molar mass g mol^{-1}	0 K $\Delta_f H_0^\circ$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H_0^\circ$	S° J mol^{-1} K^{-1}	C_p
$Mg(NO_3)_2$	in 1 000 H_2O		148.3218	—	-880.163	—	—	—	—
	in 2 000 H_2O		148.3218	—	-880.410	—	—	—	—
	in 5 000 H_2O		148.3218	—	-880.740	—	—	—	—
	in 10 000 H_2O		148.3218	—	-880.945	—	—	—	—
	in 20 000 H_2O		148.3218	—	-881.109	—	—	—	—
$Mg(NO_3)_2$	in 50 000 H_2O		148.3218	—	-881.259	—	—	—	—
	in 100 000 H_2O		148.3218	—	-881.343	—	—	—	—
	in ∞ H_2O		148.3218	—	-881.57	—	—	—	—
$Mg(NO_3)_2 \cdot 2H_2O$		cr	184.3526	—	-1409.2	—	—	—	—
$Mg(NO_3)_2 \cdot 6H_2O$		cr	256.4142	—	-2613.28	-2080.3	—	452.	—
$Mg(NH_3)_2^{2+}$		aq	58.3734	—	-621.7	—	—	—	—
$MgCl_2 \cdot NH_3$		cr	112.2487	—	-777.0	—	—	—	—
$MgCl_2 \cdot 2NH_3$		cr	129.2794	—	-899.6	—	—	—	—
$Mg(NH_3)_2Cl_2$		aq	129.2794	—	-956.5	—	—	—	—
$Mg(ClO_4)_2 \cdot 6NH_3$		cr	325.3974	—	-1263.6	—	—	—	—
$MgBr_2 \cdot NH_3$		cr	201.1607	—	-664.0	—	—	—	—
$MgBr_2 \cdot 2NH_3$		cr	218.1914	—	-796.2	—	—	—	—
$MgI_2 \cdot 2NH_3$		cr	312.1822	—	-656.5	—	—	—	—
$Mg(NH_3)_2SO_4$		aq	154.4350	—	-1530.9	—	—	—	—
$(MgSO_3)_3 \cdot (NH_4)_2SO_3 \cdot 6H_2O$		cr	537.3546	—	-5773.5	—	—	—	—
$(MgSO_3)_3 \cdot (NH_4)_2SO_3 \cdot 18H_2O$		cr	753.5394	—	-9329.5	—	—	—	—
$MgP_2O_7^{2-}$		ao	198.2554	—	-2725.9	-2414.9	—	-79.	—
$Mg_2P_2O_7$	α	cr	222.5674	—	—	—	27.058	154.89	177.95
$Mg_3(PO_4)_2$		cr	262.8788	-3752.96	-3780.7	-3538.7	32.740	189.20	213.47
$MgHPO_4$		aq	120.2914	—	-1756.4	—	—	—	—
$MgNH_4PO_4 \cdot 6H_2O$		cr	245.4145	—	-3681.9	—	—	—	—
$MgAs_4$		cr	323.9984	—	-126.	—	—	—	—
Mg_3As_2		cr	222.7792	—	-371.5	—	—	—	—
$Mg_3(AsO_4)_2$		cr	350.7744	—	-3092.8	—	—	—	—
$MgHAsO_4$		aq	164.2392	—	-1363.6	—	—	—	—
$Mg(H_2AsO_4)_2$		aq	306.1824	—	-2282.4	—	—	—	—
$MgNH_4AsO_4 \cdot 6H_2O$		cr	289.3623	—	-3316.7	—	—	—	—
Mg_3Sb_2	α	cr	316.4360	—	-234.	—	—	—	—
Mg_3Bi_2	β	cr	490.8960	—	-154.0	—	—	—	—
MgC_2		cr	48.3344	—	84.	—	—	—	—
Mg_2C_3		cr	84.6576	—	71.	—	—	—	—
$MgCO_3$	magnesite	cr	84.3214	—	-1095.8	-1012.1	—	65.7	75.52
$MgCO_3 \cdot 3H_2O$	nesquehonite	cr	138.3676	—	—	-1726.1	—	—	—
$MgCO_3 \cdot 5H_2O$	lansfordite	cr	174.3984	—	—	-2199.2	—	—	—
MgC_2O_4	oxalate	cr	112.3320	—	-1269.0	—	—	—	—
MgC_2O_4		ai	112.3320	—	-1292.0	-1128.8	—	-92.5	—
$MgC_2O_4 \cdot 2H_2O$		cr	148.3628	—	—	-1633.3	—	—	—
$Mg(C_2O_4)_2^{2-}$		ao	200.3520	—	—	-1827.8	—	—	—
$MgHCO_3^+$		ao	85.3294	—	—	-1047.2	—	—	—
$Mg(HCO_2)_2$	formate	cr	114.3480	—	—	—	22.531	143.97	128.28
$MgCH_3CO_2^+$	acetate	ao	83.3572	—	—	-831.3	—	—	—
$Mg(CH_2OHCO_2)_2$	glycolate	cr	174.4012	—	-1750.6	—	—	—	—
		aq	174.4012	—	-1769.0	—	—	—	—
$Mg(CH_2OHCO_2)_2 \cdot 2H_2O$		cr	210.4320	—	-2348.1	—	—	—	—
$(MgCO_3)_3 \cdot Mg(OH)_2 \cdot 3H_2O$		cr	365.3372	—	—	-4603.3	—	—	—

Table 93:**Mg** — **MAGNESIUM** (Prepared 1967) — Continued — Table 93:**Mg**

Substance Formula and Description		State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
$MgCl_2 \cdot 6CH_3OH$		cr	287.4736	—	-2125.	—	—	—	—
$MgCl_2 \cdot 6C_2H_5OH$		cr	371.6368	—	-2548.	—	—	—	—
$MgCN_2$	cyanamide	cr	64.3366	—	-252.3	—	—	—	—
$Mg(CN)_2$		aq	76.3478	—	-164.0	—	—	—	—
$MgNH_2CH_2COO^+$	glycinate	ao	98.3719	—	—	-789.4	—	—	—
$Mg(NO_3)_2 \cdot 6CH_3OH$		cr	340.5774	—	-2339.	—	—	—	—
$Mg(NO_3)_2 \cdot 6C_2H_5OH$		cr	424.7406	—	-2523.	—	—	—	—
Mg_2Si		cr	76.7100	—	-77.8	-75.3	—	75.	73.6
$MgSiO_3$	clinoenstatite	cr	100.3962	-1539.875	-1549.00	-1462.09	12.113	67.74	81.38
Mg_2SiO_4	forsterite	cr	140.7076	-2160.70	-2174.0	-2055.1	17.276	95.14	118.49
$Mg_3Si_2O_5(OH)_4$	chrysotile	cr	277.1346	—	-4365.6	-4037.8	—	221.3	273.68
	antigorite	cr2	277.1346	—	—	—	—	222.6	273.93
$Mg_3Si_4O_{10}(OH)_2$	talc	cr	379.2888	-5880.90	-5922.5	-5542.7	46.86	260.7	321.7
Mg_2Ge		cr	121.2140	-107.65	-108.8	-105.9	13.510	86.48	69.54
Mg_2Sn		cr	167.3140	—	-80.8	—	—	—	—
Mg_2Pb		cr	255.8140	—	-51.5	—	—	—	—
$PbI_2 \cdot 2MgI_2$		cr	1017.2404	—	-864.0	—	—	—	—
MgB_2		cr	45.9340	—	—	—	6.799	35.94	48.49
MgB_4		cr	67.5560	—	—	—	9.498	52.34	70.21
MgB_{12}		cr	154.0440	-220.9	-222.	-218.	18.79	89.5	151.5
$MgO \cdot Al_2O_3$	spinel	cr	142.2726	-2283.84	-2299.9	-2175.2	15.410	80.63	116.19
$Mg_2Al_4Si_5O_{18}$	cordierite	cr	584.9692	—	-9161.7	-8651.4	—	407.1	452.3
MgTl		cr	228.6820	—	-50.	—	—	—	—
MgZn		cr	89.6820	—	-16.7	—	—	—	—
$MgZn_2$		cr	155.0520	—	-32.6	—	—	—	74.1
Mg_2Zn_{11}		cr	767.6940	—	-126.	—	—	—	—
MgCd		cr	136.7120	-15.958	-16.07	-15.52	11.13	82.68	51.55
$MgCd_3$		cr	361.5120	-19.506	-18.91	-19.71	24.31	190.62	118.16
Mg_3Cd		cr	185.3360	-21.941	-22.26	-21.51	20.92	147.28	100.58
$MgHgBr_4$		aq	544.5380	—	-880.3	—	—	—	—
$Mg(HgBr_3)_2$		aq	904.9460	—	-1042.2	—	—	—	—
$(MgBr_2)_2 \cdot HgBr_2$		aq	728.6680	—	-1594.9	—	—	—	—
$(MgBr_2)_4 \cdot HgBr_2$		aq	1096.9280	—	-3017.5	—	—	—	—
$MgHg(CN)_4$		aq	328.9736	—	81.2	—	—	—	—
$Mg(Hg(CN)_3)_2$		aq	581.5994	—	341.4	—	—	—	—
$(Hg(CN)_2)_2 \cdot MgCl_2$		aq	600.4696	—	-238.9	—	—	—	—
$(Hg(CN)_2)_2 \cdot MgCl_2 \cdot 6H_2O$		cr	708.5620	—	-1993.7	—	—	—	—
$(Hg(CN)_2)_2 \cdot MgBr_2$		aq	689.3816	—	-150.6	—	—	—	—
$(Hg(CN)_2)_2 \cdot MgBr_2 \cdot 8H_2O$		cr	833.5048	—	-2501.6	—	—	—	—
$(Hg(CN)_2)_2 \cdot MgI_2$		aq	783.3724	—	-35.1	—	—	—	—
$(Hg(CN)_2)_2 \cdot MgI_2 \cdot 8H_2O$		cr	927.4956	—	-2402.5	—	—	—	—
$MgCu_2$	β phase	cr	151.3920	—	-33.56	-33.9	—	100.	72.93
Mg_2Cu	γ phase	cr	112.1640	—	-28.62	—	—	—	—
$MgNi_2$		cr	141.7320	—	-55.2	-54.0	—	88.70	73.39
Mg_2Ni		cr	107.3340	—	-39.7	—	—	—	—
$MgFe_2O_4$		cr	200.0036	—	-1428.4	-1317.1	—	123.8	143.72
$MgFe(CN)_6^-$		ao	236.2664	—	—	258.7	—	—	—
$MgFe(CN)_6^{2-}$		ao	236.2664	—	—	218.5	—	—	—
$Mg_2Fe(CN)_6$	from $Fe(CN)_6^{4-}$	ai	260.5784	—	-478.2	-214.5	—	-181.2	—
	in 1 500 H_2O		260.5784	—	-467.44	—	—	—	—

Substance Formula and Description		State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$	S° J mol⁻¹ K⁻¹	C_p
$Mg_2Fe(CN)_6$	in 2 000 H_2O		260.5784	—	-468.19	—	—	—	—
	in 5 000 H_2O		260.5784	—	-470.03	—	—	—	—
	in 7 500 H_2O		260.5784	—	-470.66	—	—	—	—
	in 10 000 H_2O		260.5784	—	-471.08	—	—	—	—
	in 20 000 H_2O		260.5784	—	-471.96	—	—	—	—
$Mg_2Fe(CN)_6$	in 50 000 H_2O		260.5784	—	-473.21	—	—	—	—
	in 100 000 H_2O		260.5784	—	-474.42	—	—	—	—
	in 200 000 H_2O		260.5784	—	-475.51	—	—	—	—
	in 500 000 H_2O		260.5784	—	-476.72	—	—	—	—
	in 1 000 000 H_2O		260.5784	—	-477.48	—	—	—	—
$Mg_2Fe(CN)_6$	in ∞ H_2O		260.5784	—	-478.2	—	—	—	—
$MgCrO_4$		cr	140.3056	—	-1343.5	—	—	—	—
		aq	140.3056	—	-1355.6	—	—	—	—
$MgCr_2O_4$		cr	192.3016	—	-1783.6	-1668.9	—	106.02	126.78
$MgMoO_4$		cr	184.2496	—	-1400.85	-1295.68	—	118.8	111.17
$MgMoO_4$		g	184.2496	-937.	—	—	—	—	—
$MgWO_4$		cr	272.1596	-1522.47	-1532.6	-1420.8	17.217	101.17	109.37
		g	272.1596	-929.	—	—	—	—	—
MgV_2O_6	metavanadate	cr	222.1924	—	-2201.58	-2039.31	—	160.7	165.14
$Mg_2V_2O_7$	pyrovanadate	cr	262.5038	—	-2835.92	-2645.18	—	200.4	203.47
$MgTiO_3$	metatitanate	cr	120.2102	-1563.52	-1572.8	-1484.4	13.556	74.56	91.88
$MgTi_2O_5$		cr	200.1090	-2496.01	-2509.6	-2366.8	22.711	127.28	147.07
Mg_2TiO_4	orthotitanate	cr	160.5216	-2151.91	-2165.2	-2046.7	18.836	109.33	128.66
MgY		cr	113.2170	—	-25.	—	—	—	—
Mg_5Y_2		cr	299.3700	—	-88.	—	—	—	—
$Mg_{17}Y_3$		cr	680.0190	—	-209.	—	—	—	—
MgPr		cr	165.2190	—	-34.3	—	—	—	—
Mg_3Pr		cr	213.8430	—	-46.4	—	—	—	—
MgCe		cr	164.4320	—	-54.	—	—	—	—
Mg_3Ce		cr	213.0560	—	-71.	—	—	—	—
MgLa		cr	163.2220	—	-23.8	—	—	—	—
Mg_3La		cr	211.8460	—	-53.6	—	—	—	—
$(La(NO_3)_3)_2 \cdot 3Mg(NO_3)_2 \cdot 24H_2O$		cr	1527.1844	—	—	—	—	2197.	2021.7
$MgUO_4$		cr	326.3386	—	-1857.3	-1749.7	—	131.8	128.0
MgU_3O_{10}		cr	898.3930	—	—	—	—	338.5	305.4

Table 94:Ca CALCIUM (Prepared 1968) Table 94:Ca

Substance Formula and Description		State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$	S° J mol⁻¹ K⁻¹	C_p
Ca	α	cr	40.0800	0	0	0	5.707	41.42	25.31
		g	40.0800	177.74	178.2	144.3	6.197	154.884	20.786
Ca^{+}		g	40.0800	767.55	774.25	—	6.197	—	—
Ca^{2+}		g	40.0800	1913.01	1925.90	—	6.197	—	—
Ca^{3+}		g	40.0800	6825.4	6844.6	—	6.197	—	—
Ca^{4+}		g	40.0800	13316.4	13341.5	—	6.197	—	—
Ca^{5+}		g	40.0800	21469.8	21501.6	—	6.197	—	—
Ca^{6+}		g	40.0800	31965.8	32003.4	—	6.222	—	—
Ca^{7+}		g	40.0800	44237.	44283.	—	6.197	—	—
Ca^{8+}		g	40.0800	58446.	58497.	—	6.197	—	—
Ca^{2+}		ao	40.0800	—	-542.83	-553.58	—	-53.1	—
CaO		cr	56.0794	—	-635.09	-604.03	—	39.75	42.80
		g	56.0794	46.	—	—	—	—	—
CaO_2		cr	72.0788	—	-652.7	—	—	—	—
$CaO_2{\cdot}8H_2O$		cr	216.2020	—	-3004.9	—	—	—	—
CaH		g	41.0880	230.	228.9	200.4	8.686	201.74	29.75
CaH^{+}		g	41.0880	795.	799.	—	—	—	—
CaH_2		cr	42.0960	—	-186.2	-147.2	—	42.	—
CaOH		g	57.0874	—	-201.	—	—	—	—
$CaOH^{+}$		ao	57.0874	—	—	-718.4	—	—	—
$Ca(OH)_2$		cr	74.0948	—	-986.09	-898.49	—	83.39	87.49
		g	74.0948	—	-544.	—	—	—	—
		ai	74.0948	—	-1002.82	-868.07	—	-74.5	—
$Ca(OH)_2{\cdot}H_2O_2$		cr	108.1096	—	-1218.4	—	—	—	—
CaF		g	59.0784	-270.96	-272.0	-297.9	9.125	229.4	33.60
CaF_2		cr	78.0768	—	-1219.6	-1167.3	—	68.87	67.03
		g	78.0768	-779.69	-781.6	-790.4	12.657	274.37	51.25
		ai	78.0768	—	-1208.09	-1111.15	—	-80.8	—
CaCl		g	75.5330	-97.19	-97.9	-124.3	9.590	241.53	35.90
$CaCl_2$		cr	110.9860	—	-795.8	-748.1	—	104.6	72.59
$CaCl_2$		g	110.9860	-471.79	-471.5	-479.24	15.117	290.27	59.33
		ai	110.9860	—	-877.13	-816.01	—	59.8	—
	in 10 H_2O		110.9860	—	-862.74	—	—	—	—
	in 11 H_2O		110.9860	—	-864.21	—	—	—	—
	in 12 H_2O		110.9860	—	-865.38	—	—	—	—
$CaCl_2$	in 13 H_2O		110.9860	—	-866.34	—	—	—	—
	in 15 H_2O		110.9860	—	-867.85	—	—	—	—
	in 20 H_2O		110.9860	—	-870.06	—	—	—	—
	in 25 H_2O		110.9860	—	-871.07	—	—	—	—
	in 40 H_2O		110.9860	—	-872.49	—	—	—	—
$CaCl_2$	in 50 H_2O		110.9860	—	-872.91	—	—	—	—
	in 75 H_2O		110.9860	—	-873.489	—	—	—	—
	in 100 H_2O		110.9860	—	-873.824	—	—	—	—
	in 300 H_2O		110.9860	—	-874.787	—	—	—	—
	in 400 H_2O		110.9860	—	-874.983	—	—	—	—
$CaCl_2$	in 500 H_2O		110.9860	—	-875.134	—	—	—	—
	in 800 H_2O		110.9860	—	-875.406	—	—	—	—
	in 1 000 H_2O		110.9860	—	-875.540	—	—	—	—
	in 2 000 H_2O		110.9860	—	-875.891	—	—	—	—
	in 5 000 H_2O		110.9860	—	-876.268	—	—	—	—

Substance Formula	and Description	State	Molar mass g mol^{-1}	0 K $\Delta_f H^\circ_0$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H^\circ_0$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
$CaCl_2$	in 10 000 H_2O		110.9860	—	-876.485	—	—	—	—
	in 20 000 H_2O		110.9860	—	-876.657	—	—	—	—
	in 50 000 H_2O		110.9860	—	-876.820	—	—	—	—
	in 100 000 H_2O		110.9860	—	-876.904	—	—	—	—
	in 500 000 H_2O		110.9860	—	-877.029	—	—	—	—
$CaCl_2$	in ∞ H_2O		110.9860	—	-877.13	—	—	—	—
$CaCl_2 \cdot H_2O$		cr	129.0014	—	-1109.2	—	—	—	—
$CaCl_2 \cdot 2H_2O$		cr	147.0168	—	-1402.9	—	—	—	—
$CaCl_2 \cdot 4H_2O$		cr	183.0476	—	-2009.6	—	—	—	—
$CaCl_2 \cdot 6H_2O$		cr	219.0784	—	-2607.9	—	—	—	—
$Ca(OCl)Cl$		cr	126.9854	—	-746.4	—	—	—	—
		aq	126.9854	—	-790.4	—	—	—	—
$Ca(OCl)Cl \cdot H_2O$		cr	145.0008	—	-1042.2	—	—	—	—
$Ca(OCl)_2$		aq	142.9848	—	-754.4	—	—	—	—
$Ca(ClO_2)_2$		cr	174.9836	—	-678.2	—	—	—	—
$Ca(ClO_4)_2$		cr	238.9812	—	-736.76	—	—	—	—
		ai	238.9812	—	-801.49	-570.62	—	310.9	—
	in 8 H_2O		238.9812	—	-788.10	—	—	—	—
	in 9 H_2O		238.9812	—	-789.60	—	—	—	—
	in 10 H_2O		238.9812	—	-791.45	—	—	—	—
$Ca(ClO_4)_2$	in 12 H_2O		238.9812	—	-794.04	—	—	—	—
	in 15 H_2O		238.9812	—	-796.42	—	—	—	—
	in 20 H_2O		238.9812	—	-798.39	—	—	—	—
	in 25 H_2O		238.9812	—	-799.27	—	—	—	—
	in 30 H_2O		238.9812	—	-799.65	—	—	—	—
$Ca(ClO_4)_2$	in 40 H_2O		238.9812	—	-799.94	—	—	—	—
	in 50 H_2O		238.9812	—	-799.98	—	—	—	—
	in 75 H_2O		238.9812	—	-799.98	—	—	—	—
	in 100 H_2O		238.9812	—	-799.94	—	—	—	—
	in 200 H_2O		238.9812	—	-799.86	—	—	—	—
$Ca(ClO_4)_2$	in 300 H_2O		238.9812	—	-799.90	—	—	—	—
	in 500 H_2O		238.9812	—	-799.98	—	—	—	—
	in 1 000 H_2O		238.9812	—	-800.19	—	—	—	—
	in 10 000 H_2O		238.9812	—	-800.86	—	—	—	—
	in 100 000 H_2O		238.9812	—	-801.28	—	—	—	—
$Ca(ClO_4)_2$	in ∞ H_2O		238.9812	—	-801.49	—	—	—	—
	in CH_3OH:s		238.9812	—	-854.8	—	—	—	—
	in C_2H_5OH:s		238.9812	—	-828.0	—	—	—	—
	in C_3H_7OH:s in 1–propanol		238.9812	—	-812.5	—	—	—	—
	in C_3H_7OH:s2 in 2–propanol		238.9812	—	-821.3	—	—	—	—
$Ca(ClO_4)_2$	in C_4H_9OH:s in 1–butanol		238.9812	—	-806.3	—	—	—	—
$Ca(ClO_4)_2 \cdot 4H_2O$		cr	311.0428	—	-1948.9	-1476.47	—	433.5	—
$CaCl_2 \cdot 2CaO$		cr	223.1448	—	-2113.	—	—	—	—
$CaCl_2 \cdot 3CaO$		cr	279.2242	—	-2736.	—	—	—	—
$CaCl_2 \cdot 3CaO \cdot 3H_2O$		cr	333.2704	—	-3807.	—	—	—	—
$CaCl_2 \cdot 3CaO \cdot 16H_2O$		cr	567.4706	—	-7665.	—	—	—	—
$CaClH$		cr	76.5410	—	-504.2	—	—	—	—
$CaBr_2$		cr	199.8980	—	-682.8	-663.6	—	130.	—
		g	199.8980	—	-398.3	—	—	—	—
		ai	199.8980	—	-785.92	-761.49	—	111.7	—

Substance Formula and Description		State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
$CaBr_2$	in 400 H_2O		199.8980	—	-784.04	—	—	—	—
	in 500 H_2O		199.8980	—	-784.17	—	—	—	—
	in 800 H_2O		199.8980	—	-784.37	—	—	—	—
	in 1 000 H_2O		199.8980	—	-784.475	—	—	—	—
	in 2 000 H_2O		199.8980	—	-784.776	—	—	—	—
$CaBr_2$	in 5 000 H_2O		199.8980	—	-785.102	—	—	—	—
	in 10 000 H_2O		199.8980	—	-785.307	—	—	—	—
	in 20 000 H_2O		199.8980	—	-785.458	—	—	—	—
	in 50 000 H_2O		199.8980	—	-785.617	—	—	—	—
	in 100 000 H_2O		199.8980	—	-785.697	—	—	—	—
$CaBr_2$	in 500 000 H_2O		199.8980	—	-785.818	—	—	—	—
	in ∞ H_2O		199.8980	—	-785.92	—	—	—	—
$CaBr_2{\cdot}6H_2O$		cr	307.9904	—	-2506.2	-2152.8	—	410.	—
$Ca(BrO_3)_2$		cr	295.8944	—	-685.8	—	—	—	—
	in 1 000 H_2O		295.8944	—	-679.9	—	—	—	—
$CaBr_2{\cdot}3CaO{\cdot}16H_2O$		cr	656.3826	—	-7577.	—	—	—	—
$CaBrH$		cr	120.9970	—	-443.5	—	—	—	—
CaI_2		cr	293.8888	—	-533.5	-528.9	—	142.	—
		g	293.8888	—	-272.	—	—	—	—
		ai	293.8888	—	-653.21	-656.72	—	169.5	—
CaI_2	in 400 H_2O		293.8888	—	-651.0	—	—	—	—
$CaI_2{\cdot}8H_2O$		cr	438.0120	—	-2929.6	—	—	—	—
$Ca(IO_3)_2$		cr	389.8852	—	-1002.5	-839.2	—	230.	—
$Ca(IO_3)_2{\cdot}H_2O$		cr	407.9006	—	-1293.3	—	—	—	—
$Ca(IO_3)_2{\cdot}6H_2O$		cr	497.9776	—	-2780.7	-2267.3	—	452.	—
$CaI_2{\cdot}3CaO{\cdot}16H_2O$		cr	750.3734	—	-7443.	—	—	—	—
$Ca_5(IO_6)_2$		cr	646.2016	—	-3828.	—	—	—	—
$CaIH$		cr	167.9924	—	-366.1	—	—	—	—
CaS		cr	72.1440	—	-482.4	-477.4	—	56.5	47.40
		g	72.1440	134.	—	—	—	—	—
$CaSO_3$		cr	120.1422	—	—	—	—	101.38	91.71
$CaSO_3{\cdot}0.5H_2O$		cr	129.1499	—	-1311.7	-1199.23	—	121.3	—
$CaSO_4$	insoluble, anhydrite	cr	136.1416	—	-1434.11	-1321.79	—	106.7	99.66
	soluble, α	cr2	136.1416	—	-1425.24	-1313.42	—	108.4	100.21
	soluble, β	cr3	136.1416	—	-1420.80	-1308.98	—	108.4	99.04
$CaSO_4$		ai	136.1416	—	-1452.10	-1298.10	—	-33.1	—
	in 5 000 H_2O		136.1416	—	-1449.396	—	—	—	—
	in 7 500 H_2O		136.1416	—	-1449.831	—	—	—	—
	in 10 000 H_2O		136.1416	—	-1450.032	—	—	—	—
	in 20 000 H_2O		136.1416	—	-1450.530	—	—	—	—
$CaSO_4$	in 50 000 H_2O		136.1416	—	-1451.124	—	—	—	—
	in 100 000 H_2O		136.1416	—	-1451.492	—	—	—	—
	in 500 000 H_2O		136.1416	—	-1451.886	—	—	—	—
	in 1 000 000 H_2O		136.1416	—	-1451.957	—	—	—	—
	in ∞ H_2O		136.1416	—	-1452.10	—	—	—	—
$CaSO_4{\cdot}0.5H_2O$	macrocrystalline, α	cr	145.1493	—	-1576.74	-1436.74	—	130.5	119.41
	microcrystalline, β	cr2	145.1493	—	-1574.65	-1435.78	—	134.3	124.22
$CaSO_4{\cdot}2H_2O$	selenite	cr	172.1724	—	-2022.63	-1797.28	—	194.1	186.02
CaS_2O_3	in 35 H_2O		152.2062	—	-1190.60	—	—	—	—
	in 100 H_2O		152.2062	—	-1191.60	—	—	—	—

Substance Formula	and Description	State	Molar mass g mol^{-1}	0 K $\Delta_f H_0^\circ$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H_0^\circ$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
CaS_2O_3	in 200 H_2O		152.2062	—	-1192.23	—	—	—	—
	in 400 H_2O		152.2062	—	-1192.52	—	—	—	—
	in 1 000 H_2O		152.2062	—	-1192.86	—	—	—	—
	in ∞ H_2O		152.2062	—	-1195.0	—	—	—	—
$CaS_2O_6 \cdot 4H_2O$	dithionate	cr	272.2660	—	-2916.	—	—	—	—
$Ca(HS)_2$		aq	106.2240	—	-577.8	—	—	—	—
CaSe		cr	119.0400	—	-368.2	-363.2	—	67.	—
$CaSeO_3 \cdot 2H_2O$		cr	203.0690	—	—	-1428.7	—	—	—
	precipitated	cr2	203.0690	—	-1610.4	—	—	—	—
$CaSeO_4$		cr	183.0376	—	-1109.81	—	—	—	—
$CaSeO_4$	in 1 600 H_2O		183.0376	—	-1143.49	—	—	—	—
$CaSeO_4 \cdot 2H_2O$		cr	219.0684	—	-1706.7	-1486.8	—	222.	—
CaTe		cr	167.6800	—	—	—	—	79.	—
$Ca(N_3)_2$		cr	124.1202	—	14.6	—	—	—	—
$Ca(N_3)_2 \cdot 0.5H_2O$		cr	133.1279	—	-139.3	—	—	—	—
$Ca(N_3)_2 \cdot 1.5H_2O$		cr	151.1433	—	-437.2	—	—	—	—
$Ca(N_3)_2 \cdot 4H_2O$		cr	196.1818	—	-1164.0	—	—	—	—
Ca_3N_2		cr	148.2534	—	-431.	—	—	—	—
$CaN_2O_2 \cdot 4H_2O$	hyponitrite	cr	172.1538	—	-1705.0	—	—	—	—
$Ca(NO_2)_2$		cr	132.0910	—	-741.4	—	—	—	—
$Ca(NO_2)_2$	in 800 H_2O		132.0910	—	-751.0	—	—	—	—
$Ca(NO_2)_2 \cdot 4H_2O$		cr	204.1526	—	-1885.7	—	—	—	—
$Ca(NO_3)_2$		cr	164.0898	—	-938.39	-743.07	—	193.3	149.37
		ai	164.0898	—	-957.55	-776.09	—	239.7	—
	in 3 H_2O		164.0898	—	-954.638	—	—	—	—
$Ca(NO_3)_2$	in 4 H_2O		164.0898	—	-957.270	—	—	—	—
	in 5 H_2O		164.0898	—	-959.169	—	—	—	—
	in 6 H_2O		164.0898	—	-960.416	—	—	—	—
	in 7 H_2O		164.0898	—	-961.307	—	—	—	—
	in 8 H_2O		164.0898	—	-961.923	—	—	—	—
$Ca(NO_3)_2$	in 9 H_2O		164.0898	—	-962.270	—	—	—	—
	in 10 H_2O		164.0898	—	-962.475	—	—	—	—
	in 11 H_2O		164.0898	—	-962.579	—	—	—	—
	in 12 H_2O		164.0898	—	-962.617	—	—	—	—
	in 13 H_2O		164.0898	—	-962.604	—	—	—	—
$Ca(NO_3)_2$	in 15 H_2O		164.0898	—	-962.492	—	—	—	—
	in 20 H_2O		164.0898	—	-961.918	—	—	—	—
	in 25 H_2O		164.0898	—	-961.194	—	—	—	—
	in 40 H_2O		164.0898	—	-959.646	—	—	—	—
	in 50 H_2O		164.0898	—	-959.056	—	—	—	—
$Ca(NO_3)_2$	in 75 H_2O		164.0898	—	-958.262	—	—	—	—
	in 100 H_2O		164.0898	—	-957.822	—	—	—	—
	in 300 H_2O		164.0898	—	-956.877	—	—	—	—
	in 400 H_2O		164.0898	—	-956.701	—	—	—	—
	in 500 H_2O		164.0898	—	-956.642	—	—	—	—
$Ca(NO_3)_2$	in 800 H_2O		164.0898	—	-956.596	—	—	—	—
	in 1 000 H_2O		164.0898	—	-956.596	—	—	—	—
	in 2 000 H_2O		164.0898	—	-956.667	—	—	—	—
	in 5 000 H_2O		164.0898	—	-956.860	—	—	—	—
	in 10 000 H_2O		164.0898	—	-957.002	—	—	—	—

Table 94:**Ca** **CALCIUM** (Prepared 1968) — Continued Table 94:**Ca**

Substance Formula	Description	State	Molar mass g mol^{-1}	0 K $\Delta_f H_0^\circ$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H_0^\circ$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
$Ca(NO_3)_2$	in 20 000 H_2O		164.0898	—	-957.128	—	—	—	—
	in 50 000 H_2O		164.0898	—	-957.262	—	—	—	—
	in 100 000 H_2O		164.0898	—	-957.337	—	—	—	—
	in 500 000 H_2O		164.0898	—	-957.450	—	—	—	—
	in ∞ H_2O		164.0898	—	-957.55	—	—	—	—
$Ca(NO_3)_2$	in 100 C_2H_5OH		164.0898	—	-968.85	—	—	—	—
	in ∞ C_2H_5OH		164.0898	—	-970.10	—	—	—	—
$Ca(NO_3)_2{\cdot}2H_2O$		cr	200.1206	—	-1540.76	-1229.11	—	269.4	—
$Ca(NO_3)_2{\cdot}3H_2O$		cr	218.1360	—	-1838.0	-1471.7	—	319.2	—
$Ca(NO_3)_2{\cdot}4H_2O$		cr	236.1514	—	-2132.33	-1713.15	—	375.3	—
$Ca(NH_2)_2$		cr	72.1254	—	-384.5	—	—	—	—
$Ca(N_3)_2{\cdot}N_2H_4$		cr	156.1656	—	52.7	—	—	—	—
$Ca(N_3)_2{\cdot}2N_2H_4$		cr	188.2110	—	16.7	—	—	—	—
$Ca(NO_3)_2{\cdot}Ca(OH)_2$		cr	238.1846	—	-1930.9	—	—	—	—
$Ca(NO_3)_2{\cdot}Ca(OH)_2{\cdot}2.5H_2O$		cr	283.2231	—	-2681.5	—	—	—	—
$CaCl_2{\cdot}NH_3$		cr	128.0167	—	-910.0	—	—	—	—
$CaCl_2{\cdot}2NH_3$		cr	145.0474	—	-1015.9	—	—	—	—
$CaCl_2{\cdot}4NH_3$		cr	179.1088	—	-1193.3	—	—	—	—
$CaCl_2{\cdot}8NH_3$		cr	247.2316	—	-1543.5	—	—	—	—
$Ca(ClO_4)_2{\cdot}6NH_3$		cr	341.1654	—	-1320.9	—	—	—	—
$CaBr_2{\cdot}NH_3$		cr	216.9287	—	-801.2	—	—	—	—
$CaBr_2{\cdot}2NH_3$		cr	233.9594	—	-916.3	—	—	—	—
$CaBr_2{\cdot}6NH_3$		cr	302.0822	—	-1293.3	—	—	—	—
$CaBr_2{\cdot}8NH_3$		cr	336.1436	—	-1467.3	—	—	—	—
$CaI_2{\cdot}NH_3$		cr	310.9195	—	-658.6	—	—	—	—
$CaI_2{\cdot}2NH_3$		cr	327.9502	—	-780.7	—	—	—	—
$CaI_2{\cdot}6NH_3$		cr	396.0730	—	-1192.0	—	—	—	—
$CaI_2{\cdot}8NH_3$		cr	430.1344	—	-1356.9	—	—	—	—
Ca_3P_2		cr	182.1876	—	-506.	—	—	—	—
$Ca(PO_3)_2$	β	cr	198.0240	—	—	—	23.912	146.65	145.10
$Ca(PO_3)_2$		vit	198.0240	—	-2456.0	—	—	—	—
$Ca_2P_2O_7$	β	cr	254.1034	-3317.41	-3338.8	-3132.0	31.087	189.24	187.82
$Ca_3(PO_4)_2$	β, low temp. form	cr	310.1828	—	-4120.8	-3884.7	—	236.0	227.82
	α, high temp. form	cr2	310.1828	—	-4109.9	-3875.5	—	240.91	231.58
		ai	310.1828	—	-4183.2	-3698.1	—	-602.	—
$Ca_3P_4O_{13}$		vit	452.1274	—	-5749.	—	—	—	—
$CaHPO_4$		cr	136.0594	-1800.371	-1814.39	-1681.18	18.640	111.38	110.04
	from HPO_4^{2-}	ai	136.0594	—	-1834.98	-1642.72	—	-86.6	—
$CaHPO_4{\cdot}2H_2O$		cr	172.0902	-2376.646	-2403.58	-2154.58	31.338	189.45	197.07
$Ca(H_2PO_2)_2$	hypophosphite	cr	170.0572	—	-1752.7	—	—	—	—
$Ca(H_2PO_2)_2$	from $H_2PO_2^-$	ai	170.0572	—	-1770.3	—	—	—	—
	in 50 H_2O		170.0572	—	-1756.4	—	—	—	—
	in 100 H_2O		170.0572	—	-1759.8	—	—	—	—
	in 200 H_2O		170.0572	—	-1763.1	—	—	—	—
	in 300 H_2O		170.0572	—	-1764.8	—	—	—	—
$Ca(H_2PO_2)_2$	in 400 H_2O		170.0572	—	-1766.1	—	—	—	—
	in 600 H_2O		170.0572	—	-1767.3	—	—	—	—
	in 800 H_2O		170.0572	—	-1768.2	—	—	—	—
	in 1 000 H_2O		170.0572	—	-1769.0	—	—	—	—
$Ca(H_2PO_4)_2$		cr	234.0548	—	-3104.70	—	—	—	—

Table 94:Ca — CALCIUM (Prepared 1968) — Continued — Table 94:Ca

Substance Formula and Description	State	Molar mass g mol^{-1}	0 K $\Delta_f H^\circ_0$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H^\circ_0$	S°	C_p J mol^{-1} K^{-1}
$Ca(H_2PO_4)_2$ from $H_2PO_4^-$	ai	234.0548	—	−3135.41	−2814.13	—	127.6	—
$Ca(H_2PO_4)_2 \cdot H_2O$	cr	252.0702	−3370.409	−3409.67	−3058.18	41.631	259.8	258.82
$Ca_8H_2(PO_4)_6 \cdot 5H_2O$	cr	982.5614	—	—	−12263.	—	—	—
$Ca_{10}(PO_4)_6(OH)_2$ hydroxyapatite	cr	1004.6432	−13394.7	−13477.	−12677.	128.49	780.7	769.9
	ai	1004.6432	—	−13552.4	−11962.4	−1695.	—	
$Ca_{10}(PO_4)_6F_2$ fluorapatite	cr	1008.6252	−13669.1	−13744.	−12983.	126.94	775.7	751.9
$Ca(H_2PO_4)_2 \cdot H_2O \cdot NH_3$	cr	269.1009	—	−3504.1	—	—	—	—
$Ca(H_2PO_4)_2 \cdot H_2O \cdot 2NH_3$	cr	286.1316	—	−3588.2	—	—	—	—
$Ca(H_2PO_4)_2 \cdot H_2O \cdot 4NH_3$	cr	320.1930	—	−3743.8	—	—	—	—
$Ca_3(AsO_4)_2$	cr	398.0784	—	−3298.7	−3063.0	—	226.	—
$Ca_3(AsO_4)_2$ hydrated precipitate	cr2	398.0784	—	−3343.	—	—	—	—
$CaHAsO_4$	aq	180.0072	—	−1446.0	—	—	—	—
$Ca(H_2AsO_4)_2$	aq	321.9504	—	−2358.1	—	—	—	—
Ca_3Sb_2	cr	363.7400	—	−728.	—	—	—	—
Ca_3Bi_2	cr	538.2000	—	−448.	—	—	—	—
CaC_2	cr	64.1024	−63.35	−59.8	−64.9	11.343	69.96	62.72
$CaCO_3$ calcite	cr	100.0894	—	−1206.92	−1128.79	—	92.9	81.88
aragonite	cr2	100.0894	—	−1207.13	−1127.75	—	88.7	81.25
	ai	100.0894	—	−1219.97	−1081.39	—	−110.0	—
CaC_2O_4 oxalate	cr	128.1000	—	−1360.6	—	—	—	—
CaC_2O_4	ai	128.1000	—	−1367.7	−1227.39	—	−7.5	—
$CaC_2O_4 \cdot H_2O$	cr	146.1154	—	−1674.86	−1513.87	—	156.5	152.80
$Ca(HCOO)_2$ formate	cr	130.1160	—	−1386.6	—	—	—	—
in 400 H_2O		130.1160	—	−1391.2	—	—	—	—
$CaCH_3CO_2^+$ acetate	ao	99.1252	—	—	−929.2	—	—	—
$Ca(CH_3CO_2)_2$	cr	158.1704	—	−1479.5	—	—	—	—
	ai	158.1704	—	−1514.86	−1292.19	—	120.1	—
in 100 H_2O		158.1704	—	−1506.7	—	—	—	—
in 200 H_2O		158.1704	—	−1509.2	—	—	—	—
in 300 H_2O		158.1704	—	−1510.0	—	—	—	—
$Ca(CH_3CO_2)_2$ in 400 H_2O		158.1704	—	−1510.8	—	—	—	—
in 1 000 H_2O		158.1704	—	−1512.1	—	—	—	—
in 3 000 H_2O		158.1704	—	−1513.4	—	—	—	—
in 5 000 H_2O		158.1704	—	−1513.8	—	—	—	—
in 10 000 H_2O		158.1704	—	−1514.2	—	—	—	—
$Ca(CH_3CO_2)_2$ in 50 000 H_2O		158.1704	—	−1514.6	—	—	—	—
in ∞ H_2O		158.1704	—	−1514.86	—	—	—	—
$Ca(CH_3CO_2)_2 \cdot H_2O$	cr	176.1858	—	−1772.3	—	—	—	—
$Ca(CH_2OHCO_2)_2$ glycolate	cr	190.1692	—	−1856.0	—	—	—	—
	aq	190.1692	—	−1849.3	—	—	—	—
$Ca(CH_2OHCO_2)_2 \cdot 3H_2O$	cr	244.2154	—	−2736.3	—	—	—	—
$Ca(CH_2OHCO_2)_2 \cdot 5H_2O$	cr	280.2462	—	−3311.2	—	—	—	—
$Ca(C_2H_5O)_2$ ethylate	cr	130.2036	—	−949.8	—	—	—	—
$Ca(C_2H_5O)_2 \cdot 2C_2H_5OH$	cr	222.3432	—	−1540.5	—	—	—	—
$(CaO)_3 \cdot 4C_2H_5OH$	cr	352.5174	—	−3246.4	—	—	—	—
$CaCl_2 \cdot 3C_2H_5OH$	cr	249.1954	—	−1673.2	—	—	—	—
$CaCl_2 \cdot 4C_2H_5OH$	cr	295.2652	—	−1956.0	—	—	—	—
$CaCN_2$ cyanamide	cr	80.1046	—	−350.6	—	—	—	—
$Ca(CN)_2$	cr	92.1158	—	−184.5	—	—	—	—
	aq	92.1158	—	−238.1	—	—	—	—

Table 94:**Ca** **CALCIUM** (Prepared 1968) — Continued Table 94:**Ca**

Substance Formula and Description		State	Molar mass g mol^{-1}	0 K $\Delta_f H_0^\circ$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H_0^\circ$	S° J mol^{-1} K^{-1}	C_p
$(CaO)_3 \cdot Ca(CN)_2 \cdot 15H_2O$		cr	530.5850	—	-6720.	—	—	—	—
$Ca(NO_3)_2 \cdot 2CH_3OH$		cr	228.1750	—	-1435.1	—	—	—	—
$CaSi$		cr	68.1660	—	-151.	—	—	—	—
$CaSi_2$		cr	96.2520	—	-151.	—	—	—	—
Ca_2Si		cr	108.2460	—	-209.	—	—	—	—
$CaO \cdot SiO_2$	wollastonite	cr	116.1642	—	-1634.94	-1549.66	—	81.92	85.27
	pseudowollastonite	cr2	116.1642	—	-1628.4	-1544.7	—	87.36	86.48
		vit	116.1642	—	-1601.01	—	—	—	—
$(CaO)_2 \cdot SiO_2$	β	cr	172.2436	-2296.81	-2307.5	-2192.8	21.330	127.74	128.78
	γ	cr2	172.2436	-2306.43	-2317.9	-2201.1	20.493	120.79	126.65
$(CaO)_3 \cdot SiO_2$		cr	228.3230	—	-2929.2	-2784.0	—	168.6	171.88
$(CaO)_3 \cdot 2SiO_2$	rankinite	cr	288.4078	-3942.29	-3961.0	-3761.3	35.246	210.79	214.39
$(CaO)_3 \cdot 2SiO_2 \cdot CaF_2$	cuspidine	cr	366.4846	—	-5234.	—	—	—	—
$CaO \cdot GeO_2$		cr	160.6682	—	-1291.6	—	—	—	—
$(CaO)_2 \cdot GeO_2$		cr	216.7476	—	-1994.9	—	—	—	—
$(CaO)_3 \cdot GeO_2$		cr	272.8270	—	-2608.7	—	—	—	—
$CaSn$		cr	158.7700	—	-159.	—	—	—	—
Ca_2Sn		cr	198.8500	—	-314.	—	—	—	—
$CaPb$		cr	247.2700	—	-121.	—	—	—	—
$CaPb_3$		cr	661.6500	—	-126.	—	—	—	—
Ca_2Pb		cr	287.3500	—	-213.	—	—	—	—
$CaI_2 \cdot 2PbI_2$		cr	1215.8864	—	-932.6	—	—	—	—
$CaI_2 \cdot 2PbI_2 \cdot 7H_2O$		cr	1341.9942	—	-2980.7	—	—	—	—
$CaO \cdot B_2O_3$		cr	125.6996	—	-2030.96	-1924.03	—	104.85	103.97
$CaO \cdot 2B_2O_3$		cr	195.3198	—	-3360.25	-3167.01	—	134.7	157.95
$CaO \cdot 2B_2O_3$		vit	195.3198	—	-3307.37	—	—	—	—
$(CaO)_2 \cdot B_2O_3$		cr	181.7790	—	-2734.41	-2596.59	—	145.10	147.11
$(CaO)_2 \cdot 3B_2O_3$		cr	321.0194	—	-5397.	—	—	—	—
$(CaO)_2 \cdot 3B_2O_3 \cdot 13H_2O$	inyoite	cr	555.2196	—	-9293.	—	—	—	—
$(CaO)_3 \cdot B_2O_3$		cr	237.8584	—	-3429.08	-3259.82	—	183.7	187.86
$Ca(BF_4)_2$		cr	213.6892	—	-3891.	—	—	—	—
$(CaO)_2 \cdot B_2O_3 \cdot 2SiO_2$		cr	301.9486	—	-4602.	—	—	—	—
$(CaO)_2 \cdot B_2O_3 \cdot 2SiO_2 \cdot H_2O$		cr	319.9640	—	-4895.	—	—	—	—
$CaAl_2$		cr	94.0430	—	-218.	—	—	—	—
$CaAl_4$		cr	148.0060	—	-213.	—	—	—	—
$CaO \cdot Al_2O_3$		cr	158.0406	-2313.21	-2326.3	-2208.7	19.117	114.22	120.79
		vit	158.0406	—	-2301.	—	—	—	—
$CaO \cdot 2Al_2O_3$		cr	260.0018	-4001.91	-4025.8	-3818.6	30.485	177.82	200.83
$(CaO)_2 \cdot Al_2O_3$		cr	214.1200	—	-2958.	—	—	—	—
		vit	214.1200	—	-2933.	—	—	—	—
$(CaO)_2 \cdot Al_2O_3 \cdot 5H_2O$		cr	304.1970	—	-4523.	—	—	—	—
$(CaO)_3 \cdot Al_2O_3$		cr	270.1994	-3569.83	-3587.8	-3411.5	34.376	205.9	209.87
		vit	270.1994	—	-3552.	—	—	—	—
$(CaO)_3 \cdot Al_2O_3 \cdot 6H_2O$		cr	378.2918	—	-5548.	—	—	—	—
$(CaO)_4 \cdot Al_2O_3$		cr	326.2788	—	-4217.	—	—	—	—
$(CaO)_{12} \cdot 7Al_2O_3$		cr	1386.6812	-19330.5	-19430.	-18468.	175.64	1046.8	1085.7
		vit	1386.6812	—	-19087.	—	—	—	—
$(CaCl_2)_3 \cdot 4AlCl_3$		cr	866.3200	—	-5281.9	—	—	—	—
$(CaO)_3 \cdot Al_2O_3 \cdot CaSO_4 \cdot 12H_2O$		cr	622.5258	—	-8778.	—	—	—	—
$(CaO)_3 \cdot Al_2O_3 \cdot 3CaSO_4 \cdot 31H_2O$		cr	1237.1016	—	-17242.	—	—	—	—

Table 94:Ca — CALCIUM (Prepared 1968) — Continued — Table 94:Ca

Substance Formula and Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$	S° J mol⁻¹ K⁻¹	C_p
$(CaO)_3 \cdot Al_2O_3 \cdot 3CaSO_4 \cdot 32H_2O$	cr	1255.1140	—	-17539.	—	—	—	—
$(CaO)_3 \cdot Al_2O_3 \cdot CaCO_3 \cdot 10.68H_2O$	cr	562.6933	—	-8176.	—	—	—	—
$(CaO)_3 \cdot Al_2O_3 \cdot 3CaCO_3 \cdot 30H_2O$	cr	1110.9268	—	-16217.	—	—	—	—
$CaO \cdot Al_2O_3 \cdot SiO_2$ monoclinic, clinopyroxene	cr	218.1254	—	-3298.2	-3122.0	—	141.4	165.7
$CaO \cdot Al_2O_3 \cdot 2SiO_2$ anorthite, triclinic	cr	278.2102	-4205.25	-4227.9	-4002.3	33.334	199.28	211.42
$CaO \cdot Al_2O_3 \cdot 2SiO_2$ anorthite, hexagonal	cr2	278.2102	—	-4209.5	-3988.5	—	214.6	—
	vit	278.2102	—	-4155.1	-3940.8	—	237.2	—
$CaO \cdot Al_2O_3 \cdot 2SiO_2 \cdot 2H_2O$ lawsonite	cr	314.2410	—	-4858.5	-4505.1	—	237.7	285.18
$CaO \cdot Al_2O_3 \cdot 6SiO_2$ heulandite	cr	518.5494	—	-7979.	—	—	—	—
$(CaO)_2 \cdot Al_2O_3 \cdot SiO_2$ gehlenite	cr	274.2048	—	-3981.5	-3783.1	—	210.0	205.43
$(CaO)_2 \cdot Al_2O_3 \cdot SiO_2$	vit	274.2048	—	-3931.7	—	—	—	—
$(CaO)_2 \cdot 2Al_2O_3 \cdot 8SiO_2 \cdot 7H_2O$ leonhardite	cr	922.8674	—	-14249.0	-13199.8	—	922.2	954.0
$(CaO)_3 \cdot Al_2O_3 \cdot 2SiO_2$	cr	390.3690	—	-5561.	—	—	—	—
$CaAlGaSi_2O_8$	cr	320.9487	—	-3914.6	—	—	—	—
CaTl	cr	244.4500	—	-163.	—	—	—	—
$CaHgBr_4$	aq	560.3060	—	-954.4	—	—	—	—
$CaHg_2Br_6$	aq	920.7140	—	-1114.2	—	—	—	—
$CaHg(CN)_4$ in 700 H_2O		344.7416	—	-8.4	—	—	—	—
$CaHg_2(CN)_6$ in 1 000 H_2O		597.3674	—	275.3	—	—	—	—
$CaCl_2 \cdot 2Hg(CN)_2$ in 1 000 H_2O		616.2376	—	-311.7	—	—	—	—
$CaCl_2 \cdot 2Hg(CN)_2 \cdot 6H_2O$	cr	724.3300	—	-2083.6	—	—	—	—
$CaBr_2 \cdot 2Hg(CN)_2$ in 1 000 H_2O		705.1496	—	-224.3	—	—	—	—
$CaBr_2 \cdot 2Hg(CN)_2 \cdot 7H_2O$	cr	831.2574	—	-2304.1	—	—	—	—
$CaI_2 \cdot 2Hg(CN)_2$ in 1 000 H_2O		799.1404	—	-109.2	—	—	—	—
$CaI_2 \cdot 2Hg(CN)_2 \cdot 7H_2O$	cr	925.2482	—	-2199.9	—	—	—	—
$CaAg(CN)_3$ in 1 200 H_2O		226.0037	—	-122.6	—	—	—	—
$CaAg_2(CN)_4$ in 550 H_2O		359.8916	—	-3.8	—	—	—	—
$CaO \cdot Fe_2O_3$	cr	215.7716	-1513.717	-1520.34	-1412.75	25.422	145.35	153.59
$(CaO)_2 \cdot Fe_2O_3$	cr	271.8510	-2128.836	-2139.28	-2001.71	31.648	188.78	193.26
$CaFe(CN)_6^-$	ao	252.0344	—	—	159.5	—	—	—
$CaFe(CN)_6^{2-}$	ao	252.0344	—	—	119.8	—	—	—
$Ca_2Fe(CN)_6$ from $Fe(CN)_6^{4-}$	ai	292.1144	—	-630.1	-412.07	—	-11.3	—
	ao	292.1144	—	—	-441.7	—	—	—
in 1 500 H_2O		292.1144	—	-624.55	—	—	—	—
in 2 000 H_2O		292.1144	—	-624.34	—	—	—	—
$Ca_2Fe(CN)_6$ in 5 000 H_2O		292.1144	—	-624.59	—	—	—	—
in 7 500 H_2O		292.1144	—	-624.96	—	—	—	—
in 10 000 H_2O		292.1144	—	-625.26	—	—	—	—
in 20 000 H_2O		292.1144	—	-625.88	—	—	—	—
in 50 000 H_2O		292.1144	—	-626.60	—	—	—	—
$Ca_2Fe(CN)_6$ in 100 000 H_2O		292.1144	—	-627.01	—	—	—	—
in 500 000 H_2O		292.1144	—	-628.31	—	—	—	—
in 1 000 000 H_2O		292.1144	—	-629.15	—	—	—	—
in ∞ H_2O		292.1144	—	-630.1	—	—	—	—
$Ca_2Fe(CN)_6 \cdot 11H_2O$	cr	490.2838	—	-3781.1	—	—	—	—
$Ca_3(Fe(CN)_6)_2$ from $Fe(CN)_6^{3-}$	ai	544.1488	—	-504.6	-201.9	—	381.2	—

Table 94:**Ca** | **CALCIUM** (Prepared 1968) — Continued | Table 94:**Ca**

Substance Formula and Description	State	Molar mass g mol^{-1}	0 K $\Delta_f H_0^\circ$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H_0^\circ$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
$Ca_3(Fe(CN)_6)_2$ in 1 500 H_2O		544.1488	—	-497.52	—	—	—	—
in 2 000 H_2O		544.1488	—	-497.73	—	—	—	—
in 5 000 H_2O		544.1488	—	-498.44	—	—	—	—
in 7 500 H_2O		544.1488	—	-498.82	—	—	—	—
in 10 000 H_2O		544.1488	—	-499.07	—	—	—	—
$Ca_3(Fe(CN)_6)_2$ in 20 000 H_2O		544.1488	—	-499.70	—	—	—	—
in 50 000 H_2O		544.1488	—	-500.62	—	—	—	—
in 100 000 H_2O		544.1488	—	-501.33	—	—	—	—
in 500 000 H_2O		544.1488	—	-502.92	—	—	—	—
in 1 000 000 H_2O		544.1488	—	-503.42	—	—	—	—
$Ca_3(Fe(CN)_6)_2$ in ∞ H_2O		544.1488	—	-504.6	—	—	—	—
$CaH_2Fe(CN)_6$	aq	254.0504	—	-84.5	—	—	—	—
$CaFeSiO_4$	cr	188.0106	—	-1908.	—	—	—	—
$CaCrO_4$	aq	156.0736	—	-1426.3	—	—	—	—
$CaMoO_3$	cr	184.0182	—	-1238.	—	—	—	—
$CaMoO_4$	cr	200.0176	—	-1541.4	-1434.6	—	122.6	114.31
	g	200.0176	-824.	—	—	—	—	—
	ai	200.0176	—	-1540.5	-1389.9	—	-25.9	—
$CaWO_3$	g	271.9282	-473.	—	—	—	—	—
$CaWO_4$	cr	287.9276	-1637.082	-1645.15	-1538.43	19.979	126.40	114.14
$CaWO_4$	g	287.9276	-941.	—	—	—	—	—
	ai	287.9276	—	-1618.4	—	—	—	—
$CaO \cdot V_2O_5$	cr	237.9604	—	-2329.27	-2169.60	—	179.1	166.77
$(CaO)_2 \cdot V_2O_5$	cr	294.0398	—	-3083.36	-2893.08	—	220.5	209.53
$(CaO)_3 \cdot V_2O_5$	cr	350.1192	—	-3777.94	-3560.96	—	274.9	252.25
$CaO \cdot TiO_2$ perovskite	cr	135.9782	—	-1660.6	-1575.2	—	93.64	97.65
$(CaO)_3 \cdot 2TiO_2$	cr	328.0358	—	-3950.5	-3751.3	—	234.7	239.32
$CaTiSiO_5$ sphene	cr	196.0630	—	-2603.3	-2461.8	—	129.20	138.95
$CaZrO_3$	cr	179.2982	—	-1766.9	-1681.1	—	100.08	99.91
$CaHfO_3$	cr	266.5682	—	-1811.7	—	—	—	—
$CaUO_4$	cr	342.1066	—	-2001.6	—	—	—	—
$CaMg_2$ γ	cr	88.7040	-40.04	-40.2	-39.3	15.564	104.27	75.69
$CaCl_2 \cdot 2MgCl_2 \cdot 2H_2O$	cr	337.4528	—	-2949.3	—	—	—	—
$CaCO_3 \cdot MgCO_3$ dolomite	cr	184.4108	-2313.46	-2326.3	-2163.4	25.983	155.18	157.53
$CaO \cdot MgO \cdot SiO_2$ monticellite	cr	156.4756	—	-2263.08	—	—	—	—
$CaO \cdot MgO \cdot 2SiO_2$ diopside	cr	216.5604	—	-3206.2	-3032.0	—	142.93	166.52
	vit	216.5604	—	-3113.	—	—	—	—
$(CaO)_2 \cdot MgO \cdot 2SiO_2$ ankermanite	cr	272.6398	—	-3877.19	-3679.84	—	209.2	212.00
	vit	272.6398	—	-3844.7	—	—	—	—
$(CaO)_2 \cdot 5MgO \cdot 8SiO_2 \cdot H_2O$ tremolite	cr	812.4096	—	-12360.	-11631.	97.65	548.9	655.6
$(CaO)_3 \cdot MgO \cdot 2SiO_2$ mervinite	cr	328.7192	—	-4567.7	-4340.4	—	253.1	252.25

Table 95:Sr — **STRONTIUM** (Prepared 1970) — Table 95:Sr

Substance Formula and Description		State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
Sr	α	cr	87.6200	0	0	0	—	52.3	26.4
		g	87.6200	—	164.4	130.9	6.197	164.62	20.786
Sr^+		g	87.6200	—	720.11	—	6.197	—	—
Sr^{2+}		g	87.6200	—	1790.54	—	6.197	—	—
Sr^{3+}		g	87.6200	—	5933.37	—	6.197	—	—
Sr^{4+}		g	87.6200	—	11369.6	—	—	—	—
Sr^{5+}		g	87.6200	—	18288.	—	—	—	—
Sr^{6+}		g	87.6200	—	27058.	—	—	—	—
Sr^{7+}		g	87.6200	—	37292.	—	—	—	—
Sr^{8+}		g	87.6200	—	49103.	—	—	—	—
Sr^{2+}		ao	87.6200	—	-545.80	-559.48	—	-32.6	—
SrO		cr	103.6194	—	-592.0	-561.9	—	54.4	45.02
		g	103.6194	—	-8.	—	—	—	—
SrO_2		cr	119.6188	—	-633.5	—	—	—	—
$SrO_2 \cdot 8H_2O$		cr	263.7420	—	-3023.4	—	—	—	—
Sr_2O		cr	191.2394	—	-647.3	—	—	—	—
		g	191.2394	—	-234.	—	—	—	—
SrH		g	88.6280	—	218.	188.	8.703	212.66	30.00
SrH_2		cr	89.6360	—	-180.3	—	—	—	—
SrOH		g	104.6274	—	-172.	—	—	—	—
$SrOH^+$		ao	104.6274	—	—	-721.3	—	—	—
$Sr(OH)_2$		cr	121.6348	—	-959.0	—	—	—	—
		g	121.6348	—	-565.	—	—	—	—
	in 800 H_2O		121.6348	—	-1004.6	—	—	—	—
$Sr(OH)_2 \cdot H_2O$		cr	139.6502	—	-1264.8	—	—	—	—
$Sr(OH)_2 \cdot 8H_2O$		cr	265.7580	—	-3352.2	—	—	—	—
SrF		g	106.6184	—	-288.7	-314.2	9.284	239.89	34.60
SrF^+		g	106.6184	—	201.	—	—	—	—
SrF_2		cr	125.6168	—	-1216.3	-1164.8	13.075	82.13	70.00
		g	125.6168	—	-764.4	-775.3	13.355	291.06	52.97
SrCl		g	123.0730	—	-126.4	-152.7	9.782	252.0	36.53
$SrCl_2$	α	cr	158.5260	—	-828.9	-781.1	16.234	114.85	75.60
		g	158.5260	—	-485.8	-496.2	14.452	310.81	55.77
		ai	158.5260	—	-880.10	-821.91	—	80.3	—
	in 200 H_2O		158.5260	—	-877.72	—	—	—	—
$SrCl_2$	in 300 H_2O		158.5260	—	-877.93	—	—	—	—
	in 400 H_2O		158.5260	—	-878.100	—	—	—	—
	in 500 H_2O		158.5260	—	-878.222	—	—	—	—
	in 800 H_2O		158.5260	—	-878.452	—	—	—	—
	in 1 000 H_2O		158.5260	—	-878.544	—	—	—	—
$SrCl_2$	in 2 000 H_2O		158.5260	—	-878.878	—	—	—	—
	in 5 000 H_2O		158.5260	—	-879.242	—	—	—	—
	in 10 000 H_2O		158.5260	—	-879.456	—	—	—	—
	in 20 000 H_2O		158.5260	—	-879.627	—	—	—	—
	in 50 000 H_2O		158.5260	—	-879.786	—	—	—	—
$SrCl_2$	in 100 000 H_2O		158.5260	—	-879.874	—	—	—	—
	in 500 000 H_2O		158.5260	—	-880.000	—	—	—	—
	in 1 000 000 H_2O		158.5260	—	-880.029	—	—	—	—
	in ∞ H_2O		158.5260	—	-880.10	—	—	—	—
	in 28 (HCl + 59.5 H_2O)		158.5260	—	-875.3	—	—	—	—

Table 95:Sr — STRONTIUM (Prepared 1970) — Continued — Table 95:Sr

Substance Formula	Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
$SrCl_2$	in 37 (HCl + 44.6 H_2O)		158.5260	—	-875.3	—	—	—	—
	in 56 (HCl + 29.8 H_2O)		158.5260	—	-873.6	—	—	—	—
	in 115 (HCl + 14.4 H_2O)		158.5260	—	-869.0	—	—	—	—
	in 726 (HCl + 12.8 H_2O)		158.5260	—	-866.9	—	—	—	—
$SrCl_2^+$		g	158.5260	—	456.	—	—	—	—
$SrCl_2 \cdot H_2O$		cr	176.5414	—	-1136.8	-1036.3	—	172.	120.1
$SrCl_2 \cdot 2H_2O$		cr	194.5568	—	-1438.0	-1281.8	—	218.	160.2
$SrCl_2 \cdot 6H_2O$		cr	266.6184	—	-2623.8	-2240.92	—	390.8	—
$Sr(OCl)_2$		aq	190.5248	—	-755.2	—	—	—	—
$Sr(ClO_2)_2$		aq	222.5236	—	-678.	—	—	—	—
$Sr(ClO_4)_2$		cr	286.5212	—	-762.79	—	—	—	—
		ai	286.5212	—	-804.46	-576.52	—	331.4	—
	in 13 H_2O		286.5212	—	-802.70	—	—	—	—
	in 15 H_2O		286.5212	—	-803.45	—	—	—	—
	in 20 H_2O		286.5212	—	-804.21	—	—	—	—
$Sr(ClO_4)_2$	in 25 H_2O		286.5212	—	-804.50	—	—	—	—
	in 30 H_2O		286.5212	—	-804.58	—	—	—	—
	in 40 H_2O		286.5212	—	-804.382	—	—	—	—
	in 50 H_2O		286.5212	—	-804.182	—	—	—	—
	in 75 H_2O		286.5212	—	-803.792	—	—	—	—
$Sr(ClO_4)_2$	in 100 H_2O		286.5212	—	-803.546	—	—	—	—
	in 150 H_2O		286.5212	—	-803.311	—	—	—	—
	in 200 H_2O		286.5212	—	-803.223	—	—	—	—
	in 300 H_2O		286.5212	—	-803.161	—	—	—	—
	in 400 H_2O		286.5212	—	-803.152	—	—	—	—
$Sr(ClO_4)_2$	in 500 H_2O		286.5212	—	-803.169	—	—	—	—
	in 800 H_2O		286.5212	—	-803.236	—	—	—	—
	in 1 000 H_2O		286.5212	—	-803.295	—	—	—	—
	in 2 000 H_2O		286.5212	—	-803.466	—	—	—	—
	in 5 000 H_2O		286.5212	—	-803.713	—	—	—	—
$Sr(ClO_4)_2$	in 10 000 H_2O		286.5212	—	-803.880	—	—	—	—
	in 20 000 H_2O		286.5212	—	-804.018	—	—	—	—
	in 50 000 H_2O		286.5212	—	-804.161	—	—	—	—
	in 100 000 H_2O		286.5212	—	-804.240	—	—	—	—
	in 500 000 H_2O		286.5212	—	-804.353	—	—	—	—
$Sr(ClO_4)_2$	in 1 000 000 H_2O		286.5212	—	-804.382	—	—	—	—
	in ∞ H_2O		286.5212	—	-804.46	—	—	—	—
	in CH_3OH:u		286.5212	—	-865.7	—	—	—	—
	in C_2H_5OH:u		286.5212	—	-828.4	—	—	—	—
	in C_3H_7OH:u in 1–propanol		286.5212	—	-818.8	—	—	—	—
$Sr(ClO_4)_2$	in C_3H_7OH:u2 in 2–propanol		286.5212	—	-825.55	—	—	—	—
	in C_4H_9OH:u in 1–butanol		286.5212	—	-814.6	—	—	—	—
$Sr(ClO_4)_2 \cdot 2H_2O$		cr	322.5520	—	-1374.4	—	—	—	—
$Sr(ClO_4)_2 \cdot 4H_2O$		cr	358.5828	—	-1962.3	—	—	—	—
$SrCl_2 \cdot SrO \cdot 9H_2O$		cr	424.2840	—	-4211.6	—	—	—	—
SrClH		cr	124.0810	—	-525.1	—	—	—	—
SrFCl		cr	142.0714	—	-1046.0	—	—	—	—
$SrBr_2$		cr	247.4380	—	-717.6	-697.1	17.828	135.10	75.35
		g	247.4380	—	-410.	-444.	15.9	323.5	60.7
		ai	247.4380	—	-788.89	-767.39	—	132.2	—

Table 95:Sr STRONTIUM (Prepared 1970) — Continued Table 95:Sr

Substance Formula and Description		State	Molar mass g mol^{-1}	0 K $\Delta_f H^\circ_0$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H^\circ_0$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
$SrBr_2$	in 400 H_2O		247.4380	—	-787.18	—	—	—	—
	in 500 H_2O		247.4380	—	-787.26	—	—	—	—
	in 800 H_2O		247.4380	—	-787.47	—	—	—	—
	in 1 000 H_2O		247.4380	—	-787.533	—	—	—	—
	in 2 000 H_2O		247.4380	—	-787.789	—	—	—	—
$SrBr_2$	in 5 000 H_2O		247.4380	—	-788.094	—	—	—	—
	in 10 000 H_2O		247.4380	—	-788.287	—	—	—	—
	in 20 000 H_2O		247.4380	—	-788.441	—	—	—	—
	in 50 000 H_2O		247.4380	—	-788.588	—	—	—	—
	in 100 000 H_2O		247.4380	—	-788.671	—	—	—	—
$SrBr_2$	in 500 000 H_2O		247.4380	—	-788.789	—	—	—	—
	in 1 000 000 H_2O		247.4380	—	-788.818	—	—	—	—
	in ∞ H_2O		247.4380	—	-788.89	—	—	—	—
$SrBr_2 \cdot H_2O$		cr	265.4534	—	-1031.4	-954.3	—	180.	120.9
$SrBr_2 \cdot 6H_2O$		cr	355.5304	—	-2531.3	-2174.1	—	406.	343.5
$Sr(BrO_3)_2 \cdot H_2O$		cr	361.4498	—	-993.7	-763.0	—	280.	—
$SrBr_2 \cdot SrO \cdot 3H_2O$		cr	405.1036	—	-2313.8	—	—	—	—
$SrBr_2 \cdot SrO \cdot 9H_2O$		cr	513.1960	—	-4121.2	—	—	—	—
$SrBrH$		cr	168.5370	—	-464.4	—	—	—	—
SrI_2		cr	341.4288	—	-558.1	—	—	—	81.6
SrI_2		g	341.4288	—	-272.	—	—	—	—
		ai	341.4288	—	-656.18	-662.62	—	190.0	—
$SrI_2 \cdot H_2O$		cr	359.4442	—	-886.6	—	—	—	119.2
$SrI_2 \cdot 2H_2O$		cr	377.4596	—	-1182.4	—	—	—	163.6
$SrI_2 \cdot 6H_2O$		cr	449.5212	—	-2388.6	—	—	—	355.2
$Sr(IO_3)_2$		cr	437.4252	—	-1019.2	-855.1	—	234.	—
$Sr(IO_3)_2 \cdot H_2O$		cr	455.4406	—	-1310.4	-1089.4	—	276.	—
$Sr(IO_3)_2 \cdot 6H_2O$		cr	545.5176	—	-2789.9	-2274.4	—	456.	—
$SrIH$		cr	215.5324	—	-385.8	—	—	—	—
SrS		cr	119.6840	—	-472.4	-467.8	—	68.2	48.70
SrS		g	119.6840	—	109.	—	—	—	—
$SrSO_3$		cr	167.6822	—	-1177.0	—	—	—	—
$SrSO_4$		cr	183.6816	—	-1453.1	-1340.9	—	117.	—
	precipitated	cr2	183.6816	—	-1449.8	—	—	—	—
		ai	183.6816	—	-1455.07	-1304.00	—	-12.6	—
$SrS_2O_6 \cdot 4H_2O$		cr	319.8060	—	-2925.0	—	—	—	—
$SrI_2 \cdot 2SO_2$		cr	469.5544	—	-1244.3	—	—	—	—
$SrI_2 \cdot 4SO_2$		cr	597.6800	—	-1928.0	—	—	—	—
$SrSe$		cr	166.5800	—	-385.8	—	—	—	—
$SrSeO_3$		cr	214.5782	—	-1047.7	—	—	—	—
$SrSeO_4$		cr	230.5776	—	-1142.7	—	—	—	—
$Sr(N_3)_2$		cr	171.6602	—	8.8	—	—	—	—
Sr_3N_2		cr	290.8734	—	-391.2	—	—	—	—
$SrN_2O_2 \cdot 5H_2O$	hyponitrite	cr	237.7092	—	-1992.0	—	—	—	—
$Sr(NO_2)_2$		cr	179.6310	—	-762.3	—	—	—	—
$Sr(NO_2)_2$	in 800 H_2O		179.6310	—	-755.2	—	—	—	—
$Sr(NO_2)_2 \cdot H_2O$		cr	197.6464	—	-1063.6	—	—	—	—
$Sr(NO_3)_2$		cr	211.6298	—	-978.22	-780.02	28.677	194.56	149.91
		ai	211.6298	—	-960.52	-781.98	—	260.2	—
	in 20 H_2O		211.6298	—	-969.487	—	—	—	—

Substance Formula	Description	State	Molar mass g mol^{-1}	0 K $\Delta_f H_0^\circ$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H_0^\circ$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
$Sr(NO_3)_2$	in 25 H_2O		211.6298	—	-968.324	—	—	—	—
	in 30 H_2O		211.6298	—	-967.383	—	—	—	—
	in 40 H_2O		211.6298	—	-965.906	—	—	—	—
	in 50 H_2O		211.6298	—	-964.809	—	—	—	—
	in 75 H_2O		211.6298	—	-963.073	—	—	—	—
$Sr(NO_3)_2$	in 100 H_2O		211.6298	—	-962.178	—	—	—	—
	in 150 H_2O		211.6298	—	-961.278	—	—	—	—
	in 200 H_2O		211.6298	—	-960.605	—	—	—	—
	in 300 H_2O		211.6298	—	-960.366	—	—	—	—
	in 400 H_2O		211.6298	—	-960.169	—	—	—	—
$Sr(NO_3)_2$	in 500 H_2O		211.6298	—	-960.036	—	—	—	—
	in 800 H_2O		211.6298	—	-959.868	—	—	—	—
	in 1 000 H_2O		211.6298	—	-959.831	—	—	—	—
	in 2 000 H_2O		211.6298	—	-959.793	—	—	—	—
	in 5 000 H_2O		211.6298	—	-959.910	—	—	—	—
$Sr(NO_3)_2$	in 10 000 H_2O		211.6298	—	-960.023	—	—	—	—
	in 20 000 H_2O		211.6298	—	-960.128	—	—	—	—
	in 50 000 H_2O		211.6298	—	-960.249	—	—	—	—
	in 100 000 H_2O		211.6298	—	-960.316	—	—	—	—
	in 500 000 H_2O		211.6298	—	-960.420	—	—	—	—
$Sr(NO_3)_2$	in 1 000 000 H_2O		211.6298	—	-960.450	—	—	—	—
	in ∞ H_2O		211.6298	—	-960.52	—	—	—	—
$Sr(NO_3)_2 \cdot 4H_2O$		cr	283.6914	—	-2154.8	-1730.39	—	369.0	—
$Sr(NH_2)_2$		cr	119.6654	—	-347.7	—	—	—	—
$Sr(NH_3)_6$		cr	189.8042	—	-517.6	—	—	—	—
$SrCl_2 \cdot NH_3$		cr	175.5567	—	-923.0	—	—	—	—
$SrCl_2 \cdot 8NH_3$		cr	294.7716	—	-1535.9	—	—	—	—
$Sr(ClO_4)_2 \cdot 2NH_3$		cr	320.5826	—	-946.4	—	—	—	—
$Sr(ClO_4)_2 \cdot 6NH_3$		cr	388.7054	—	-1315.9	—	—	—	—
$Sr(ClO_4)_2 \cdot 7NH_3$		cr	405.7361	—	-1400.0	—	—	—	—
$SrBr_2 \cdot NH_3$		cr	264.4687	—	-833.9	—	—	—	—
$SrBr_2 \cdot 2NH_3$		cr	281.4994	—	-933.5	—	—	—	—
$SrBr_2 \cdot 8NH_3$		cr	383.6836	—	-1484.9	—	—	—	—
$SrI_2 \cdot NH_3$		cr	358.4595	—	-680.7	—	—	—	—
$SrI_2 \cdot 2NH_3$		cr	375.4902	—	-791.6	—	—	—	—
$SrI_2 \cdot 6NH_3$		cr	443.6130	—	-1186.2	—	—	—	—
$SrI_2 \cdot 8NH_3$		cr	477.6744	—	-1372.4	—	—	—	—
$Sr(NH_4)_2(SO_4)_2$		cr	315.8206	—	-2639.3	—	—	—	—
Sr_3P_2		cr	324.8076	—	-636.	—	—	—	—
$Sr_3(PO_4)_2$		cr	452.8028	—	-4122.9	—	—	—	—
$SrHPO_4$		cr	183.5994	—	-1821.7	-1688.6	—	121.	—
$Sr(H_2PO_4)_2$		cr	281.5948	—	-3134.7	—	—	—	—
Sr_3As_2		cr	412.7032	—	-616.3	—	—	—	—
$Sr_3(AsO_4)_2$		cr	540.6984	—	-3317.1	-3080.1	—	255.	—
	hydrated precipitate	cr2	540.6984	—	-3360.	—	—	—	—
$SrHAsO_4$		aq	227.5472	—	-1446.4	—	—	—	—
$Sr(H_2AsO_4)_2$		aq	369.4904	—	-2356.4	—	—	—	—
$SrSb$		cr	209.3700	—	-192.	—	—	—	—
Sr_2Sb		cr	296.9900	—	-322.	—	—	—	—
Sr_3Sb_2		cr	506.3600	—	-565.	—	—	—	—

Table 95:Sr | **STRONTIUM** (Prepared 1970) — Continued | Table 95:Sr

Substance Formula and Description		State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$	S° J mol⁻¹ K⁻¹	C_p
SrBi		cr	296.6000	—	-180.	—	—	—	—
Sr_2Bi		cr	384.2200	—	-314.	—	—	—	—
Sr_3Bi_2		cr	680.8200	—	-531.	—	—	—	—
SrC_2		cr	111.6424	—	-75.	—	—	—	—
$SrCO_3$	strontianite	cr	147.6294	—	-1220.1	-1140.1	—	97.1	81.42
$SrCO_3$		ai	147.6294	—	-1222.94	-1087.29	—	-89.5	—
SrC_2O_4	oxalate	cr	175.6400	—	-1370.7	—	—	—	—
		ai	175.6400	—	-1370.7	-1233.4	—	8.8	—
$Sr(HCO_2)_2$	formate	cr	177.6560	—	-1393.3	—	—	—	—
$Sr(HCO_2)_2 \cdot 2H_2O$		cr	213.6868	—	-1990.7	—	—	—	—
$Sr(HCO_3)_2$		aq	209.6548	—	-1928.0	—	—	—	—
$SrCH_3CO_2^+$	acetate	ao	146.6652	—	—	-935.1	—	—	—
$Sr(CH_3CO_2)_2$		cr	205.7104	—	-1487.4	—	—	—	—
		aq	205.7104	—	-1512.1	—	—	—	—
$Sr(CH_3CO_2)_2 \cdot 0.5H_2O$		cr	214.7181	—	-1631.8	—	—	—	—
$Sr(CH_2OHCO_2)_2$	glycolate	cr	237.7092	—	-1846.8	—	—	—	—
		aq	237.7092	—	-1846.0	—	—	—	—
$SrBr_2 \cdot 0.5C_2H_5OH$		cr	270.4729	—	-858.	—	—	—	—
$SrCN_2$	cyanamide	cr	127.6446	—	-303.3	—	—	—	—
$Sr(CN)_2$		aq	139.6558	—	-238.5	—	—	—	—
$Sr(CN)_2 \cdot 4H_2O$		cr	211.7174	—	-1396.2	—	—	—	—
$SrSiO_3$		cr	163.7042	—	-1633.9	-1549.7	—	96.7	88.53
		vit	163.7042	—	-1590.	—	—	—	—
Sr_2SiO_4		cr	267.3236	—	-2304.5	-2191.1	—	153.1	134.26
Sr_2Ge		cr	247.8300	—	-314.	—	—	—	—
Sr_2Sn		cr	293.9300	—	-347.	—	—	—	—
Sr_2Pb		cr	382.4300	—	-335.	—	—	—	—
$SrI_2 \cdot 2PbI_2$		cr	1263.4264	—	-930.5	—	—	—	—
$SrI_2 \cdot 2PbI_2 \cdot 7H_2O$		cr	1389.5342	—	-2987.4	—	—	—	—
$Sr(BF_4)_2$		cr	261.2292	—	-3853.	—	—	—	—
$SrO \cdot Al_2O_3$		cr	205.5806	—	-2324.6	—	—	—	—
$(SrO)_3 \cdot Al_2O_3$		cr	412.8194	—	-3544.7	—	—	—	—
$(SrO)_4 \cdot Al_2O_3$	α	cr	516.4388	—	-4092.8	—	—	—	—
	β	cr2	516.4388	—	-4086.5	—	—	—	—
$(SrCl_2)_3 \cdot 4AlCl_3$		cr	1008.9400	—	-5373.9	—	—	—	—
$(SrO)_2 \cdot Al_2O_3 \cdot SiO_2$		cr	369.2848	—	-3933.4	—	—	—	—
$SrBr_2 \cdot HgBr_2$		aq	607.8460	—	-959.0	—	—	—	—
$SrBr_2 \cdot 2HgBr_2$		aq	968.2540	—	-1121.3	—	—	—	—
$(SrBr_2)_2 \cdot HgBr_2$		aq	855.2840	—	-1755.6	—	—	—	—
$SrHg(CN)_4$		aq	392.2816	—	-16.3	—	—	—	—
$Sr(Hg(CN)_3)_2$		aq	644.9074	—	258.6	—	—	—	—
$SrCl_2 \cdot 2Hg(CN)_2$		aq	663.7776	—	-323.4	—	—	—	—
$SrCl_2 \cdot 2Hg(CN)_2 \cdot 6H_2O$		cr	771.8700	—	-2107.5	—	—	—	—
$SrBr_2 \cdot 2Hg(CN)_2$		aq	752.6896	—	-236.0	—	—	—	—
$SrBr_2 \cdot 2Hg(CN)_2 \cdot 6H_2O$		cr	860.7820	—	-2032.2	—	—	—	—
$SrI_2 \cdot 2Hg(CN)_2$		aq	846.6804	—	-121.8	—	—	—	—
$SrI_2 \cdot 2Hg(CN)_2 \cdot 7H_2O$		cr	972.7882	—	-2209.2	—	—	—	—
$SrAg(CN)_3$		aq	273.5437	—	-164.4	—	—	—	—
$Sr(Ag(CN)_2)_2$		aq	407.4316	—	-1.7	—	—	—	—
$SrNi(CN)_4$		aq	250.4016	—	-164.4	—	—	—	—

Substance Formula and Description		State	Molar mass g mol⁻¹	0 K $\Delta_f H_0^\circ$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H_0^\circ$	S° J mol⁻¹ K⁻¹	C_p
$(SrO)_2 \cdot Fe_2O_3$		cr	366.9310	—	-2137.6	—	—	—	—
$(SrO)_3 \cdot Fe_2O_3$		cr	470.5504	—	-2871.5	—	—	—	—
$(SrO)_7 \cdot 5Fe_2O_3$		cr	1523.7968	—	-8527.	—	—	—	—
$SrFe(CN)_6^-$		ao	299.5744	—	—	153.7	—	—	—
$Sr_2Fe(CN)_6$	from $Fe(CN)_6^{4-}$	ai	387.1944	—	-636.0	-423.87	—	29.7	—
$Sr_2Fe(CN)_6$	in 1 500 H_2O		387.1944	—	-627.77	—	—	—	—
	in 2 000 H_2O		387.1944	—	-627.93	—	—	—	—
	in 5 000 H_2O		387.1944	—	-628.48	—	—	—	—
	in 7 500 H_2O		387.1944	—	-628.81	—	—	—	—
	in 10 000 H_2O		387.1944	—	-629.11	—	—	—	—
$Sr_2Fe(CN)_6$	in 20 000 H_2O		387.1944	—	-629.98	—	—	—	—
	in 50 000 H_2O		387.1944	—	-631.11	—	—	—	—
	in 100 000 H_2O		387.1944	—	-631.91	—	—	—	—
	in 200 000 H_2O		387.1944	—	-635.13	—	—	—	—
	in 500 000 H_2O		387.1944	—	-633.83	—	—	—	—
$Sr_2Fe(CN)_6$	in 1 000 000 H_2O		387.1944	—	-634.84	—	—	—	—
	in ∞ H_2O		387.1944	—	-636.0	—	—	—	—
$Sr_3(Fe(CN)_6)_2$	from $Fe(CN)_6^{3-}$	ai	686.7688	—	-513.8	-219.5	—	442.7	—
	in 1 500 H_2O		686.7688	—	-506.93	—	—	—	—
	in 2 000 H_2O		686.7688	—	-507.18	—	—	—	—
$Sr_3(Fe(CN)_6)_2$	in 5 000 H_2O		686.7688	—	-508.06	—	—	—	—
	in 7 500 H_2O		686.7688	—	-508.52	—	—	—	—
	in 10 000 H_2O		686.7688	—	-508.86	—	—	—	—
	in 20 000 H_2O		686.7688	—	-509.57	—	—	—	—
	in 50 000 H_2O		686.7688	—	-510.41	—	—	—	—
$Sr_3(Fe(CN)_6)_2$	in 100 000 H_2O		686.7688	—	-510.95	—	—	—	—
	in 200 000 H_2O		686.7688	—	-511.49	—	—	—	—
	in 500 000 H_2O		686.7688	—	-512.25	—	—	—	—
	in 1 000 000 H_2O		686.7688	—	-512.75	—	—	—	—
	in ∞ H_2O		686.7688	—	-513.8	—	—	—	—
$Sr_3(FeCO(CN)_5)_2$		cr	690.7542	—	-1082.4	—	—	—	—
		aq	690.7542	—	-1256.5	—	—	—	—
$Sr_3(FeCO(CN)_5)_2 \cdot 4H_2O$		cr	762.8158	—	-2259.4	—	—	—	—
$SrMoO_3$		cr	231.5582	—	-1280.	—	—	—	—
		g	231.5582	—	-544.	—	—	—	—
$SrMoO_4$		cr	247.5576	—	-1548.	—	—	—	—
		g	247.5576	—	-983.	—	—	—	—
$SrWO_3$		g	319.4682	—	-586.	—	—	—	—
$SrWO_4$		cr	335.4676	—	-1639.7	-1531.	—	138.	—
		g	335.4676	—	-1025.	—	—	—	—
$SrTiO_3$		cr	183.5182	—	-1672.39	-1588.36	—	108.8	98.37
Sr_2TiO_4		cr	287.1376	—	-2287.4	-2172.3	—	159.0	143.68
$SrZrO_3$		cr	226.8382	—	-1767.3	-1682.8	—	115.1	103.39
$SrHfO_3$		cr	314.1082	—	-1814.6	—	—	—	—
$SrUO_4$	α, rhombohedral	cr	389.6466	—	-1985.3	—	—	—	—
$SrUO_4$	β, orthorhombic	cr2	389.6466	—	-1986.6	—	—	—	—
Sr_2UO_5		cr	493.2660	—	-2625.9	—	—	—	—
$Sr_2U_3O_{11}$		cr	1065.3204	—	-5235.0	—	—	—	—
Sr_3UO_6		cr	596.8854	—	-3248.0	—	—	—	—
$SrMg_2$	β phase	cr	136.2440	—	-21.3	—	—	—	—

Table 96:**Ba** **BARIUM** (Prepared 1969) Table 96:**Ba**

Substance Formula and Description		State	Molar mass g mol^{-1}	0 K $\Delta_f H^\circ_0$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H^\circ_0$	S° J mol^{-1} K^{-1}	C_p
Ba		cr	137.3400	0	0	0	6.90	62.8	28.07
		g	137.3400	180.7	180.	146.	6.197	170.243	20.786
Ba^+		g	137.3400	683.58	688.94	—	6.197	—	—
Ba^{2+}		g	137.3400	1648.83	1660.38	—	—	—	—
Ba^{3+}		g	137.3400	5102.4	5120.0	—	—	—	—
Ba^{2+}		ao	137.3400	—	-537.64	-560.77	—	9.6	—
BaO		cr	153.3394	-552.29	-553.5	-525.1	9.979	70.42	47.78
		g	153.3394	—	-117.	—	—	—	33.1
BaO^+		g	153.3394	—	555.6	—	—	—	—
BaO_2		cr	169.3388	—	-634.3	—	—	—	66.9
$BaO_2 \cdot H_2O$		cr	187.3542	—	-930.1	—	—	—	—
$BaO_2 \cdot 8H_2O$		cr	313.4620	—	-3006.6	—	—	—	—
Ba_2O		cr	290.6794	—	-615.5	—	—	—	—
		g	290.6794	—	-301.	—	—	—	—
Ba_2O_2		g	306.6788	—	-565.	—	—	—	—
BaH		g	138.3480	224.18	222.	197.	8.711	218.89	30.08
BaH_2		cr	139.3560	—	-178.7	—	—	—	—
BaOH		g	154.3474	—	-218.	—	—	—	—
$BaOH^+$		ao	154.3474	—	—	-730.5	—	—	—
$Ba(OH)_2$		cr	171.3548	—	-944.7	—	—	—	—
$Ba(OH)_2$		g	171.3548	—	-586.	—	—	—	—
	in 500 H_2O		171.3548	—	-995.4	—	—	—	—
$Ba(OH)_2 \cdot H_2O$		cr	189.3702	—	-1248.5	—	—	—	—
$Ba(OH)_2 \cdot 3H_2O$		cr	225.4010	—	-1849.3	—	—	—	—
$Ba(OH)_2 \cdot 8H_2O$		cr	315.4780	—	-3342.2	-2792.8	—	427.	—
$BaO_2 \cdot H_2O_2$		cr	203.3536	—	-872.4	—	—	—	—
BaF		g	156.3384	-324.39	-326.4	-350.6	9.339	246.1	34.85
BaF^+		g	156.3384	142.	146.	—	—	—	—
BaF_2		cr	175.3368	-1205.79	-1207.1	-1156.8	14.443	96.36	71.21
		g	175.3368	-815.9	-818.0	-828.4	13.648	300.98	53.76
BaF_2		ai	175.3368	—	-1202.90	-1118.35	—	-18.0	—
BaCl		cr	172.7930	—	-460.	—	—	—	—
		g	172.7930	-165.7	-167.	-192.	9.87	258.7	36.82
$BaCl^+$		g	172.7930	318.	322.	—	—	—	—
$BaCl_2$		cr	208.2460	-859.18	-858.6	-810.4	16.707	123.68	75.14
$BaCl_2$		g	208.2460	-524.55	-525.9	-537.6	14.690	325.29	56.19
		ai	208.2460	—	-871.95	-823.21	—	122.6	—
	in 30 H_2O		208.2460	—	-869.213	—	—	—	—
	in 40 H_2O		208.2460	—	-869.243	—	—	—	—
	in 50 H_2O		208.2460	—	-869.276	—	—	—	—
$BaCl_2$	in 75 H_2O		208.2460	—	-869.364	—	—	—	—
	in 100 H_2O		208.2460	—	-869.448	—	—	—	—
	in 150 H_2O		208.2460	—	-869.586	—	—	—	—
	in 200 H_2O		208.2460	—	-869.699	—	—	—	—
	in 300 H_2O		208.2460	—	-869.875	—	—	—	—
$BaCl_2$	in 400 H_2O		208.2460	—	-870.013	—	—	—	—
	in 500 H_2O		208.2460	—	-870.117	—	—	—	—
	in 800 H_2O		208.2460	—	-870.322	—	—	—	—
	in 1 000 H_2O		208.2460	—	-870.423	—	—	—	—
	in 2 000 H_2O		208.2460	—	-870.732	—	—	—	—

Table 96:**Ba** **BARIUM** (Prepared 1969) — Continued Table 96:**Ba**

Substance Formula	Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
$BaCl_2$	in 5 000 H_2O		208.2460	—	-871.096	—	—	—	—
	in 10 000 H_2O		208.2460	—	-871.314	—	—	—	—
	in 20 000 H_2O		208.2460	—	-871.477	—	—	—	—
	in 50 000 H_2O		208.2460	—	-871.636	—	—	—	—
	in 100 000 H_2O		208.2460	—	-871.720	—	—	—	—
$BaCl_2$	in 500 000 H_2O		208.2460	—	-871.841	—	—	—	—
	in 1 000 000 H_2O		208.2460	—	-871.870	—	—	—	—
	in ∞ H_2O		208.2460	—	-871.95	—	—	—	—
	in HCl + 13.88 H_2O:u		208.2460	—	-858.1	—	—	—	—
	in HCl + 18.50 H_2O:u		208.2460	—	-860.6	—	—	—	—
$BaCl_2$	in HCl + 27.75 H_2O:u		208.2460	—	-863.6	—	—	—	—
	in HCl + 55.51 H_2O:u		208.2460	—	-867.3	—	—	—	—
	in HCl + 555 H_2O:u		208.2460	—	-871.5	—	—	—	—
$BaCl_2^+$		g	208.2460	360.	364.	—	—	—	—
$BaCl_2\cdot H_2O$		cr	226.2614	—	-1160.6	-1055.63	—	166.9	—
$BaCl_2\cdot 2H_2O$		cr	244.2768	—	-1460.13	-1296.32	—	202.9	161.96
$Ba(OCl)_2$	hypochlorite	aq	240.2448	—	-750.2	—	—	—	—
$Ba(ClO_2)_2$		cr	272.2436	—	-680.3	-531.3	—	197.	—
$Ba(ClO_2)_2\cdot 3.5H_2O$		cr	335.2975	—	-1706.7	—	—	—	—
$Ba(ClO_3)_2$		cr	304.2424	—	-771.5	—	—	—	—
$Ba(ClO_3)_2$	in 400 H_2O		304.2424	—	-746.0	—	—	—	—
$Ba(ClO_3)_2\cdot H_2O$		cr	322.2578	—	-1077.8	—	—	—	211.7
$Ba(ClO_4)_2$		cr	336.2412	—	-800.0	—	—	—	—
	in 900 H_2O		336.2412	—	-795.8	—	—	—	—
	in ∞ C_2H_5OH		336.2412	—	-822.6	—	—	—	—
$Ba(ClO_4)_2$	in ∞ C_3H_7OH:i in 1–propanol		336.2412	—	-817.6	—	—	—	—
	in ∞ C_4H_9OH: in 1–butanol		336.2412	—	-815.0	—	—	—	—
	in ∞ C_3H_7OH:i2 in 2–propanol		336.2412	—	-820.1	—	—	—	—
$Ba(ClO_4)_2\cdot 3H_2O$		cr	390.2874	—	-1691.6	-1270.4	—	393.	—
$BaCl_2\cdot BaO\cdot 3H_2O$		cr	415.6316	—	-2418.4	—	—	—	—
$BaCl_2\cdot BaO\cdot 5H_2O$		cr	451.6624	—	-3041.8	—	—	—	—
$BaCl_2\cdot BaO\cdot 8H_2O$		cr	505.7086	—	-3896.1	—	—	—	—
BaClH		cr	173.8010	—	-536.0	—	—	—	—
BaClF		cr	191.7914	—	-1064.4	—	—	—	—
$BaBr_2$		cr	297.1580	—	-757.3	-736.8	—	146.	—
$BaBr_2$		g	297.1580	-424.3	-439.	-473.	16.3	331.	61.5
		ai	297.1580	—	-780.73	-768.68	—	174.5	—
	in 400 H_2O		297.1580	—	-779.06	—	—	—	—
	in 500 H_2O		297.1580	—	-779.14	—	—	—	—
	in 800 H_2O		297.1580	—	-779.31	—	—	—	—
$BaBr_2$	in 1 000 H_2O		297.1580	—	-779.396	—	—	—	—
	in 2 000 H_2O		297.1580	—	-779.642	—	—	—	—
	in 5 000 H_2O		297.1580	—	-779.931	—	—	—	—
	in 10 000 H_2O		297.1580	—	-780.119	—	—	—	—
	in 20 000 H_2O		297.1580	—	-780.274	—	—	—	—
$BaBr_2$	in 50 000 H_2O		297.1580	—	-780.425	—	—	—	—
	in 100 000 H_2O		297.1580	—	-780.508	—	—	—	—
	in 500 000 H_2O		297.1580	—	-780.630	—	—	—	—
	in 1 000 000 H_2O		297.1580	—	-780.659	—	—	—	—
	in ∞ H_2O		297.1580	—	-780.73	—	—	—	—

Substance Formula and Description	State	Molar mass	0 K	298.15 K (25°C) and 0.1 MPa (1 bar)				
		g mol^{-1}	$\Delta_f H_0^\circ$ kJ mol^{-1}	$\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H_0^\circ$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
$BaBr_2 \cdot H_2O$	cr	315.1734	—	-1068.2	—	—	—	—
$BaBr_2 \cdot 2H_2O$	cr	333.1888	—	-1366.1	-1230.4	—	226.	—
$Ba(BrO)_2$	aq	329.1568	—	-730.1	—	—	—	—
$Ba(BrO_3)_2$	cr	393.1544	—	-718.18	-544.2	—	247.	—
	ai	393.1544	—	-671.78	-523.57	—	333.0	—
$Ba(BrO_3)_2$ in 20 000 H_2O		393.1544	—	-674.59	—	—	—	—
in 50 000 H_2O		393.1544	—	-672.24	—	—	—	—
in 100 000 H_2O		393.1544	—	-671.57	—	—	—	—
$Ba(BrO_3)_2 \cdot H_2O$	cr	411.1698	-991.57	-1020.23	-789.0	41.59	288.3	223.8
$BaBr_2 \cdot BaO \cdot 2H_2O$	cr	486.5282	—	-2033.4	—	—	—	—
$BaBr_2 \cdot BaO \cdot 5H_2O$	cr	540.5744	—	-2951.4	—	—	—	—
$BaBrH$	cr	218.2570	—	-487.0	—	—	—	—
BaI_2	cr	391.1488	—	-602.1	—	—	—	—
	g	391.1488	-323.0	-326.	-377.	16.7	343.	61.5
	ai	391.1488	—	-648.02	-663.92	—	232.2	—
$BaI_2 \cdot H_2O$	cr	409.1642	—	-919.2	—	—	—	—
$BaI_2 \cdot 2H_2O$	cr	427.1796	—	-1216.7	—	—	—	—
$BaI_2 \cdot 2.5H_2O$	cr	436.1873	—	-1363.6	—	—	—	—
$BaI_2 \cdot 7H_2O$	cr	517.2566	—	-2676.5	—	—	—	—
$Ba(IO_3)_2$	cr	487.1452	-1018.01	-1027.2	-864.7	36.99	249.4	187.4
$Ba(IO_3)_2$	ai	487.1452	—	-980.3	-816.6	—	246.4	—
$Ba(IO_3)_2 \cdot H_2O$	cr	505.1606	—	-1322.1	-1104.0	—	297.	—
$BaI_2 \cdot BaO \cdot 2H_2O$	cr	580.5190	—	-1905.0	—	—	—	—
$BaI_2 \cdot BaO \cdot 9H_2O$	cr	706.6268	—	-3995.7	—	—	—	—
$BaIH$	cr	265.2524	—	-410.5	—	—	—	—
BaS	cr	169.4040	—	-460.	-456.	—	78.2	49.37
	g	169.4040	—	50.	—	—	—	—
	aq	169.4040	—	-493.3	—	—	—	—
Ba_2S_2	g	338.8080	—	-377.	—	—	—	—
$BaSO_3$	cr	217.4022	—	-1179.5	—	—	—	—
$BaSO_4$	cr	233.4016	—	-1473.2	-1362.2	—	132.2	101.75
precipitated	cr2	233.4016	—	-1466.5	—	—	—	—
	ai	233.4016	—	-1446.91	-1305.30	—	29.7	—
BaS_2O_3	cr	249.4662	—	—	—	—	—	170.3
BaS_2O_6	aq	297.4644	—	-1738.0	—	—	—	—
$BaS_2O_6 \cdot 2H_2O$	cr	333.4952	—	-2337.2	—	—	—	—
BaS_2O_8 in 800 H_2O		329.4632	—	-1904.1	—	—	—	—
$BaS_2O_8 \cdot 4H_2O$	cr	401.5248	—	-3095.3	—	—	—	—
$BaS_4O_6 \cdot 2H_2O$	cr	397.6232	—	-2361.0	—	—	—	—
$Ba(HS)_2$	aq	203.4840	—	-561.9	—	—	—	—
$Ba(HSO_3)_2$	aq	299.4804	—	-1799.1	—	—	—	—
$BaSO_4 \cdot H_2SO_4$	cr	331.4792	—	-2295.3	—	—	—	—
$BaSO_4 \cdot 2H_2SO_4 \cdot H_2O$	cr	447.5722	—	-3430.0	—	—	—	—
$BaI_2 \cdot 2SO_2$	cr	519.2744	—	-1290.8	—	—	—	—
$BaI_2 \cdot 4SO_2$	cr	647.4000	—	-1967.3	—	—	—	—
$BaSe$	cr	216.3000	—	-372.	—	—	—	—
$BaSeO_3$	cr	264.2982	—	-1040.6	-968.1	—	167.	—
$BaSeO_4$	cr	280.2976	—	-1146.4	-1044.7	—	176.	—
BaN_2	cr	165.3534	—	-172.	—	—	—	—
$Ba(N_3)_2 \cdot H_2O$	cr	239.3956	—	-308.4	-104.9	—	188.	—

Table 96:**Ba** **BARIUM** (Prepared 1969) — Continued Table 96:**Ba**

Substance Formula and Description		State	Molar mass g mol^{-1}	0 K $\Delta_f H_0^\circ$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H_0^\circ$	S° J mol^{-1} K^{-1}	C_p
Ba_2N		cr	288.6867	—	−217.6	—	—	—	—
Ba_3N_2		cr	440.0334	—	−363.2	—	—	—	—
$BaNO_3^+$		ao	199.3449	—	−735.5	−666.67	—	172.	—
$Ba(NO_2)_2$		cr	229.3510	—	−768.2	—	—	—	—
		aq	229.3510	—	−746.8	—	—	—	—
$Ba(NO_2)_2 \cdot H_2O$		cr	247.3664	—	−1066.1	—	—	—	—
$Ba(NO_3)_2$		cr	261.3498	—	−992.07	−796.59	—	213.8	151.38
		ai	261.3498	—	−952.36	−783.28	—	302.5	—
	in 200 H_2O		261.3498	—	−955.935	—	—	—	—
	in 300 H_2O		261.3498	—	−954.621	—	—	—	—
$Ba(NO_3)_2$	in 400 H_2O		261.3498	—	−953.973	—	—	—	—
	in 500 H_2O		261.3498	—	−953.592	—	—	—	—
	in 800 H_2O		261.3498	—	−952.990	—	—	—	—
	in 1 000 H_2O		261.3498	—	−952.776	—	—	—	—
	in 2 000 H_2O		261.3498	—	−952.350	—	—	—	—
$Ba(NO_3)_2$	in 5 000 H_2O		261.3498	—	−952.094	—	—	—	—
	in 10 000 H_2O		261.3498	—	−952.048	—	—	—	—
	in 20 000 H_2O		261.3498	—	−952.065	—	—	—	—
	in 50 000 H_2O		261.3498	—	−952.124	—	—	—	—
	in 100 000 H_2O		261.3498	—	−952.174	—	—	—	—
$Ba(NO_3)_2$	in 500 000 H_2O		261.3498	—	−952.266	—	—	—	—
	in 1 000 000 H_2O		261.3498	—	−952.291	—	—	—	—
	in ∞ H_2O		261.3498	—	−952.36	—	—	—	—
	in 500 NH_3		261.3498	—	−1056.13	—	—	—	—
BaNH		cr	152.3547	—	−223.4	—	—	—	—
$Ba(NH_2)_2$		cr	169.3854	—	−328.4	—	—	—	—
$Ba(NH_3)_6$		cr	239.5242	—	−518.8	—	—	—	—
Ba_2NCl		cr	324.1397	—	−616.3	—	—	—	—
$BaCl_2 \cdot 8NH_3$		cr	344.4916	—	−1525.1	—	—	—	—
$Ba(ClO_4)_2 \cdot 2NH_3$		cr	370.3026	—	−974.9	—	—	—	—
$Ba(ClO_4)_2 \cdot 6NH_3$		cr	438.4254	—	−1313.8	—	—	—	—
Ba_2NBr		cr	368.5957	—	−573.2	—	—	—	—
$BaBr_2 \cdot NH_3$		cr	314.1887	—	−853.1	—	—	—	—
$BaBr_2 \cdot 2NH_3$		cr	331.2194	—	−943.5	—	—	—	—
$BaBr_2 \cdot 4NH_3$		cr	365.2808	—	−1120.9	—	—	—	—
$BaBr_2 \cdot 8NH_3$		cr	433.4036	—	−1471.9	—	—	—	—
Ba_6NI_9		cr	1980.1863	—	−2933.	—	—	—	—
$BaI_2 \cdot 2NH_3$		cr	425.2102	—	−807.1	—	—	—	—
$BaI_2 \cdot 4NH_3$		cr	459.2716	—	−993.7	—	—	—	—
$BaI_2 \cdot 6NH_3$		cr	493.3330	—	−1178.6	—	—	—	—
$BaI_2 \cdot 8NH_3$		cr	527.3944	—	−1360.2	—	—	—	—
$BaI_2 \cdot 9NH_3$		cr	544.4251	—	−1448.1	—	—	—	—
$BaI_2 \cdot 10NH_3$		cr	561.4558	—	−1525.9	—	—	—	—
$Ba_3(PO_4)_2$	colloidal	cr	601.9628	—	−4092.	—	—	—	—
$BaHPO_4$		cr	233.3194	—	−1814.6	—	—	—	—
$Ba(H_2PO_2)_2$	hypophosphite	cr	267.3172	—	−1762.3	—	—	—	—
	in 400 H_2O		267.3172	—	−1763.1	—	—	—	—
	in 800 H_2O		267.3172	—	−1764.0	—	—	—	—
	in 1 200 H_2O		267.3172	—	−1764.8	—	—	—	—
	in ∞ H_2O		267.3172	—	−1765.2	—	—	—	—

Substance Formula and Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H_0^\circ$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H_0^\circ$	S° J mol⁻¹ K⁻¹	C_p
$Ba(H_2PO_2)_2 \cdot H_2O$	cr	285.3326	—	-2052.3	—	—	—	—
$Ba(H_2PO_4)_2$	cr	331.3148	—	-3125.	—	—	—	—
$Ba_3(AsO_4)_2$ hydrated precipitate	cr	689.8584	—	-3427.	—	—	—	—
$BaHAsO_4 \cdot H_2O$	cr	295.2826	—	-1726.3	—	—	—	—
$Ba(H_2AsO_4)_2 \cdot 2H_2O$	cr	455.2412	—	-2915.8	—	—	—	—
BaC_2	cr	161.3624	—	-75.	—	—	—	—
$BaCO_3$ witherite	cr	197.3494	—	-1216.3	-1137.6	—	112.1	85.35
	ai	197.3494	—	-1214.78	-1088.59	—	-47.3	—
BaC_2O_4 oxalate	cr	225.3600	—	-1368.6	—	—	—	—
$BaC_2O_4 \cdot 0.5H_2O$	cr	234.3677	—	-1528.8	—	—	—	—
$BaC_2O_4 \cdot 2H_2O$	cr	261.3908	—	-1971.1	—	—	—	—
$BaC_2O_4 \cdot 3.5H_2O$	cr	288.4139	—	-2412.5	—	—	—	—
$Ba(HCO_2)_2$ formate	cr	227.3760	—	-1395.8	—	—	—	—
in 440 H_2O		227.3760	—	-1387.4	—	—	—	—
$Ba(HCO_3)_2$	ai	259.3748	—	-1921.63	-1734.30	—	192.0	—
$Ba(CH_3CO_2)_2$ acetate	cr	255.4304	—	-1484.5	—	—	—	—
	ai	255.4304	—	-1509.67	-1299.39	—	182.8	—
in 500 H_2O		255.4304	—	-1507.1	—	—	—	—
$Ba(CH_3CO_2)_2 \cdot 3H_2O$	cr	309.4766	—	-2369.0	—	—	—	—
$Ba(CH_2OHCO_2)_2$ glycolate	cr	287.4292	—	-1860.6	—	—	—	—
$Ba(CH_2OHCO_2)_2$	ai	287.4292	—	-1839.3	—	—	—	—
$Ba(C_2H_5O)_2$ ethylate	cr	227.4636	—	-914.6	—	—	—	—
$(BaO)_3 \cdot 4CH_3OH$	cr	588.1886	—	-2979.8	—	—	—	—
$(BaO)_3 \cdot 4C_2H_5OH$	cr	644.2974	—	-3076.1	—	—	—	—
$BaCS_3$ trithiocarbonate	cr	245.5432	—	-531.	—	—	—	—
$Ba(HSO_3)_2 \cdot C_2H_2O_2$	aq	357.5176	—	-2186.6	—	—	—	—
$Ba(HSO_3)_2 \cdot C_2H_2O_2 \cdot 2.5H_2O$ glyoxal barium bisulfite	cr	402.5561	—	-2935.5	—	—	—	—
$Ba(C_2H_5SO_4)_2$ in 400 H_2O ethylsulfate		387.5880	—	-2289.9	—	—	—	—
$Ba(C_2H_5SO_4)_2 \cdot 2H_2O$	cr	423.6188	—	-2880.3	—	—	—	—
$BaCN_2$ cyanamide	cr	177.3646	—	-266.1	—	—	—	—
$Ba(CN)_2$	cr	189.3758	—	-218.4	—	—	—	—
	ai	189.3758	—	-230.1	—	—	—	—
$Ba(CN)_2 \cdot H_2O$	cr	207.3912	—	-520.5	—	—	—	—
$Ba(CN)_2 \cdot 2H_2O$	cr	225.4066	—	-817.6	—	—	—	—
$Ba(CNO)_2$	cr	221.3746	—	-891.	—	—	—	—
$BaO \cdot SiO_2$	cr	213.4242	—	-1623.60	-1540.21	—	109.6	90.00
	vit	213.4242	—	-1573.	—	—	—	—
$BaO \cdot 2SiO_2$	cr	273.5090	—	-2548.1	-2410.7	—	153.1	134.10
$(BaO)_2 \cdot SiO_2$	cr	366.7636	—	-2287.8	-2174.8	—	176.1	134.89
$(BaO)_2 \cdot 3SiO_2$	cr	486.9332	—	-4184.8	-3963.0	—	258.2	224.60
$BaSiF_6$	cr	279.4164	—	-2952.2	-2794.0	—	163.	—
$BaO \cdot GeO_2$	cr	257.9282	—	-1237.6	—	—	—	—
$(BaO)_2 \cdot GeO_2$	cr	411.2676	—	-1867.3	—	—	—	—
$(BaO)_3 \cdot GeO_2$	cr	564.6070	—	-2467.3	—	—	—	—
$BaI_2 \cdot 2PbI_2$	cr	1313.1464	—	-959.4	—	—	—	—
$BaI_2 \cdot 2PbI_2 \cdot 7H_2O$	cr	1439.2542	—	-2999.1	—	—	—	—
$BaAl_4$	cr	245.2660	—	-117.	—	—	—	—
$BaO \cdot Al_2O_3$	cr	255.3006	—	-2326.	—	—	—	—

Table 96:**Ba** **BARIUM** (Prepared 1969) — Continued Table 96:**Ba**

Substance Formula and Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
$BaO \cdot Al_2O_3 \cdot H_2O$	cr	273.3160	—	-2649.7	—	—	—	—
$BaO \cdot Al_2O_3 \cdot 2H_2O$	cr	291.3314	—	-2949.7	—	—	—	—
$BaO \cdot Al_2O_3 \cdot 4H_2O$	cr	327.3622	—	-3558.9	—	—	—	—
$BaO \cdot Al_2O_3 \cdot 7H_2O$	cr	381.4084	—	-4441.3	—	—	—	—
$(BaO)_2 \cdot Al_2O_3 \cdot 5H_2O$	cr	498.7170	—	-4538.8	—	—	—	—
$(BaO)_3 \cdot Al_2O_3$	cr	561.9794	—	-3519.	—	—	—	—
$(BaO)_7 \cdot 6Al_2O_3 \cdot 36H_2O$	cr	2333.6938	—	-25347.	—	—	—	—
$BaCl_2 \cdot Al_2Cl_6$	cr	474.9270	—	-2289.1	—	—	—	—
$(BaCl_2)_3 \cdot 2Al_2Cl_6$	cr	1158.1000	—	-5453.4	—	—	—	—
$(Ba(NO_2)_2)_2 \cdot TlNO_2$	cr	709.0775	—	-1597.9	—	—	—	—
$BaHgBr_4$	aq	657.5660	—	-951.9	—	—	—	—
$Ba(HgBr_3)_2$	aq	1017.9740	—	-1113.8	—	—	—	—
Ba_2HgBr_6	aq	954.7240	—	-1739.3	—	—	—	—
Ba_4HgBr_{10}	aq	1549.0400	—	-3298.2	—	—	—	—
$BaHg(CN)_4$	aq	442.0016	—	-3.8	—	—	—	—
$Ba(Hg(CN)_3)_2$	aq	694.6274	—	266.9	—	—	—	—
$BaCl_2 \cdot 2Hg(CN)_2$	aq	713.4976	—	-315.1	—	—	—	—
$BaCl_2 \cdot 2Hg(CN)_2 \cdot 5H_2O$	cr	803.5746	—	-1819.6	—	—	—	—
$BaBr_2 \cdot 2Hg(CN)_2$	aq	802.4096	—	-227.6	—	—	—	—
$BaBr_2 \cdot 2Hg(CN)_2 \cdot 7H_2O$	cr	928.5174	—	-2318.8	—	—	—	—
$(Hg(CN)_2)_2 \cdot BaI_2$	aq	896.4004	—	-113.0	—	—	—	—
$(Hg(CN)_2)_2 \cdot BaI_2 \cdot 6H_2O$	cr	1004.4928	—	-1924.6	—	—	—	—
$BaAg(CN)_3$	aq	323.2637	—	-119.7	—	—	—	—
$Ba(Ag(CN)_2)_2$	aq	457.1516	—	7.9	—	—	—	—
$Ba(Ni(CN)_4)$	aq	300.1216	—	-142.7	—	—	—	—
$Ba_2Fe(CN)_6$	aq	486.6344	—	-609.6	—	—	—	—
$Ba_2Fe(CN)_6 \cdot 6H_2O$	cr	594.7268	—	-2372.3	—	—	—	—
$Ba_3(Fe(CN)_6)_2$ from $Fe(CN)_6^{3-}$	ai	835.9288	—	-489.1	-223.6	—	569.4	—
in 1 500 H_2O		835.9288	—	-481.29	—	—	—	—
in 2 000 H_2O		835.9288	—	-481.45	—	—	—	—
$Ba_3(Fe(CN)_6)_2$ in 5 000 H_2O		835.9288	—	-482.16	—	—	—	—
in 7 500 H_2O		835.9288	—	-482.62	—	—	—	—
in 10 000 H_2O		835.9288	—	-482.96	—	—	—	—
in 20 000 H_2O		835.9288	—	-483.92	—	—	—	—
in 50 000 H_2O		835.9288	—	-485.34	—	—	—	—
$Ba_3(Fe(CN)_6)_2$ in 100 000 H_2O		835.9288	—	-486.10	—	—	—	—
in 200 000 H_2O		835.9288	—	-486.64	—	—	—	—
in 500 000 H_2O		835.9288	—	-487.48	—	—	—	—
in 1 000 000 H_2O		835.9288	—	-488.02	—	—	—	—
in ∞ H_2O		835.9288	—	-489.1	—	—	—	—
$Ba_3(FeCO(CN)_5)_2$	cr	839.9142	—	-1142.7	—	—	—	—
	aq	839.9142	—	-1219.2	—	—	—	—
$Ba_3(FeCO(CN)_5)_2 \cdot 11H_2O$	cr	1038.0836	—	-4391.5	—	—	—	—
$BaH_2Fe(CN)_6$	aq	351.3104	—	-78.2	—	—	—	—
$BaPdCl_4$	cr	385.5520	—	-960.2	—	—	—	—
$Ba_3(RhCl_6)_2$	cr	1043.2660	—	-2870.	—	—	—	—
$BaRuO_4 \cdot H_2O$	cr	320.4230	—	-1308.3	—	—	—	—
$BaPtCl_6$	cr	545.1480	—	-1184.9	—	—	—	—
	aq	545.1480	—	-1223.8	—	—	—	—
$BaPtCl_6 \cdot 6H_2O$	cr	653.2404	—	-2943.4	—	—	—	—

Table 96:**Ba** **BARIUM** (Prepared 1969) — Continued Table 96:**Ba**

Substance Formula and Description	State	Molar mass $g\ mol^{-1}$	0 K $\Delta_f H_0^\circ$ $kJ\ mol^{-1}$	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$	$\Delta_f G^\circ$ $kJ\ mol^{-1}$	$H^\circ - H_0^\circ$	S° $J\ mol^{-1}\ K^{-1}$	C_p
$BaOsCl_6$	cr	540.2580	—	-1128.0	—	—	—	—
$BaMnO_4$ manganate	cr	256.2756	—	—	-1119.2	—	—	—
$Ba(ReO_4)_2 \cdot 4H_2O$	cr	709.7968	—	-3368.	-2918.0	—	377.	—
$BaCrO_4$	cr	253.3336	—	-1446.0	-1345.22	—	158.6	—
$BaMoO_3$	cr	281.2782	—	-1234.	—	—	—	—
$BaMoO_4$	cr	297.2776	—	-1548.	-1439.6	—	138.	123.0
$BaWO_4$	cr	385.1876	—	-1703.	—	—	—	—
Ba_3WO_6	cr	691.8664	—	-3146.	—	—	—	—
$BaTiO_3$	cr	233.2382	—	-1659.8	-1572.3	—	107.9	102.47
Ba_2TiO_4	cr	386.5776	—	-2243.0	-2132.9	—	196.6	152.63
$BaZrO_3$	cr	276.5582	—	-1779.5	-1694.5	—	124.7	101.71
$BaHfO_3$	cr	363.8282	—	-1832.2	—	—	—	—
$BaUO_4$	cr	439.3666	—	-1997.0	—	—	—	133.5
$BaMg_2$ β phase	cr	185.9640	—	-6.3	—	—	—	—
$BaCa(CO_3)_2$ alstonite	cr	297.4388	—	—	-2272.7	—	—	—
$BaCa(CO_3)_2$ barytocalcite	cr2	297.4388	—	—	-2271.8	—	—	—
$BaSrTiO_4$	cr	336.8576	—	-2276.1	-2167.7	—	191.6	146.23

Table 97:**Ra** **RADIUM** (Prepared 1970) Table 97:**Ra**

Substance Formula and Description	State	Molar mass g mol^{-1}	0 K $\Delta_f H_0^\circ$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H_0^\circ$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
Ra	cr	226.0250	0	0	0	—	71.	—
	g	226.0250	—	159.	130.	6.197	176.47	20.79
Ra^+	g	226.0250	—	674.54	—	—	—	—
Ra^{2+}	g	226.0250	—	1659.79	—	—	—	—
	ao	226.0250	—	-527.6	-561.5	—	54.	—
RaO	cr	242.0244	—	-523.	—	—	—	—
$RaCl_2$	cr	296.9310	—	—	—	—	134.	—
	ai	296.9310	—	-861.9	-823.8	—	167.	—
$RaCl_2 \cdot 2H_2O$	cr	332.9618	—	-1464.	-1302.8	—	213.	—
$Ra(IO_3)_2$	cr	575.8302	—	-1026.8	-868.5	—	272.	—
$RaSO_4$	cr	322.0866	—	-1471.1	-1365.6	—	138.	—
	ai	322.0866	—	-1436.8	-1306.2	—	75.	—
$Ra(NO_3)_2$	cr	350.0348	—	-992.	-796.1	—	222.	—
	ai	350.0348	—	-942.2	-784.0	—	347.	—

Table 98:**Li** — **LITHIUM** (Prepared 1980) — Table 98:**Li**

Substance Formula	Substance Description	State	Molar mass g mol^{-1}	0 K: $\Delta_f H^\circ_0$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar): $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H^\circ_0$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
Li		cr	6.9410	0	0	0	4.628	29.12	24.77
		g	6.9410	157.800	159.37	126.66	6.197	138.77	20.786
	in D:99Hg		6.9410	—	-82.01	—	—	—	—
	in Hg:x		6.9410	—	—	-81.6	—	—	—
Li^+		g	6.9410	678.017	685.783	—	6.197	—	—
Li^{2+}		g	6.9410	7976.122	7990.084	—	6.197	—	—
Li^{3+}		g	6.9410	19791.07	19811.24	—	—	—	—
Li^+		ao	6.9410	—	-278.49	-293.31	—	13.4	68.6
Li_2		g	13.8820	215.48	215.9	174.4	9.673	196.996	36.104
Li_2^+		g	13.8820	714.6	721.3	—	—	—	—
LiO		g	22.9404	75.73	75.7	52.3	8.95	210.98	32.43
LiO_2		g	38.9398	—	—	—	10.88	243.91	43.26
Li_2O		cr	29.8814	-591.588	-597.94	-561.18	7.247	37.57	54.10
		g	29.8814	-159.75	-160.7	-181.6	12.68	231.48	49.83
Li_2O_2		cr	45.8808	—	-634.3	—	—	—	—
Li_2O_2		aq	45.8808	—	-664.4	—	—	—	—
LiH		cr	7.9490	-85.458	-90.54	-68.35	3.778	20.008	27.87
	^{7}Li	cr2	8.0240	—	—	—	3.866	20.422	28.79
		g	7.9490	139.419	139.24	116.47	8.686	170.900	29.727
LiD		cr	8.9551	-86.542	-90.92	-67.68	4.540	23.598	34.31
LiD		g	8.9551	141.147	141.0	118.4	8.765	177.386	30.71
LiOH		cr	23.9484	-479.139	-484.93	-438.95	7.414	42.80	49.66
		g	23.9484	-235.777	-238.1	-242.3	10.908	210.90	46.02
		ai	23.9484	—	-508.48	-450.58	—	2.80	-79.9
		ao	23.9484	—	-508.4	-451.8	—	7.1	—
LiOH	in 12 H_2O		23.9484	—	-504.724	—	—	—	—
	in 15 H_2O		23.9484	—	-505.285	—	—	—	—
	in 20 H_2O		23.9484	—	-505.833	—	—	—	—
	in 30 H_2O		23.9484	—	-506.364	—	—	—	—
	in 50 H_2O		23.9484	—	-506.833	—	—	—	—
LiOH	in 100 H_2O		23.9484	—	-507.281	—	—	—	—
	in 110 H_2O		23.9484	—	-507.335	—	—	—	—
	in 200 H_2O		23.9484	—	-507.607	—	—	—	—
	in 400 H_2O		23.9484	—	-507.850	—	—	—	—
	in 500 H_2O		23.9484	—	-507.908	—	—	—	—
LiOH	in 1 000 H_2O		23.9484	—	-508.063	—	—	—	—
	in 2 000 H_2O		23.9484	—	-508.180	—	—	—	—
	in 5 000 H_2O		23.9484	—	-508.285	—	—	—	—
	in 10 000 H_2O		23.9484	—	-508.343	—	—	—	—
	in 50 000 H_2O		23.9484	—	-508.423	—	—	—	—
LiOH	in 100 000 H_2O		23.9484	—	-508.444	—	—	—	—
$LiOH\cdot H_2O$		cr	41.9638	-774.140	-788.01	-680.95	12.134	71.21	79.50
LiOD		cr	24.9545	—	-488.7	—	—	—	—
		g	24.9545	—	-250.6	—	—	—	—
LiF		cr	25.9394	-613.613	-615.97	-587.71	6.473	35.65	41.59
LiF		g	25.9394	-339.820	-339.82	-360.64	8.824	200.297	31.30
		ai	25.9394	—	-611.12	-571.9	—	-0.4	-38.07
	in 900 H_2O		25.9394	—	-610.663	—	—	—	—
	in 1 000 H_2O		25.9394	—	-610.684	—	—	—	—
	in 5 000 H_2O		25.9394	—	-610.918	—	—	—	—

Table 98:**Li** — **LITHIUM** (Prepared 1980) — Continued — Table 98:**Li**

Substance Formula and Description		State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
LiF	in 10 000 H_2O		25.9394	—	-610.977	—	—	—	—
	in 500 000 H_2O		25.9394	—	-611.102	—	—	—	—
Li_2F_2		g	51.8788	-935.84	-940.6	-940.1	13.35	258.64	63.14
Li_3F_3		g	77.8182	-1508.33	-1514.2	-1494.	20.42	318.1	102.5
$LiHF_2$		cr	45.9458	-935.79	-942.32	-874.87	11.824	71.1	70.17
$LiHF_2$	in 6 000 H_2O		45.9458	—	-932.57	—	—	—	—
LiCl		cr	42.3940	-408.701	-408.61	-384.37	9.305	59.33	47.99
		g	42.3940	-195.238	-195.4	-216.7	9.058	212.824	33.22
		ai	42.3940	—	-445.64	-424.58	—	69.9	-67.8
	in 3 H_2O		42.3940	—	-429.366	—	—	—	—
LiCl	in 5 H_2O		42.3940	—	-436.805	—	—	—	—
	in 8 H_2O		42.3940	—	-440.529	—	—	—	—
	in 10 H_2O		42.3940	—	-441.579	—	—	—	—
	in 12 H_2O		42.3940	—	-442.224	—	—	—	—
	in 15 H_2O		42.3940	—	-442.835	—	—	—	—
LiCl	in 20 H_2O		42.3940	—	-443.387	—	—	—	—
	in 30 H_2O		42.3940	—	-443.918	—	—	—	—
	in 50 H_2O		42.3940	—	-444.349	—	—	—	—
	in 100 H_2O		42.3940	—	-444.722	—	—	—	—
	in 110 H_2O		42.3940	—	-444.759	—	—	—	—
LiCl	in 200 H_2O		42.3940	—	-444.964	—	—	—	—
	in 400 H_2O		42.3940	—	-445.136	—	—	—	—
	in 500 H_2O		42.3940	—	-445.182	—	—	—	—
	in 750 H_2O		42.3940	—	-445.253	—	—	—	—
	in 1 000 H_2O		42.3940	—	-445.295	—	—	—	—
LiCl	in 2 000 H_2O		42.3940	—	-445.383	—	—	—	—
	in 5 000 H_2O		42.3940	—	-445.475	—	—	—	—
	in 10 000 H_2O		42.3940	—	-445.521	—	—	—	—
	in 50 000 H_2O		42.3940	—	-445.596	—	—	—	—
	in 18.5 D_2O		42.3940	—	-441.508	—	—	—	—
LiCl	in 20 D_2O		42.3940	—	-441.634	—	—	—	—
	in 27.75 D_2O		42.3940	—	-442.044	—	—	—	—
	in 50 D_2O		42.3940	—	-442.517	—	—	—	—
	in 55.5 D_2O		42.3940	—	-442.579	—	—	—	—
	in 100 D_2O		42.3940	—	-442.860	—	—	—	—
LiCl	in 200 D_2O		42.3940	—	-443.090	—	—	—	—
	in 500 D_2O		42.3940	—	-443.29	—	—	—	—
	in 1 000 D_2O		42.3940	—	-443.412	—	—	—	—
	in 5 000 D_2O		42.3940	—	-443.588	—	—	—	—
	in 10 000 D_2O		42.3940	—	-443.634	—	—	—	—
LiCl	in 50 000 D_2O		42.3940	—	-443.709	—	—	—	—
	in D_2O:s		42.3940	—	-443.768	—	—	—	—
	in 7 CH_3OH		42.3940	—	-447.10	—	—	—	—
	in 8 CH_3OH		42.3940	—	-447.94	—	—	—	—
	in 10 CH_3OH		42.3940	—	-449.11	—	—	—	—
LiCl	in 20 CH_3OH		42.3940	—	-452.04	—	—	—	—
	in 50 CH_3OH		42.3940	—	-454.55	—	—	—	—
	in 100 CH_3OH		42.3940	—	-455.89	—	—	—	—
	in 200 CH_3OH		42.3940	—	-456.81	—	—	—	—
	in 500 CH_3OH		42.3940	—	-457.56	—	—	—	—

Table 98:Li — **LITHIUM** (Prepared 1980) — Continued — Table 98:Li

Substance Formula	Description	State	Molar mass g mol⁻¹	0 K: $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar): $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
LiCl	in 1 000 CH_3OH		42.3940	—	-457.98	—	—	—	—
	in 2 000 CH_3OH		42.3940	—	-458.40	—	—	—	—
	in 20 C_2H_5OH		42.3940	—	-455.72	—	—	—	—
	in 25 C_2H_5OH		42.3940	—	-456.10	—	—	—	—
	in 50 C_2H_5OH		42.3940	—	-456.89	—	—	—	—
LiCl	in 100 C_2H_5OH		42.3940	—	-457.48	—	—	—	—
	in 1 000 C_2H_5OH		42.3940	—	-458.82	—	—	—	—
$LiCl\cdot H_2O$		cr	60.4094	—	-712.58	-631.80	—	102.84	—
$LiCl\cdot 2H_2O$		cr	78.4248	—	-1012.65	—	—	—	—
$LiCl\cdot 3H_2O$		cr	96.4402	—	-1311.3	—	—	—	—
Li_2Cl_2		g	84.7880	-590.78	-593.7	-596.2	15.48	288.8	72.22
Li_3Cl_3		g	127.1820	-955.04	-962.	-937.	20.38	335.7	102.1
LiClO	in 250 H_2O		58.3934	—	-384.47	—	—	—	—
$LiClO_3$		cr	90.3922	—	-369.0	—	—	—	—
		ai	90.3922	—	-382.46	-301.27	—	175.7	-13.8
$LiClO_3$	in 3 H_2O		90.3922	—	-369.45	—	—	—	—
	in 5 H_2O		90.3922	—	-374.80	—	—	—	—
	in 10 H_2O		90.3922	—	-375.60	—	—	—	—
	in 20 H_2O		90.3922	—	-376.77	—	—	—	—
	in 50 H_2O		90.3922	—	-377.82	—	—	—	—
$LiClO_3$	in 100 H_2O		90.3922	—	-378.57	—	—	—	—
	in 200 H_2O		90.3922	—	-379.32	—	—	—	—
	in 500 H_2O		90.3922	—	-380.24	—	—	—	—
	in 1 000 H_2O		90.3922	—	-380.79	—	—	—	—
	in 2 000 H_2O		90.3922	—	-381.20	—	—	—	—
$LiClO_3$	in 5 000 H_2O		90.3922	—	-381.62	—	—	—	—
$LiClO_3\cdot 0.25H_2O$		cr	94.8960	—	—	-328.24	—	—	—
$LiClO_4$		cr	106.3916	—	-381.00	—	—	—	—
		ai	106.3916	—	-407.823	-302.0	—	195.4	-7.5
	in 13.88 H_2O		106.3916	—	-405.635	—	—	—	—
$LiClO_4$	in 15 H_2O		106.3916	—	-405.769	—	—	—	—
	in 20 H_2O		106.3916	—	-406.191	—	—	—	—
	in 50 H_2O		106.3916	—	-406.819	—	—	—	—
	in 100 H_2O		106.3916	—	-407.020	—	—	—	—
	in 200 H_2O		106.3916	—	-407.179	—	—	—	—
$LiClO_4$	in 400 H_2O		106.3916	—	-407.325	—	—	—	—
	in 500 H_2O		106.3916	—	-407.363	—	—	—	—
	in 1 000 H_2O		106.3916	—	-407.467	—	—	—	—
	in 2 000 H_2O		106.3916	—	-407.551	—	—	—	—
	in 5 000 H_2O		106.3916	—	-407.643	—	—	—	—
$LiClO_4$	in 10 000 H_2O		106.3916	—	-407.693	—	—	—	—
	in 50 000 H_2O		106.3916	—	-407.764	—	—	—	—
	in 100 000 H_2O		106.3916	—	-407.781	—	—	—	—
	in CH_3OH:s		106.3916	—	-432.46	—	—	—	—
	in C_2H_5OH:s		106.3916	—	-427.86	—	—	—	—
$LiClO_4\cdot H_2O$		cr	124.4070	—	-697.1	-509.5	—	155.2	—
$LiClO_4\cdot 3H_2O$		cr	160.4378	—	-1297.96	-1001.00	—	254.8	—
LiBr		cr	86.8500	—	-351.213	-342.00	—	74.27	—
		g	86.8500	—	—	—	9.176	224.33	33.93
		ai	86.8500	—	-400.041	-397.27	—	95.8	-73.2

Substance Formula	Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
LiBr	in 3.25 H_2O		86.8500	—	-385.233	—	—	—	—
	in 4 H_2O		86.8500	—	-389.284	—	—	—	—
	in 5 H_2O		86.8500	—	-392.309	—	—	—	—
	in 6 H_2O		86.8500	—	-393.919	—	—	—	—
	in 8 H_2O		86.8500	—	-395.568	—	—	—	—
LiBr	in 10 H_2O		86.8500	—	-396.426	—	—	—	—
	in 12 H_2O		86.8500	—	-396.974	—	—	—	—
	in 15 H_2O		86.8500	—	-397.472	—	—	—	—
	in 20 H_2O		86.8500	—	-397.965	—	—	—	—
	in 30 H_2O		86.8500	—	-398.426	—	—	—	—
LiBr	in 50 H_2O		86.8500	—	-398.806	—	—	—	—
	in 100 H_2O		86.8500	—	-399.154	—	—	—	—
	in 110 H_2O		86.8500	—	-399.191	—	—	—	—
	in 200 H_2O		86.8500	—	-399.392	—	—	—	—
	in 220 H_2O		86.8500	—	-399.413	—	—	—	—
LiBr	in 400 H_2O		86.8500	—	-399.559	—	—	—	—
	in 500 H_2O		86.8500	—	-399.601	—	—	—	—
	in 1 000 H_2O		86.8500	—	-399.706	—	—	—	—
	in 1 500 H_2O		86.8500	—	-399.748	—	—	—	—
	in 2 000 H_2O		86.8500	—	-399.790	—	—	—	—
LiBr	in 5 000 H_2O		86.8500	—	-399.873	—	—	—	—
	in 10 000 H_2O		86.8500	—	-399.919	—	—	—	—
	in 50 000 H_2O		86.8500	—	-399.986	—	—	—	—
	in 100 000 H_2O		86.8500	—	-404.183	—	—	—	—
	in 500 000 H_2O		86.8500	—	-400.020	—	—	—	—
$LiBr\cdot H_2O$		cr	104.8654	—	-662.58	-594.29	—	109.6	—
$LiBr\cdot 2H_2O$		cr	122.8808	—	-962.7	-840.5	—	162.3	—
$LiBrO_3$		cr	134.8482	—	-346.98	—	—	—	—
		ai	134.8482	—	-345.56	-274.71	—	174.9	—
LiI		cr	133.8454	-270.550	-270.41	-270.29	11.364	86.78	51.04
LiI		g	133.8454	-79.16	-81.09	-124.34	9.309	232.321	34.64
		ai	133.8454	—	-333.67	-344.8	—	124.7	-73.6
	in 20 H_2O		133.8454	—	-331.703	—	—	—	—
	in 30 H_2O		133.8454	—	-332.138	—	—	—	—
	in 50 H_2O		133.8454	—	-332.490	—	—	—	—
LiI	in 100 H_2O		133.8454	—	-332.825	—	—	—	—
	in 110 H_2O		133.8454	—	-332.887	—	—	—	—
	in 200 H_2O		133.8454	—	-333.055	—	—	—	—
	in 400 H_2O		133.8454	—	-333.218	—	—	—	—
	in 500 H_2O		133.8454	—	-333.256	—	—	—	—
LiI	in 1 000 H_2O		133.8454	—	-333.356	—	—	—	—
	in 2 000 H_2O		133.8454	—	-333.440	—	—	—	—
	in 5 000 H_2O		133.8454	—	-333.519	—	—	—	—
	in 10 000 H_2O		133.8454	—	-333.561	—	—	—	—
	in 500 000 H_2O		133.8454	—	-333.661	—	—	—	—
LiI	in 40 $C_2H_5OC_2H_5$ in ethyl ether		133.8454	—	-305.9	—	—	—	—
$LiI\cdot H_2O$		cr	151.8608	—	-590.32	-531.3	—	123.0	—
$LiI\cdot 2H_2O$		cr	169.8762	—	-890.40	-780.2	—	184.	—
$LiI\cdot 3H_2O$		cr	187.8916	—	-1192.15	-1032.13	—	250.2	—

Substance Formula	Description	State	Molar mass g mol^{-1}	0 K: $\Delta_f H_0^\circ$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar): $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H_0^\circ$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
Li_2I_2		g	267.6908	–358.6	–364.	–410.	17.2	331.	76.1
$LiIO_3$		cr	181.8436	—	–503.38	—	—	—	—
		ai	181.8436	—	–499.82	–421.28	—	131.4	–55.2
	in 800 H_2O		181.8436	—	–499.482	—	—	—	—
Li_2S		cr	45.9460	—	–441.4	—	—	—	—
Li_2S	in 1 400 H_2O		45.9460	—	–507.1	—	—	—	—
Li_2S_2		cr	78.0100	—	–438.1	—	—	—	—
	in 10 000 H_2O		78.0100	—	–520.5	—	—	—	—
$LiSO_4^-$		ao	103.0026	—	–1190.8	–1042.2	—	38.5	—
Li_2SO_3		cr	93.9442	—	–1177.0	—	—	—	—
Li_2SO_4		cr	109.9436	–1424.221	–1436.49	–1321.70	18.627	115.1	117.57
		ai	109.9436	—	–1466.24	–1331.20	—	47.3	–155.6
	in 18 H_2O		109.9436	—	–1459.496	—	—	—	—
	in 20 H_2O		109.9436	—	–1460.208	—	—	—	—
	in 25 H_2O		109.9436	—	–1461.049	—	—	—	—
Li_2SO_4	in 30 H_2O		109.9436	—	–1461.551	—	—	—	—
	in 35 H_2O		109.9436	—	–1461.890	—	—	—	—
	in 40 H_2O		109.9436	—	–1462.128	—	—	—	—
	in 50 H_2O		109.9436	—	–1462.434	—	—	—	—
	in 60 H_2O		109.9436	—	–1462.626	—	—	—	—
Li_2SO_4	in 80 H_2O		109.9436	—	–1462.881	—	—	—	—
	in 100 H_2O		109.9436	—	–1463.057	—	—	—	—
	in 150 H_2O		109.9436	—	–1463.350	—	—	—	—
	in 200 H_2O		109.9436	—	–1463.538	—	—	—	—
	in 300 H_2O		109.9436	—	–1463.781	—	—	—	—
Li_2SO_4	in 400 H_2O		109.9436	—	–1463.998	—	—	—	—
	in 500 H_2O		109.9436	—	–1464.11	—	—	—	—
	in 800 H_2O		109.9436	—	–1464.350	—	—	—	—
	in 1 000 H_2O		109.9436	—	–1464.492	—	—	—	—
	in 2 000 H_2O		109.9436	—	–1464.869	—	—	—	—
Li_2SO_4	in 5 000 H_2O		109.9436	—	–1465.308	—	—	—	—
	in 8 000 H_2O		109.9436	—	–1465.488	—	—	—	—
	in 10 000 H_2O		109.9436	—	–1465.563	—	—	—	—
	in 15 000 H_2O		109.9436	—	–1465.689	—	—	—	—
	in 20 000 H_2O		109.9436	—	–1465.764	—	—	—	—
Li_2SO_4	in 50 000 H_2O		109.9436	—	–1465.936	—	—	—	—
	in 100 000 H_2O		109.9436	—	–1466.028	—	—	—	—
	in H_2SO_4 + 34.72 H_2O:u		109.9436	—	–1443.1	—	—	—	—
	in H_2SO_4 + 1 100 H_2O:u		109.9436	—	–1453.9	—	—	—	—
$Li_2SO_4{\cdot}H_2O$		cr	127.9590	–1715.52	–1735.5	–1565.5	23.836	163.6	151.08
$Li_2SO_4{\cdot}D_2O$		cr	129.9712	—	–1744.3	–1571.4	—	167.	—
$LiHS$		cr	40.0130	—	–251.5	—	—	—	—
	in 700 H_2O		40.0130	—	–287.4	—	—	—	—
$LiI{\cdot}SO_2$		cr	197.9082	—	–607.9	—	—	—	—
$LiI{\cdot}2SO_2$		cr	261.9710	—	–944.3	—	—	—	—
Li_2Se		cr	92.8420	—	–419.2	—	—	—	—
	in 440 H_2O		92.8420	—	–472.0	—	—	—	—
$Li_2Se{\cdot}9H_2O$		cr	254.9806	—	–3089.5	—	—	—	—
$Li_2SeO_3{\cdot}H_2O$		cr	158.8556	—	–1334.3	—	—	—	—
Li_2SeO_4		cr	156.8396	—	–1127.2	—	—	—	—

Table 98:Li — LITHIUM (Prepared 1980) — Continued — Table 98:Li

Substance Formula and Description		State	Molar mass g mol^{-1}	0 K $\Delta_f H_0^\circ$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H_0^\circ$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
Li_2SeO_4	in 800 H_2O		156.8396	—	-1159.0	—	—	—	—
$Li_2SeO_4 \cdot H_2O$		cr	174.8550	—	-1419.6	—	—	—	—
LiN_3		cr	48.9611	—	7.9	—	—	—	—
		ai	48.9611	—	-3.3	54.9	—	121.	—
Li_3N		cr	34.8297	-158.013	-164.4	-128.4	11.213	62.59	75.27
$LiNO_2$		cr	52.9465	—	-372.4	-302.0	—	96.	—
		ai	52.9465	—	-383.09	-325.5	—	136.8	-28.9
$LiNO_2 \cdot 0.5H_2O$		cr	61.9542	—	—	-423.3	—	—	—
$LiNO_2 \cdot H_2O$		cr	70.9619	—	-676.1	-544.2	—	121.	—
$LiNO_3$		cr	68.9459	—	-483.13	-381.1	—	90.0	—
$LiNO_3$		ai	68.9459	—	-485.85	-404.5	—	160.2	-18.0
		ao	68.9459	—	—	-406.6	—	—	—
	in 3 H_2O		68.9459	—	-480.616	—	—	—	—
	in 5 H_2O		68.9459	—	-480.708	—	—	—	—
	in 10 H_2O		68.9459	—	-483.762	—	—	—	—
$LiNO_3$	in 27 H_2O		68.9459	—	-484.750	—	—	—	—
	in 50 H_2O		68.9459	—	-484.942	—	—	—	—
	in 100 H_2O		68.9459	—	-485.114	—	—	—	—
	in 400 H_2O		68.9459	—	-485.407	—	—	—	—
	in 500 H_2O		68.9459	—	-485.436	—	—	—	—
$LiNO_3$	in 1 000 H_2O		68.9459	—	-485.55	—	—	—	—
	in 5 000 H_2O		68.9459	—	-485.695	—	—	—	—
	in 10 000 H_2O		68.9459	—	-485.737	—	—	—	—
	in 100 000 H_2O		68.9459	—	-485.813	—	—	—	—
	in 500 000 H_2O		68.9459	—	-485.834	—	—	—	—
$LiNO_3$	in 30 CH_3OH		68.9459	—	-928.8	—	—	—	—
$LiNO_3 \cdot 3H_2O$		cr	122.9921	—	-1374.4	-1103.5	—	223.4	—
$LiNH_2$		cr	22.9637	—	-179.5	—	—	—	—
$Li(NH_3)_4$		cr	75.0638	—	—	-83.8	—	—	—
		l	75.0638	—	-322.6	—	—	—	—
Li_2NH		cr	28.8967	—	-220.9	—	—	—	—
$LiCl \cdot NH_3$		cr	59.4247	—	-500.8	-409.5	—	125.9	—
$LiCl \cdot ND_3$		cr	62.4430	—	-515.9	-419.2	—	130.	—
$LiCl \cdot 3NH_3$		cr	93.4861	—	-684.1	-451.7	—	236.4	—
$LiCl \cdot 3ND_3$		cr	102.5410	—	-726.3	-481.8	—	259.	—
$LiCl \cdot 4NH_3$		cr	110.5168	—	-764.4	-466.2	—	307.9	—
$LiCl \cdot 4ND_3$		cr	122.5900	—	-822.6	-506.8	—	339.	—
$LiClO_4 \cdot 2N_2H_4$		cr	170.4824	—	-368.6	—	—	—	—
$LiBr \cdot NH_3$		cr	103.8807	—	-451.9	—	—	—	—
$LiBr \cdot ND_3$		cr	106.8990	—	-468.2	—	—	—	—
$LiBr \cdot 2NH_3$		cr	120.9114	—	-544.3	—	—	—	—
$LiBr \cdot 2ND_3$		cr	126.9480	—	-574.5	—	—	—	—
$LiBr \cdot 3NH_3$		cr	137.9421	—	-640.2	—	—	—	—
$LiBr \cdot 3ND_3$		cr	146.9970	—	-686.6	—	—	—	—
$LiBr \cdot 4NH_3$		cr	154.9728	—	-727.2	—	—	—	—
$LiBr \cdot 4ND_3$		cr	167.0460	—	-787.4	—	—	—	—
$LiBr \cdot 5NH_3$		cr	172.0035	—	-808.3	—	—	—	—
$LiI \cdot NH_3$		cr	150.8761	—	-385.8	—	—	—	—
$LiI \cdot 2NH_3$		cr	167.9068	—	-494.5	—	—	—	—
$LiI \cdot 3NH_3$		cr	184.9375	—	-588.7	—	—	—	—

Substance Formula	Description	State	Molar mass g mol^{-1}	0 K $\Delta_f H^\circ_0$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H^\circ_0$	S° J mol^{-1} K^{-1}	C_p
$LiI \cdot 4NH_3$		cr	201.9682	—	-682.0	—	—	—	—
$LiPO_3$		cr	85.9130	—	-1255.2	—	—	—	—
		vit	85.9130	—	-1239.3	—	—	—	—
$LiP_2O_7^{3-}$		ao	180.8844	—	-2545.1	-2232.8	—	-22.2	—
Li_3PO_4		cr	115.7944	—	-2095.8	—	—	—	—
$Li_4P_2O_7$		cr	201.7074	—	-3356.	—	—	—	—
$Li_5P_3O_{10}$		vit	287.6204	—	-4561.	—	—	—	—
$Li_6P_4O_{13}$		vit	373.5334	—	-5791.	—	—	—	—
$LiHPO_4^-$		ao	102.9204	—	-1546.0	-1389.4	—	88.	—
LiH_2PO_4		cr	103.9284	—	-1573.6	—	—	—	—
$LiHP_2O_7^{2-}$		ao	181.8924	—	-2552.2	-2276.8	—	100.	—
Li_3Sb		cr	142.5730	—	-322.	—	—	—	—
Li_3Sb_2		cr	264.3230	—	-182.0	—	—	—	—
Li_3Bi		cr	229.8030	—	-230.	—	—	—	—
Li_2C_2		cr	37.9044	—	-59.4	—	—	—	—
Li_2CO_3		cr	73.8914	-1207.720	-1215.9	-1132.06	15.175	90.37	99.12
	G–H–S constraint has been relaxed; see Introduction.								
		ai	73.8914	—	-1234.11	-1114.6	—	-29.7	—
	in 1 900 H_2O		73.8914	—	-1230.1	—	—	—	—
$LiHCO_3$	in 950 H_2O		67.9584	—	-959.0	—	—	—	—
$LiOC_2H_5$		cr	52.0028	—	-456.5	—	—	—	—
$LiCN$	in 110 H_2O		32.9589	—	-125.1	—	—	—	—
	in 220 H_2O		32.9589	—	-125.5	—	—	—	—
Li_2SiO_3		cr	89.9662	-1637.03	-1648.1	-1557.2	14.447	79.83	99.08
		vit	89.9662	—	-1628.	—	—	—	—
$Li_2Si_2O_5$		cr	150.0510	-2544.08	-2559.8	-2414.5	21.702	122.17	144.72
$Li_2Si_2O_5$		vit	150.0510	—	-2512.5	—	—	—	—
$Li_2Si_3O_7$		vit	210.1358	—	-3360.	—	—	—	—
Li_2SiF_6		cr	155.9584	—	-2947.2	—	—	—	—
		ai	155.9584	—	-2946.04	-2786.0	—	151.	—
$LiSn$		cr	125.6310	—	-70.3	—	—	—	—
Li_7Sn_2		cr	285.9670	—	-360.	—	—	—	—
$Li_{22}Sn_5$		cr	746.1520	—	-1063.	—	—	—	—
$LiPb$		cr	214.1310	—	-60.2	—	—	—	—
Li_7Pb_2		cr	462.9670	—	-318.0	—	—	—	—
$Li_2PbI_4 \cdot 4H_2O$		cr	800.7512	—	-2043.9	—	—	—	—
$LiBO_2$		cr	49.7508	-1026.63	-1032.2	-976.1	8.970	51.5	59.8
		g	49.7508	-661.24	-662.3	-672.8	13.447	274.6	57.3
$Li_2B_2O_4$		g	99.5016	—	-1607.	—	—	—	—
$Li_2B_4O_7$		cr	169.1218	—	-3390.3	—	—	—	—
		vit	169.1218	—	-3342.2	—	—	—	—
$Li_2B_6O_{10}$		cr	238.7420	—	-4680.2	—	—	—	—
		vit	238.7420	—	-4633.8	—	—	—	—
$Li_2B_8O_{13}$		vit	308.3622	—	-5911.2	—	—	—	—
$LiBH_4$		cr	21.7840	-180.75	-190.8	-125.0	12.757	75.86	82.55
		ai	21.7840	—	-230.33	-179.0	—	124.3	—
$LiBF_4$		cr	93.7456	—	-1843.5	—	—	—	—
$LiBH_4 \cdot NH_3$		cr	38.8147	—	-270.3	—	—	—	—
$LiBH_4 \cdot 2NH_3$		cr	55.8454	—	-356.5	—	—	—	—

Table 98:**Li** **LITHIUM** (Prepared 1980) — Continued Table 98:**Li**

Substance Formula and Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
$LiBH_4 \cdot 3NH_3$	cr	72.8761	—	-446.4	—	—	—	—
$LiBH_4 \cdot 4(NH_3)$	cr	89.9068	—	-533.9	—	—	—	—
$LiBH_4 \cdot (CH_3)_2O$	cr	67.8538	—	-474.9	-301.9	—	222.	—
$LiBH_4 \cdot (CH_2)_4O$ tetrahydrofuran	cr	93.8922	—	-415.5	-220.3	—	289.	—
$LiBH_4 \cdot (C_2H_5)_2O$	cr	95.9082	—	-495.8	-260.4	—	285.	—
$LiBH_4 \cdot 2((CH_3)_2O)$	cr	113.9236	—	-753.5	-469.6	—	356.	—
$LiBH_4 \cdot (CH(CH_3)_2)_2O$ diisopropyl ether	cr	123.9626	—	-563.6	-255.3	—	314.	—
$(LiBH_4)_2 \cdot (CH_3)_2O$	cr	89.6378	—	-668.2	-428.2	—	293.	—
$(LiBH_4)_2(C_2H_5)_2O$	cr	117.6922	—	-683.2	-386.7	—	377.	—
$LiBH_4 \cdot N(CH_3)_3$	cr	80.8963	—	-271.5	-39.1	—	218.	—
$LiBH_4 \cdot 2N(CH_3)_3$	cr	140.0086	—	-341.8	58.5	—	356.	—
LiAl	cr	33.9225	—	-48.1	—	—	—	—
$LiAlO_2$	cr	65.9213	-1185.461	-1193.32	-1131.3	9.694	53.346	67.78
$LiAl_5O_8$	cr	269.8437	-4546.226	-4579.4	-4328.6	29.070	149.79	224.18
$LiAlH_4$	cr	37.9545	-103.22	-116.3	-44.7	13.054	78.74	83.18
Li_3AlH_6	cr	53.8525	-293.84	-319.2	-198.43	18.451	102.59	127.74
$LiAlF_4$	g	109.9161	—	-1842.6	—	—	—	—
Li_2AlF_5	g	135.8555	—	-2431.	—	—	—	—
$(LiAlF_4)_2$	g	219.8322	—	-3887.	—	—	—	—
Li_3AlF_6	cr	161.7949	—	-3367.7	-3207.8	—	187.86	—
$LiAlCl_4$	cr	175.7345	—	-1124.2	—	—	—	—
in 3 000 H_2O		175.7345	—	-1481.6	—	—	—	—
$LiAlBr_4$	cr	353.5585	—	-910.4	—	—	—	—
in 3 000 H_2O		353.5585	—	-1314.57	—	—	—	—
$LiAlSiO_4$ eucryptite, low-temp. form	cr	126.0061	—	-2124.2	-2010.3	—	103.8	113.4
$LiAlSi_2O_6$ α spodumene	cr	186.0909	—	-3054.7	-2881.46	—	129.29	159.0
β spodumene	cr2	186.0909	—	-3026.7	-2860.88	—	154.39	162.8
$Li_2Al_2Si_8O_{20}$ petalite	cr	612.5210	-9717.63	-9772.2	-9220.0	76.437	464.4	490.4
LiGaO	g	92.6604	—	-105.	—	—	—	—
$LiGaF_4$	g	152.6546	—	-1506.	-1469.	—	356.	—
Li_2GaF_5	g	178.5940	—	-2079.	-2029.	—	439.	—
$(LiGaF_4)_2$	g	305.3092	—	-3184.	-3079.	—	594.	—
$GaF_3 \cdot 3LiF$	cr	204.5334	—	-3029.	-2874.	—	222.	—
LiInO	g	137.7604	—	-71.	—	—	—	—
LiTl	cr	211.3110	—	-53.6	—	—	—	—
$LiNO_3 \cdot Zn(NO_3)_2$ in 82 H_2O		258.3257	—	-1052.3	—	—	—	—
LiHg	cr	207.5310	—	-86.2	—	—	—	—
$LiHg_2$	cr	408.1210	—	-101.3	—	—	—	—
$LiHg_3$	cr	608.7110	-104.253	-111.3	-98.99	25.614	215.9	117.78
$LiBr \cdot 0.125HgBr_2$ in 740 H_2O		131.9010	—	-422.6	—	—	—	—
$LiBr \cdot 0.25HgBr_2$ in 1 250 H_2O		176.9520	—	-443.9	—	—	—	—
$LiBr \cdot 0.5HgBr_2$ in 2 370 H_2O		267.0540	—	-485.3	—	—	—	—
$LiBr \cdot HgBr_2$ in 4 510 H_2O		447.2580	—	-565.7	—	—	—	—
$LiCN \cdot 0.5Hg(CN)_2$ in 330 H_2O		159.2718	—	-12.6	—	—	—	—
$LiCN \cdot Hg(CN)_2$ in 550 H_2O		285.5847	—	123.4	—	—	—	—
$LiCl \cdot 0.5Hg(CN)_2$ in 330 H_2O		168.7069	—	-306.3	—	—	—	—
$LiCl \cdot Hg(CN)_2$ in 550 H_2O		295.0198	—	-167.4	—	—	—	—
$LiBr \cdot 0.5Hg(CN)_2$ in 330 H_2O		213.1629	—	-262.3	—	—	—	—
$LiBr \cdot Hg(CN)_2$ in 550 H_2O		339.4758	—	-123.4	—	—	—	—

Table 98:Li — **LITHIUM** (Prepared 1980) — Continued — Table 98:Li

Substance Formula and Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
$LiBr \cdot Hg(CN)_2 \cdot 3.5H_2O$	cr	402.5297	—	-1161.1	—	—	—	—
$LiI \cdot 0.5Hg(CN)_2$ in 330 H_2O		260.1583	—	-201.7	—	—	—	—
$LiI \cdot Hg(CN)_2$ in 550 H_2O		386.4712	—	-66.5	—	—	—	—
$LiI \cdot Hg(CN)_2 \cdot 3.5H_2O$	cr	449.5251	—	-1108.8	—	—	—	—
CuLi	g	70.4810	—	306.7	—	—	—	—
AgLi	g	114.8110	—	266.5	—	—	—	—
AuLi	g	203.9080	—	241.0	—	—	—	—
$Li_{0.5}Fe_{2.5}O_4$	cr	207.0856	—	—	—	21.690	122.17	144.06
$LiFeO_2$	cr	94.7868	—	-750.2	-694.5	—	75.31	—
$LiFe(CN)_6^{3-}$	ao	218.8954	—	—	391.8	—	—	—
$Li_{0.05}Zn_{0.9}Fe_{2.05}O_4$ annealed	cr	237.6640	—	—	—	22.861	150.79	139.70
quenched	cr2	237.6640	—	—	—	23.623	151.71	142.51
Li_2PtCl_6	cr	421.6900	—	-1155.	—	—	—	—
$LiReO_4$	cr	257.1386	—	-1050.	—	—	—	—
	ai	257.1386	—	-1066.1	-987.8	—	213.	—
$LiReO_4 \cdot H_2O$	cr	275.1540	—	-1351.	—	—	—	—
$LiReO_4 \cdot 2H_2O$	cr	293.1694	—	-1644.	—	—	—	—
Li_2CrO_4	cr	129.8756	—	-1388.7	—	—	—	—
	ai	129.8756	—	-1438.0	-1314.5	—	77.4	—
in 800 H_2O		129.8756	—	-1433.9	—	—	—	—
$Li_2CrO_4 \cdot 2H_2O$	cr	165.9064	—	-1984.5	-1761.	—	209.	—
Li_2MoO_4	cr	173.8196	—	-1520.30	-1409.5	—	126.	—
	g	173.8196	—	-1167.	-1121.	—	335.	—
Li_2WO_4	cr	261.7296	—	-1603.3	—	—	—	—
$LiWF_6$	cr	304.7814	—	-2226.	—	—	—	—
$LiNbO_3$	cr	147.8452	—	—	-1266.0	—	—	—
Li_2TiO_3	cr	109.7802	-1660.128	-1670.7	-1579.8	16.539	91.76	111.04
Li_2ZrO_3	cr	153.1002	—	-1760.2	—	—	—	—
Li_4ZrO_4	cr	182.9816	—	-2372.	—	—	—	—
Li_8ZrO_6	cr	242.7444	—	-3577.	—	—	—	—
Li_2HfO_3	cr	240.3702	—	-1803.	—	—	—	—
$LiScF_4$	g	127.8906	—	-1891.	—	—	—	—
$LiLuCl_4$	g	323.7230	—	-1117.	—	—	—	—
Li_4PuF_8	cr	418.8012	—	-4322.	—	—	—	—
Li_2UO_4 α	cr	315.9086	—	-1971.9	—	—	—	—
Li_4UO_5	cr	345.7900	—	-2640.5	—	—	—	—
Li_2UCl_6	cr	464.6290	—	-1832.6	—	—	—	—
in 100 HCl + 10 000 H_2O		464.6290	—	-2084.9	—	—	—	—
$LiUO_2AsO_4$	cr	415.8880	—	—	-2002.8	—	—	—
$LiThCl_5 \cdot 8H_2O$	cr	560.3673	—	-4051.8	—	—	—	—
Li_2ThCl_6	cr	458.6381	—	-2025.	—	—	—	—
$Li_2O \cdot 2BeO$	cr	79.9046	—	-1833.	—	—	—	—
$LiBeF_3$	cr	72.9484	—	-1649.8	—	—	—	—
	g	72.9484	—	-1390.3	—	—	—	—
Li_2BeF_4	cr	98.8878	—	-2275.7	—	—	—	—
Li_2BeF_4	g	98.8878	—	-1949.3	—	—	—	—
Li_2BeCl_4	cr	164.7062	—	-1315.9	—	—	—	—
$Ca_{1.5}Li_3P_4O_{13}$	vit	412.8304	—	-5782.	—	—	—	—

Table 99:**Na** **SODIUM** (Prepared 1980) Table 99:**Na**

Substance Formula	Description	State	Molar mass g mol^{-1}	0 K $\Delta_f H^\circ_0$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H^\circ_0$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
Na		cr	22.9898	0	0	0	6.44	51.21	28.24
		g	22.9898	107.566	107.32	76.761	6.197	153.712	20.786
	in 40 NH_3		22.9898	—	-6.234	—	—	—	—
	in 50 NH_3		22.9898	—	-6.192	—	—	—	—
	in 100 NH_3		22.9898	—	-6.150	—	—	—	—
Na	in 200 NH_3		22.9898	—	-5.858	—	—	—	—
	in 400 NH_3		22.9898	—	-4.979	—	—	—	—
	in 500 NH_3		22.9898	—	-4.686	—	—	—	—
	in 600 NH_3		22.9898	—	-4.393	—	—	—	—
	in 800 NH_3		22.9898	—	-4.058	—	—	—	—
Na	in 1 000 NH_3		22.9898	—	-3.807	—	—	—	—
	in 2 000 NH_3		22.9898	—	-3.138	—	—	—	—
	in 5 000 NH_3		22.9898	—	-2.469	—	—	—	—
	in 10 000 NH_3		22.9898	—	-2.092	—	—	—	—
	in 17.9 Hg		22.9898	—	—	-80.291	—	—	—
Na	in 19 Hg		22.9898	—	—	-80.584	—	—	—
	in 24 Hg		22.9898	—	—	-81.588	—	—	—
	in 32 Hg		22.9898	—	—	-82.969	—	—	—
	in 49 Hg		22.9898	—	—	-84.308	—	—	—
	in 99 Hg		22.9898	—	—	-86.609	—	—	—
Na	in 999 Hg		22.9898	—	—	-92.048	—	—	—
Na^+		g	22.9898	603.408	609.358	—	6.197	—	—
Na^{2+}		g	22.9898	5164.86	5176.99	—	6.209	—	—
Na^{3+}		g	22.9898	12075.0	12093.4	—	6.238	—	—
Na^{4+}		g	22.9898	21618.7	21643.4	—	6.197	—	—
Na^{5+}		g	22.9898	34974.	35003.	—	6.443	—	—
Na^+		ao	22.9898	—	-240.12	-261.905	—	59.0	46.4
Na_2		g	45.9796	144.549	142.05	103.94	10.401	230.23	37.57
Na_2^+		g	45.9796	614.2	617.6	—	—	—	—
NaO		g	38.9892	106.3	105.	82.4	9.29	228.6	34.7
NaO^+		g	38.9892	—	791.	—	—	—	—
NaO^-		g	38.9892	—	1.7	—	—	—	—
NaO_2		cr	54.9886	-263.42	-260.2	-218.4	18.28	115.9	72.13
		g	54.9886	—	—	—	11.46	266.6	44.8
Na_2O		cr	61.9790	-409.40	-414.22	-375.46	12.401	75.06	69.12
Na_2O		g	61.9790	-32.2	-35.6	-52.3	13.8	261.2	55.2
Na_2O_2		cr	77.9784	-505.01	-510.87	-447.7	15.69	95.0	89.24
$Na_2O_2 \cdot 8H_2O$		cr	222.1016	—	-2943.0	—	—	—	—
Na_3O		cr	84.9688	—	-424.7	—	—	—	—
NaH		cr	23.9978	-51.856	-56.275	-33.46	6.259	40.016	36.401
NaH		g	23.9978	132.21	130.25	108.85	8.732	188.377	30.29
NaOH		cr	39.9972	-421.082	-425.609	-379.494	10.489	64.455	59.54
		g	39.9972	-203.3	-207.1	-210.0	11.38	228.43	48.37
		ai	39.9972	—	-470.114	-419.150	—	48.1	-102.1
	in 2.5 H_2O		39.9972	—	-452.290	—	—	—	—
NaOH	in 3 H_2O		39.9972	—	-456.278	—	—	—	—
	in 4 H_2O		39.9972	—	-461.935	—	—	—	—
	in 4.5 H_2O		39.9972	—	-463.784	—	—	—	—
	in 5 H_2O		39.9972	—	-465.185	—	—	—	—
	in 6 H_2O		39.9972	—	-467.072	—	—	—	—

Table 99:Na — **SODIUM** (Prepared 1980) — Continued — Table 99:Na

Substance Formula	Description	State	Molar mass g mol^{-1}	0 K: $\Delta_f H^\circ_0$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar): $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H^\circ_0$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
NaOH	in 8 H_2O		39.9972	—	-468.905	—	—	—	—
	in 10 H_2O		39.9972	—	-469.646	—	—	—	—
	in 12 H_2O		39.9972	—	-469.972	—	—	—	—
	in 15 H_2O		39.9972	—	-470.156	—	—	—	—
	in 20 H_2O		39.9972	—	-470.198	—	—	—	—
NaOH	in 25 H_2O		39.9972	—	-470.131	—	—	—	—
	in 30 H_2O		39.9972	—	-470.060	—	—	—	—
	in 40 H_2O		39.9972	—	-469.930	—	—	—	—
	in 50 H_2O		39.9972	—	-469.834	—	—	—	—
	in 75 H_2O		39.9972	—	-469.700	—	—	—	—
NaOH	in 100 H_2O		39.9972	—	-469.646	—	—	—	—
	in 150 H_2O		39.9972	—	-469.621	—	—	—	—
	in 200 H_2O		39.9972	—	-469.608	—	—	—	—
	in 300 H_2O		39.9972	—	-469.629	—	—	—	—
	in 400 H_2O		39.9972	—	-469.654	—	—	—	—
NaOH	in 500 H_2O		39.9972	—	-469.679	—	—	—	—
	in 800 H_2O		39.9972	—	-469.738	—	—	—	—
	in 1 000 H_2O		39.9972	—	-469.763	—	—	—	—
	in 1 500 H_2O		39.9972	—	-469.813	—	—	—	—
	in 2 000 H_2O		39.9972	—	-469.842	—	—	—	—
NaOH	in 3 000 H_2O		39.9972	—	-469.884	—	—	—	—
	in 5 000 H_2O		39.9972	—	-469.930	—	—	—	—
	in 10 000 H_2O		39.9972	—	-469.980	—	—	—	—
	in 20 000 H_2O		39.9972	—	-470.018	—	—	—	—
	in 50 000 H_2O		39.9972	—	-470.051	—	—	—	—
NaOH	in 100 000 H_2O		39.9972	—	-470.068	—	—	—	—
	in ∞ H_2O		39.9972	—	-470.11	—	—	—	—
$NaOH \cdot H_2O$		cr	58.0126	-722.305	-734.543	-629.338	15.585	99.50	90.17
$NaOH \cdot 2H_2O$		l	76.0280	-1017.026	-1019.076	-873.091	38.581	195.979	239.41
$NaOH \cdot 3.5H_2O$		l	103.0511	-1456.187	-1459.798	-1236.356	56.23	286.089	354.43
$NaOH \cdot 4H_2O$		l	112.0588	—	-1605.15	-1356.64	—	318.70	—
$NaOH \cdot 5H_2O$		l	130.0742	—	-1894.31	-1596.34	—	386.06	—
$NaOH \cdot 7H_2O$		l	166.1050	—	-2469.02	-2073.80	—	526.31	—
$NaHO_2$	from HO_2^-	ai	55.9966	—	-400.45	-329.2	—	82.8	—
$(NaOH)_2$		g	79.9944	-615.0	-628.	-587.8	17.32	306.	79.1
NaF		cr	41.9882	-571.292	-573.647	-543.494	8.498	51.46	46.86
		g	41.9882	-289.5	-291.2	-310.5	9.226	217.59	34.221
		ai	41.9882	—	-572.75	-540.68	—	45.2	-60.2
	in 50 H_2O		41.9882	—	-572.509	—	—	—	—
	in 75 H_2O		41.9882	—	-572.363	—	—	—	—
NaF	in 100 H_2O		41.9882	—	-572.300	—	—	—	—
	in 150 H_2O		41.9882	—	-572.267	—	—	—	—
	in 200 H_2O		41.9882	—	-572.250	—	—	—	—
	in 300 H_2O		41.9882	—	-572.267	—	—	—	—
	in 500 H_2O		41.9882	—	-572.313	—	—	—	—
NaF	in 800 H_2O		41.9882	—	-572.371	—	—	—	—
	in 1 000 H_2O		41.9882	—	-572.396	—	—	—	—
	in 1 500 H_2O		41.9882	—	-572.446	—	—	—	—
	in 2 000 H_2O		41.9882	—	-572.476	—	—	—	—
	in 2 500 H_2O		41.9882	—	-572.493	—	—	—	—

Substance Formula	Substance Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
NaF	in 3 000 H_2O		41.9882	—	-572.518	—	—	—	—
	in 5 000 H_2O		41.9882	—	-572.564	—	—	—	—
	in 10 000 H_2O		41.9882	—	-572.614	—	—	—	—
	in 20 000 H_2O		41.9882	—	-572.652	—	—	—	—
	in 50 000 H_2O		41.9882	—	-572.685	—	—	—	—
NaF	in 100 000 H_2O		41.9882	—	-572.702	—	—	—	—
	in ∞ H_2O		41.9882	—	-572.75	—	—	—	—
	in 1 100 HF		41.9882	—	-637.286	—	—	—	—
	in KOH + 20 H_2O:u		41.9882	—	-573.346	—	—	—	—
Na_2F_2		g	83.9764	-824.37	-829.3	-827.6	16.82	299.3	74.9
$NaHF_2$		cr	61.9946	-914.71	-920.27	-852.15	13.949	90.92	75.02
	from HF_2^-	ai	61.9946	—	-890.06	-839.97	—	151.5	—
	in 400 H_2O		61.9946	—	-895.8	—	—	—	—
NaH_2F_3		cr	82.0010	—	-1235.1	—	—	—	—
NaCl		cr	58.4428	-410.735	-411.153	-384.138	10.611	72.13	50.50
NaCl		g	58.4428	-175.3	-176.65	-196.66	9.615	229.81	35.77
		ai	58.4428	—	-407.27	-393.133	—	115.5	-90.0
	in 9 H_2O		58.4428	—	-409.279	—	—	—	—
	in 10 H_2O		58.4428	—	-409.233	—	—	—	—
	in 12 H_2O		58.4428	—	-409.070	—	—	—	—
NaCl	in 15 H_2O		58.4428	—	-408.806	—	—	—	—
	in 20 H_2O		58.4428	—	-408.417	—	—	—	—
	in 25 H_2O		58.4428	—	-408.137	—	—	—	—
	in 30 H_2O		58.4428	—	-407.923	—	—	—	—
	in 40 H_2O		58.4428	—	-407.626	—	—	—	—
NaCl	in 50 H_2O		58.4428	—	-407.442	—	—	—	—
	in 75 H_2O		58.4428	—	-407.187	—	—	—	—
	in 100 H_2O		58.4428	—	-407.066	—	—	—	—
	in 150 H_2O		58.4428	—	-406.961	—	—	—	—
	in 200 H_2O		58.4428	—	-406.923	—	—	—	—
NaCl	in 300 H_2O		58.4428	—	-406.902	—	—	—	—
	in 400 H_2O		58.4428	—	-406.907	—	—	—	—
	in 500 H_2O		58.4428	—	-406.915	—	—	—	—
	in 1 000 H_2O		58.4428	—	-406.965	—	—	—	—
	in 1 500 H_2O		58.4428	—	-407.003	—	—	—	—
NaCl	in 2 000 H_2O		58.4428	—	-407.024	—	—	—	—
	in 3 000 H_2O		58.4428	—	-407.057	—	—	—	—
	in 5 000 H_2O		58.4428	—	-407.095	—	—	—	—
	in 10 000 H_2O		58.4428	—	-407.141	—	—	—	—
	in 20 000 H_2O		58.4428	—	-407.179	—	—	—	—
NaCl	in 50 000 H_2O		58.4428	—	-407.212	—	—	—	—
	in 100 000 H_2O		58.4428	—	-407.225	—	—	—	—
	in ∞ H_2O		58.4428	—	-407.27	—	—	—	—
	in 3.762 HCl + 3 190 H_2O		58.4428	—	-406.517	—	—	—	—
	in 23.77 HCl + 5 288 H_2O		58.4428	—	-406.312	—	—	—	—
NaCl	in 40 HCl + 800 H_2O		58.4428	—	-405.099	—	—	—	—
	in CH_3OH:x		58.4428	—	-419.53	—	—	—	—
	in $HCONH_2$:s in formamide		58.4428	—	-419.95	—	—	—	—
$NaCl^+$		g	58.4428	686.0	691.2	—	—	—	—
Na_2Cl_2		g	116.8856	-567.69	-571.1	-571.41	18.62	326.5	78.83

Substance Formula	Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
Na_3Cl_3		g	175.3284	—	−874.	—	—	—	—
$NaClO$		ai	74.4422	—	−347.3	−298.7	—	100.	—
	in 400 H_2O		74.4422	—	−346.4	—	—	—	—
$NaClO_2$		cr	90.4416	—	−307.02	—	—	—	—
		ai	90.4416	—	−306.7	−244.7	—	160.2	—
$NaClO_2$	in 1 000 H_2O		90.4416	—	−306.56	—	—	—	—
$NaClO_2{\cdot}3H_2O$		cr	144.4878	—	−1192.77	—	—	—	—
$NaClO_3$		cr	106.4410	—	−365.774	−262.259	—	123.4	—
		ai	106.4410	—	−344.09	−269.84	—	221.3	—
	in 6 H_2O		106.4410	—	−351.12	—	—	—	—
$NaClO_3$	in 8 H_2O		106.4410	—	−350.24	—	—	—	—
	in 10 H_2O		106.4410	—	−349.57	—	—	—	—
	in 12 H_2O		106.4410	—	−349.03	—	—	—	—
	in 15 H_2O		106.4410	—	−348.32	—	—	—	—
	in 20 H_2O		106.4410	—	−347.48	—	—	—	—
$NaClO_3$	in 25 H_2O		106.4410	—	−346.94	—	—	—	—
	in 30 H_2O		106.4410	—	−346.48	—	—	—	—
	in 40 H_2O		106.4410	—	−345.89	—	—	—	—
	in 50 H_2O		106.4410	—	−345.47	—	—	—	—
	in 75 H_2O		106.4410	—	−344.93	—	—	—	—
$NaClO_3$	in 100 H_2O		106.4410	—	−344.64	—	—	—	—
	in 150 H_2O		106.4410	—	−344.34	—	—	—	—
	in 200 H_2O		106.4410	—	−344.18	—	—	—	—
	in 300 H_2O		106.4410	—	−344.05	—	—	—	—
	in 500 H_2O		106.4410	—	−343.92	—	—	—	—
$NaClO_3$	in 1 000 H_2O		106.4410	—	−343.88	—	—	—	—
	in 2 000 H_2O		106.4410	—	−343.92	—	—	—	—
	in 5 000 H_2O		106.4410	—	−343.92	—	—	—	—
	in 10 000 H_2O		106.4410	—	−343.97	—	—	—	—
	in 20 000 H_2O		106.4410	—	−344.01	—	—	—	—
$NaClO_3$	in ∞ H_2O		106.4410	—	−344.09	—	—	—	—
$NaClO_4$		cr	122.4404	—	−383.30	−254.85	—	142.3	—
		ai	122.4404	—	−369.45	−270.41	—	241.0	—
	in 3.25 H_2O		122.4404	—	−378.57	—	—	—	—
	in 3.5 H_2O		122.4404	—	−378.48	—	—	—	—
$NaClO_4$	in 4 H_2O		122.4404	—	−378.28	—	—	—	—
	in 4.5 H_2O		122.4404	—	−378.07	—	—	—	—
	in 5 H_2O		122.4404	—	−377.86	—	—	—	—
	in 6 H_2O		122.4404	—	−377.35	—	—	—	—
	in 8 H_2O		122.4404	—	−376.48	—	—	—	—
$NaClO_4$	in 10 H_2O		122.4404	—	−375.77	—	—	—	—
	in 12 H_2O		122.4404	—	−375.14	—	—	—	—
	in 15 H_2O		122.4404	—	−374.38	—	—	—	—
	in 20 H_2O		122.4404	—	−373.38	—	—	—	—
	in 25 H_2O		122.4404	—	−372.75	—	—	—	—
$NaClO_4$	in 30 H_2O		122.4404	—	−372.25	—	—	—	—
	in 40 H_2O		122.4404	—	−371.58	—	—	—	—
	in 50 H_2O		122.4404	—	−371.12	—	—	—	—
	in 75 H_2O		122.4404	—	−370.49	—	—	—	—
	in 100 H_2O		122.4404	—	−370.16	—	—	—	—

Substance Formula	Substance Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
$NaClO_4$	in 150 H_2O		122.4404	—	-369.78	—	—	—	—
	in 200 H_2O		122.4404	—	-369.61	—	—	—	—
	in 300 H_2O		122.4404	—	-369.45	—	—	—	—
	in 500 H_2O		122.4404	—	-369.32	—	—	—	—
	in 1 000 H_2O		122.4404	—	-369.28	—	—	—	—
$NaClO_4$	in 1 500 H_2O		122.4404	—	-369.24	—	—	—	—
	in 2 000 H_2O		122.4404	—	-369.28	—	—	—	—
	in 10 000 H_2O		122.4404	—	-369.32	—	—	—	—
	in 20 000 H_2O		122.4404	—	-369.36	—	—	—	—
	in 100 000 H_2O		122.4404	—	-369.41	—	—	—	—
$NaClO_4$	in ∞ H_2O		122.4404	—	-369.4	—	—	—	—
	in CH_3OH:x		122.4404	—	-393.3	—	—	—	—
	in C_2H_5OH:x		122.4404	—	-384.9	—	—	—	—
$NaClO_4 \cdot H_2O$		cr	140.4558	—	-677.77	-494.29	—	190.8	—
NaBr		cr	102.8988	-353.950	-361.062	-348.983	11.590	86.82	51.38
NaBr		g	102.8988	-134.22	-143.1	-177.06	9.816	241.19	36.32
		ai	102.8988	—	-361.665	-365.849	—	141.4	-95.4
	in 6.5 H_2O		102.8988	—	-364.753	—	—	—	—
	in 8 H_2O		102.8988	—	-364.698	—	—	—	—
	in 10 H_2O		102.8988	—	-364.422	—	—	—	—
NaBr	in 12 H_2O		102.8988	—	-364.117	—	—	—	—
	in 15 H_2O		102.8988	—	-363.711	—	—	—	—
	in 20 H_2O		102.8988	—	-363.205	—	—	—	—
	in 25 H_2O		102.8988	—	-362.845	—	—	—	—
	in 30 H_2O		102.8988	—	-362.581	—	—	—	—
NaBr	in 40 H_2O		102.8988	—	-362.226	—	—	—	—
	in 50 H_2O		102.8988	—	-362.004	—	—	—	—
	in 75 H_2O		102.8988	—	-361.707	—	—	—	—
	in 100 H_2O		102.8988	—	-361.569	—	—	—	—
	in 150 H_2O		102.8988	—	-361.439	—	—	—	—
NaBr	in 200 H_2O		102.8988	—	-361.389	—	—	—	—
	in 500 H_2O		102.8988	—	-361.351	—	—	—	—
	in 800 H_2O		102.8988	—	-361.368	—	—	—	—
	in 1 000 H_2O		102.8988	—	-361.380	—	—	—	—
	in 1 500 H_2O		102.8988	—	-361.414	—	—	—	—
NaBr	in 2 000 H_2O		102.8988	—	-361.431	—	—	—	—
	in 3 000 H_2O		102.8988	—	-361.460	—	—	—	—
	in 5 000 H_2O		102.8988	—	-361.498	—	—	—	—
	in 10 000 H_2O		102.8988	—	-361.539	—	—	—	—
	in 20 000 H_2O		102.8988	—	-361.577	—	—	—	—
NaBr	in 50 000 H_2O		102.8988	—	-361.606	—	—	—	—
	in 100 000 H_2O		102.8988	—	-361.619	—	—	—	—
	in ∞ H_2O		102.8988	—	-361.66	—	—	—	—
	in 187 HBr + 2 600 H_2O		102.8988	—	-358.57	—	—	—	—
	in CH_3OH:s		102.8988	—	-378.15	—	—	—	—
NaBr	in $HCONH_2$:s in formamide		102.8988	—	-379.53	—	—	—	—
	in 1 400 $HCONHC_2H_5$ in N–ethylformamide		102.8988	—	-378.23	—	—	—	—
	in C_2H_5OH:s		102.8988	—	-372.17	—	—	—	—
	in $HCON(CH_3)_2$:s in N,N–dimethylformamide		102.8988	—	-390.91	—	—	—	—

Table 99:Na — SODIUM (Prepared 1980) — Continued — Table 99:Na

Substance Formula	Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
$NaBr^+$		g	102.8988	669.	665.	—	—	—	—
$NaBr \cdot 2H_2O$		cr	138.9296	—	-951.94	-828.29	—	179.1	—
$NaBr_3$		ai	262.7168	—	-370.54	-368.95	—	274.5	—
$NaBr_5$		ai	422.5348	—	-382.4	-365.7	—	375.7	—
$(NaBr)_2$		g	205.7976	-468.69	-486.6	-514.87	19.50	349.5	80.12
$NaBrO$		ai	118.8982	—	-334.3	-295.4	—	100.	—
	in 500 H_2O		118.8982	—	-333.05	—	—	—	—
$NaBrO_2$	in 2 000 H_2O		134.8976	—	-287.9	—	—	—	—
$NaBrO_3$		cr	150.8970	—	-334.09	-242.62	—	128.9	—
		ai	150.8970	—	-307.19	-243.29	—	220.9	—
$NaBrO_3$	in 50 H_2O		150.8970	—	-308.82	—	—	—	—
	in 75 H_2O		150.8970	—	-308.24	—	—	—	—
	in 100 H_2O		150.8970	—	-307.90	—	—	—	—
	in 150 H_2O		150.8970	—	-307.57	—	—	—	—
	in 200 H_2O		150.8970	—	-307.40	—	—	—	—
$NaBrO_3$	in 300 H_2O		150.8970	—	-307.23	—	—	—	—
	in 500 H_2O		150.8970	—	-307.097	—	—	—	—
	in 800 H_2O		150.8970	—	-307.047	—	—	—	—
	in 1 000 H_2O		150.8970	—	-307.039	—	—	—	—
	in 1 500 H_2O		150.8970	—	-307.026	—	—	—	—
$NaBrO_3$	in 2 000 H_2O		150.8970	—	-307.022	—	—	—	—
	in 3 000 H_2O		150.8970	—	-307.030	—	—	—	—
	in 5 000 H_2O		150.8970	—	-307.051	—	—	—	—
	in 7 000 H_2O		150.8970	—	-307.064	—	—	—	—
	in 10 000 H_2O		150.8970	—	-307.080	—	—	—	—
$NaBrO_3$	in 20 000 H_2O		150.8970	—	-307.106	—	—	—	—
	in 50 000 H_2O		150.8970	—	-307.131	—	—	—	—
	in 100 000 H_2O		150.8970	—	-307.147	—	—	—	—
	in ∞ H_2O		150.8970	—	-307.19	—	—	—	—
$NaBrO_4$		ai	166.8964	—	-227.19	-143.86	—	258.6	—
$NaBrF_4$		cr	178.8924	—	-928.8	—	—	—	—
	in BrF_3:x		178.8924	—	-924.92	—	—	—	—
NaI		cr	149.8942	-286.993	-287.78	-286.06	12.26	98.53	52.09
	G–H–S constraint has been relaxed; see Introduction.								
		g	149.8942	-76.6	-79.5	-121.0	9.954	248.978	36.65
		ai	149.8942	—	-295.31	-313.47	—	170.3	-95.8
NaI	in 4.5 H_2O		149.8942	—	-298.675	—	—	—	—
	in 5 H_2O		149.8942	—	-299.035	—	—	—	—
	in 6 H_2O		149.8942	—	-299.319	—	—	—	—
	in 6.5 H_2O		149.8942	—	-299.340	—	—	—	—
	in 8 H_2O		149.8942	—	-299.173	—	—	—	—
NaI	in 10 H_2O		149.8942	—	-298.771	—	—	—	—
	in 12 H_2O		149.8942	—	-298.378	—	—	—	—
	in 15 H_2O		149.8942	—	-297.872	—	—	—	—
	in 20 H_2O		149.8942	—	-297.240	—	—	—	—
	in 25 H_2O		149.8942	—	-296.805	—	—	—	—
NaI	in 30 H_2O		149.8942	—	-296.491	—	—	—	—

Table 99:Na SODIUM (Prepared 1980) — Continued Table 99:Na

Substance Formula	and Description	State	Molar mass g mol^{-1}	0 K $\Delta_fH^\circ_0$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) Δ_fH° kJ mol^{-1}	Δ_fG° kJ mol^{-1}	$H^\circ - H^\circ_0$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
NaI	in 40 H_2O		149.8942	—	-296.077	—	—	—	—
	in 50 H_2O		149.8942	—	-295.817	—	—	—	—
	in 75 H_2O		149.8942	—	-295.470	—	—	—	—
	in 100 H_2O		149.8942	—	-295.303	—	—	—	—
	in 150 H_2O		149.8942	—	-295.144	—	—	—	—
NaI	in 200 H_2O		149.8942	—	-295.077	—	—	—	—
	in 300 H_2O		149.8942	—	-295.022	—	—	—	—
	in 500 H_2O		149.8942	—	-295.005	—	—	—	—
	in 800 H_2O		149.8942	—	-295.018	—	—	—	—
	in 1 000 H_2O		149.8942	—	-295.031	—	—	—	—
NaI	in 1 500 H_2O		149.8942	—	-295.064	—	—	—	—
	in 2 000 H_2O		149.8942	—	-295.081	—	—	—	—
	in 3 000 H_2O		149.8942	—	-295.106	—	—	—	—
	in 4 000 H_2O		149.8942	—	-295.127	—	—	—	—
	in 5 000 H_2O		149.8942	—	-295.144	—	—	—	—
NaI	in 10 000 H_2O		149.8942	—	-295.181	—	—	—	—
	in 20 000 H_2O		149.8942	—	-295.219	—	—	—	—
	in 50 000 H_2O		149.8942	—	-295.248	—	—	—	—
	in 100 000 H_2O		149.8942	—	-295.261	—	—	—	—
	in ∞ H_2O		149.8942	—	-295.31	—	—	—	—
NaI	in 100 HI + 10 000 H_2O		149.8942	—	-294.76	—	—	—	—
	in 200 HI + 2 500 H_2O		149.8942	—	-294.22	—	—	—	—
	in CH_3OH:s		149.8942	—	-317.73	—	—	—	—
	in $HCONH_2$:s in formamide		149.8942	—	-318.86	—	—	—	—
	in C_2H_5OH:s		149.8942	—	-312.04	—	—	—	—
NaI	in 2 000 $HCONHC_2H_5$ in N–ethylformamide		149.8942	—	-321.50	—	—	—	—
	in $HCONHC_2H_5$:s		149.8942	—	-321.67	—	—	—	—
NaI^+		g	149.8942	660.7	664.0	—	—	—	—
$NaI{\cdot}2H_2O$		cr	185.9250	—	-883.096	-771.10	—	196.2	—
NaI_3		cr	403.7030	—	-235.1	—	—	—	—
NaI_3	from I_3^-	ai	403.7030	—	-291.6	-313.4	—	298.3	—
$(NaI)_2$		g	299.7884	-348.53	-354.4	-398.89	20.21	367.9	80.8
NaIO		ai	165.8936	—	-347.7	-300.4	—	53.6	—
$NaIO_3$		cr	197.8924	—	-481.788	—	—	—	92.0
		ai	197.8924	—	-461.5	-389.9	—	177.4	—
$NaIO_3$	in 500 H_2O		197.8924	—	-461.788	—	—	—	—
	in 600 H_2O		197.8924	—	-461.688	—	—	—	—
	in 800 H_2O		197.8924	—	-461.596	—	—	—	—
	in 1 000 H_2O		197.8924	—	-461.537	—	—	—	—
	in 2 000 H_2O		197.8924	—	-461.453	—	—	—	—
$NaIO_3$	in 5 000 H_2O		197.8924	—	-461.412	—	—	—	—
	in 20 000 H_2O		197.8924	—	-461.424	—	—	—	—
	in 50 000 H_2O		197.8924	—	-461.453	—	—	—	—
	in 100 000 H_2O		197.8924	—	-461.466	—	—	—	—
	in ∞ H_2O		197.8924	—	-461.5	—	—	—	—
$NaIO_3{\cdot}H_2O$		cr	215.9078	—	-779.48	-634.03	—	162.3	—
$NaIO_3{\cdot}5H_2O$		cr	287.9694	—	-1952.25	—	—	—	—
$NaIO_4$		cr	213.8918	—	-429.28	-323.02	—	163.	—
		ai	213.8918	—	-391.62	-320.43	—	280.	—

Table 99:**Na** **SODIUM** (Prepared 1980) — Continued Table 99:**Na**

Substance Formula	Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
$NaIO_4$	in 2 000 H_2O		213.8918	—	-392.493	—	—	—	—
$NaIO_4 \cdot 3H_2O$		cr	267.9380	—	—	-1036.6	—	—	—
NaH_4IO_6	from $H_4IO_6^-$	aq	249.9226	—	-999.6	—	—	—	—
$Na_2H_3IO_6$	from $H_3IO_6^{2-}$	aq	271.9044	—	-1236.4	—	—	—	—
$NaIO_2F_2$		cr	219.8898	—	-847.26	—	—	—	—
$NaICl_2$		cr	220.8002	—	-402.	—	—	—	—
	from ICl_2^-	ai	220.8002	—	—	-423.0	—	—	—
$NaICl_4$		cr	291.7062	—	-469.	—	—	—	—
$NaIBr_2$		cr	309.7122	—	-347.	—	—	—	—
	from IBr_2^-	ai	309.7122	—	—	-384.9	—	—	—
$NaBrI_2$	from BrI_2^-	ai	356.7076	—	-368.2	-372.0	—	256.5	—
$NaIBrCl$	from $IBrCl^-$	ai	265.2562	—	—	-408.3	—	—	—
Na_2S		cr	78.0436	—	-364.8	-349.8	—	83.7	—
		ai	78.0436	—	-447.3	-438.1	—	103.3	—
	in 20 H_2O		78.0436	—	-448.57	—	—	—	—
Na_2S	in 30 H_2O		78.0436	—	-447.23	—	—	—	—
	in 40 H_2O		78.0436	—	-446.56	—	—	—	—
	in 50 H_2O		78.0436	—	-446.01	—	—	—	—
	in 100 H_2O		78.0436	—	-444.93	—	—	—	—
	in 200 H_2O		78.0436	—	-444.34	—	—	—	—
Na_2S	in 300 H_2O		78.0436	—	-444.13	—	—	—	—
	in 400 H_2O		78.0436	—	-443.881	—	—	—	—
	in 500 H_2O		78.0436	—	-443.76	—	—	—	—
	in 1 000 H_2O		78.0436	—	-443.253	—	—	—	—
	in 5 000 H_2O		78.0436	—	-443.127	—	—	—	—
$Na_2S \cdot 4.5H_2O$		cr	159.1129	—	-1725.9	—	—	—	—
$Na_2S \cdot 5H_2O$		cr	168.1206	—	-1886.6	—	—	—	—
$Na_2S \cdot 9H_2O$		cr	240.1822	—	-3074.0	—	—	—	—
Na_2S_2		cr	110.1076	—	-397.1	-378.7	—	105.	—
	from S_2^{2-}	ai	110.1076	—	-450.2	-444.3	—	146.4	—
Na_2S_2	in 10 000 H_2O		110.1076	—	-446.89	—	—	—	—
Na_2S_3		cr	142.1716	—	-410.9	—	—	—	—
	from S_3^{2-}	ai	142.1716	—	-454.4	-450.2	—	184.1	—
	in 600 H_2O		142.1716	—	-446.52	—	—	—	—
Na_2S_4		cr	174.2356	—	-411.7	—	—	—	—
Na_2S_4	from S_4^{2-}	ai	174.2356	—	-457.3	-454.8	—	221.3	—
	in 600 H_2O		174.2356	—	-454.63	—	—	—	—
	in 10 000 H_2O		174.2356	—	-453.46	—	—	—	—
Na_2S_5		cr	206.2996	—	-411.7	—	—	—	—
	from S_5^{2-}	ai	206.2996	—	-459.0	-458.1	—	258.6	—
$NaSO_4^-$		ao	119.0514	—	-1144.70	-1010.61	—	108.8	—
$NaS_2O_3^-$		ao	135.1160	—	-887.97	-787.99	—	152.7	—
Na_2SO_3		cr	126.0418	-1092.90	-1100.8	-1012.5	22.43	145.94	120.25
		ai	126.0418	—	-1115.87	-1010.39	—	87.9	—
	in 200 H_2O		126.0418	—	-1115.08	—	—	—	—
Na_2SO_3	in 800 H_2O		126.0418	—	-1114.66	—	—	—	—
$Na_2SO_3 \cdot 7H_2O$		cr	252.1496	—	-3162.3	-2676.1	—	444.	—
Na_2SO_4	c,V, orthorhombic G–H–S constraint has been relaxed; see Introduction	cr	142.0412	-1375.653	-1387.08	-1270.16	23.225	149.58	128.20

Substance Formula	Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H_0^\circ$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H_0^\circ$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
Na_2SO_4	c,III, metastable	cr2	142.0412	—	—	—	23.531	154.934	129.29
		ai	142.0412	—	-1389.51	-1268.36	—	138.1	-201.
	in 18 H_2O		142.0412	—	-1396.837	—	—	—	—
	in 20 H_2O		142.0412	—	-1396.619	—	—	—	—
	in 25 H_2O		142.0412	—	-1395.753	—	—	—	—
Na_2SO_4	in 28.37 H_2O		142.0412	—	-1395.326	—	—	—	—
	in 30 H_2O		142.0412	—	-1395.079	—	—	—	—
	in 40 H_2O		142.0412	—	-1393.962	—	—	—	—
	in 50 H_2O		142.0412	—	-1393.222	—	—	—	—
	in 60 H_2O		142.0412	—	-1392.603	—	—	—	—
Na_2SO_4	in 80 H_2O		142.0412	—	-1391.619	—	—	—	—
	in 100 H_2O		142.0412	—	-1390.845	—	—	—	—
	in 120 H_2O		142.0412	—	-1390.239	—	—	—	—
	in 140 H_2O		142.0412	—	-1389.858	—	—	—	—
	in 160 H_2O		142.0412	—	-1389.598	—	—	—	—
Na_2SO_4	in 180 H_2O		142.0412	—	-1389.406	—	—	—	—
	in 200 H_2O		142.0412	—	-1389.26	—	—	—	—
	in 250 H_2O		142.0412	—	-1389.004	—	—	—	—
	in 300 H_2O		142.0412	—	-1388.850	—	—	—	—
	in 350 H_2O		142.0412	—	-1388.745	—	—	—	—
Na_2SO_4	in 400 H_2O		142.0412	—	-1388.674	—	—	—	—
	in 500 H_2O		142.0412	—	-1388.582	—	—	—	—
	in 600 H_2O		142.0412	—	-1388.532	—	—	—	—
	in 800 H_2O		142.0412	—	-1388.490	—	—	—	—
	in 1 000 H_2O		142.0412	—	-1388.481	—	—	—	—
Na_2SO_4	in 2 000 H_2O		142.0412	—	-1388.552	—	—	—	—
	in 3 000 H_2O		142.0412	—	-1388.636	—	—	—	—
	in 4 000 H_2O		142.0412	—	-1388.699	—	—	—	—
	in 5 000 H_2O		142.0412	—	-1388.75	—	—	—	—
	in 10 000 H_2O		142.0412	—	-1388.912	—	—	—	—
Na_2SO_4	in 20 000 H_2O		142.0412	—	-1389.054	—	—	—	—
	in 50 000 H_2O		142.0412	—	-1389.201	—	—	—	—
	in 100 000 H_2O		142.0412	—	-1389.285	—	—	—	—
	in ∞ H_2O		142.0412	—	-1389.51	—	—	—	—
	in 1.54 H_2SO_4 + 1 700 H_2O		142.0412	—	-1377.12	—	—	—	—
Na_2SO_4	in 127.5 H_2SO_4 + 7 141 H_2O		142.0412	—	-1372.23	—	—	—	—
$Na_2SO_4 \cdot 10H_2O$	G–H–S constraint has been relaxed; see Introduction.	cr	322.1952	—	-4327.26	-3646.85	—	592.0	—
$Na_2SO_4 \cdot 10D_2O$		cr	342.3172	—	-4417.55	-3709.77	—	646.0	—
$Na_2S_2O_3$		cr	158.1058	—	-1123.0	-1028.0	—	155.	—
		ai	158.1058	—	-1132.40	-1046.0	—	184.1	—
$Na_2S_2O_3$	in 8 H_2O		158.1058	—	-1141.312	—	—	—	—
	in 10 H_2O		158.1058	—	-1141.228	—	—	—	—
	in 15 H_2O		158.1058	—	-1140.391	—	—	—	—
	in 20 H_2O		158.1058	—	-1139.471	—	—	—	—
	in 25 H_2O		158.1058	—	-1138.634	—	—	—	—
$Na_2S_2O_3$	in 40 H_2O		158.1058	—	-1136.751	—	—	—	—
	in 50 H_2O		158.1058	—	-1135.914	—	—	—	—
	in 100 H_2O		158.1058	—	-1133.822	—	—	—	—

Substance Formula	Description	State	Molar mass g mol^{-1}	0 K $\Delta_f H^\circ_0$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H^\circ_0$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
$Na_2S_2O_3$	in 200 H_2O		158.1058	—	-1132.236	—	—	—	—
	in 300 H_2O		158.1058	—	-1131.780	—	—	—	—
	in 500 H_2O		158.1058	—	-1131.605	—	—	—	—
	in 1 000 H_2O		158.1058	—	-1131.521	—	—	—	—
	in 2 000 H_2O		158.1058	—	-1131.584	—	—	—	—
$Na_2S_2O_3$	in 3 000 H_2O		158.1058	—	-1131.659	—	—	—	—
	in 5 000 H_2O		158.1058	—	-1131.768	—	—	—	—
	in 10 000 H_2O		158.1058	—	-1131.906	—	—	—	—
	in 20 000 H_2O		158.1058	—	-1132.036	—	—	—	—
	in 50 000 H_2O		158.1058	—	-1132.178	—	—	—	—
$Na_2S_2O_3 \cdot 5H_2O$		cr	248.1828	—	-2607.93	-2229.8	—	372.	—
$Na_2S_2O_4$		cr	174.1052	—	-1232.2	—	—	—	—
		ai	174.1052	—	-1233.9	-1124.2	—	209.2	—
$Na_2S_2O_5$		cr	190.1046	—	-1478.2	—	—	—	—
	in 700 H_2O		190.1046	—	-1469.59	—	—	—	—
$Na_2S_2O_6$		cr	206.1040	—	-1699.04	—	—	—	—
	in 400 H_2O		206.1040	—	-1677.70	—	—	—	—
$Na_2S_2O_6 \cdot 2H_2O$		cr	242.1348	—	-2295.80	—	—	—	—
$Na_2S_2O_7$		cr	222.1034	—	-1925.1	-1722.0	—	202.1	—
	in 50 H_2O		222.1034	—	-1888.2	—	—	—	—
$Na_2S_2O_8$		ai	238.1028	—	-1825.1	-1638.7	—	362.3	—
$Na_2S_3O_6$	in 1 000 H_2O		238.1680	—	-1682.	—	—	—	—
$Na_2S_3O_6 \cdot 3H_2O$		cr	292.2142	—	-2580.3	—	—	—	—
$Na_2S_4O_6$	in 600 H_2O		270.2320	—	-1707.1	—	—	—	—
$Na_2S_4O_6 \cdot 2H_2O$		cr	306.2628	—	-2317.5	—	—	—	—
$Na_2S_5O_6$	from $S_5O_6^{2-}$	aq	302.2960	—	-1716.7	—	—	—	—
NaHS		cr	56.0618	—	-237.23	—	—	—	—
	from HS^-	ai	56.0618	—	-257.73	-249.81	—	121.8	—
	in 5 H_2O		56.0618	—	-261.04	—	—	—	—
	in 10 H_2O		56.0618	—	-261.58	—	—	—	—
NaHS	in 15 H_2O		56.0618	—	-260.50	—	—	—	—
	in 20 H_2O		56.0618	—	-259.70	—	—	—	—
	in 40 H_2O		56.0618	—	-258.49	—	—	—	—
	in 50 H_2O		56.0618	—	-257.99	—	—	—	—
	in 100 H_2O		56.0618	—	-257.61	—	—	—	—
NaHS	in 200 H_2O		56.0618	—	-257.36	—	—	—	—
	in 400 H_2O		56.0618	—	-257.27	—	—	—	—
	in 800 H_2O		56.0618	—	-257.36	—	—	—	—
$NaHS \cdot 2H_2O$		cr	92.0926	—	-838.47	—	—	—	—
$NaHSO_3$	from HSO_3^-	ai	104.0600	—	-866.34	-789.62	—	198.7	—
$NaHSO_4$		cr	120.0594	—	-1125.5	-992.8	—	113.0	—
	from HSO_4^-	ai	120.0594	—	-1127.46	-1017.80	—	190.8	-38.
	in 10 H_2O		120.0594	—	-1127.965	—	—	—	—
	in 20 H_2O		120.0594	—	-1129.764	—	—	—	—
	in 25 H_2O		120.0594	—	-1129.847	—	—	—	—
$NaHSO_4$	in 50 H_2O		120.0594	—	-1130.182	—	—	—	—
	in 100 H_2O		120.0594	—	-1130.287	—	—	—	—
	in 200 H_2O		120.0594	—	-1130.910	—	—	—	—
	in 300 H_2O		120.0594	—	-1131.646	—	—	—	—
	in 400 H_2O		120.0594	—	-1132.207	—	—	—	—

Table 99:Na SODIUM (Prepared 1980) — Continued Table 99:Na

Substance Formula and Description		State	Molar mass g mol⁻¹	0 K $\Delta_f H_0^\circ$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H_0^\circ$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
$NaHSO_4$	in 500 H_2O		120.0594	—	-1132.651	—	—	—	—
	in 800 H_2O		120.0594	—	-1133.738	—	—	—	—
	in 1 000 H_2O		120.0594	—	-1134.32	—	—	—	—
	in 2 000 H_2O		120.0594	—	-1136.29	—	—	—	—
	in 5 000 H_2O		120.0594	—	-1139.14	—	—	—	—
$NaHSO_4 \cdot H_2O$		cr	138.0748	—	-1421.7	-1231.6	—	155.	—
$NaHS_2O_4$	from $HS_2O_4^-$	ai	152.1234	—	—	-876.5	—	—	—
$NaSO_3F$		cr	122.0504	—	-1122.1	—	—	—	—
	in 3 000 H_2O		122.0504	—	-1110.39	—	—	—	—
	in 300 HSO_3F		122.0504	—	-1153.40	—	—	—	—
$(NaI \cdot 4SO_2)$		cr	406.1454	—	-1644.3	-1491.5	—	544.	—
$(3NaI \cdot 8SO_2)$		cr	962.1850	—	-3584.4	-3292.5	—	1230.	—
Na_2Se		cr	124.9396	—	-341.4	—	—	—	—
		ai	124.9396	—	—	-394.6	—	—	—
$Na_2Se \cdot 4.5H_2O$		cr	206.0089	—	-1741.0	—	—	—	—
$Na_2Se \cdot 9H_2O$		cr	287.0782	—	-3040.1	—	—	—	—
$Na_2Se \cdot 16H_2O$		cr	413.1860	—	-5091.9	—	—	—	—
Na_2Se_2		cr	203.8996	—	-374.5	—	—	—	—
Na_2SeO_3		cr	172.9378	—	-958.6	—	—	—	—
		ai	172.9378	—	-989.5	-893.7	—	130.	—
Na_2SeO_3	in 1 000 H_2O		172.9378	—	-987.4	—	—	—	—
$Na_2SeO_3 \cdot 5H_2O$		cr	263.0148	—	-2404.13	—	—	—	—
Na_2SeO_4		cr	188.9372	—	-1069.0	—	—	—	—
		ai	188.9372	—	-1079.5	-965.2	—	172.0	—
	in 500 H_2O		188.9372	—	-1077.4	—	—	—	—
Na_2SeO_4	in 5 000 H_2O		188.9372	—	-1079.1	—	—	—	—
$Na_2SeO_4 \cdot 10H_2O$		cr	369.0912	—	-4006.6	—	—	—	—
$NaHSe$		cr	102.9578	—	-163.	—	—	—	—
	in 4 000 H_2O		102.9578	—	-187.4	—	—	—	—
$NaHSeO_3$		cr	150.9560	—	-759.23	—	—	—	—
$NaHSeO_3$	from $HSeO_3^-$	ai	150.9560	—	-754.67	-673.35	—	194.1	—
	in 1 000 H_2O		150.9560	—	-753.5	—	—	—	—
$NaHSeO_4$		cr	166.9554	—	-821.40	—	—	—	—
	from $HSeO_4^-$	ai	166.9554	—	-821.7	-714.1	—	208.4	—
	in 800 H_2O		166.9554	—	-829.48	—	—	—	—
$NaH_3(SeO_3)_2$		cr	279.9302	—	-1317.58	—	—	—	—
	in 800 H_2O		279.9302	—	-1267.42	—	—	—	—
$NaTe_3$		cr	405.7898	—	-134.	—	—	—	—
Na_2Te		cr	173.5796	—	-349.4	—	—	—	—
Na_2Te_2		cr	301.1796	—	-422.6	—	—	—	—
Na_2Te_2	in 85 NH_3		301.1796	—	-441.0	—	—	—	—
Na_2TeO_3		cr	221.5778	—	-1002.9	—	—	—	—
	in 1 000 H_2O		221.5778	—	-1040.6	—	—	—	—
$Na_2TeO_3 \cdot 5H_2O$		cr	311.6548	—	-2483.2	—	—	—	—
Na_2TeO_4		cr	237.5772	—	-1270.7	—	—	—	—
NaH_5TeO_6	from $H_5TeO_6^-$	aq	251.6262	—	-1501.6	—	—	—	—
$Na_2H_4TeO_6$	from $H_4TeO_6^{2-}$	aq	273.6080	—	-1702.5	—	—	—	—
NaN_3		cr	65.0099	26.426	21.71	93.81	14.736	96.86	76.61
		ai	65.0099	—	35.02	86.2	—	166.9	—
	in 25 H_2O		65.0099	—	36.895	—	—	—	—

Substance Formula	Description	State	Molar mass g mol⁻¹	0 K: $\Delta_f H_0^\circ$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar): $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H_0^\circ$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
NaN_3	in 30 H_2O		65.0099	—	36.539	—	—	—	—
	in 35 H_2O		65.0099	—	36.330	—	—	—	—
	in 40 H_2O		65.0099	—	36.183	—	—	—	—
	in 50 H_2O		65.0099	—	36.016	—	—	—	—
	in 55 H_2O		65.0099	—	35.953	—	—	—	—
NaN_3	in 2 000 H_2O		65.0099	—	35.054	—	—	—	—
$NaNO_2$		cr	68.9953	—	-358.65	-284.55	—	103.8	—
		ai	68.9953	—	-344.8	-294.1	—	182.0	-51.0
	in 4.5 H_2O		68.9953	—	-348.15	—	—	—	—
	in 5 H_2O		68.9953	—	-348.07	—	—	—	—
$NaNO_2$	in 6 H_2O		68.9953	—	-347.86	—	—	—	—
	in 8 H_2O		68.9953	—	-347.61	—	—	—	—
	in 10 H_2O		68.9953	—	-347.40	—	—	—	—
	in 12 H_2O		68.9953	—	-347.23	—	—	—	—
	in 15 H_2O		68.9953	—	-347.06	—	—	—	—
$NaNO_2$	in 20 H_2O		68.9953	—	-346.81	—	—	—	—
	in 25 H_2O		68.9953	—	-346.64	—	—	—	—
	in 30 H_2O		68.9953	—	-346.52	—	—	—	—
	in 40 H_2O		68.9953	—	-346.35	—	—	—	—
	in 50 H_2O		68.9953	—	-346.14	—	—	—	—
$NaNO_2$	in 75 H_2O		68.9953	—	-345.81	—	—	—	—
	in 100 H_2O		68.9953	—	-345.56	—	—	—	—
	in 150 H_2O		68.9953	—	-345.18	—	—	—	—
	in 200 H_2O		68.9953	—	-344.93	—	—	—	—
	in 300 H_2O		68.9953	—	-344.59	—	—	—	—
$NaNO_2$	in ∞ H_2O		68.9953	—	-344.8	—	—	—	—
$NaNO_3$		cr	84.9947	-461.278	-467.85	-367.00	17.217	116.52	92.88
		ai	84.9947	—	-447.48	-373.15	—	205.4	-40.2
	in 6 H_2O		84.9947	—	-454.625	—	—	—	—
	in 8 H_2O		84.9947	—	-454.060	—	—	—	—
$NaNO_3$	in 10 H_2O		84.9947	—	-453.466	—	—	—	—
	in 12 H_2O		84.9947	—	-452.931	—	—	—	—
	in 15 H_2O		84.9947	—	-452.265	—	—	—	—
	in 20 H_2O		84.9947	—	-451.408	—	—	—	—
	in 25 H_2O		84.9947	—	-450.788	—	—	—	—
$NaNO_3$	in 30 H_2O		84.9947	—	-450.316	—	—	—	—
	in 40 H_2O		84.9947	—	-449.650	—	—	—	—
	in 50 H_2O		84.9947	—	-449.203	—	—	—	—
	in 75 H_2O		84.9947	—	-448.546	—	—	—	—
	in 100 H_2O		84.9947	—	-448.203	—	—	—	—
$NaNO_3$	in 150 H_2O		84.9947	—	-447.839	—	—	—	—
	in 200 H_2O		84.9947	—	-447.659	—	—	—	—
	in 300 H_2O		84.9947	—	-447.487	—	—	—	—
	in 400 H_2O		84.9947	—	-447.403	—	—	—	—
	in 500 H_2O		84.9947	—	-447.357	—	—	—	—
$NaNO_3$	in 600 H_2O		84.9947	—	-447.332	—	—	—	—
	in 800 H_2O		84.9947	—	-447.307	—	—	—	—
	in 1 000 H_2O		84.9947	—	-447.295	—	—	—	—
	in 3 000 H_2O		84.9947	—	-447.311	—	—	—	—
	in 5 000 H_2O		84.9947	—	-447.332	—	—	—	—

Table 99:**Na** — **SODIUM** (Prepared 1980) — Continued — Table 99:**Na**

Substance Formula	Description	State	Molar mass g mol^{-1}	0 K $\Delta_f H^\circ_0$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H^\circ_0$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
$NaNO_3$	in 10 000 H_2O		84.9947	—	-447.362	—	—	—	—
	in 20 000 H_2O		84.9947	—	-447.387	—	—	—	—
	in 50 000 H_2O		84.9947	—	-447.416	—	—	—	—
	in 100 000 H_2O		84.9947	—	-447.433	—	—	—	—
	in ∞ H_2O		84.9947	—	-447.48	—	—	—	—
$NaNO_3$	in HNO_3 + 7.50 H_2O:u		84.9947	—	-452.416	—	—	—	—
$NaONO_2$		aq2	84.9947	—	-287.0	—	—	—	—
	sodium peroxynitrite; from ONO_2^-								
$Na_2N_2O_2$	hyponitrite	aq	105.9918	—	-497.5	—	—	—	—
$Na_2N_2O_3$		cr	121.9912	—	-556.64	—	—	—	—
	in 5 NaOH + 2 775 H_2O		121.9912	—	-571.74	—	—	—	—
$NaNH_2$		cr	39.0125	-116.48	-123.8	-64.0	11.891	76.90	66.15
$NaNH_3$		cr	40.0205	—	-68.07	-12.24	—	155.6	—
$NaHN_2O_2$	bihyponitrite; from $HN_2O_2^-$	aq	84.0100	—	-292.0	—	—	—	—
$NaNO_2 \cdot NaOH$		cr	108.9925	—	-790.82	—	—	—	—
$NaNO_3 \cdot NaOH$		cr	124.9919	—	-898.35	—	—	—	—
$NaNO_3 \cdot 2NaOH$		cr	164.9891	—	-1326.50	—	—	—	—
$NaCl \cdot 5NH_3$		cr	143.5963	—	-799.6	-434.4	—	397.	—
$NaBr \cdot 5.25NH_3$		cr	192.3100	—	-797.5	—	—	—	—
$NaBr \cdot 5.75NH_3$		cr	200.8253	—	-832.6	—	—	—	—
$NaI \cdot 4.5NH_3$		l	226.5323	—	-645.2	-365.8	—	485.	—
$NaI \cdot 4.5ND_3$		l	240.1147	—	-703.	—	—	—	—
$Na_2SO_4 \cdot (NH_4)_2SO_4 \cdot H_2O$		cr	292.1956	—	-2898.3	—	—	—	—
Na_2P		g	76.9534	—	-209.	—	—	—	—
Na_3P		cr	99.9432	—	-92.5	—	—	—	—
NaOP		g	69.9630	-201.7	-205.9	-228.5	11.97	270.90	47.74
NaPO		g2	69.9630	—	—	—	12.76	281.53	48.74
$NaPO_2$		g	85.9624	-502.1	-509.2	-506.3	13.51	288.0	59.8
$NaPO_3$		g	101.9618	-856.5	-866.	-838.0	15.27	306.	71.5
		aq	101.9618	—	-1217.1	—	—	—	—
$NaP_2O_7^{3-}$		ao	196.9332	—	-2514.54	—	—	—	—
$(NaPO_3)_2$		g	203.9236	—	-1937.	—	—	—	—
$Na_2P_2O_7^{2-}$		ao	219.9230	—	—	-2456.7	—	—	—
Na_3PO_4		cr	163.9408	-1902.84	-1917.40	-1788.80	27.472	173.80	153.47
		ai	163.9408	—	-1997.9	-1804.5	—	-46.	—
	in 300 H_2O		163.9408	—	-1985.31	—	—	—	—
Na_3PO_4	in 500 H_2O		163.9408	—	-1984.47	—	—	—	—
	in 800 H_2O		163.9408	—	-1982.67	—	—	—	—
	in 1 000 H_2O		163.9408	—	-1981.54	—	—	—	—
$(NaPO_3)_3$		cr	305.8854	-3622.9	-3653.	-3381.	44.852	286.48	259.41
$Na_3P_3O_9$		am	305.8854	—	-3623.	—	—	—	—
$Na_4P_2O_7$		cr	265.9026	-3163.9	-3188.	-2969.3	42.593	270.29	241.12
		ai	265.9026	—	-3231.7	-2966.8	—	117.	—
	in 2 000 H_2O		265.9026	—	-3223.8	—	—	—	—
$Na_4P_2O_7 \cdot 10H_2O$		cr	446.0566	—	-6138.	—	—	—	—
$Na_4P_4O_{12}$		cr	407.8472	—	-4862.	—	—	—	—
$Na_5P_3O_{10}$	form I, quenched	cr	367.8644	-4366.30	-4399.1	-4093.9	58.869	381.79	327.02
	form II	cr2	367.8644	-4375.46	-4409.9	-4100.2	57.20	365.56	325.18
	in 5 200 H_2O		367.8644	—	-4468.9	—	—	—	—

Table 99:Na SODIUM (Prepared 1980) — Continued Table 99:Na

Substance Formula and Description		State	Molar mass g mol⁻¹	0 K $\Delta_fH^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) Δ_fH° kJ mol⁻¹	Δ_fG° kJ mol⁻¹	$H^\circ-H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
$Na_5P_3O_{10}\cdot6H_2O$		cr	475.9568	-6123.3	-6194.8	-5540.8	97.03	611.3	573.6
NaH_2PO_2		cr	87.9784	—	-838.9	—	—	—	—
	in 50 H_2O		87.9784	—	-848.9	—	—	—	—
	in 100 H_2O		87.9784	—	-849.77	—	—	—	—
	in 200 H_2O		87.9784	—	-850.31	—	—	—	—
NaH_2PO_2	in 300 H_2O		87.9784	—	-850.61	—	—	—	—
	in 400 H_2O		87.9784	—	-850.69	—	—	—	—
NaH_2PO_3		cr	103.9778	—	-1205.0	—	—	—	—
	in 600 H_2O		103.9778	—	-1209.6	—	—	—	—
$NaH_2PO_3\cdot2.5H_2O$		cr	149.0163	—	-1946.0	—	—	—	—
NaH_2PO_4		cr	119.9772	-1519.04	-1536.8	-1386.1	19.87	127.49	116.86
	from $H_2PO_4^-$	ai	119.9772	—	-1536.41	-1392.17	—	149.4	—
	in 10 H_2O		119.9772	—	-1537.20	—	—	—	—
	in 20 H_2O		119.9772	—	-1536.74	—	—	—	—
	in 50 H_2O		119.9772	—	-1536.03	—	—	—	—
NaH_2PO_4	in 400 H_2O		119.9772	—	-1535.61	—	—	—	—
	in 700 H_2O		119.9772	—	-1535.44	—	—	—	—
	in 5 000 H_2O		119.9772	—	-1536.20	—	—	—	—
$NaH_2PO_4\cdot H_2O$		cr	137.9926	—	-1833.0	—	—	—	—
$NaH_2PO_4\cdot2H_2O$		cr	156.0080	—	-2128.4	—	—	—	—
$NaHP_2O_7^{2-}$	from $HP_2O_7^{3-}$	ao	197.9412	—	—	-2225.3	—	—	—
$NaH_3P_2O_7$		cr	199.9572	—	-2511.78	—	—	—	—
	in 1 200 H_2O		199.9572	—	-2516.7	—	—	—	—
Na_2HPO_3		cr	125.9596	—	-1409.2	—	—	—	—
	in 800 H_2O		125.9596	—	-1448.9	—	—	—	—
$Na_2HPO_3\cdot5H_2O$		cr	216.0366	—	-2897.4	—	—	—	—
Na_2HPO_4		cr	141.9590	-1731.84	-1748.1	-1608.2	23.623	150.50	135.31
	from HPO_4^{2-}	ai	141.9590	—	-1772.38	-1612.98	—	84.5	—
	in 200 H_2O		141.9590	—	-1775.02	—	—	—	—
	in 300 H_2O		141.9590	—	-1774.409	—	—	—	—
Na_2HPO_4	in 400 H_2O		141.9590	—	-1774.075	—	—	—	—
	in 500 H_2O		141.9590	—	-1773.824	—	—	—	—
	in 700 H_2O		141.9590	—	-1773.447	—	—	—	—
	in 1 000 H_2O		141.9590	—	-1773.154	—	—	—	—
	in 3 600 H_2O		141.9590	—	-1772.162	—	—	—	—
$Na_2HPO_4\cdot2H_2O$		cr	177.9898	—	-2346.0	-2088.5	—	221.3	—
$Na_2HPO_4\cdot7H_2O$		cr	268.0668	—	-3821.7	-3279.8	—	434.59	—
$Na_2HPO_4\cdot12H_2O$		cr	358.1438	—	-5297.8	-4467.8	—	633.83	—
$Na_2H_2P_2O_5$		cr	189.9402	—	-2105.	—	—	—	—
		aq	189.9402	—	-2100.	—	—	—	—
$Na_2H_2P_2O_7$		cr	221.9390	-2736.59	-2764.8	-2522.4	34.242	220.20	198.15
	from $H_2P_2O_7^{2-}$	ai	221.9390	—	-2758.9	-2534.1	—	280.	—
	in 1 200 H_2O		221.9390	—	-2758.9	—	—	—	—
$Na_2H_2P_2O_7\cdot6H_2O$		cr	330.0314	—	-4531.	—	—	—	—
$Na_3HP_2O_7$		cr	243.9208	—	-2965.6	—	—	—	—
$Na_3HP_2O_7$	from $HP_2O_7^{3-}$	ai	243.9208	—	-2995.3	-2758.0	—	222.	—
	in 1 200 H_2O		243.9208	—	-2995.3	—	—	—	—
$Na_3HP_2O_7\cdot H_2O$		cr	261.9362	—	-3276.5	—	—	—	—
$Na_3HP_2O_7\cdot6H_2O$		cr	352.0132	—	-4740.9	—	—	—	—
Na_2PO_3F		ai	143.9500	—	—	-1698.6	—	—	—

Table 99:**Na** — **SODIUM** (Prepared 1980) — Continued — Table 99:**Na**

Substance Formula and Description		State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
$NaNH_4HPO_4$	in 550 H_2O		137.0079	—	-1664.60	—	—	—	—
$NaNH_4HPO_4{\cdot}4H_2O$		cr	209.0695	—	-2852.27	—	—	—	—
$NaAs$		cr	97.9114	—	-96.2	-89.1	—	62.8	—
$NaAs_2$		cr	172.8330	—	-106.7	-100.4	—	100.	—
Na_3As		cr	143.8910	—	-205.	-187.4	—	130.	—
$NaAsO_2$		cr	129.9102	—	-660.53	—	—	—	—
		ai	129.9102	—	-669.15	-611.88	—	99.6	—
	in 64 NaOH + 2 000 H_2O		129.9102	—	-680.95	—	—	—	—
Na_3AsO_3	in 500 H_2O		191.8892	—	-1324.2	—	—	—	—
Na_3AsO_4		cr	207.8886	—	-1540.	—	—	—	—
Na_3AsO_4		ai	207.8886	—	-1608.50	-1434.13	—	14.2	—
	in 500 H_2O		207.8886	—	-1604.6	—	—	—	—
$Na_3AsO_4{\cdot}12H_2O$		cr	424.0734	—	-5092.	—	—	—	—
NaH_2AsO_3	from $H_2AsO_3^-$	ai	147.9256	—	-954.91	-849.02	—	169.5	—
	in 400 H_2O		147.9256	—	-954.0	—	—	—	—
NaH_2AsO_4	from $H_2AsO_4^-$	ai	163.9250	—	-1149.68	-1015.07	—	176.	—
	in 300 H_2O		163.9250	—	-1149.8	—	—	—	—
Na_2HAsO_3	in 400 H_2O		169.9074	—	-1139.7	—	—	—	—
Na_2HAsO_4	from $HAsO_4^{2-}$	ai	185.9068	—	-1386.58	-1238.42	—	116.3	—
	in 400 H_2O		185.9068	—	-1385.7	—	—	—	—
Na_2AsO_3F	from AsO_3F^{2-}	ai	187.8978	—	—	-1551.28	—	—	—
$NaSb$		cr	144.7398	—	-63.	-63.	—	96.	—
Na_3Sb		cr	190.7194	—	-205.	-180.	—	126.	—
$NaSbO_2$		ai	176.7386	—	—	-602.09	—	—	—
$Na_2Sb_2S_4$	in 400 H_2O		417.7356	—	-699.6	—	—	—	—
Na_3SbS_3	in 900 H_2O		286.9114	—	-799.1	—	—	—	—
Na_3Bi		cr	277.9494	—	-176.	—	—	—	—
Na_3BiO_4		cr	341.9470	—	-1218.	—	—	—	—
$NaBiCl_4$		ai	373.7818	—	—	-743.4	—	—	—
Na_3BiCl_6		ai	490.6674	—	—	-1532.46	—	—	—
$NaBiBr_4$		ai	551.6058	—	—	-639.3	—	—	—
Na_2BiI_4		ai	762.5772	—	—	-470.7	—	—	—
$Na_2NH_4BiCl_6$	from $NH_4BiCl_6^{2-}$	ai	485.7163	—	—	-1350.4	—	—	—
Na_2C_2	sodium carbide	cr	70.0020	—	17.2	—	—	—	—
$NaCO_3^-$		ao	82.9992	—	-935.92	-792.80	—	-49.8	—
Na_2CO_3		cr	105.9890	-1124.49	-1130.68	-1044.44	20.748	134.98	112.30
	G–H–S constraint has been relaxed; see Introduction.								
		ai	105.9890	—	-1157.38	-1051.64	—	61.1	—
	in 15 H_2O		105.9890	—	-1164.28	—	—	—	—
	in 20 H_2O		105.9890	—	-1163.70	—	—	—	—
	in 25 H_2O		105.9890	—	-1162.148	—	—	—	—
Na_2CO_3	in 30 H_2O		105.9890	—	-1161.520	—	—	—	—
	in 40 H_2O		105.9890	—	-1160.428	—	—	—	—
	in 50 H_2O		105.9890	—	-1159.554	—	—	—	—
	in 55.5 H_2O		105.9890	—	-1159.156	—	—	—	—
	in 75 H_2O		105.9890	—	-1158.165	—	—	—	—
Na_2CO_3	in 100 H_2O		105.9890	—	-1157.403	—	—	—	—
	in 150 H_2O		105.9890	—	-1156.525	—	—	—	—
	in 200 H_2O		105.9890	—	-1156.006	—	—	—	—

Table 99:Na — SODIUM (Prepared 1980) — Continued — Table 99:Na

Substance Formula	Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
Na_2CO_3	in 300 H_2O		105.9890	—	-1155.445	—	—	—	—
	in 400 H_2O		105.9890	—	-1155.186	—	—	—	—
	in 500 H_2O		105.9890	—	-1155.002	—	—	—	—
	in 1 000 H_2O		105.9890	—	-1154.391	—	—	—	—
	in 1 500 H_2O		105.9890	—	-1153.989	—	—	—	—
Na_2CO_3	in 2 000 H_2O		105.9890	—	-1153.646	—	—	—	—
	in 2 500 H_2O		105.9890	—	-1153.361	—	—	—	—
	in 3 000 H_2O		105.9890	—	-1153.102	—	—	—	—
	in 4 000 H_2O		105.9890	—	-1152.617	—	—	—	—
	in 5 000 H_2O		105.9890	—	-1152.190	—	—	—	—
Na_2CO_3	in 7 000 H_2O		105.9890	—	-1151.412	—	—	—	—
	in 10 000 H_2O		105.9890	—	-1150.454	—	—	—	—
	in 20 000 H_2O		105.9890	—	-1147.713	—	—	—	—
	in 50 000 H_2O		105.9890	—	-1142.943	—	—	—	—
$Na_2CO_3 \cdot H_2O$	G–H–S constraint has been relaxed; see Introduction.	cr	124.0044	-1417.83	-1431.26	-1285.31	26.342	168.11	145.60
$Na_2CO_3 \cdot 7H_2O$	G–H–S constraint has been relaxed; see Introduction.	cr	232.0968	—	-3199.96	-2714.2	—	422.2	—
$Na_2CO_3 \cdot 10H_2O$	G–H–S constraint has been relaxed; see Introduction.	cr	286.1430	-4015.05	-4081.32	-3427.66	88.74	562.7	550.32
$Na_2C_2O_4$	oxalate	cr	133.9996	—	-1318.0	—	—	—	—
		ai	133.9996	—	-1305.4	-1197.8	—	163.6	—
	in 1 000 H_2O		133.9996	—	-1303.94	—	—	—	—
$NaHC_2$	sodium acetylide	cr	48.0202	—	103.3	—	—	—	—
HCOONa	formate	cr	68.0078	-661.87	-666.5	-599.9	15.761	103.76	82.68
		ai	68.0078	—	-665.67	-612.9	—	151.	-41.4
	in 400 H_2O		68.0078	—	-665.3	—	—	—	—
$HCOONa \cdot 2H_2O$		cr	104.0386	—	-1259.0	-1077.2	—	184.	—
$HCOONa \cdot 3H_2O$		cr	122.0540	—	-1552.	—	—	—	—
$NaHCO_3$	G–H–S constraint has been relaxed; see Introduction.	cr	84.0072	-942.03	-950.81	-851.0	15.94	101.7	87.61
	from HCO_3^-	ai	84.0072	—	-932.11	-848.66	—	150.2	—
		ao	84.0072	—	-943.9	-849.7	—	113.8	—
	in 40 H_2O		84.0072	—	-933.036	—	—	—	—
$NaHCO_3$	in 50 H_2O		84.0072	—	-932.777	—	—	—	—
	in 75 H_2O		84.0072	—	-932.371	—	—	—	—
	in 100 H_2O		84.0072	—	-932.162	—	—	—	—
	in 150 H_2O		84.0072	—	-931.953	—	—	—	—
	in 200 H_2O		84.0072	—	-931.860	—	—	—	—
$NaHCO_3$	in 300 H_2O		84.0072	—	-931.789	—	—	—	—
	in 400 H_2O		84.0072	—	-931.748	—	—	—	—
	in 500 H_2O		84.0072	—	-931.739	—	—	—	—
	in 1 000 H_2O		84.0072	—	-931.764	—	—	—	—
	in 2 000 H_2O		84.0072	—	-931.785	—	—	—	—
$NaHCO_3$	in 5 000 H_2O		84.0072	—	-931.869	—	—	—	—
	in 10 000 H_2O		84.0072	—	-931.902	—	—	—	—
	in 50 000 H_2O		84.0072	—	-931.927	—	—	—	—

Table 99:Na — SODIUM (Prepared 1980) — Continued — Table 99:Na

Substance Formula and Description		State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
$NaHCO_3$	in 500 000 H_2O		84.0072	—	-931.672	—	—	—	—
$NaOCH_3$		cr	54.0244	-357.36	-367.8	-294.74	14.117	110.58	69.45
		ai	54.0244	—	-433.59	-332.77	—	17.6	—
	in 100 H_2O		54.0244	—	-417.19	—	—	—	—
	in 60 CH_3OH		54.0244	—	-440.16	—	—	—	—
$NaHC_2O_4$	bioxalate	cr	112.0178	—	-1082.0	—	—	—	—
	in 400 H_2O		112.0178	—	-1059.8	—	—	—	—
$NaHC_2O_4 \cdot H_2O$		cr	130.0332	—	-1384.1	—	—	—	—
$NaCH_3CO_2$	acetate	cr	82.0350	—	-708.81	-607.18	—	123.0	79.9
		ai	82.0350	—	-726.13	-631.20	—	145.6	40.2
$NaCH_3CO_2$	in 3 H_2O		82.0350	—	-712.619	—	—	—	—
	in 3.5 H_2O		82.0350	—	-714.585	—	—	—	—
	in 4 H_2O		82.0350	—	-716.050	—	—	—	—
	in 4.5 H_2O		82.0350	—	-717.263	—	—	—	—
	in 5 H_2O		82.0350	—	-718.225	—	—	—	—
$NaCH_3CO_2$	in 5.5 H_2O		82.0350	—	-719.054	—	—	—	—
	in 6 H_2O		82.0350	—	-719.732	—	—	—	—
	in 7 H_2O		82.0350	—	-720.778	—	—	—	—
	in 8 H_2O		82.0350	—	-721.531	—	—	—	—
	in 9 H_2O		82.0350	—	-722.091	—	—	—	—
$NaCH_3CO_2$	in 10 H_2O		82.0350	—	-722.493	—	—	—	—
	in 12 H_2O		82.0350	—	-722.995	—	—	—	—
	in 15 H_2O		82.0350	—	-723.435	—	—	—	—
	in 20 H_2O		82.0350	—	-723.807	—	—	—	—
	in 25 H_2O		82.0350	—	-724.066	—	—	—	—
$NaCH_3CO_2$	in 30 H_2O		82.0350	—	-724.213	—	—	—	—
	in 40 H_2O		82.0350	—	-724.430	—	—	—	—
	in 50 H_2O		82.0350	—	-724.577	—	—	—	—
	in 75 H_2O		82.0350	—	-724.803	—	—	—	—
	in 100 H_2O		82.0350	—	-724.937	—	—	—	—
$NaCH_3CO_2$	in 150 H_2O		82.0350	—	-725.116	—	—	—	—
	in 200 H_2O		82.0350	—	-725.234	—	—	—	—
	in 300 H_2O		82.0350	—	-725.380	—	—	—	—
	in 400 H_2O		82.0350	—	-725.468	—	—	—	—
	in 500 H_2O		82.0350	—	-725.535	—	—	—	—
$NaCH_3CO_2$	in 600 H_2O		82.0350	—	-725.581	—	—	—	—
	in 800 H_2O		82.0350	—	-725.648	—	—	—	—
	in 1 000 H_2O		82.0350	—	-725.698	—	—	—	—
	in 1 500 H_2O		82.0350	—	-725.773	—	—	—	—
	in 2 000 H_2O		82.0350	—	-725.819	—	—	—	—
$NaCH_3CO_2$	in 3 000 H_2O		82.0350	—	-725.874	—	—	—	—
	in 4 000 H_2O		82.0350	—	-725.907	—	—	—	—
	in 5 000 H_2O		82.0350	—	-725.932	—	—	—	—
	in 10 000 H_2O		82.0350	—	-725.987	—	—	—	—
	in 20 000 H_2O		82.0350	—	-726.029	—	—	—	—
$NaCH_3CO_2$	in 50 000 H_2O		82.0350	—	-726.066	—	—	—	—
	in 100 000 H_2O		82.0350	—	-726.083	—	—	—	—
	in ∞ H_2O		82.0350	—	-726.13	—	—	—	—
	in 2 000 CH_3CO_2H		82.0350	—	-728.9	—	—	—	—
	in 1 100 C_2H_5OH		82.0350	—	-714.6	—	—	—	—

Table 99:**Na** — **SODIUM** (Prepared 1980) — Continued — Table 99:**Na**

Substance Formula and Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H_0^\circ$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H_0^\circ$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
$NaCH_3CO_2 \cdot 3H_2O$	cr	136.0812	—	-1603.3	-1328.6	—	243.	—
$CH_2OHCOONa$ glycolate	cr	98.0344	—	-900.8	—	—	—	—
	ai	98.0344	—	-892.4	—	—	—	—
in 10 H_2O		98.0344	—	-893.58	—	—	—	—
in 15 H_2O		98.0344	—	-893.12	—	—	—	—
$CH_2OHCOONa$ in 20 H_2O		98.0344	—	-892.78	—	—	—	—
in 25 H_2O		98.0344	—	-892.53	—	—	—	—
in 30 H_2O		98.0344	—	-892.32	—	—	—	—
in 40 H_2O		98.0344	—	-891.90	—	—	—	—
in 50 H_2O		98.0344	—	-891.61	—	—	—	—
$CH_2OHCOONa$ in 100 H_2O		98.0344	—	-891.15	—	—	—	—
in 200 H_2O		98.0344	—	-891.2	—	—	—	—
$CH_2OHCOONa \cdot 1/2H_2O$	cr	107.0421	—	-1048.9	—	—	—	—
$CH(OH)_2COONa$ dihydroxyacetate	cr	114.0338	—	-1082.0	—	—	—	—
in 200 H_2O		114.0338	—	-1062.3	—	—	—	—
$NaOC_2H_5$	cr	68.0516	—	-413.80	—	—	—	—
	ai	68.0516	—	-473.	—	—	—	—
in 50 H_2O		68.0516	—	-472.0	—	—	—	—
in 60 C_2H_5OH		68.0516	—	-465.7	—	—	—	—
$NaC_2H_5O_2$ sodium ethylene glycolate	cr	84.0510	—	-620.9	—	—	—	—
$NaC_2H_5O_2 \cdot CH_3OH$	cr	116.0936	—	-884.9	—	—	—	—
$CH_2OHCOONa \cdot CH_2OHCOOH$ hydroxyacetate	cr	174.0870	—	-1577.4	—	—	—	—
$NaC_2H_5O_2 \cdot C_2H_5OH$	cr	130.1208	—	-920.9	—	—	—	—
$NaC_2H_5O_2 \cdot (CH_2OH)_2$	cr	146.1202	—	-1107.5	—	—	—	—
$NaOC_2H_5 \cdot 2C_2H_5OH$	cr	160.1912	—	-1004.58	—	—	—	—
$NaOCH_2CO_2Na$ disodium hydroxyacetate	cr	120.0162	—	-1037.2	—	—	—	—
in 300 H_2O		120.0162	—	-1075.7	—	—	—	—
$NaOCH_2CO_2Na \cdot 2H_2O$	cr	156.0470	—	-1649.3	—	—	—	—
$NaHCO_3 \cdot Na_2CO_3 \cdot 2H_2O$ trona	cr	226.0270	—	-2684.9	-2383.37	—	301.2	—
$3NaHCO_3 \cdot Na_2CO_3$	cr	358.0106	—	-3982.7	—	—	—	—
CCl_3COONa trichloracetate	cr	185.3700	—	-748.5	—	—	—	—
in 400 H_2O		185.3700	—	-756.34	—	—	—	—
$CH_2ClCOONa$	ai	116.4800	—	-741.40	—	—	—	—
in 400 H_2O		116.4800	—	-741.15	—	—	—	—
$CHCl_2COONa$ in 400 H_2O		150.9250	—	-752.3	—	—	—	—
$NaI \cdot 3CH_3OH$	cr	246.0220	—	-1040.1	—	—	—	—
$NaC_2H_5SO_4$ in 600 H_2O ethylsulfate		148.1138	—	-1113.8	—	—	—	—
$(CHO)_2 \cdot 2NaHSO_3$ in 800 H_2O glyoxal sodium bisulfite		266.1572	—	-2142.6	—	—	—	—
$(CHO)_2 \cdot 2NaHSO_3 \cdot H_2O$	cr	284.1726	—	-2467.7	—	—	—	—
NaCN cr I, cubic	cr	49.0077	-94.39	-87.49	-76.43	18.744	115.60	70.37
NaCN cr II, orthorhombic	cr2	49.0077	—	-90.75	—	—	—	—
	g	49.0077	107.86	109.	79.94	12.736	249.43	51.17
	ai	49.0077	—	-89.5	-89.5	—	153.1	—
in 200 H_2O		49.0077	—	-87.9	—	—	—	—
$NaCN \cdot 1/2H_2O$	cr	58.0154	—	-235.77	—	—	—	—
$NaCN \cdot 2H_2O$	cr	85.0385	—	-679.77	—	—	—	—

Table 99:Na SODIUM (Prepared 1980) — Continued Table 99:Na

Substance Formula and Description		State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
NaCNO		cr	65.0071	—	-405.39	-358.1	—	96.7	86.6
		ai	65.0071	—	-386.2	-359.4	—	165.7	—
$NaHCN_2$	in 700 H_2O cyanamide		64.0224	—	-124.81	—	—	—	—
NH_2COONa	carbamate	cr	83.0225	—	-894.1	—	—	—	—
$NaCH_2NO_2$	sodium salt of nitromethane	aq	83.0225	—	-325.1	—	—	—	—
NH_2CH_2COONa	in 200 H_2O glycinate		97.0497	—	-710.0	—	—	—	—
$NaCNI_2$		ai	302.8165	—	—	-125.75	—	—	—
$Na(CN)_2I$		ai	201.9300	—	96.32	—	—	—	—
NaCNS		cr	81.0717	—	-170.50	—	—	—	—
		ai	81.0717	—	-163.68	-169.18	—	203.3	6.3
NaCNS	in 4 H_2O		81.0717	—	-168.465	—	—	—	—
	in 4.5 H_2O		81.0717	—	-168.594	—	—	—	—
	in 5 H_2O		81.0717	—	-168.686	—	—	—	—
	in 6 H_2O		81.0717	—	-168.670	—	—	—	—
	in 7 H_2O		81.0717	—	-168.485	—	—	—	—
NaCNS	in 8 H_2O		81.0717	—	-168.247	—	—	—	—
	in 9 H_2O		81.0717	—	-167.983	—	—	—	—
	in 10 H_2O		81.0717	—	-167.720	—	—	—	—
	in 12 H_2O		81.0717	—	-167.243	—	—	—	—
	in 15 H_2O		81.0717	—	-166.682	—	—	—	—
NaCNS	in 20 H_2O		81.0717	—	-166.038	—	—	—	—
	in 25 H_2O		81.0717	—	-165.603	—	—	—	—
	in 30 H_2O		81.0717	—	-165.285	—	—	—	—
	in 40 H_2O		81.0717	—	-164.837	—	—	—	—
	in 50 H_2O		81.0717	—	-164.548	—	—	—	—
NaCNS	in 75 H_2O		81.0717	—	-164.126	—	—	—	—
	in 100 H_2O		81.0717	—	-163.908	—	—	—	—
	in 150 H_2O		81.0717	—	-163.691	—	—	—	—
	in 200 H_2O		81.0717	—	-163.590	—	—	—	—
	in 300 H_2O		81.0717	—	-163.498	—	—	—	—
NaCNS	in 500 H_2O		81.0717	—	-163.448	—	—	—	—
	in 800 H_2O		81.0717	—	-163.427	—	—	—	—
	in 1 000 H_2O		81.0717	—	-163.435	—	—	—	—
	in 2 000 H_2O		81.0717	—	-163.465	—	—	—	—
	in 3 000 H_2O		81.0717	—	-163.486	—	—	—	—
NaCNS	in 4 000 H_2O		81.0717	—	-163.507	—	—	—	—
	in 5 000 H_2O		81.0717	—	-163.519	—	—	—	—
	in 10 000 H_2O		81.0717	—	-163.557	—	—	—	—
	in 20 000 H_2O		81.0717	—	-163.586	—	—	—	—
	in 50 000 H_2O		81.0717	—	-163.620	—	—	—	—
NaCNS	in 100 000 H_2O		81.0717	—	-163.632	—	—	—	—
	in ∞ H_2O		81.0717	—	-163.68	—	—	—	—
	in 9 C_2H_5OH		81.0717	—	-166.61	—	—	—	—
	in 10 C_2H_5OH		81.0717	—	-166.94	—	—	—	—
	in 12 C_2H_5OH		81.0717	—	-167.99	—	—	—	—
NaCNS	in 15 C_2H_5OH		81.0717	—	-169.66	—	—	—	—
	in 20 C_2H_5OH		81.0717	—	-171.75	—	—	—	—
	in 25 C_2H_5OH		81.0717	—	-172.59	—	—	—	—
	in 30 C_2H_5OH		81.0717	—	-173.09	—	—	—	—

Table 99:Na — **SODIUM** (Prepared 1980) — Continued — Table 99:Na

Substance Formula	Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
NaCNS	in 50 C_2H_5OH		81.0717	—	-174.18	—	—	—	—
	in 100 C_2H_5OH		81.0717	—	-174.85	—	—	—	—
	in 200 C_2H_5OH		81.0717	—	-175.18	—	—	—	—
	in NH_2CHO:s in formamide		81.0717	—	-185.98	—	—	—	—
	in CH_3NHCHO:s in N-methylformamide		81.0717	—	-190.50	—	—	—	—
NaCNS	in $(CH_3)_2NCHO$:s in N,N-dimethylformamide		81.0717	—	-206.61	—	—	—	—
$NaCNS{\cdot}2SO_2$		cr	209.1973	—	-851.0	—	—	—	—
NH_2CSSNa	dithiocarbamate; from $NH_2CS_2^-$	ai	115.1517	—	-208.8	—	—	—	—
$NHCS_2Na_2$	disodium dithioiminocarbonate; from $NHCS_2^{2-}$	ai	137.1335	—	-407.5	—	—	—	—
Na_2SiO_3		cr	122.0638	—	-1554.90	-1462.80	—	113.85	—
Na_2SiO_3		vit	122.0638	—	-1540.1	—	—	—	—
		aq	122.0638	—	-1586.2	—	—	—	—
$Na_2SiO_3{\cdot}5H_2O$		cr	212.1408	—	-3048.5	—	—	—	—
$Na_2SiO_3{\cdot}9H_2O$		cr	284.2024	—	-4228.8	—	—	—	—
$Na_2Si_2O_5$	stable up to 951K; formerly β	cr	182.1486	—	-2467.7	-2322.0	—	164.05	—
$Na_2Si_2O_5$	stable 951K to m.pt.(1147K); formerly α	cr2	182.1486	—	-2465.30	—	—	—	—
	unstable	cr3	182.1486	—	-2457.18	—	—	—	—
		vit	182.1486	—	-2445.80	—	—	—	—
Na_4SiO_4		cr	184.0428	—	—	—	—	195.64	—
$Na_6Si_2O_7$		cr	306.1066	—	-3632.	—	—	—	—
$NaHSi(OH)_6$		ai	154.1282	—	-1996.6	—	—	—	—
Na_2SiF_6		cr	188.0560	-2919.93	-2909.6	-2754.2	32.22	207.1	187.07
	in 630 H_2O		188.0560	—	-2866.5	—	—	—	—
$NaHSiF_6$	in 400 H_2O		166.0742	—	-2627.6	—	—	—	—
NaSn		cr	141.6798	—	-48.1	—	—	—	—
Na_4Sn		cr	210.6492	—	-86.6	—	—	—	—
Na_2SnO_3		cr	212.6678	—	-1155.	—	—	—	—
$NaSnCl_3$		ai	248.0388	—	-727.2	-692.0	—	318.	—
Na_2SnCl_6	from $SnCl_6^{2-}$	aq	377.3876	—	-1450.6	—	—	—	—
$NaSnBr_3$		ai	381.4068	—	-615.0	-608.8	—	310.	—
NaPb		cr	230.1798	—	-48.5	—	—	—	—
Na_5Pb_2		cr	529.3290	—	-146.4	—	—	—	—
Na_2PbO_3		cr	301.1678	—	-862.	—	—	—	—
$NaHPbO_2$	from $HPbO_2^-$	ai	263.1866	—	—	-600.31	—	—	—
$NaPb(OH)_3$		ai	281.2020	—	—	-837.5	—	—	—
$NaPbCl_3$		ai	336.5388	—	—	-688.2	—	—	—
$NaPbBr_3$		ai	469.9068	—	—	-605.0	—	—	—
$NaPbI_3$		ai	610.8930	—	—	-460.7	—	—	—
$(NaI)_2PbI_2{\cdot}4H_2O$		cr	832.8488	—	-2011.83	—	—	—	—
$(NaI)_2PbI_2{\cdot}6H_2O$		cr	868.8796	—	-2595.75	—	—	—	—
$PbS_2O_3{\cdot}2Na_2S_2O_3$		cr	635.5278	—	-2942.19	—	—	—	—
		aq	635.5278	—	-2930.89	—	—	—	—
$Na_6Pb(P_2O_7)_2$	from $Pb(P_2O_7)_2^{6-}$	aq	693.0156	—	-5986.9	—	—	—	—

Table 99:**Na** **SODIUM** (Prepared 1980) — Continued Table 99:**Na**

Substance Formula and Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
$NaBO_2$	cr	65.7996	-972.28	-977.0	-920.70	11.632	73.51	65.94
	g	65.7996	-641.8	-644.	-653.	13.68	287.1	58.2
	ai	65.7996	—	-1012.49	-940.78	—	21.76	—
in 220 H_2O		65.7996	—	-1012.5	—	—	—	—
$NaBO_2 \cdot 2H_2O$	cr	101.8304	—	-1582.	-1409.9	—	155.	—
$NaBO_2 \cdot 4H_2O$	cr	137.8612	—	-2176.	-1888.0	—	230.	—
$NaBO_3$	aq	81.7990	—	-922.2	—	—	—	—
$NaBO_3 \cdot 4H_2O$	cr	153.8606	—	-2114.2	—	—	—	—
NaB_3O_5	cr	135.4198	—	-2301.6	—	—	—	—
$NaB_5O_8 \cdot 5H_2O$	cr	295.1170	—	—	—	—	380.12	—
$Na_2B_4O_7$	cr	201.2194	-3273.39	-3291.1	-3096.0	30.384	189.54	186.77
	am	201.2194	—	-3271.1	-3076.8	—	192.9	—
	ai	201.2194	—	—	-3128.7	—	—	—
$Na_2B_4O_7 \cdot 4H_2O$	cr	273.2810	—	-4507.4	—	—	—	—
$Na_2B_4O_7 \cdot 5H_2O$	cr	291.2964	—	-4802.4	—	—	—	—
$Na_2B_4O_7 \cdot 10H_2O$ borax	cr	381.3734	—	-6288.6	-5516.0	—	586.	615.
$Na_2O \cdot 3B_2O_3$	cr	270.8396	—	-4603.2	—	—	—	—
	am	270.8396	—	-4569.8	—	—	—	—
$Na_2O \cdot 4B_2O_3$	cr	340.4598	—	-5912.0	—	—	—	—
	am	340.4598	—	-5853.	—	—	—	—
$NaBH_4$	cr	37.8328	-180.330	-188.61	-123.86	16.276	101.29	86.78
	ai	37.8328	—	-191.96	-147.55	—	169.5	—
in 350 H_2O		37.8328	—	-191.581	—	—	—	—
$NaBH_4 \cdot 2H_2O$	cr	73.8636	—	-784.9	-604.76	—	180.	—
$NaB(OH)_4$	ai	101.8304	—	-1584.15	-1415.07	—	161.5	—
$NaH_2BO_3 \cdot H_2O_2$	ai	117.8298	—	—	-1319.5	—	—	—
$NaHB_4O_7$ from $HB_4O_7^-$	ai	179.2376	—	—	-2947.1	—	—	—
$NaBF_4$	cr	109.7944	-1841.13	-1844.7	-1750.10	21.719	145.31	120.25
	ai	109.7944	—	-1815.0	-1748.8	—	243.	—
$NaBF_2(OH)_2$	ai	105.8124	—	—	-1602.8	—	—	—
$NaOH \cdot BF_3$	cr	107.8034	—	-1651.4	—	—	—	—
$NaBF_3OH$	ai	107.8034	—	-1767.3	-1676.4	—	226.	—
$NaBH_4 \cdot 3NH_3$	cr	88.9249	—	-435.	-170.0	—	305.	—
$NaBH_4 \cdot 4.5NH_3$	cr	114.4709	—	-552.	-184.2	—	397.	—
$NaB(OCH_3)_4$	cr	157.9392	—	-1403.7	-1109.3	—	287.0	—
$NaAlO_2$	cr	81.9701	—	-1135.12	-1071.32	—	70.71	73.30
	ai	81.9701	—	-1171.1	-1092.8	—	22.2	—
$NaAlH_4$	cr	54.0033	—	-115.5	—	—	—	—
$NaAl(OH)_4$	ai	118.0009	—	-1742.6	-1567.2	—	161.9	—
$NaAlF_4$	g	125.9649	-1861.9	-1869.0	-1827.5	21.573	345.7	105.9
Na_3AlF_6	cr	209.9413	—	-3301.2	-3136.6	—	238.5	215.89
	aq	209.9413	—	-3341.8	—	—	—	—
$Na_3AlF_6 \cdot 3.5H_2O$	cr	272.9952	—	-4395.3	—	—	—	—
$AlCl_3 \cdot NaCl$	cr	191.7833	—	-1140.60	—	—	—	—
$AlBr_3 \cdot NaBr$	cr	369.6073	—	-912.1	—	—	—	—
$(AlBr_3)_2 \cdot NaBr$	cr	636.3158	—	-1410.4	—	—	—	—
$AlCl_3 \cdot NaBr$	cr	236.2393	—	-1079.5	—	—	—	—
$AlBr_3 \cdot NaCl$	cr	325.1513	—	-961.1	—	—	—	—
$(AlBr_3)_2 \cdot NaCl$	cr	591.8598	—	-1469.0	—	—	—	—

Substance Formula and Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H_0^\circ$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H_0^\circ$	S° J mol⁻¹ K⁻¹	C_p
$NaAl(SO_4)_2$ from SO_4^{2-}, Al^{3+}	ai	242.0945	—	-2590.	-2238.	—	-222.6	—
$NaAl(SO_4)_2 \cdot 2H_2O$	cr	278.1253	—	-3025.45	—	—	—	—
$NaAl(SO_4)_2 \cdot 5H_2O$	cr	332.1715	—	-3934.84	—	—	—	—
$NaAl(SO_4)_2 \cdot 6H_2O$	cr	350.1869	—	-4233.45	—	—	—	—
$NaAl(SO_4)_2 \cdot 12H_2O$ alum.	cr	458.2793	—	-6002.74	—	—	—	—
$NaAlSiO_4$ nepheline, nephelite	cr	142.0549	—	-2092.8	-1978.1	—	124.3	—
$NaAlSi_2O_6$ jadeite	cr	202.1397	—	-3030.9	-2852.1	—	133.5	—
dehydrated analcite	cr2	202.1397	—	-2985.3	-2819.1	—	175.3	164.43
$NaAlSi_2O_6 \cdot H_2O$ analcite	cr	220.1551	—	-3300.8	-3082.6	—	234.3	209.91
$NaAlSi_3O_8$ low albite	cr	262.2245	-3913.13	-3935.1	-3711.5	33.451	207.40	205.10
$NaAlSi_3O_8$ analbite	cr2	262.2245	-3903.88	-3925.8	-3708.1	33.422	226.40	204.81
	am	262.2245	-3854.09	-3875.2	-3665.1	34.254	251.9	209.91
Na_3GaO_3	ai	186.6876	—	—	-1406.	—	—	—
NaH_2GaO_3 from $H_2GaO_3^-$	ai	142.7240	—	—	-1008.	—	—	—
Na_2HGaO_3 from $HGaO_3^{2-}$	ai	164.7058	—	—	-1209.	—	—	—
$NaGaBr_4$	ai	412.3458	—	-902.1	-812.1	—	95.0	—
NaTl	cr	227.3598	—	-32.68	-29.29	—	104.2	—
$NaTl(CN)_4$ from $Tl(CN)_4^{3-}$	ai	331.4314	—	—	439.	—	—	—
Na_2ZnO_2	cr	143.3484	—	-791.	—	—	—	—
	ai	143.3484	—	—	-908.06	—	—	—
$NaHZnO_2$ from $HZnO_2^-$	ai	121.3666	—	—	-718.97	—	—	—
$NaZn(OH)_3$	ai	139.3820	—	—	-956.11	—	—	—
$Na_2Zn(OH)_4$	ai	179.3792	—	—	-1382.35	—	—	—
$NaZnCl_3$	ai	194.7188	—	—	-802.4	—	—	—
Na_2ZnCl_4	ai	253.1616	—	—	-1191.5	—	—	—
$NaZnBr_3$	ai	328.0868	—	—	-710.9	—	—	—
$NaZnI_3$	ai	469.0730	—	—	-553.5	—	—	—
Na_2ZnI_4	ai	618.9672	—	—	-864.0	—	—	—
$Na_2Zn(SO_4)_2$	cr	303.4728	—	-2418.	—	—	—	—
$Na_2Zn(SO_4)_2 \cdot 2H_2O$	cr	339.5036	—	-3014.2	—	—	—	—
$Na_2Zn(SO_4)_2 \cdot 4H_2O$	cr	375.5344	—	-3592.0	—	—	—	—
$Na_2Zn(CN)_4$	ai	215.4212	—	-138.1	-76.9	—	343.	—
$Na_2Zn(CNS)_4$	ai	343.6772	—	—	-307.5	—	—	—
Na_2CdO_2	ai	190.3784	—	—	-808.3	—	—	—
$NaHCdO_2$ from $HCdO_2^-$	ai	168.3966	—	—	-625.5	—	—	—
$NaCd(OH)_3$	ai	186.4120	—	—	-863.9	—	—	—
$Na_2Cd(OH)_4$	ai	226.4092	—	—	-1282.3	—	—	—
$NaCdCl_3$	ai	241.7488	—	-801.2	-748.9	—	261.9	—
$NaCdBr_3$	ai	375.1168	—	—	-669.4	—	—	—
$NaCdI_3$	ai	516.1030	—	—	-521.3	—	—	—
Na_2CdI_4	ai	665.9972	—	-822.2	-839.7	—	444.	—
$Na_2Cd(N_3)_4$	ai	326.4600	—	—	771.3	—	—	—
$Na_2CdP_2O_7$	ai	332.3230	—	—	-2570.1	—	—	—
$NaCd(CN)_3$	ai	213.4435	—	—	92.9	—	—	—
$Na_2Cd(CN)_4$	ai	262.4512	—	-52.3	-16.3	—	439.	—
$NaCd(CNS)_3$	ai	309.6355	—	—	-72.3	—	—	—
NaHg	cr	223.5798	—	-47.3	-40.84	—	105.	—
$NaHg_2$	cr	424.1698	—	-76.1	-67.8	—	176.	—
$NaHg_4$	cr	825.3498	—	-88.7	-74.1	—	305.	—
Na_3Hg	cr	269.5594	—	-46.0	-45.35	—	226.	—

Table 99:Na — SODIUM (Prepared 1980) — Continued — Table 99:Na

Substance Formula and Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H_0^\circ$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H_0^\circ$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
Na_3Hg_2	cr	470.1494	—	-91.6	-86.6	—	289.	—
Na_5Hg_2	cr	516.1290	—	—	-90.8	—	—	—
Na_7Hg_8	cr	1765.6486	—	-353.1	-318.0	—	849.	—
$NaHgCl_3$	ai	329.9388	—	-628.9	-571.1	—	268.	—
Na_2HgCl_4	ai	388.3816	—	-1034.3	-970.6	—	410.	—
$NaHgBr_3$	ai	463.3068	—	-533.5	-521.3	—	318.	—
Na_2HgBr_4	ai	566.2056	—	-911.3	-895.0	—	427.	—
Na_4HgBr_6	ai	772.0032	—	-1622.6	—	—	—	—
Na_8HgBr_{10}	ai	1183.5984	—	-3073.1	—	—	—	—
$NaHgI_3$	ai	604.2930	—	-392.9	-410.5	—	360.	—
Na_2HgI_4	ai	754.1872	—	-715.5	-735.5	—	477.	—
Na_8HgS_5	ai	544.8284	—	-1857.3	—	—	—	—
$NaHg(CN)_3$	ai	301.6335	—	156.9	201.3	—	284.1	—
$Na_2Hg(CN)_4$	ai	350.6412	—	46.0	94.6	—	423.0	—
$NaHg(CN)_2Cl$ in 550 H_2O		311.0686	—	-131.0	—	—	—	—
$NaHg(CN)_2Cl\cdot1.25H_2O$	cr	333.5878	—	-520.5	—	—	—	—
$Na_2Hg(CN)_2Cl_2$ in 550 H_2O		369.5114	—	-536.8	—	—	—	—
$NaHg(CN)_2Br$ in 550 H_2O		355.5246	—	-87.9	—	—	—	—
$NaHg(CN)_2Br\cdot2H_2O$	cr	391.5554	—	-708.4	—	—	—	—
$Na_2Hg(CN)_2Br_2$ in 550 H_2O		458.4234	—	-453.1	—	—	—	—
$NaHg(CN)_2I$ in 550 H_2O		402.5200	—	-28.24	—	—	—	—
$NaHg(CN)_2I\cdot2H_2O$	cr	438.5508	—	-646.4	—	—	—	—
$Na_2Hg(CN)_2I_2$ in 550 H_2O		552.4142	—	-328.4	—	—	—	—
$NaHg(CNS)_3$	ai	397.8255	—	—	66.6	—	—	—
$Na_2Hg(CNS)_4$	ai	478.8972	—	-154.0	-112.5	—	573.	—
NaCu	g	86.5298	273.6	272.	225.9	9.83	238.2	36.23
Na_2CuO_2	ai	141.5184	—	—	-707.5	—	—	—
Na_2CuO_3	cr	157.5178	—	-708.4	—	—	—	—
$NaHCuO_2$	ai	119.5366	—	—	-520.4	—	—	—
$NaCuCl_2$	ai	157.4358	—	—	-502.0	—	—	—
$Na_2Cu(CO_3)_2$	cr	229.5384	—	-1712.5	—	—	—	—
$Na_2Cu(CO_3)_2\cdot3H_2O$	cr	283.5846	—	-2608.89	—	—	—	—
$NaCu(CN)_2$	ai	138.5656	—	—	-4.2	—	—	—
$Na_2Cu(CN)_3$	ai	187.5733	—	—	-120.0	—	—	—
$Na_3Cu(CN)_4$	ai	236.5810	—	—	-219.2	—	—	—
$Na_3Cu(CNS)_4$	ai	364.8370	—	-392.0	-421.7	—	820.	—
NaAg	g	130.8598	255.6	253.6	208.3	9.92	245.7	36.44
$Na_2Ag_2O_3$	cr	309.7178	—	-623.	—	—	—	—
$NaAgCl_2$	ai	201.7658	—	-485.3	-477.4	—	290.4	—
$NaAgBr_2$	ai	290.6778	—	—	-434.3	—	—	—
Na_2AgBr_3	ai	393.5766	—	—	-808.3	—	—	—
$NaAgI_2$	ai	384.6686	—	—	-348.9	—	—	—
Na_2AgI_3	ai	534.5628	—	-662.3	-677.8	—	371.1	—
Na_3AgI_4	ai	684.4570	—	—	-995.4	—	—	—
$NaAg(CN)_2$	ai	182.8956	—	30.12	43.5	—	251.	—
$Na_2Ag(CN)_3$	ai	231.9033	—	-63.30	—	—	—	—
$NaAg(SCN)_2$	ai	247.0236	—	—	-46.8	—	—	—
$Na_2Ag(SCN)_3$	ai	328.0953	—	—	-223.0	—	—	—
$Na_3Ag(SCN)_4$	ai	409.1670	—	—	-393.6	—	—	—
NaAu	g	219.9568	261.5	258.6	212.9	9.67	251.1	35.82

Substance Formula and Description	State	Molar mass g mol^{-1}	0 K $\Delta_f H_0^\circ$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H_0^\circ$	S° J mol^{-1} K^{-1}	C_p
$NaAuCl_4$	ai	361.7688	—	−562.3	−497.04	—	325.9	—
$NaAuBr_4$	ai	539.5928	—	−431.8	−429.3	—	—	—
$NaAu(CN)_2$	ai	271.9926	—	2.1	23.9	—	230.	—
$NaAu(SCN)_2$	ai	336.1206	—	—	−10.0	—	—	—
$NaAu(SCN)_4$	ai	452.2844	—	—	299.6	—	—	—
$Na_2Ni(CN)_4$	ai	208.7612	—	−112.5	−51.8	—	335.	—
Na_2CoO_3	cr	152.9110	—	−858.	—	—	—	—
$Na_3(Co(NO_2)_6)$	cr	403.9356	—	−1423.0	—	—	—	—
in 14 000 H_2O		403.9356	—	−1350.2	—	—	—	—
$Na_3Co(CN)_6$	ai	284.0100	—	—	—	—	409.6	—
$Na(Co(NH_3)_2(NO_2)_2C_2O_4)$	cr	296.0154	—	−1504.6	—	—	—	—
$NaFeO_2$	cr	110.8356	—	−698.18	−639.95	—	88.3	—
$NaFeF_3$	cr	135.8320	—	−1287.4	—	—	—	—
$NaFeCl_4$	cr	220.6488	—	−814.2	—	—	—	—
	g	220.6488	—	−646.8	—	—	—	—
$NaFe(SO_4)_2$	ai	270.9600	—	—	−1786.4	—	—	—
$Na_3Fe(CN)_6$ from $Fe(CN)_6^{3-}$	ai	280.9238	—	−158.6	−56.4	—	447.3	—
in 500 H_2O		280.9238	—	−156.02	—	—	—	—
in 800 H_2O		280.9238	—	−155.85	—	—	—	—
in 1 000 H_2O		280.9238	—	−156.06	—	—	—	—
$Na_3Fe(CN)_6$ in 2 000 H_2O		280.9238	—	−156.19	—	—	—	—
in 3 000 H_2O		280.9238	—	−156.40	—	—	—	—
in 5 000 H_2O		280.9238	—	−156.69	—	—	—	—
in 10 000 H_2O		280.9238	—	−157.07	—	—	—	—
in 20 000 H_2O		280.9238	—	−157.36	—	—	—	—
$Na_3Fe(CN)_6$ in 50 000 H_2O		280.9238	—	−157.69	—	—	—	—
in 100 000 H_2O		280.9238	—	−157.90	—	—	—	—
$Na_4Fe(CN)_6$	ai	303.9136	—	−505.0	−352.53	—	331.0	—
$Na_3FeCO(CN)_5$	cr	282.9165	—	−501.7	—	—	—	—
	aq	282.9165	—	−525.9	—	—	—	—
$Na_3FeCO(CN)_5 \cdot 7H_2O$	cr	409.0243	—	−2557.3	—	—	—	—
$NaH_3Fe(CN)_6$ from $H_3Fe(CN)_6^-$	ai	237.9682	—	215.5	—	—	—	—
$Na_2H_2Fe(CN)_6$ from $H_2Fe(CN)_6^{2-}$	ai	259.9500	—	−24.7	134.77	—	335.	—
$Na_3HFe(CN)_6$ from $HFe(CN)_6^{3-}$	ai	281.9318	—	−264.8	−114.44	—	351.	—
$NaH_2FeCO(CN)_5$ from $H_2FeCO(CN)_5^-$	ai	238.9529	—	−46.4	—	—	—	—
$Na_2HFeCO(CN)_5$ from $HFeCO(CN)_5^{2-}$	ai	260.9347	—	−287.9	—	—	—	—
$NaPdCl_3$	ai	235.7488	—	—	−538.0	—	—	—
Na_2PdCl_4	ai	294.1916	—	−1030.5	−940.5	—	285.	—
Na_2PdCl_6	ai	365.0976	—	—	−953.9	—	—	—
$NaPdBr_3$	ai	369.1168	—	—	−466.1	—	—	—
Na_2PdBr_4	ai	472.0156	—	−865.3	−841.8	—	364.	—
Na_2PdBr_6	ai	631.8336	—	—	−859.0	—	—	—
Na_2PdI_4	ai	659.9972	—	—	−682.8	—	—	—
Na_2PdI_6	ai	913.8060	—	—	−694.1	—	—	—
$Na_2Pd(NO_2)_4$	ai	336.4016	—	—	−611.9	—	—	—
$Na_2Pd(CN)_4$	ai	256.4512	—	—	104.7	—	—	—
$Na_2Pd(CNS)_4$	ai	384.7072	—	—	−113.3	—	—	—
Na_3RhCl_6	cr	384.5924	—	−1534.3	—	—	—	—

Substance Formula and Description	State	Molar mass g mol^{-1}	0 K $\Delta_f H^\circ_0$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H^\circ_0$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
Na_3RhCl_6	ai	384.5924	—	-1569.0	—	—	—	—
$Na_3RhCl_6 \cdot 12H_2O$	cr	600.7772	—	-5085.2	—	—	—	—
$NaRuO_4$	ai	188.0574	—	—	-507.5	—	—	—
Na_2RuO_4	ai	211.0472	—	—	-827.5	—	—	—
in $NaOH + 55H_2O$:u		211.0472	—	-951.9	—	—	—	—
$NaPtCl_3$	ai	324.4388	—	—	-483.6	—	—	—
Na_2PtCl_4	ai	382.8816	—	-979.5	-885.3	—	272.	—
Na_2PtCl_6	cr	453.7876	—	-1115.9	—	—	—	—
in 400 H_2O		453.7876	—	-1153.5	—	—	—	—
in 4 500 H_2O		453.7876	—	-1148.1	—	—	—	—
$Na_2PtCl_6 \cdot 2H_2O$	cr	489.8184	—	-1723.8	—	—	—	—
$Na_2PtCl_6 \cdot 6H_2O$	cr	561.8800	—	-2912.1	—	—	—	—
Na_2PtBr_4	aq	560.7056	—	-848.5	—	—	—	—
Na_2PtBr_6	cr	720.5236	—	-907.1	—	—	—	—
in 1 500 H_2O		720.5236	—	-950.2	—	—	—	—
$Na_2PtBr_6 \cdot 6H_2O$	cr	828.6160	—	-2700.4	—	—	—	—
Na_2PtI_6 in 800 H_2O		1002.4960	—	-693.7	—	—	—	—
$Na_2Pt(CN)_4$	ai	345.1412	—	—	182.9	—	—	—
Na_2IrCl_6	cr	450.8976	—	-975.7	—	—	—	—
	aq	450.8976	—	-1050.	—	—	—	—
Na_3IrCl_6	cr	473.8874	—	-1331.3	—	—	—	—
	aq	473.8874	—	-1443.	—	—	—	—
Na_2OsCl_6	cr	448.8976	—	-1121.	—	—	—	—
$NaMnO_4$	ai	141.9254	—	-781.6	-709.1	—	250.2	—
$NaMnO_4 \cdot H_2O$	cr	159.9408	—	-1079.14	—	—	—	—
$NaMnO_4 \cdot 3H_2O$	cr	195.9716	—	-1672.85	—	—	—	—
Na_2MnO_4	cr	164.9152	—	-1156.0	—	—	—	—
	ai	164.9152	—	-1134.	-1024.6	—	176.	—
$NaMnCl_3$	cr	184.2868	—	-895.42	—	—	—	—
in 1 200 H_2O		184.2868	—	-959.14	—	—	—	—
$Na_2Mn(SO_4)_2$	cr	293.0408	—	-2490.7	—	—	—	—
$Na_2Mn(SO_4)_2 \cdot 2H_2O$	cr	329.0716	—	-3080.3	—	—	—	—
$Na_4Mn(CN)_6$	ai	303.0046	—	-406.	—	—	—	—
$NaReO_4$	cr	273.1874	—	-1057.09	-953.68	—	151.5	133.9
	g	273.1874	—	-820.	—	—	—	—
$NaReO_4$	ai	273.1874	—	-1027.6	-956.4	—	260.2	33.1
in 5 000 H_2O		273.1874	—	-1027.415	—	—	—	—
in 20 000 H_2O		273.1874	—	-1027.498	—	—	—	—
$(NaReO_4)_2$	g	546.3748	—	-1816.	—	—	—	—
Na_2ReCl_6	ai	444.8976	—	-1242.6	-1113.3	—	372.	—
$NaCrO_2$	cr	106.9846	—	-878.2	—	—	—	—
Na_2CrO_4	cr	161.9732	-1334.36	-1342.2	-1234.93	26.455	176.61	142.13
	ai	161.9732	—	-1361.39	-1251.58	—	168.2	—
in 800 H_2O		161.9732	—	-1357.7	—	—	—	—
in 0.11 $NaOH$ + 6 000 H_2O:u		161.9732	—	-1360.6	—	—	—	—
$Na_2CrO_4 \cdot 4H_2O$	cr	234.0348	—	-2528.8	—	—	—	—
$Na_2CrO_4 \cdot 10H_2O$	cr	342.1272	—	-4281.1	—	—	—	—
$Na_2Cr_2O_7$	cr	261.9674	—	-1978.6	—	—	—	—
	ai	261.9674	—	-1970.7	-1824.9	—	379.9	—
in 200 H_2O		261.9674	—	-1968.6	—	—	—	—

Substance Formula	Description	State	Molar mass g mol⁻¹	0 K: $\Delta_f H_0^\circ$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar): $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H_0^\circ$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
$Na_2Cr_2O_7$	in 300 H_2O		261.9674	—	-1967.7	—	—	—	—
	in 400 H_2O		261.9674	—	-1966.9	—	—	—	—
	in 500 H_2O		261.9674	—	-1966.5	—	—	—	—
	in 600 H_2O		261.9674	—	-1966.1	—	—	—	—
	in 800 H_2O		261.9674	—	-1965.6	—	—	—	—
$Na_2Cr_2O_7$	in 1 000 H_2O		261.9674	—	-1965.2	—	—	—	—
	in 1 200 H_2O		261.9674	—	-1964.8	—	—	—	—
$Na_2Cr_2O_7 \cdot 2H_2O$		cr	297.9982	—	-2574.8	—	—	—	—
$NaHCrO_4$	from $HCrO_4^-$	ai	139.9914	—	-1118.4	-1026.7	—	243.1	—
$Na_2CrO_4 \cdot 4NaOH$		cr	321.9620	—	-3056.8	—	—	—	—
Na_3CrCl_6		cr	333.6834	—	-1814.2	—	—	—	—
Na_2MoO_4		cr	205.9172	-1458.67	-1468.12	-1354.34	25.397	159.70	141.71
		g	205.9172	—	-1059.	—	—	—	—
		ai	205.9172	—	-1478.2	-1360.2	—	145.2	—
	in dilute NaOH	aq	205.9172	—	-1477.4	—	—	—	—
$Na_2MoO_4 \cdot 2H_2O$		cr	241.9480	—	-2058.9	-1830.17	—	240.6	—
Na_2MoO_5	in 1 100 H_2O		221.9166	—	-1370.3	—	—	—	—
$Na_2MoO_6 \cdot H_2O$		cr	255.9314	—	-1658.5	—	—	—	—
$Na_2MoO_8 \cdot 2H_2O$		cr	305.9456	—	-1766.5	—	—	—	—
$Na_2MoO_8 \cdot 4H_2O$		cr	341.9764	—	-2348.1	—	—	—	—
$Na_2Mo_2O_7$		cr	349.8554	-2231.75	-2245.05	-2058.08	39.12	250.6	217.15
$NaHMoO_5$	in 1 100 H_2O		199.9348	—	-1168.2	—	—	—	—
$NaMoF_7$		cr	251.9186	—	-2180.3	-2006.1	—	205.	—
Na_2MoF_8		cr	293.9068	—	-2766.5	-2556.7	—	238.	—
Na_2MoCl_6		cr	354.6376	—	-1367.7	—	—	—	—
Na_2WO_4		cr	293.8272	-1539.00	-1548.9	-1434.46	25.31	161.5	139.79
		ai	293.8272	—	-1556.0	—	—	—	—
	in dilute NaOH	aq	293.8272	—	-1554.8	—	—	—	—
$Na_2WO_4 \cdot 2H_2O$		cr	329.8580	—	-2140.1	—	—	—	—
$Na_2WO_6 \cdot H_2O$		cr	343.8414	—	-1752.3	—	—	—	—
$Na_2WO_8 \cdot 2H_2O$		cr	393.8556	—	-1833.4	—	—	—	—
$Na_2W_2O_7$		cr	525.6754	-2390.90	-2405.0	-2216.74	39.16	254.4	214.89
$Na_2W_4O_{13}$		cr	989.3718	—	-4157.6	—	—	—	—
$Na_6W_{12}O_{39}$		ai	2968.1153	—	-12355.	—	—	—	—
$Na_5HW_6O_{21}$		aq	1555.0444	—	-7040.0	—	—	—	—
$NaWF_6$		cr	320.8302	—	-2213.	—	—	—	—
$NaWF_7$		cr	339.8286	—	-2360.	-2205.	—	272.	—
Na_2WF_8		cr	381.8168	—	-2958.	-2765.	—	297.	—
$Na_3PW_3O_{13}$		ai	859.4854	—	-4559.3	—	—	—	—
	in 25 000 H_2O		859.4854	—	-4559.3	—	—	—	—
$Na_3PW_3O_{13} \cdot 4H_2O$		cr	931.5470	—	-5656.8	—	—	—	—
$Na_3PW_3O_{13} \cdot 5.5H_2O$		cr	958.5701	—	-6106.5	—	—	—	—
$Na_3PW_3O_{13} \cdot 6.5H_2O$		cr	976.5855	—	-6405.7	—	—	—	—
$Na_3PW_3O_{13} \cdot 8.5H_2O$		cr	1012.6163	—	-6999.8	—	—	—	—
$NaVO_3$		cr	121.9300	-1139.35	-1145.79	-1064.07	17.644	113.68	97.57
$NaVO_3$		ai	121.9300	—	-1128.4	-1045.5	—	109.	—
Na_3VO_4		cr	183.9090	-1746.23	-1757.87	-1637.76	29.677	190.0	164.85
		ai	183.9090	—	—	-1684.8	—	—	—
$Na_3VO_4 \cdot 1/2H_2O$	ortho	cr	192.9167	—	-1909.6	—	—	—	—
	'pseudosalt'	cr2	192.9167	—	-1910.4	—	—	—	—

Table 99:Na — SODIUM (Prepared 1980) — Continued — Table 99:Na

Substance Formula and Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
$Na_3VO_4{\cdot}2H_2O$ ortho	cr	219.9398	—	-2360.2	—	—	—	—
$Na_3VO_4{\cdot}7/2H_2O$ 'pseudosalt'	cr	246.9629	—	-2815.0	—	—	—	—
$Na_3VO_4{\cdot}7H_2O$ ortho	cr	310.0168	—	-3857.2	—	—	—	—
$Na_3VO_4{\cdot}8H_2O$ 'pseudosalt'	cr	328.0322	—	-4154.7	—	—	—	—
$Na_3VO_4{\cdot}10H_2O$ ortho	cr	364.0630	—	-4738.0	—	—	—	—
$Na_3VO_4{\cdot}10H_2O$ 'pseudosalt'	cr2	364.0630	—	-4742.6	—	—	—	—
$Na_3VO_4{\cdot}12H_2O$ ortho	cr	400.0938	—	-5324.1	—	—	—	—
'pseudosalt'	cr2	400.0938	—	-5329.6	—	—	—	—
$Na_4V_2O_7$	cr	305.8390	-2902.57	-2918.84	-2721.41	49.16	318.4	269.74
$Na_4V_2O_7{\cdot}2H_2O$	cr	341.8698	—	-3512.9	—	—	—	—
$Na_4V_2O_7{\cdot}10H_2O$	cr	485.9930	—	-5881.4	—	—	—	—
$Na_4V_2O_7{\cdot}12H_2O$	cr	522.0238	—	-6472.2	—	—	—	—
$Na_4V_2O_7{\cdot}18H_2O$	cr	630.1162	—	-8246.2	—	—	—	—
NaH_2VO_4 from $H_2VO_4^-$	ai	139.9454	—	-1414.2	-1282.7	—	180.	—
$NaH_3V_2O_7$ from $H_3V_2O_7^-$	ai	239.8936	—	—	-2125.7	—	—	—
$Na_3HV_2O_7$ from $HV_2O_7^{3-}$	ai	283.8572	—	—	-2578.1	—	—	—
$Na_4H_2V_{10}O_{28}$ from $H_2V_{10}O_{28}^{4-}$	ai	1051.3784	—	—	-8769.	—	—	—
$Na_5HV_{10}O_{28}$ from $HV_{10}O_{28}^{5-}$	ai	1073.3602	—	-9895.	-9012.	—	519.	—
$NaVF_4$	g	149.9254	—	-1469.	—	—	—	—
NaV_2F_7	g	257.8626	—	-2615.	—	—	—	—
$Na_2V_3F_{11}$	cr	407.7880	—	-4707.	—	—	—	—
Na_3VF_6	cr	233.9018	—	-2946.	—	—	—	—
$Na_5V_3F_{14}$	cr	533.7526	—	-6473.	—	—	—	—
Na_3VCl_6	cr	332.6294	—	-1833.4	—	—	—	—
$NaNbO_3$	cr	163.8940	—	-1315.9	-1233.0	—	117.	—
$NaNbO_3$	ai	163.8940	—	-1265.7	-1194.1	—	155.	—
$NaNbO_3{\cdot}3.5H_2O$	cr	226.9479	—	—	-2036.1	—	—	—
$(3Na_2O{\cdot}Nb_2O_5)$	cr	451.7460	—	-3573.	—	—	—	—
Na_2NbF_7	cr	271.8744	—	-3029.6	—	—	—	—
$NaNbCl_6$	cr	328.6138	—	-1216.3	—	—	—	—
$NaNbOCl_4$	cr	273.7072	—	-1285.7	—	—	—	—
$NaTaF_6$	ai	317.9282	—	—	-1137.1	—	—	—
Na_2TaF_7	cr	359.9164	—	-3170.6	—	—	—	—
	ai	359.9164	—	—	-1696.1	—	—	—
$NaTaCl_6$	cr	416.6558	—	-1286.6	—	—	—	—
Na_2TiO_3	cr	141.8778	-1581.05	-1591.2	-1496.1	20.573	121.67	125.65
$Na_2Ti_2O_5$	cr	221.7766	—	—	—	28.911	173.89	174.39
$Na_2Ti_3O_7$	cr	301.6754	—	—	—	38.325	233.9	229.49
$NaTiCl_3$	cr	177.2488	—	-953.1	—	—	—	—
Na_3TiCl_6	cr	329.5874	—	-1965.2	—	—	—	—
$NaZrF_5$	cr	209.2018	—	-2502.	—	—	—	—
	g	209.2018	—	-2234.	—	—	—	—
Na_2ZrCl_6	cr	349.9176	—	-1828.	—	—	—	—
Na_2ZrSiO_5	cr	245.2826	—	-2654.7	-2508.2	—	182.0	—
$Na_2ZrSi_2O_7$	cr	305.3674	—	-3606.2	—	—	—	—
$Na_6Zr_2Si_4O_{15}$	cr	672.7138	—	-7905.2	—	—	—	—
$Na_{14}Zr_2Si_{10}O_{31}$	cr	1281.1386	—	-16037.	—	—	—	—
Na_2HfCl_6	cr	437.1876	—	-1823.4	—	—	—	—
$NaScF_4$	g	143.9394	—	-1866.	—	—	—	—

Substance Formula and Description	State	Molar mass	0 K	298.15 K (25°C) and 0.1 MPa (1 bar)				
			$\Delta_f H^\circ_0$	$\Delta_f H^\circ$	$\Delta_f G^\circ$	$H^\circ - H^\circ_0$	S°	C_p
		g mol^{-1}	kJ mol^{-1}		kJ mol^{-1}		J mol^{-1} K^{-1}	
Na_3ScF_6	cr	227.9158	—	-3410.	—	—	—	—
$NaErCl_4$	g	332.0618	—	-1125.	—	—	—	—
$NaNdCl_4$	g	309.0418	—	-1151.	—	—	—	—
Na_4CeO_4	cr	296.0768	—	-1946.	—	—	—	—
$NaLaCl_4$	g	303.7118	—	-1192.	—	—	—	—
$NaUO_3$	cr	309.0170	—	-1506.	—	—	—	—
Na_2UO_4 α form	cr	348.0062	-1882.88	-1893.3	-1777.72	26.225	166.02	146.65
β form	cr2	348.0062	—	-1883.6	—	—	—	—
$Na_2U_2O_7$	cr	634.0334	—	-3196.2	—	—	—	—
$Na_2U_2O_7\cdot1.5H_2O$	cr	661.0565	—	-3653.51	—	—	—	—
Na_3UO_4	cr	370.9960	-2013.13	-2025.1	-1901.1	31.108	198.20	173.01
Na_4UO_5	cr	409.9852	—	-2455.6	—	—	—	—
$Na_4O_4UO_4$ in 1 350 H_2O		457.9834	—	-2455.6	—	—	—	—
$Na_4O_4UO_4\cdot9H_2O$	cr	620.1220	—	-5087.7	—	—	—	—
$Na_6U_7O_{24}$	cr	2188.1273	—	-11351.6	—	—	—	—
$NaUF_6$	cr	375.0092	—	-2691.82	—	—	—	—
$Na(UO_2)_2F_5$	cr	658.0374	—	-3903.80	—	—	—	—
$Na_3UO_2F_5$	cr	433.9892	—	-3400.46	—	—	—	—
$NaUCl_6$ α form	cr	473.7368	—	-1472.8	—	—	—	—
β form	cr2	473.7368	—	-1473.6	—	—	—	—
Na_2UCl_6	cr	496.7266	—	-1848.1	—	—	—	—
$NaThCl_5\cdot10H_2O$	cr	612.4469	—	-4726.7	—	—	—	—
Na_2ThCl_6	cr	490.7357	—	-2026.7	—	—	—	—
$NaBeF_3$	g	88.9972	—	-1360.	—	—	—	—
Na_2BeF_4	g	130.9854	—	-1854.	—	—	—	—
$(NaBeF_3)_2$	g	177.9944	—	-2891.	—	—	—	—
$NaBeCl_3$	g	138.3610	—	-761.	—	—	—	—
Na_2BeCl_4	cr	196.8038	—	-1320.5	—	—	—	—
$NaMgF_3$	cr	104.2970	—	-1679.0	—	—	—	—
$(2NaCl\cdot MgCl_2)$	cr	212.1036	—	-1457.7	—	—	—	—
$Na_2Mg(SO_4)_2$	cr	262.4148	—	-2691.1	—	—	—	—
$Na_2Mg(SO_4)_2\cdot2H_2O$	cr	298.4456	—	-3389.9	—	—	—	—
$NaMgFe(CN)_6$	ai	259.2562	—	—	-3.2	—	—	—
$Na_2MgFe(CN)_6$	ai	282.2460	—	—	-305.3	—	—	—
Na_2CaCl_4	cr	227.8716	—	-1621.7	—	—	—	—
$Na_2Ca(SO_4)_2$	cr	278.1828	—	-2829.2	—	—	—	—
$Na_4Ca(SO_4)_3$	cr	420.2240	—	-4230.0	—	—	—	—
$NaCaFe(CN)_6$	ai	275.0242	—	—	-102.4	—	—	—
$Na_2CaFe(CN)_6$	ai	298.0140	—	—	-404.1	—	—	—
$(2NaCl\cdot SrCl_2)$	cr	275.4116	—	-1648.1	—	—	—	—
$Na_2SO_4\cdot SrSO_4$	cr	325.7228	—	-2830.1	—	—	—	—
$(2Na_2SO_4\cdot SrSO_4)$	cr	467.7640	—	-4209.1	—	—	—	—
$NaSrFe(CN)_6$	ai	322.5642	—	—	-108.3	—	—	—
$(2NaCl\cdot BaCl_2)$	cr	325.1316	—	-1678.6	—	—	—	—
$Na_2SO_4\cdot BaSO_4$	cr	375.4428	—	-2853.9	—	—	—	—
$(2Na_2SO_4\cdot BaSO_4)$	cr	517.4840	—	-4240.1	—	—	—	—
$Na_2CO_3\cdot BaCO_3$	cr	303.3384	—	-2348.5	—	—	—	—
$NaLiF_2$	g	67.9276	—	-884.9	-885.8	—	285.	—
$NaLiICl$	cr	192.2882	—	-694.1	—	—	—	—
$(0.5Na_2O\cdot0.5Li_2O\cdot2B_2O_3)$	cr	185.1706	—	-3342.93	—	—	—	—

Table 99:**Na** **SODIUM** (Prepared 1980) — Continued Table 99:**Na**

Substance Formula and Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
$(0.5Na_2O{\cdot}0.5Li_2O{\cdot}2B_2O_3)$	am	185.1706	—	-3297.79	—	—	—	—
$(0.5Na_2O{\cdot}0.5Li_2O{\cdot}3B_2O_3)$	cr	254.7908	—	-4629.93	—	—	—	—
	am	254.7908	—	-4587.50	—	—	—	—
$(0.5Na_2O{\cdot}0.5Li_2O{\cdot}4B_2O_3)$	cr	324.4110	—	-5900.57	—	—	—	—
	am	324.4110	—	-5851.87	—	—	—	—
$(0.25Na_2O{\cdot}0.75Li_2O{\cdot}2B_2O_3)$	cr	177.1462	—	-3353.94	—	—	—	—
	am	177.1462	—	-3315.19	—	—	—	—
$(0.25Na_2O{\cdot}0.75Li_2O{\cdot}3B_2O_3)$	cr	246.7664	—	-4641.48	—	—	—	—
	am	246.7664	—	-4603.40	—	—	—	—
$(0.25Na_2O{\cdot}0.75Li_2O{\cdot}4B_2O_3)$	cr	316.3866	—	-5893.37	—	—	—	—
$(0.25Na_2O{\cdot}0.75Li_2O{\cdot}4B_2O_3)$	am	316.3866	—	-5858.06	—	—	—	—
$(0.75Na_2O{\cdot}0.25Li_2O{\cdot}2B_2O_3)$	cr	193.1950	—	-3318.87	—	—	—	—
	am	193.1950	—	-3281.39	—	—	—	—
$(0.75Na_2O{\cdot}0.25Li_2O{\cdot}3B_2O_3)$	cr	262.8152	—	-4617.88	—	—	—	—
	am	262.8152	—	-4575.66	—	—	—	—
$(0.75Na_2O{\cdot}0.25Li_2O{\cdot}4B_2O_3)$	cr	332.4354	—	-5894.84	—	—	—	—
	am	332.4354	—	-5848.10	—	—	—	—

Table 100:K **POTASSIUM** (Prepared 1979) Table 100:K

Substance Formula and Description		State	Molar mass g mol⁻¹	0 K $\Delta_f H_0^\circ$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H_0^\circ$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
K		cr	39.1020	0	0	0	7.092	64.18	29.58
		g	39.1020	90.14	89.24	60.59	6.197	160.336	20.786
	in 88.81 Hg		39.1020	—	—	-102.13	—	—	—
K^+		g	39.1020	508.94	514.26	—	6.197	—	—
K^{2+}		g	39.1020	3560.6	3572.3	—	6.197	—	—
K^{3+}		g	39.1020	7980.1	7997.7	—	6.201	—	—
K^{4+}		g	39.1020	13857.4	13881.3	—	6.197	—	—
K^+		ao	39.1020	—	-252.38	-283.27	—	102.5	21.8
K_2		g	78.2040	127.1	123.7	87.5	10.732	249.73	37.89
K_2^+		g	78.2040	518.86	521.62	—	—	—	—
KO_2		cr	71.1008	—	-284.93	-239.4	—	116.7	77.53
KO_3		cr	87.1002	—	-260.2	—	—	—	—
K_2O		cr	94.2034	—	-361.5	—	—	—	—
		g	94.2034	—	-63.	—	—	—	—
K_2O^+		g	94.2034	—	674.	—	—	—	—
K_2O_2		cr	110.2028	—	-494.1	-425.1	—	102.1	—
		g	110.2028	—	-159.	—	—	—	—
KH		cr	40.1100	—	-57.74	—	—	—	—
KD		cr	41.1161	—	-55.27	—	—	—	—
KH		g	40.1100	133.9	130.	113.	8.795	192.41	31.049
KD		g	41.1161	135.44	133.1	114.6	8.996	198.93	32.840
KOH		cr	56.1094	-421.249	-424.764	-379.08	12.150	78.9	64.9
		g	56.1094	-226.98	-231.0	-232.6	11.673	238.3	49.20
		ai	56.1094	—	-482.37	-440.50	—	91.6	-126.8
	in 3 H_2O		56.1094	—	-469.462	—	—	—	—
KOH	in 3.5 H_2O		56.1094	—	-471.302	—	—	—	—
	in 4 H_2O		56.1094	—	-472.955	—	—	—	—
	in 4.5 H_2O		56.1094	—	-474.503	—	—	—	—
	in 5 H_2O		56.1094	—	-475.712	—	—	—	—
	in 6 H_2O		56.1094	—	-477.093	—	—	—	—
KOH	in 8 H_2O		56.1094	—	-478.775	—	—	—	—
	in 10 H_2O		56.1094	—	-479.725	—	—	—	—
	in 12 H_2O		56.1094	—	-480.306	—	—	—	—
	in 15 H_2O		56.1094	—	-480.825	—	—	—	—
	in 20 H_2O		56.1094	—	-481.189	—	—	—	—
KOH	in 25 H_2O		56.1094	—	-481.302	—	—	—	—
	in 30 H_2O		56.1094	—	-481.369	—	—	—	—
	in 40 H_2O		56.1094	—	-481.461	—	—	—	—
	in 50 H_2O		56.1094	—	-481.520	—	—	—	—
	in 75 H_2O		56.1094	—	-481.595	—	—	—	—
KOH	in 100 H_2O		56.1094	—	-481.637	—	—	—	—
	in 150 H_2O		56.1094	—	-481.700	—	—	—	—
	in 200 H_2O		56.1094	—	-481.742	—	—	—	—
	in 300 H_2O		56.1094	—	-481.813	—	—	—	—
	in 400 H_2O		56.1094	—	-481.855	—	—	—	—
KOH	in 500 H_2O		56.1094	—	-481.892	—	—	—	—
	in 700 H_2O		56.1094	—	-481.947	—	—	—	—
	in 800 H_2O		56.1094	—	-481.968	—	—	—	—
	in 1 000 H_2O		56.1094	—	-482.001	—	—	—	—
	in 1 500 H_2O		56.1094	—	-482.060	—	—	—	—

Table 100:**K** **POTASSIUM** (Prepared 1979) — Continued Table 100:**K**

Substance Formula and Description		State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
KOH	in 2 000 H_2O		56.1094	—	-482.093	—	—	—	—
	in 3 000 H_2O		56.1094	—	-482.139	—	—	—	—
	in 5 000 H_2O		56.1094	—	-482.189	—	—	—	—
	in 7 000 H_2O		56.1094	—	-482.214	—	—	—	—
	in 10 000 H_2O		56.1094	—	-482.239	—	—	—	—
KOH	in 20 000 H_2O		56.1094	—	-482.277	—	—	—	—
	in 50 000 H_2O		56.1094	—	-482.306	—	—	—	—
	in 100 000 H_2O		56.1094	—	-482.327	—	—	—	—
	in ∞ H_2O		56.1094	—	-482.37	—	—	—	—
	in C_2H_5OH:u in ethyl alcohol		56.1094	—	-462.4	—	—	—	—
$KOH \cdot H_2O$		cr	74.1248	—	-748.9	-645.1	—	117.2	—
$KOH \cdot 2H_2O$		cr	92.1402	—	-1051.0	-887.3	—	150.6	—
$K_2(OH)_2$		g	112.2188	-225.22	-656.5	-615.8	18.49	328.1	81.6
KF		cr	58.1004	-565.773	-567.27	-537.75	10.008	66.57	49.04
		g	58.1004	-323.38	-325.43	-343.62	9.452	226.41	35.23
KF		ai	58.1004	—	-585.01	-562.06	—	88.7	-84.9
	in 3.5 H_2O		58.1004	—	-578.041	—	—	—	—
	in 4 H_2O		58.1004	—	-579.237	—	—	—	—
	in 4.5 H_2O		58.1004	—	-580.195	—	—	—	—
	in 5 H_2O		58.1004	—	-580.948	—	—	—	—
KF	in 6 H_2O		58.1004	—	-581.999	—	—	—	—
	in 8 H_2O		58.1004	—	-583.091	—	—	—	—
	in 10 H_2O		58.1004	—	-583.576	—	—	—	—
	in 12 H_2O		58.1004	—	-583.819	—	—	—	—
	in 15 H_2O		58.1004	—	-583.999	—	—	—	—
KF	in 20 H_2O		58.1004	—	-584.116	—	—	—	—
	in 25 H_2O		58.1004	—	-584.158	—	—	—	—
	in 30 H_2O		58.1004	—	-584.191	—	—	—	—
	in 50 H_2O		58.1004	—	-584.250	—	—	—	—
	in 75 H_2O		58.1004	—	-584.291	—	—	—	—
KF	in 100 H_2O		58.1004	—	-584.317	—	—	—	—
	in 150 H_2O		58.1004	—	-584.363	—	—	—	—
	in 200 H_2O		58.1004	—	-584.396	—	—	—	—
	in 300 H_2O		58.1004	—	-584.455	—	—	—	—
	in 400 H_2O		58.1004	—	-584.501	—	—	—	—
KF	in 500 H_2O		58.1004	—	-584.534	—	—	—	—
	in 700 H_2O		58.1004	—	-584.584	—	—	—	—
	in 800 H_2O		58.1004	—	-584.605	—	—	—	—
	in 1 000 H_2O		58.1004	—	-584.634	—	—	—	—
	in 1 500 H_2O		58.1004	—	-584.693	—	—	—	—
KF	in 2 000 H_2O		58.1004	—	-584.727	—	—	—	—
	in 3 000 H_2O		58.1004	—	-584.773	—	—	—	—
	in 5 000 H_2O		58.1004	—	-584.823	—	—	—	—
	in 7 000 H_2O		58.1004	—	-584.848	—	—	—	—
	in 10 000 H_2O		58.1004	—	-584.873	—	—	—	—
KF	in 20 000 H_2O		58.1004	—	-584.911	—	—	—	—
	in 50 000 H_2O		58.1004	—	-584.944	—	—	—	—
	in 100 000 H_2O		58.1004	—	-584.961	—	—	—	—
	in ∞ H_2O		58.1004	—	-585.01	—	—	—	—

Table 100:K **POTASSIUM** (Prepared 1979) — Continued Table 100:K

Substance Formula	Description	State	Molar mass g mol^{-1}	0 K $\Delta_f H_0^\circ$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H_0^\circ$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
KF	in 500 D_2O		58.1004	—	-584.296	—	—	—	—
	in $HCONH_2$:s in formamide		58.1004	—	-580.57	—	—	—	—
	in $HCONHCH_3$:s in N–methyl formamide		58.1004	—	-578.15	—	—	—	—
$KF·2H_2O$		cr	94.1312	—	-1163.621	-1021.49	—	155.2	—
K_2F_2		g	116.2008	-854.25	-859.0	-856.0	18.292	321.0	78.28
KHF_2	α	cr	78.1068	-922.823	-927.68	-859.68	15.293	104.27	76.94
	from HF_2^-	ai	78.1068	—	-902.32	-861.35	—	195.0	—
	in 25 H_2O		78.1068	—	-902.78	—	—	—	—
	in 50 H_2O		78.1068	—	-901.78	—	—	—	—
	in 100 H_2O		78.1068	—	-901.53	—	—	—	—
KHF_2	in 200 H_2O		78.1068	—	-901.65	—	—	—	—
	in 400 H_2O		78.1068	—	-901.86	—	—	—	—
	in ∞ H_2O		78.1068	—	-902.32	—	—	—	—
KF·2HF		cr	98.1132	—	-1255.6	—	—	—	—
KF·3HF		cr	118.1196	—	-1577.4	—	—	—	—
KCl		cr	74.5550	-436.433	-436.747	-409.14	11.368	82.59	51.30
		g	74.5550	-212.342	-214.14	-233.0	9.883	239.10	36.48
		ai	74.5550	—	-419.53	-414.49	—	159.0	-114.6
	in 12 H_2O		74.5550	—	-421.412	—	—	—	—
	in 15 H_2O		74.5550	—	-421.057	—	—	—	—
KCl	in 20 H_2O		74.5550	—	-420.630	—	—	—	—
	in 25 H_2O		74.5550	—	-420.325	—	—	—	—
	in 30 H_2O		74.5550	—	-420.111	—	—	—	—
	in 40 H_2O		74.5550	—	-419.835	—	—	—	—
	in 50 H_2O		74.5550	—	-419.664	—	—	—	—
KCl	in 60 H_2O		74.5550	—	-419.572	—	—	—	—
	in 75 H_2O		74.5550	—	-419.433	—	—	—	—
	in 100 H_2O		74.5550	—	-419.320	—	—	—	—
	in 150 H_2O		74.5550	—	-419.228	—	—	—	—
	in 200 H_2O		74.5550	—	-419.191	—	—	—	—
KCl	in 300 H_2O		74.5550	—	-419.174	—	—	—	—
	in 400 H_2O		74.5550	—	-419.178	—	—	—	—
	in 500 H_2O		74.5550	—	-419.187	—	—	—	—
	in 700 H_2O		74.5550	—	-419.212	—	—	—	—
	in 800 H_2O		74.5550	—	-419.220	—	—	—	—
KCl	in 1 000 H_2O		74.5550	—	-419.237	—	—	—	—
	in 1 200 H_2O		74.5550	—	-419.249	—	—	—	—
	in 1 500 H_2O		74.5550	—	-419.270	—	—	—	—
	in 2 000 H_2O		74.5550	—	-419.291	—	—	—	—
	in 3 000 H_2O		74.5550	—	-419.320	—	—	—	—
KCl	in 5 000 H_2O		74.5550	—	-419.358	—	—	—	—
	in 7 000 H_2O		74.5550	—	-419.379	—	—	—	—
	in 10 000 H_2O		74.5550	—	-419.400	—	—	—	—
	in 20 000 H_2O		74.5550	—	-419.438	—	—	—	—
	in 50 000 H_2O		74.5550	—	-419.471	—	—	—	—
KCl	in 100 000 H_2O		74.5550	—	-419.488	—	—	—	—
	in ∞ H_2O		74.5550	—	-419.53	—	—	—	—
	in 500 D_2O		74.5550	—	-416.710	—	—	—	—
	in $HCONH_2$:s in formamide		74.5550	—	-433.316	—	—	—	—

Table 100:K POTASSIUM (Prepared 1979) — Continued Table 100:K

Substance Formula	and Description	State	Molar mass g mol^{-1}	0 K $\Delta_f H_0^\circ$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H_0^\circ$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
KCl	in HCO_2H:s in formic acid		74.5550	—	-437.98	—	—	—	—
	in $HCONHCH_3$:s in N-methylformamide		74.5550	—	-435.30	-401.27	—	61.1	—
	in $HCON(CH_3)_2$:s in N,N-dimethylformamide		74.5550	—	—	-378.13	—	—	—
	in CH_3OH:u in methyl alcohol		74.5550	—	-430.20	—	—	—	—
K_2Cl_2		g	149.1100	-619.57	-623.0	-622.6	19.937	350.3	80.67
KClO		ai	90.5544	—	-359.4	-320.0	—	146.	—
$KClO_2$		ai	106.5538	—	-318.8	-266.1	—	203.8	—
$KClO_3$		cr	122.5532	—	-397.73	-296.25	—	143.1	100.25
		ai	122.5532	—	-356.35	-291.22	—	264.8	—
	in 100 H_2O		122.5532	—	-358.360	—	—	—	—
$KClO_3$	in 150 H_2O		122.5532	—	-357.648	—	—	—	—
	in 200 H_2O		122.5532	—	-357.159	—	—	—	—
	in 300 H_2O		122.5532	—	-356.745	—	—	—	—
	in 400 H_2O		122.5532	—	-356.560	—	—	—	—
	in 500 H_2O		122.5532	—	-356.448	—	—	—	—
$KClO_3$	in 1 000 H_2O		122.5532	—	-356.293	—	—	—	—
	in 3 000 H_2O		122.5532	—	-356.226	—	—	—	—
	in 10 000 H_2O		122.5532	—	-356.251	—	—	—	—
	in 100 000 H_2O		122.5532	—	-356.309	—	—	—	—
	in ∞ H_2O		122.5532	—	-356.35	—	—	—	—
$KClO_4$		cr	138.5526	-424.781	-432.75	-303.09	21.071	151.0	112.38
		ai	138.5526	—	-381.71	-291.79	—	284.5	—
	in 600 H_2O		138.5526	—	-382.12	—	—	—	—
	in 800 H_2O		138.5526	—	-382.00	—	—	—	—
	in 900 H_2O		138.5526	—	-381.96	—	—	—	—
$KClO_4$	in 1 000 H_2O		138.5526	—	-381.92	—	—	—	—
	in 1 300 H_2O		138.5526	—	-381.83	—	—	—	—
	in 5 000 H_2O		138.5526	—	-381.66	—	—	—	—
	in 10 000 H_2O		138.5526	—	-381.62	—	—	—	—
	in 100 000 H_2O		138.5526	—	-381.66	—	—	—	—
$KClO_4$	in ∞ H_2O		138.5526	—	-381.71	—	—	—	—
	in $HCONH_2$:s in formamide		138.5526	—	-418.11	—	—	—	—
	in $HCONHCH_3$:s in N-methylformamide		138.5526	—	-426.48	—	—	—	—
	in $HCON(CH_3)_2$:s in N,N-dimethyl formamide		138.5526	—	-442.37	—	—	—	—
KBr		cr	119.0110	-386.660	-393.798	-380.66	12.213	95.90	52.30
KBr		g	119.0110	-170.841	-180.08	-212.96	10.109	250.52	36.920
		ai	119.0110	—	-373.92	-387.23	—	184.9	-120.1
	in 10 H_2O		119.0110	—	-377.376	—	—	—	—
	in 12 H_2O		119.0110	—	-376.911	—	—	—	—
	in 15 H_2O		119.0110	—	-376.368	—	—	—	—
KBr	in 20 H_2O		119.0110	—	-375.974	—	—	—	—
	in 25 H_2O		119.0110	—	-375.359	—	—	—	—
	in 30 H_2O		119.0110	—	-375.066	—	—	—	—
	in 40 H_2O		119.0110	—	-374.673	—	—	—	—
	in 50 H_2O		119.0110	—	-374.426	—	—	—	—
KBr	in 75 H_2O		119.0110	—	-374.079	—	—	—	—

Table 100:K POTASSIUM (Prepared 1979) — Continued Table 100:K

Substance Formula	Description	State	Molar mass g mol⁻¹	0 K $\Delta_fH^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) Δ_fH° kJ mol⁻¹	Δ_fG° kJ mol⁻¹	$H^\circ-H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
KBr	in 100 H_2O		119.0110	—	-373.916	—	—	—	—
	in 150 H_2O		119.0110	—	-373.765	—	—	—	—
	in 200 H_2O		119.0110	—	-373.702	—	—	—	—
	in 300 H_2O		119.0110	—	-373.656	—	—	—	—
	in 400 H_2O		119.0110	—	-373.644	—	—	—	—
KBr	in 500 H_2O		119.0110	—	-373.644	—	—	—	—
	in 800 H_2O		119.0110	—	-373.652	—	—	—	—
	in 1 000 H_2O		119.0110	—	-373.660	—	—	—	—
	in 1 500 H_2O		119.0110	—	-373.686	—	—	—	—
	in 2 000 H_2O		119.0110	—	-373.702	—	—	—	—
KBr	in 3 000 H_2O		119.0110	—	-373.732	—	—	—	—
	in 5 000 H_2O		119.0110	—	-373.765	—	—	—	—
	in 10 000 H_2O		119.0110	—	-373.803	—	—	—	—
	in 20 000 H_2O		119.0110	—	-373.836	—	—	—	—
	in 50 000 H_2O		119.0110	—	-373.866	—	—	—	—
KBr	in 100 000 H_2O		119.0110	—	-373.882	—	—	—	—
	in ∞ H_2O		119.0110	—	-373.92	—	—	—	—
	in 500 D_2O		119.0110	—	-370.460	—	—	—	—
	in 10.86 HCO_2H in formic acid		119.0110	—	-385.97	—	—	—	—
	in 21.73 HCO_2H		119.0110	—	-388.53	—	—	—	—
KBr	in $HCONH_2$:s in formamide		119.0110	—	-392.84	—	—	—	—
	in $HCONHCH_3$:s in N-methylformamide		119.0110	—	-397.23	—	—	—	—
	in $HCON(CH_3)_2$:s in N,N-dimethylformamide		119.0110	—	-410.07	—	—	—	—
	in CH_3OH:u in methyl alcohol		119.0110	—	-388.19	—	—	—	—
KBr^+		g	119.0110	586.	582.	—	—	—	—
KBr_3	from Br_3^-	ai	278.8290	—	-382.79	-390.33	—	318.0	—
	in 110 H_2O		278.8290	—	-382.0	—	—	—	—
KBr_5		ai	438.6470	—	-394.6	-387.0	—	419.2	—
K_2Br_2		g	238.0220	-523.92	-541.8	-570.	20.79	375.4	81.46
KBrO		ai	135.0104	—	-346.4	-316.7	—	142.	—
$KBrO_3$		cr	167.0092	-348.808	-360.24	-271.16	20.941	149.16	105.19
		ai	167.0092	—	-319.45	-264.67	—	264.22	—
	in 120 H_2O		167.0092	—	-320.904	—	—	—	—
	in 150 H_2O		167.0092	—	-320.515	—	—	—	—
	in 200 H_2O		167.0092	—	-320.185	—	—	—	—
$KBrO_3$	in 300 H_2O		167.0092	—	-319.850	—	—	—	—
	in 400 H_2O		167.0092	—	-319.687	—	—	—	—
	in 500 H_2O		167.0092	—	-319.595	—	—	—	—
	in 600 H_2O		167.0092	—	-319.536	—	—	—	—
	in 800 H_2O		167.0092	—	-319.465	—	—	—	—
$KBrO_3$	in 1 000 H_2O		167.0092	—	-319.427	—	—	—	—
	in 2 000 H_2O		167.0092	—	-319.361	—	—	—	—
	in 5 000 H_2O		167.0092	—	-319.340	—	—	—	—
	in 10 000 H_2O		167.0092	—	-319.352	—	—	—	—
	in 50 000 H_2O		167.0092	—	-319.390	—	—	—	—
$KBrO_3$	in 100 000 H_2O		167.0092	—	-319.407	—	—	—	—

Table 100:**K** **POTASSIUM** (Prepared 1979) — Continued Table 100:**K**

Substance Formula	and Description	State	Molar mass g mol⁻¹	0 K $\Delta_fH^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) Δ_fH° kJ mol⁻¹	Δ_fG° kJ mol⁻¹	$H^\circ-H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
$KBrO_3$	in ∞ H_2O		167.0092	—	-319.45	—	—	—	—
	in 1 667 D_2O		167.0092	—	-316.62	—	—	—	—
$KBrO_4$		cr	183.0086	-274.550	-287.86	-174.41	23.401	170.08	120.16
		ai	183.0086	—	-239.32	-165.2	—	302.1	—
	in 2 500 H_2O		183.0086	—	-239.32	—	—	—	—
$KF{\cdot}BrF_3$		cr	195.0046	—	-961.5	—	—	—	—
KBr_2Cl	from Br_2Cl^-	ai	234.3730	—	-422.6	-411.7	—	291.2	—
KI		cr	166.0064	-326.925	-327.900	-324.892	12.715	106.32	52.93
	G–H–S constraint has been relaxed; see Introduction								
		g	166.0064	-122.1	-125.5	-166.1	10.242	258.3	37.11
		ai	166.0064	—	-307.57	-334.85	—	213.8	-120.5
KI	in 8 H_2O		166.0064	—	-313.164	—	—	—	—
	in 10 H_2O		166.0064	—	-312.369	—	—	—	—
	in 12 H_2O		166.0064	—	-311.746	—	—	—	—
	in 13 H_2O		166.0064	—	-311.499	—	—	—	—
	in 15 H_2O		166.0064	—	-311.047	—	—	—	—
KI	in 20 H_2O		166.0064	—	-310.239	—	—	—	—
	in 25 H_2O		166.0064	—	-309.695	—	—	—	—
	in 30 H_2O		166.0064	—	-309.311	—	—	—	—
	in 40 H_2O		166.0064	—	-308.792	—	—	—	—
	in 50 H_2O		166.0064	—	-308.461	—	—	—	—
KI	in 75 H_2O		166.0064	—	-308.026	—	—	—	—
	in 85 H_2O		166.0064	—	-307.934	—	—	—	—
	in 100 H_2O		166.0064	—	-307.796	—	—	—	—
	in 150 H_2O		166.0064	—	-307.574	—	—	—	—
	in 200 H_2O		166.0064	—	-307.474	—	—	—	—
KI	in 300 H_2O		166.0064	—	-307.382	—	—	—	—
	in 400 H_2O		166.0064	—	-307.344	—	—	—	—
	in 500 H_2O		166.0064	—	-307.327	—	—	—	—
	in 600 H_2O		166.0064	—	-307.323	—	—	—	—
	in 700 H_2O		166.0064	—	-307.319	—	—	—	—
KI	in 800 H_2O		166.0064	—	-307.319	—	—	—	—
	in 900 H_2O		166.0064	—	-307.323	—	—	—	—
	in 1 000 H_2O		166.0064	—	-307.327	—	—	—	—
	in 2 000 H_2O		166.0064	—	-307.352	—	—	—	—
	in 3 000 H_2O		166.0064	—	-307.378	—	—	—	—
KI	in 5 000 H_2O		166.0064	—	-307.411	—	—	—	—
	in 10 000 H_2O		166.0064	—	-307.444	—	—	—	—
	in 20 000 H_2O		166.0064	—	-307.478	—	—	—	—
	in 50 000 H_2O		166.0064	—	-307.507	—	—	—	—
	in 100 000 H_2O		166.0064	—	-307.524	—	—	—	—
KI	in ∞ H_2O		166.0064	—	-307.57	—	—	—	—
	in 500 NH_3 in liquid NH_3		166.0064	—	-367.4	—	—	—	—
	in 500 D_2O		166.0064	—	-303.499	—	—	—	—
	in 190 $HCONH_2$ in formamide		166.0064	—	-332.21	—	—	—	—
	in 200 C_2H_5OH		166.0064	—	-318.8	—	—	—	—
KI	in 400 C_2H_5OH		166.0064	—	-319.7	—	—	—	—
	in 600 C_2H_5OH		166.0064	—	-321.3	—	—	—	—
	in $HCONH_2$:s in formamide		166.0064	—	-332.15	—	—	—	—

Substance Formula	Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
KI	in $HCONHCH_3$:s in N-methylformamide		166.0064	—	-341.385	—	—	—	—
	in $HCON(CH_3)_2$:s in N,N-dimethylformamide		166.0064	—	-361.54	—	—	—	—
	in CH_3OH:u		166.0064	—	-328.53	—	—	—	—
	in CH_3CN:u in acetonitrile		166.0064	—	-337.6	—	—	—	—
KI^+		g	166.0064	573.	577.	—	—	—	—
KI_3		cr	419.8152	—	-328.0	—	—	—	—
	from I_3^-	ai	419.8152	—	-303.8	-334.7	—	341.8	—
	in 13 H_2O		419.8152	—	-308.4	—	—	—	—
	in 40 H_2O		419.8152	—	-305.9	—	—	—	—
	in 100 H_2O		419.8152	—	-304.2	—	—	—	—
KI_3	in 250 H_2O		419.8152	—	-303.8	—	—	—	—
	in 400 H_2O		419.8152	—	-303.8	—	—	—	—
	in 600 H_2O		419.8152	—	-303.3	—	—	—	—
K_2I_2		g	332.0128	-418.69	-424.7	-469.1	21.38	393.8	82.0
KIO		ai	182.0058	—	-359.8	-321.7	—	97.1	—
KIO_3		cr	214.0046	-495.97	-501.37	-418.35	21.30	151.46	106.48
		ai	214.0046	—	-473:6	-411.2	—	220.9	—
	in 150 H_2O		214.0046	—	-475.365	—	—	—	—
	in 200 H_2O		214.0046	—	-474.884	—	—	—	—
	in 250 H_2O		214.0046	—	-474.595	—	—	—	—
KIO_3	in 300 H_2O		214.0046	—	-474.386	—	—	—	—
	in 400 H_2O		214.0046	—	-474.135	—	—	—	—
	in 500 H_2O		214.0046	—	-473.993	—	—	—	—
	in 600 H_2O		214.0046	—	-473.901	—	—	—	—
	in 800 H_2O		214.0046	—	-473.784	—	—	—	—
KIO_3	in 1 000 H_2O		214.0046	—	-473.721	—	—	—	—
	in 1 667 H_2O		214.0046	—	-473.654	—	—	—	—
	in 2 000 H_2O		214.0046	—	-473.608	—	—	—	—
	in 5 000 H_2O		214.0046	—	-473.553	—	—	—	—
	in 10 000 H_2O		214.0046	—	-473.545	—	—	—	—
KIO_3	in 50 000 H_2O		214.0046	—	-473.579	—	—	—	—
	in 100 000 H_2O		214.0046	—	-473.591	—	—	—	—
KIO_4		cr	230.0040	—	-467.23	-361.35	—	176.	—
		ai	230.0040	—	-403.8	-341.8	—	322.	—
K_2I_2O	from I_2O^{2-}	ai	348.0122	—	—	-648.9	—	—	—
KH_4IO_6	from $H_4IO_6^-$	aq	266.0348	—	-1011.7	—	—	—	—
$K_2H_3IO_6$	from $H_3IO_6^{2-}$	aq	304.1288	—	-1260.6	—	—	—	—
KIO_2F_2		cr	236.0020	—	-875.71	—	—	—	—
$KICl_2$	from ICl_2^-	ai	236.9124	—	—	-444.3	—	—	—
KI_2Cl	from I_2Cl^-	ai	328.3638	—	-389.9	-399.6	—	324.7	—
$KIBr_2$		cr	325.8244	—	—	-391.2	—	—	—
	from IBr_2^-	ai	325.8244	—	—	-406.3	—	—	—
$KIBr_2 \cdot H_2O$		cr	343.8398	—	—	-632.2	—	—	—
$KBrI_2$	from I_2Br^-	ai	372.8198	—	-380.3	-393.3	—	300.0	—
KClBrI		cr	281.3684	—	—	-415.5	—	—	—
KClBrI	from $ClBrI^-$	ai	281.3684	—	—	-429.7	—	—	—
K_2S		cr	110.2680	—	-380.7	-364.0	—	105.	—
		ai	110.2680	—	-471.5	-480.7	—	190.4	—

Table 100:K — **POTASSIUM** (Prepared 1979) — Continued — Table 100:K

Substance Formula	Substance Description	State	Molar mass g mol⁻¹	0 K: $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar): $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
K_2S	in 7 H_2O		110.2680	—	-456.9	—	—	—	—
	in 10 H_2O		110.2680	—	-463.2	—	—	—	—
	in 20 H_2O		110.2680	—	-467.8	—	—	—	—
	in 50 H_2O		110.2680	—	-468.40	—	—	—	—
	in 100 H_2O		110.2680	—	-468.19	—	—	—	—
K_2S	in 200 H_2O		110.2680	—	-467.69	—	—	—	—
	in 400 H_2O		110.2680	—	-467.4	—	—	—	—
$K_2S{\cdot}2H_2O$		cr	146.2988	—	-975.3	—	—	—	—
$K_2S{\cdot}5H_2O$		cr	200.3450	—	-1871.5	—	—	—	—
K_2S_2		cr	142.3320	—	-432.2	—	—	—	—
K_2S_2		ai	142.3320	—	-474.5	-487.0	—	233.5	—
	in 11 000 H_2O		142.3320	—	-473.2	—	—	—	—
K_2S_3		cr	174.3960	—	-467.4	—	—	—	—
		ai	174.3960	—	-478.6	-492.9	—	271.1	—
	in 11 000 H_2O		174.3960	—	-479.9	—	—	—	—
K_2S_4		cr	206.4600	—	-469.9	—	—	—	—
		ai	206.4600	—	-481.6	-497.5	—	308.4	—
	in 300 H_2O		206.4600	—	-476.6	—	—	—	—
	in 11 000 H_2O		206.4600	—	-481.6	—	—	—	—
$K_2S_4{\cdot}0.5H_2O$		cr	215.4677	—	-627.2	—	—	—	—
$K_2S_4{\cdot}2H_2O$		cr	242.4908	—	-1078.6	—	—	—	—
K_2S_5		cr	238.5240	—	-469.0	—	—	—	—
		ai	238.5240	—	-483.3	-500.8	—	345.6	—
K_2S_6		cr	270.5880	—	-468.2	—	—	—	—
KSO_4^-		ao	135.1636	—	-1157.42	-1032.07	—	151.0	—
$KS_2O_8^-$		ao	231.2252	—	-1590.3	-1403.2	—	385.	—
K_2SO_3		cr	158.2662	—	-1125.5	—	—	—	—
		ai	158.2662	—	-1140.1	-1053.1	—	176.	—
	in 50 H_2O		158.2662	—	-1138.9	—	—	—	—
	in 100 H_2O		158.2662	—	-1136.0	—	—	—	—
K_2SO_3	in 200 H_2O		158.2662	—	-1134.7	—	—	—	—
	in 350 H_2O		158.2662	—	-1134.7	—	—	—	—
	in 400 H_2O		158.2662	—	-1135.1	—	—	—	—
	in 500 H_2O		158.2662	—	-1135.5	—	—	—	—
	in 600 H_2O		158.2662	—	-1136.0	—	—	—	—
K_2SO_3	in 1 000 H_2O		158.2662	—	-1137.6	—	—	—	—
	in ∞ H_2O		158.2662	—	-1140.1	—	—	—	—
K_2SO_4	G–H–S constraint has been relaxed; see Introduction	cr	174.2656	-1427.271	-1437.79	-1321.37	25.435	175.56	131.46
		g	174.2656	-1083.	-1096.	-1033.	22.47	364.	108.8
		ai	174.2656	—	-1414.02	-1311.07	—	225.1	-251.
K_2SO_4	in 50 H_2O		174.2656	—	-1416.1	—	—	—	—
	in 60 H_2O		174.2656	—	-1415.7	—	—	—	—
	in 80.2 H_2O		174.2656	—	-1414.9	—	—	—	—
	in 100 H_2O		174.2656	—	-1414.40	—	—	—	—
	in 200 H_2O		174.2656	—	-1413.44	—	—	—	—
K_2SO_4	in 300 H_2O		174.2656	—	-1413.23	—	—	—	—
	in 400 H_2O		174.2656	—	-1413.06	—	—	—	—
	in 500 H_2O		174.2656	—	-1413.02	—	—	—	—

Table 100:K — POTASSIUM (Prepared 1979) — Continued — Table 100:K

Substance Formula	Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
K_2SO_4	in 600 H_2O		174.2656	—	-1412.970	—	—	—	—
	in 700 H_2O		174.2656	—	-1412.962	—	—	—	—
	in 800 H_2O		174.2656	—	-1412.966	—	—	—	—
	in 1 000 H_2O		174.2656	—	-1412.983	—	—	—	—
	in 1 500 H_2O		174.2656	—	-1413.020	—	—	—	—
K_2SO_4	in 2 000 H_2O		174.2656	—	-1413.071	—	—	—	—
	in 3 000 H_2O		174.2656	—	-1413.150	—	—	—	—
	in 5 000 H_2O		174.2656	—	-1413.272	—	—	—	—
	in 8 000 H_2O		174.2656	—	-1413.380	—	—	—	—
	in 10 000 H_2O		174.2656	—	-1413.435	—	—	—	—
K_2SO_4	in 20 000 H_2O		174.2656	—	-1413.581	—	—	—	—
	in 50 000 H_2O		174.2656	—	-1413.728	—	—	—	—
	in 100 000 H_2O		174.2656	—	-1413.811	—	—	—	—
	in 500 000 H_2O		174.2656	—	-1413.933	—	—	—	—
	in ∞ H_2O		174.2656	—	-1414.02	—	—	—	—
K_2SO_4	in 500 D_2O		174.2656	—	-1410.719	—	—	—	—
$K_2S_2O_3$		cr	190.3302	—	-1173.6	—	—	—	—
		ai	190.3302	—	-1156.9	-1089.0	—	272.	—
	in 1 000 H_2O		190.3302	—	-1155.6	—	—	—	—
$K_2S_2O_3 \cdot H_2O$		cr	208.3456	—	-1464.8	—	—	—	—
$K_2S_2O_4$		ai	206.3296	—	-1258.1	-1166.9	—	297.	—
$K_2S_2O_5$		cr	222.3290	—	-1533.9	—	—	—	—
	in 500 H_2O		222.3290	—	-1487.8	—	—	—	—
$K_2S_2O_5 \cdot 0.5H_2O$		cr	231.3367	—	-1677.8	—	—	—	—
$K_2S_2O_6$		cr	238.3284	—	-1755.61	—	—	—	—
$K_2S_2O_6$		ai	238.3284	—	-1702.9	—	—	—	—
	in 400 H_2O		238.3284	—	-1702.68	—	—	—	—
	in 800 H_2O		238.3284	—	-1701.6	—	—	—	—
	in 1 600 H_2O		238.3284	—	-1701.6	—	—	—	—
$K_2S_2O_7$		cr	254.3278	—	-1986.6	-1791.5	—	255.2	—
$K_2S_2O_7$		ai	254.3278	—	-1905.8	—	—	—	—
	in 50 H_2O		254.3278	—	-1914.6	—	—	—	—
$K_2S_2O_8$		cr	270.3272	-1898.2	-1916.1	-1697.3	39.87	278.7	213.09
		ai	270.3272	—	-1849.3	-1681.4	—	449.4	—
	in 3 200 H_2O		270.3272	—	-1846.8	—	—	—	—
$K_2S_2O_8$	in 7 000 H_2O		270.3272	—	-1848.0	—	—	—	—
$K_2S_3O_6$		cr	270.3924	—	-1754.8	—	—	—	—
		ai	270.3924	—	-1704.1	—	—	—	—
	in 500 H_2O		270.3924	—	-1704.1	—	—	—	—
$K_2S_4O_6$		cr	302.4564	-1766.65	-1780.71	-1613.34	43.79	309.66	230.79
$K_2S_4O_6$		ai	302.4564	—	-1728.8	-1607.0	—	462.3	-24.3
	in 500 H_2O		302.4564	—	-1727.2	—	—	—	—
	in 1 000 H_2O		302.4564	—	-1727.36	—	—	—	—
	in 5 000 H_2O		302.4564	—	-1727.728	—	—	—	—
	in 6 000 H_2O		302.4564	—	-1727.820	—	—	—	—
$K_2S_4O_6$	in 7 000 H_2O		302.4564	—	-1727.963	—	—	—	—
	in 10 000 H_2O		302.4564	—	-1728.021	—	—	—	—
	in 25 000 H_2O		302.4564	—	-1728.297	—	—	—	—
	in 50 000 H_2O		302.4564	—	-1728.456	—	—	—	—
	in 100 000 H_2O		302.4564	—	-1728.569	—	—	—	—

Substance Formula	Description	State	Molar mass g mol⁻¹	0 K: $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar): $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
$K_2S_4O_6$	in ∞ H_2O		302.4564	—	−1728.8	—	—	—	—
$K_2S_5O_6$		ai	334.5204	—	−1741.0	—	—	—	—
	in 2 000 H_2O		334.5204	—	−1741.0	—	—	—	—
$K_2S_5O_6 \cdot 1.5H_2O$		cr	361.5435	—	−2222.5	—	—	—	—
KHS		cr	72.1740	—	−265.10	—	—	—	75.31
KHS	from HS^-	ai	72.1740	—	−269.9	−271.19	—	165.3	—
	in 5 H_2O		72.1740	—	−271.12	—	—	—	—
	in 10 H_2O		72.1740	—	−271.04	—	—	—	—
	in 20 H_2O		72.1740	—	−270.96	—	—	—	—
	in 50 H_2O		72.1740	—	−269.87	—	—	—	—
KHS	in 100 H_2O		72.1740	—	−269.78	—	—	—	—
	in 200 H_2O		72.1740	—	−269.58	—	—	—	—
	in 400 H_2O		72.1740	—	−269.37	—	—	—	—
	in 500 H_2O		72.1740	—	−269.41	—	—	—	—
$KHS \cdot 0.25H_2O$		cr	76.6778	—	−337.2	—	—	—	—
$KHSO_3$		ai	120.1722	—	−878.60	−811.00	—	242.3	—
	in 400 H_2O		120.1722	—	−878.2	—	—	—	—
$KHSO_4$		cr	136.1716	—	−1160.6	−1031.3	—	138.1	—
		ai	136.1716	—	−1139.72	−1039.18	—	234.3	−63.
	in 20 H_2O		136.1716	—	−1144.3	—	—	—	—
$KHSO_4$	in 25 H_2O		136.1716	—	−1144.3	—	—	—	—
	in 50 H_2O		136.1716	—	−1144.3	—	—	—	—
	in 100 H_2O		136.1716	—	−1144.74	—	—	—	—
	in 200 H_2O		136.1716	—	−1145.58	—	—	—	—
	in 220 H_2O		136.1716	—	−1145.75	—	—	—	—
$KHSO_4$	in 400 H_2O		136.1716	—	−1147.17	—	—	—	—
	in 800 H_2O		136.1716	—	−1148.76	—	—	—	—
	in 1 000 H_2O		136.1716	—	−1149.26	—	—	—	—
	in 2 000 H_2O		136.1716	—	−1150.81	—	—	—	—
	in 5 000 H_2O		136.1716	—	−1153.5	—	—	—	—
$KHSO_4$	in 9 000 H_2O		136.1716	—	−1154.8	—	—	—	—
KSO_2F		cr	122.1632	—	−942.7	−866.9	—	146.	—
KSO_3F		cr	138.1626	—	−1159.0	—	—	—	—
		ai	138.1626	—	−1123.8	—	—	—	—
	in 600 HSO_3F		138.1626	—	−1193.7	—	—	—	—
$KI \cdot 4SO_2$		cr	422.2576	—	−1676.1	—	—	—	—
K_2Se		cr	157.1640	—	−395.0	—	—	—	—
		ai	157.1640	—	—	−437.2	—	—	—
$K_2Se \cdot 9H_2O$		cr	319.3026	—	−3087.0	—	—	—	—
$K_2Se \cdot 14H_2O$		cr	409.3796	—	−4524.2	—	—	—	—
$K_2Se \cdot 19H_2O$		cr	499.4566	—	−5991.9	—	—	—	—
K_2SeO_3		cr	205.1622	—	−982.0	—	—	—	—
		ai	205.1622	—	−1013.8	−936.3	—	218.0	—
K_2SeO_4		cr	221.1616	—	−1110.02	−1002.8	—	222.	—
		ai	221.1616	—	−1103.7	−1007.9	—	259.0	—
K_2SeO_4	in 220 H_2O		221.1616	—	−1102.5	—	—	—	—
	in 440 H_2O		221.1616	—	−1102.9	—	—	—	—
KHSe		cr	119.0700	—	−238.1	—	—	—	—
	from HSe^-	ai	119.0700	—	−236.4	−239.3	—	180.	—
	in 500 H_2O		119.0700	—	−236.0	—	—	—	—

Table 100:K — POTASSIUM (Prepared 1979) — Continued — Table 100:K

Substance Formula	Description	State	Molar mass g mol⁻¹	0 K: $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar): $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
KHSe	in 1 500 H_2O		119.0700	—	-236.4	—	—	—	—
$KHSeO_4$	from $HSeO_4^-$	ai	183.0676	—	-833.9	-735.5	—	251.9	—
	in 220 H_2O		183.0676	—	-841.0	—	—	—	—
K_2TeO_3		cr	253.8022	—	-1012.5	—	—	—	—
		ai	253.8022	—	-1049.3	—	—	—	—
K_2TeO_3	in 1 500 H_2O		253.8022	—	-1055.50	—	—	—	—
	in 6 000 H_2O		253.8022	—	-1045.2	—	—	—	—
$K_2TeO_3 \cdot 3H_2O$		cr	307.8484	—	-1907.9	—	—	—	—
K_2TeO_4	in 300 H_2O		269.8016	—	-1166.1	—	—	—	—
$K_2Te_2O_5$		cr	413.4010	—	-1322.	—	—	—	—
$K_2Te_4O_9$		cr	732.5986	—	-1954.	—	—	—	—
$K_2Te_4O_9 \cdot 4H_2O$		cr	804.6602	—	-3158.9	—	—	—	—
$K_2H_4TeO_6$	in 300 H_2O		305.8324	—	-1737.6	—	—	—	—
K_2TeBr_6		cr	685.2580	—	-977.4	—	—	—	—
KN_3		ai	81.1221	—	22.76	64.9	—	210.5	—
KNO_2	rhombic	cr	85.1075	-370.07	-369.82	-306.55	20.380	152.09	107.40
		ai	85.1075	—	-356.9	-315.4	—	225.5	—
	in 400 H_2O		85.1075	—	-356.832	—	—	—	—
	in 1 000 H_2O		85.1075	—	-356.707	—	—	—	—
	in 9 000 H_2O		85.1075	—	-356.812	—	—	—	—
KNO_3		cr	101.1069	-488.96	-494.63	-394.86	18.778	133.05	96.40
		ai	101.1069	—	-459.74	-394.53	—	248.9	-64.9
	in 15 H_2O		101.1069	—	-467.265	—	—	—	—
	in 20 H_2O		101.1069	—	-466.068	—	—	—	—
	in 25 H_2O		101.1069	—	-465.206	—	—	—	—
KNO_3	in 30 H_2O		101.1069	—	-464.550	—	—	—	—
	in 40 H_2O		101.1069	—	-463.633	—	—	—	—
	in 50 H_2O		101.1069	—	-462.997	—	—	—	—
	in 75 H_2O		101.1069	—	-462.027	—	—	—	—
	in 100 H_2O		101.1069	—	-461.487	—	—	—	—
KNO_3	in 150 H_2O		101.1069	—	-460.884	—	—	—	—
	in 200 H_2O		101.1069	—	-460.558	—	—	—	—
	in 300 H_2O		101.1069	—	-460.215	—	—	—	—
	in 400 H_2O		101.1069	—	-460.043	—	—	—	—
	in 500 H_2O		101.1069	—	-459.939	—	—	—	—
KNO_3	in 600 H_2O		101.1069	—	-459.868	—	—	—	—
	in 700 H_2O		101.1069	—	-459.822	—	—	—	—
	in 800 H_2O		101.1069	—	-459.784	—	—	—	—
	in 1 000 H_2O		101.1069	—	-459.734	—	—	—	—
	in 1 500 H_2O		101.1069	—	-459.679	—	—	—	—
KNO_3	in 2 000 H_2O		101.1069	—	-459.658	—	—	—	—
	in 3 000 H_2O		101.1069	—	-459.638	—	—	—	—
	in 5 000 H_2O		101.1069	—	-459.633	—	—	—	—
	in 10 000 H_2O		101.1069	—	-459.642	—	—	—	—
	in 20 000 H_2O		101.1069	—	-459.658	—	—	—	—
KNO_3	in 50 000 H_2O		101.1069	—	-459.679	—	—	—	—
	in 100 000 H_2O		101.1069	—	-459.696	—	—	—	—
	in 140 $HCON(CH_3)_2$ in dimethylformamide		101.1069	—	-494.21	—	—	—	—
	in 16 000 $NH_2C_2H_4NH_2$		101.1069	—	-490.57	—	—	—	—

Substance Formula	Substance Description	State	Molar mass g mol⁻¹	0 K: $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar): $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
	in ethylenediamine								
KNO_3	in CH_3OH:s		101.1069	—	-476.68	—	—	—	—
	in $(CH_3)_2SO$:s		101.1069	—	-491.54	—	—	—	—
	in dimethylsulfoxide								
KNH_2		cr	55.1247	—	-128.9	—	—	—	—
KNH_3		cr	56.1327	—	-72.8	-14.2	—	159.	—
$KNO_2{\cdot}KOH$		cr	141.2169	—	-805.09	—	—	—	—
$KNO_3{\cdot}KOH$		cr	157.2163	—	-922.03	—	—	—	—
KPO_3		cr	118.0740	—	—	—	16.259	108.49	90.21
		ai	118.0740	—	-1229.3	—	—	—	—
$KP_2O_7^{3-}$		ao	213.0454	—	-2516.2	-2215.4	—	51.5	—
K_3PO_4		cr	212.2774	—	-1950.2	—	—	—	—
K_3PO_4		ai	212.2774	—	-2034.7	-1868.5	—	87.9	—
	in 500 H_2O		212.2774	—	-2034.7	—	—	—	—
$K_4P_2O_7$		ai	330.3514	—	-3280.7	-3052.1	—	293.	—
KH_2PO_4		cr	136.0894	-1550.59	-1568.33	-1415.85	20.54	134.85	116.57
	from $H_2PO_4^-$	ai	136.0894	—	-1548.67	-1413.55	—	192.9	—
KH_2PO_4	in 31.18 H_2O, saturated		136.0894	—	-1550.331	—	—	—	—
	in 40 H_2O		136.0894	—	-1550.063	—	—	—	—
	in 50 H_2O		136.0894	—	-1549.883	—	—	—	—
	in 75 H_2O		136.0894	—	-1549.503	—	—	—	—
	in 100 H_2O		136.0894	—	-1549.310	—	—	—	—
KH_2PO_4	in 150 H_2O		136.0894	—	-1549.109	—	—	—	—
	in 200 H_2O		136.0894	—	-1549.005	—	—	—	—
	in 300 H_2O		136.0894	—	-1548.896	—	—	—	—
	in 500 H_2O		136.0894	—	-1548.762	—	—	—	—
	in 1 000 H_2O		136.0894	—	-1548.737	—	—	—	—
$KH_3P_2O_7$	from $H_3P_2O_7^-$	ai	216.0694	—	-2528.8	—	—	—	—
K_2HPO_4	from HPO_4^{2-}	ai	174.1834	—	-1796.90	-1655.69	—	171.5	—
$K_2H_2P_2O_7$		cr	254.1634	—	-2816.	—	—	—	—
	from $H_2P_2O_7^{2-}$	ai	254.1634	—	-2783.2	-2576.8	—	368.	—
$K_3HP_2O_7$	from $HP_2O_7^{3-}$	ai	292.2574	—	-3032.1	-2822.0	—	351.	—
KPF_6		cr	184.0662	-2347.81	-2350.6	-2205.3	36.128	225.89	158.36
		ai	184.0662	—	-2306.2	-2197.8	—	349.4	—
KAs		cr	114.0236	—	-102.9	—	—	—	—
KAs_2		cr	188.9452	—	-127.2	—	—	—	—
K_3As		cr	192.2276	—	-186.2	—	—	—	—
K_5As_4		cr	495.1964	—	-452.7	—	—	—	—
K_3AsO_4		ai	256.2252	—	-1645.27	-1498.23	—	144.8	—
KH_2AsO_4		cr	180.0372	-1165.66	-1180.7	-1035.9	22.970	155.02	126.73
	from $H_2AsO_4^-$	ai	180.0372	—	-1161.94	-1036.45	—	218.	—
K_2HAsO_4	from $HAsO_4^{2-}$	ai	218.1312	—	-1411.10	-1281.14	—	203.3	—
KSb		cr	160.8520	—	-82.42	—	—	—	—
KSb_2		cr	282.6020	—	-107.11	—	—	—	—
K_3Sb		cr	239.0560	—	-183.31	—	—	—	—
K_5Sb_4		cr	682.5100	—	-379.1	—	—	—	—
$3KBr{\cdot}2SbBr_3$		cr	1079.9870	—	-1742.2	—	—	—	—
K_3Bi		cr	326.2860	—	-232.2	—	—	—	—
KC_4		cr	87.1468	—	-31.0	—	—	—	—
KC_8		cr	135.1916	—	-33.5	—	—	—	—

Table 100:K — **POTASSIUM** (Prepared 1979) — Continued — Table 100:K

Substance Formula	Description	State	Molar mass g mol^{-1}	0 K: $\Delta_f H^\circ_0$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar): $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H^\circ_0$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
KC_{10}		cr	159.2140	—	-25.1	—	—	—	—
KC_{24}		cr	327.3708	—	-38.1	—	—	—	—
KC_{36}		cr	471.5052	—	-42.7	—	—	—	—
KC_{48}		cr	615.6396	—	-43.9	—	—	—	—
KC_{60}		cr	759.7740	—	-44.8	—	—	—	—
K_2CO_3		cr	138.2134	-1145.41	-1151.02	-1063.5	22.65	155.52	114.43
	G–H–S constraint has been relaxed; see Introduction								
		ai	138.2134	—	-1181.90	-1094.36	—	148.1	—
	in 10 H_2O		138.2134	—	-1182.8	—	—	—	—
	in 50 H_2O		138.2134	—	-1182.8	—	—	—	—
	in 100 H_2O		138.2134	—	-1181.6	—	—	—	—
K_2CO_3	in 200 H_2O		138.2134	—	-1180.7	—	—	—	—
	in 300 H_2O		138.2134	—	-1180.52	—	—	—	—
	in 500 H_2O		138.2134	—	-1180.52	—	—	—	—
	in 1 000 H_2O		138.2134	—	-1180.33	—	—	—	—
	in 1 500 H_2O		138.2134	—	-1179.55	—	—	—	—
K_2CO_3	in 2 000 H_2O		138.2134	—	-1178.76	—	—	—	—
	in 3 000 H_2O		138.2134	—	-1177.71	—	—	—	—
	in 4 000 H_2O		138.2134	—	-1177.04	—	—	—	—
	in 5 000 H_2O		138.2134	—	-1176.42	—	—	—	—
	in 6 000 H_2O		138.2134	—	-1175.91	—	—	—	—
K_2CO_3	in 7 500 H_2O		138.2134	—	-1175.24	—	—	—	—
	in 10 000 H_2O		138.2134	—	-1174.24	—	—	—	—
$K_2CO_3 \cdot 1.5H_2O$		cr	165.2365	—	-1609.2	-1432.5	—	203.3	—
$K_2C_2O_4$	oxalate	cr	166.2240	—	-1346.8	—	—	—	—
	in 30 H_2O		166.2240	—	-1331.01	—	—	—	—
$K_2C_2O_4$	in 35 H_2O		166.2240	—	-1330.80	—	—	—	—
	in 40 H_2O		166.2240	—	-1330.60	—	—	—	—
	in 50 H_2O		166.2240	—	-1330.14	—	—	—	—
	in 70 H_2O		166.2240	—	-1329.76	—	—	—	—
	in 100 H_2O		166.2240	—	-1329.30	—	—	—	—
$K_2C_2O_4$	in 200 H_2O		166.2240	—	-1328.80	—	—	—	—
	in 400 H_2O		166.2240	—	-1328.71	—	—	—	—
	in 500 H_2O		166.2240	—	-1328.67	—	—	—	—
	in 800 H_2O		166.2240	—	-1328.71	—	—	—	—
	in 1 000 H_2O		166.2240	—	-1328.71	—	—	—	—
$K_2C_2O_4$	in 1 500 H_2O		166.2240	—	-1328.75	—	—	—	—
	in 2 000 H_2O		166.2240	—	-1328.84	—	—	—	—
	in 2 500 H_2O		166.2240	—	-1328.88	—	—	—	—
	in 3 000 H_2O		166.2240	—	-1328.96	—	—	—	—
	in 4 000 H_2O		166.2240	—	-1329.05	—	—	—	—
$K_2C_2O_4$	in 5 000 H_2O		166.2240	—	-1329.13	—	—	—	—
	in 7 500 H_2O		166.2240	—	-1329.21	—	—	—	—
	in 10 000 H_2O		166.2240	—	-1329.30	—	—	—	—
	in 20 000 H_2O		166.2240	—	-1329.47	—	—	—	—
	in 25 000 H_2O		166.2240	—	-1329.51	—	—	—	—
$K_2C_2O_4$	in 50 000 H_2O		166.2240	—	-1329.55	—	—	—	—
	in 100 000 H_2O		166.2240	—	-1329.63	—	—	—	—
	in 200 000 H_2O		166.2240	—	-1329.72	—	—	—	—

Table 100:**K** **POTASSIUM** (Prepared 1979) — Continued Table 100:**K**

Substance Formula	Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H_0^\circ$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H_0^\circ$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
$K_2C_2O_4 \cdot H_2O$		cr	184.2394	—	-1644.7	—	—	—	—
$7K_2CO_3 \cdot 2CO_2 \cdot 9.5H_2O$		cr	1226.6601	—	-11898.0	—	—	—	—
HCOOK	formate	cr	84.1200	—	-679.73	—	—	—	—
		ai	84.1200	—	-677.93	-634.2	—	192.	-66.1
	in 200 H_2O		84.1200	—	-677.64	—	—	—	—
HCOOK	in 400 H_2O		84.1200	—	-677.64	—	—	—	—
$KHCO_3$		cr	100.1194	—	-963.2	-863.5	—	115.5	—
	G–H–S constraint has been relaxed; see Introduction								
	from HCO_3^-	ai	100.1194	—	-944.37	-870.04	—	193.7	—
	in 200 H_2O		100.1194	—	-942.2	—	—	—	—
	in 400 H_2O		100.1194	—	-942.2	—	—	—	—
$KHCO_3$	in 1 000 H_2O		100.1194	—	-942.7	—	—	—	—
	in 2 000 H_2O		100.1194	—	-943.1	—	—	—	—
CH_3OK	in 60 CH_3OH		70.1366	—	-452.3	—	—	—	—
KHC_2O_4	from $HC_2O_4^-$	ai	128.1300	—	-1070.7	-981.61	—	251.9	—
	in 500 H_2O		128.1300	—	-1070.69	—	—	—	—
CH_3COOK	acetate	cr	98.1472	—	-723.0	—	—	—	—
		ai	98.1472	—	-738.39	-652.58	—	189.1	15.5
	in 4.5 H_2O		98.1472	—	-729.355	—	—	—	—
	in 5 H_2O		98.1472	—	-730.234	—	—	—	—
	in 5.5 H_2O		98.1472	—	-730.869	—	—	—	—
CH_3COOK	in 6 H_2O		98.1472	—	-731.405	—	—	—	—
	in 7 H_2O		98.1472	—	-732.242	—	—	—	—
	in 8 H_2O		98.1472	—	-732.869	—	—	—	—
	in 9 H_2O		98.1472	—	-733.321	—	—	—	—
	in 10 H_2O		98.1472	—	-733.706	—	—	—	—
CH_3COOK	in 12 H_2O		98.1472	—	-734.250	—	—	—	—
	in 15 H_2O		98.1472	—	-734.752	—	—	—	—
	in 20 H_2O		98.1472	—	-735.330	—	—	—	—
	in 25 H_2O		98.1472	—	-735.685	—	—	—	—
	in 30 H_2O		98.1472	—	-735.907	—	—	—	—
CH_3COOK	in 40 H_2O		98.1472	—	-736.233	—	—	—	—
	in 50 H_2O		98.1472	—	-736.468	—	—	—	—
	in 75 H_2O		98.1472	—	-736.836	—	—	—	—
	in 100 H_2O		98.1472	—	-737.045	—	—	—	—
	in 150 H_2O		98.1472	—	-737.284	—	—	—	—
CH_3COOK	in 200 H_2O		98.1472	—	-737.422	—	—	—	—
	in 300 H_2O		98.1472	—	-737.597	—	—	—	—
	in 400 H_2O		98.1472	—	-737.702	—	—	—	—
	in 500 H_2O		98.1472	—	-737.773	—	—	—	—
	in 600 H_2O		98.1472	—	-737.823	—	—	—	—
CH_3COOK	in 800 H_2O		98.1472	—	-737.894	—	—	—	—
	in 1 000 H_2O		98.1472	—	-737.945	—	—	—	—
	in 1 500 H_2O		98.1472	—	-738.028	—	—	—	—
	in 2 000 H_2O		98.1472	—	-738.074	—	—	—	—
	in 3 000 H_2O		98.1472	—	-738.129	—	—	—	—
CH_3COOK	in 5 000 H_2O		98.1472	—	-738.187	—	—	—	—
	in 10 000 H_2O		98.1472	—	-738.246	—	—	—	—
	in 20 000 H_2O		98.1472	—	-738.288	—	—	—	—

Table 100:K — **POTASSIUM** (Prepared 1979) — Continued — Table 100:K

Substance Formula	Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
CH_3COOK	in 50 000 H_2O		98.1472	—	-738.325	—	—	—	—
	in C_2H_5OH:u		98.1472	—	-713.71	—	—	—	—
	in CH_3CO_2H:u in acetic acid		98.1472	—	-692.9	—	—	—	—
$CH_2OHCOOK$	glycolate	cr	114.1466	—	-907.9	—	—	—	—
		ai	114.1466	—	-903.7	—	—	—	—
$CH_2OHCOOK$	in 200 H_2O		114.1466	—	-902.9	—	—	—	—
	in 1 200 H_2O		114.1466	—	-903.3	—	—	—	—
$CH_2OHCOOK \cdot 0.5H_2O$		cr	123.1543	—	-1064.4	—	—	—	—
C_2H_5OK	ethylate	cr	84.1638	—	-412.1	—	—	—	—
	in 60 C_2H_5OH in ethanol		84.1638	—	-486.2	—	—	—	—
$KHC_2O_4 \cdot H_2C_2O_4$		cr	218.1660	—	-1951.0	—	—	—	—
$KHC_2O_4 \cdot H_2C_2O_4 \cdot 2H_2O$		cr	254.1968	—	-2533.0	—	—	—	—
$C_2H_5OK \cdot C_2H_5OH$		cr	130.2336	—	-725.9	—	—	—	—
CCl_3COOK	trichloroacetate	ai	201.4822	—	-768.6	—	—	—	—
	in 400 H_2O		201.4822	—	-767.8	—	—	—	—
$ClCH_2COOK$	chloroacetate	ai	132.5922	—	-753.66	—	—	—	—
$Cl_2CHCOOK$	dichloroacetate	ai	167.0372	—	-764.4	—	—	—	—
$C_2H_2O_2 \cdot 2KHSO_3$	glyoxal bisulfite	cr	298.3816	—	-2219.	—	—	—	—
	in 800 H_2O		298.3816	—	-2164.4	—	—	—	—
KCN		cr	65.1199	-117.880	-113.0	-101.86	17.393	128.49	66.27
KCN		g	65.1199	89.931	90.8	64.17	13.339	261.90	52.34
		ai	65.1199	—	-101.7	-110.9	—	196.6	—
	in 200 H_2O		65.1199	—	-101.3	—	—	—	—
KCNO	cyanate	cr	81.1193	—	-418.65	—	—	—	—
		ai	81.1193	—	-398.3	-380.7	—	209.2	—
KCNO	in 200 H_2O		81.1193	—	-398.27	—	—	—	—
	in 5 500 H_2O		81.1193	—	-398.27	—	—	—	—
$CONH_2COOK$	oxamate	cr	127.1453	—	-922.2	—	—	—	—
	in 1 000 H_2O		127.1453	—	-892.4	—	—	—	—
CH_2NH_2COOK	glycinate	ai	113.1619	—	-722.16	-598.11	—	221.8	—
KCNS	thiocyanate	cr	97.1839	-200.748	-200.16	-178.31	17.472	124.26	88.53
		ai	97.1839	—	-175.94	-190.56	—	246.9	-18.4
	in 2 H_2O		97.1839	—	-186.983	—	—	—	—
	in 2.5 H_2O		97.1839	—	-186.439	—	—	—	—
	in 3 H_2O		97.1839	—	-185.937	—	—	—	—
KCNS	in 4 H_2O		97.1839	—	-185.016	—	—	—	—
	in 4.5 H_2O		97.1839	—	-184.565	—	—	—	—
	in 5 H_2O		97.1839	—	-184.138	—	—	—	—
	in 6 H_2O		97.1839	—	-183.427	—	—	—	—
	in 7 H_2O		97.1839	—	-182.791	—	—	—	—
KCNS	in 8 H_2O		97.1839	—	-182.297	—	—	—	—
	in 9 H_2O		97.1839	—	-181.828	—	—	—	—
	in 10 H_2O		97.1839	—	-181.418	—	—	—	—
	in 12 H_2O		97.1839	—	-180.728	—	—	—	—
	in 15 H_2O		97.1839	—	-179.975	—	—	—	—
KCNS	in 20 H_2O		97.1839	—	-179.096	—	—	—	—
	in 25 H_2O		97.1839	—	-178.494	—	—	—	—
	in 30 H_2O		97.1839	—	-178.058	—	—	—	—
	in 40 H_2O		97.1839	—	-177.477	—	—	—	—

Substance Formula	Description	State	Molar mass g mol^{-1}	0 K $\Delta_f H^\circ_0$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H^\circ_0$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
KCNS	in 50 H_2O		97.1839	—	-177.109	—	—	—	—
	in 75 H_2O		97.1839	—	-176.582	—	—	—	—
	in 100 H_2O		97.1839	—	-176.310	—	—	—	—
	in 150 H_2O		97.1839	—	-176.038	—	—	—	—
	in 200 H_2O		97.1839	—	-175.908	—	—	—	—
KCNS	in 300 H_2O		97.1839	—	-175.791	—	—	—	—
	in 400 H_2O		97.1839	—	-175.741	—	—	—	—
	in 500 H_2O		97.1839	—	-175.720	—	—	—	—
	in 1 000 H_2O		97.1839	—	-175.703	—	—	—	—
	in 1 500 H_2O		97.1839	—	-175.720	—	—	—	—
KCNS	in 2 000 H_2O		97.1839	—	-175.732	—	—	—	—
	in 3 000 H_2O		97.1839	—	-175.749	—	—	—	—
	in 5 000 H_2O		97.1839	—	-175.778	—	—	—	—
	in 10 000 H_2O		97.1839	—	-175.816	—	—	—	—
	in 20 000 H_2O		97.1839	—	-175.845	—	—	—	—
KCNS	in 50 000 H_2O		97.1839	—	-175.879	—	—	—	—
	in $HCONH_2$:s in formamide		97.1839	—	-203.09	—	—	—	—
	in $HCONHCH_3$:s in N-methylformamide		97.1839	—	-204.35	—	—	—	—
	in $HCON(CH_3)_2$:s in N,N-dimethylformamide		97.1839	—	-224.85	—	—	—	—
	in $CH_3CON(CH_3)_2$:s in N,N-dimethylacetamide		97.1839	—	-219.37	—	—	—	—
KCNS	in $(C_4H_9O)_3PO$:s in tributyl phosphate		97.1839	—	-206.3	—	—	—	—
$KCNS{\cdot}0.5SO_2$		cr	129.2153	—	-372.4	-330.1	—	174.1	—
$KCNS{\cdot}2SO_2$		cr	225.3095	—	-876.5	-777.7	—	339.	—
K_2SiO_3		cr	154.2882	—	—	—	21.88	146.0	118.4
$K_2Si_2O_5$		cr	214.3730	—	—	—	28.819	190.58	160.71
K_2SiF_6		cr	220.2804	—	-2956.0	-2798.6	—	225.9	—
		ai	220.2804	—	-2893.7	-2765.9	—	327.2	—
K_2GeF_6		cr	264.7844	—	—	-2438.3	—	—	—
$KSnCl_3$		ai	264.1510	—	-739.3	-713.3	—	364.	—
K_2SnCl_6		cr	409.6120	—	-1477.0	-1332.9	—	366.52	246.02
K_2SnCl_6	in 400 H_2O		409.6120	—	-1464.8	—	—	—	—
$K_2SnCl_6{\cdot}H_2O$		cr	427.6274	—	-1806.2	—	—	—	—
K_2SnOCl_4		cr	354.7054	—	-1476.	—	—	—	—
$KSnBr_3$		ai	397.5190	—	-627.2	-630.1	—	356.	—
K_2SnBr_6		cr	676.3480	—	-1218.0	-1160.2	—	443.1	246.02
$KPbCl_3{\cdot}1/3H_2O$		cr	358.6561	—	-900.8	-812.9	—	247.	—
$KCl{\cdot}2PbCl_2$		cr	630.7470	—	-1170.3	-1054.3	—	364.	—
$KPbBr_3$		ai	486.0190	—	—	-626.3	—	—	—
$KPbI_3$		ai	627.0052	—	—	-482.0	—	—	—
K_2PbI_4		cr	793.0116	—	-833.5	—	—	—	—
K_2PbI_4		ai	793.0116	—	—	-821.3	—	—	—
$K_2PbI_4{\cdot}2H_2O$		cr	829.0424	—	-1420.5	—	—	—	—
$4KI{\cdot}3PbI_2$		cr	2047.0220	—	-1831.3	—	—	—	—
$4KI{\cdot}3PbI_2{\cdot}6H_2O$		cr	2155.1144	—	-3599.9	—	—	—	—
$K_2Pb(SO_4)_2$		cr	477.5172	—	-2379.9	-2152.5	—	315.1	—
KBO_2		cr	81.9118	-976.71	-981.6	-923.4	12.113	80.00	66.73

Substance Formula	and Description	State	Molar mass	0 K	298.15 K (25°C) and 0.1 MPa (1 bar)				
			g mol^{-1}	$\Delta_f H_0^\circ$ kJ mol^{-1}	$\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H_0^\circ$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
KBO_2		g	81.9118	—	-469.	—	—	—	—
		ai	81.9118	—	-1024.75	-962.16	—	65.3	—
$KB_5O_8 \cdot 4H_2O$		cr	293.2138	—	—	—	54.844	364.43	330.49
$K_2O \cdot B_2O_3$		cr	163.8236	-1953.43	-1963.1	-1846.8	24.225	160.00	133.47
$K_2B_4O_7 \cdot 4H_2O$		cr	305.5054	—	—	-4134.7	—	—	—
$K_2O \cdot 3B_2O_3$		cr	303.0640	—	-4658.9	—	—	—	—
$K_2O \cdot 4B_2O_3$		cr	372.6842	—	-5975.2	—	—	—	—
		vit	372.6842	—	-5902.8	—	—	—	—
KBH_4		cr	53.9450	-218.61	-227.40	-160.27	16.472	106.27	96.06
		ai	53.9450	—	-204.22	-168.93	—	213.0	—
$KB(OH)_4$	from $B(OH)_4^-$	ai	117.9426	—	-1596.41	-1436.45	—	205.	—
KBF_4		cr	125.9066	-1877.28	-1882.0	-1785.7	21.280	152.30	110.58
		ai	125.9066	—	-1827.2	-1770.2	—	285.	—
KBF_3OH		cr	123.9156	—	-1810.84	—	—	—	—
	from BF_3OH^-	ai	123.9156	—	-1779.5	-1697.8	—	268.	—
KBF_3OH	in 400 H_2O		123.9156	—	-1780.3	—	—	—	—
$K_2B_3F_4O_3OH$		cr	251.6362	—	-3736.7	—	—	—	—
	in 800 H_2O		251.6362	—	-3661.0	—	—	—	—
$KBCl_4$		cr	191.7250	—	-910.9	—	—	—	—
$KAlH_4$		cr	70.1155	—	-183.7	—	—	—	—
K_3AlF_6		cr	258.2779	—	-3358.1	—	—	—	—
		aq	258.2779	—	-3315.0	—	—	—	—
$K_3AlF_6 \cdot 3.5H_2O$		cr	321.3318	—	-4427.1	—	—	—	—
$KAlCl_4$		cr	207.8955	—	-1193.3	—	—	—	—
K_3AlCl_6		cr	357.0055	—	-2081.5	—	—	—	—
$K_3Al_2Cl_9$		cr	490.3460	—	-2836.8	—	—	—	—
$KAlBr_4$		cr	385.7195	—	-969.0	—	—	—	—
KAl_2Br_7		cr	652.4280	—	-1469.4	—	—	—	—
$KBr \cdot AlCl_3$		cr	252.3515	—	-1141.4	—	—	—	—
$KCl \cdot AlBr_3$		cr	341.2635	—	-1005.8	—	—	—	—
$KCl \cdot 2AlBr_3$		cr	607.9720	—	-1525.1	—	—	—	—
$KAl(SO_4)_2$		cr	258.2067	—	-2470.2	-2240.0	—	204.6	192.97
	from Al^{3+}, SO_4^{2-}	ai	258.2067	—	-2602.	-2259.	—	-179.1	—
$KAl(SO_4)_2 \cdot 3H_2O$		cr	312.2529	—	-3381.1	-2974.5	—	314.	—
$KAl(SO_4)_2 \cdot 12H_2O$		cr	474.3915	—	-6061.8	-5141.0	—	687.4	651.03
$KAl(SeO_4)_2$		cr	351.9987	—	-1859.8	—	—	—	—
	in 1 600 H_2O		351.9987	—	-1982.8	—	—	—	—
$KAl(SeO_4)_2 \cdot 12H_2O$		cr	568.1835	—	-5441.3	—	—	—	—
$K_2Al(NO_3)_5$		cr	415.2100	—	-1965.2	—	—	—	—
$K_3Al(NO_3)_6$		cr	516.3169	—	-2533.8	—	—	—	—
$KAlCl_4 \cdot 6NH_3$		cr	310.0797	—	-1994.5	—	—	—	—
$KAl_2(PO_4)_2OH \cdot 2H_2O$		cr	336.0460	—	—	—	49.37	294.68	320.20
$K_3H_6Al_5(PO_4)_8 \cdot 18H_2O$	potassium taranakite	cr	1342.3099	-18679.0	-18919.2	-17417.3	241.75	3496.2	1482.4
$KAlSiO_4$	kaliophilite	cr	158.1671	—	-2121.3	-2005.3	—	133.1	119.79
$KAlSi_2O_6$	leucite	cr	218.2519	—	-3034.2	-2871.4	—	200.0	164.14
$KAlSi_2O_6$		vit	218.2519	—	-3058.1	—	—	—	—
$KAlSi_3O_8$	sanidine	cr	278.3367	-3937.69	-3959.7	-3739.9	33.97	232.88	204.51
	microcline	cr2	278.3367	-3946.06	-3968.1	-3742.9	33.97	214.22	202.38
		vit	278.3367	—	-3917.5	—	—	—	—

Table 100:K **POTASSIUM** (Prepared 1979) — Continued Table 100:K

Substance Formula and Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
$KAl_3Si_3O_{10}(OH)_2$ muscovite	cr	398.3133	—	-5984.4	-5608.4	—	306.3	—
$KZnF_3$	cr	161.4672	—	-1379.5	—	—	—	—
$K_2Zn(SO_4)_2$	cr	335.6972	—	-2434.3	—	—	—	—
$K_2Zn(SO_4)_2 \cdot 2H_2O$	cr	371.7280	—	-3037.6	—	—	—	—
$K_2Zn(SO_4)_2 \cdot 6H_2O$	cr	443.7896	—	-4234.2	—	—	—	—
$K_2Zn(SO_4)_2 \cdot 6D_2O$	cr	455.8628	—	-4284.4	—	—	—	—
$KCl \cdot ZnSO_4$	cr	235.9866	—	-1447.7	—	—	—	—
$KBr \cdot ZnSO_4$	cr	280.4426	—	-1402.9	—	—	—	—
$KI \cdot ZnSO_4$	cr	327.4380	—	-1332.2	—	—	—	—
$K_2Zn(CN)_4$	cr	247.6456	—	-100.0	—	—	—	—
$K_2Zn(CN)_4$	ai	247.6456	—	-162.3	-119.6	—	431.	—
in 400 H_2O		247.6456	—	-162.3	—	—	—	—
$K_2Zn(CNS)_4$	ai	375.9016	—	—	-350.1	—	—	—
$KCdCl_3$	cr	257.8610	—	-841.0	—	—	—	—
	ai	257.8610	—	-813.4	-770.2	—	305.4	—
$KCdCl_3$ in 400 H_2O		257.8610	—	-815.9	—	—	—	—
$KCdCl_3 \cdot H_2O$	cr	275.8764	—	-1139.7	-1010.8	—	251.	—
$KCl \cdot 3CdCl_2 \cdot 4H_2O$	cr	696.5346	—	-2824.6	-2431.0	—	615.	—
K_4CdCl_6	cr	481.5260	—	-2181.5	-2006.5	—	389.	—
$KCdBr_3$	ai	391.2290	—	—	-690.8	—	—	—
$KCdBr_3 \cdot H_2O$	cr	409.2444	—	-1012.9	-925.5	—	285.	—
$KBr \cdot 3CdBr_2 \cdot 4H_2O$	cr	1007.7266	—	-2530.9	-2234.9	—	695.	—
$KCdI_3$	ai	532.2152	—	—	-542.7	—	—	—
$KCdI_3 \cdot H_2O$	cr	550.2306	—	-830.1	-774.8	—	339.	—
K_2CdI_4	ai	698.2216	—	-846.4	-882.4	—	531.	—
$K_2CdI_4 \cdot 2H_2O$	cr	734.2524	—	-1450.6	-1344.6	—	523.	—
$K_2Cd(SO_4)_2 \cdot 1.5H_2O$	cr	409.7503	—	-2816.04	—	—	—	—
$K_2Cd(SO_4)_2 \cdot 2CdSO_4 \cdot 5H_2O$	cr	889.7274	—	-5752.2	—	—	—	—
K_3Hg	g	317.8960	—	61.	—	—	—	—
$KHgCl_3$	cr	346.0510	—	-671.1	—	—	—	—
$KHgCl_3$	ai	346.0510	—	-641.0	-592.4	—	314.	—
in 450 H_2O		346.0510	—	-643.1	—	—	—	—
$KHgCl_3 \cdot H_2O$	cr	364.0664	—	-964.8	—	—	—	—
K_2HgCl_4	cr	420.6060	—	-1113.8	—	—	—	—
	ai	420.6060	—	-1058.6	-1013.3	—	498.	—
K_2HgCl_4 in 400 H_2O		420.6060	—	-1055.6	—	—	—	—
$K_2HgCl_4 \cdot H_2O$	cr	438.6214	—	-1406.7	—	—	—	—
$KHgBr_3$	cr	479.4190	—	-550.2	—	—	—	—
	ai	479.4190	—	-545.6	-542.7	—	360.	—
in 4 000 H_2O		479.4190	—	-540.6	—	—	—	—
$KHgBr_3 \cdot H_2O$	cr	497.4344	—	-850.6	—	—	—	—
K_2HgBr_4	cr	598.4300	—	-963.6	—	—	—	—
	ai	598.4300	—	-935.5	-937.6	—	515.	—
in 600 H_2O		598.4300	—	-925.1	—	—	—	—
in 4 000 H_2O		598.4300	—	-926.3	—	—	—	—
$KHgI_3$	cr	620.4052	—	-442.7	—	—	—	—
	ai	620.4052	—	-405.0	-431.8	—	406.	—
$KHgI_3 \cdot H_2O$	cr	638.4206	—	-728.0	—	—	—	—
K_2HgI_4	cr	786.4116	—	-774.0	—	—	—	—
	ai	786.4116	—	-739.7	-778.2	—	565.	—

Table 100:**K** **POTASSIUM** (Prepared 1979) — Continued Table 100:**K**

Substance Formula and Description		State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
K_2HgI_4	in 1 000 H_2O		786.4116	—	-735.5	—	—	—	—
$KHg(CN)_3$		ai	317.7457	—	144.8	180.0	—	327.6	—
	in 500 H_2O		317.7457	—	146.0	—	—	—	—
$K_2Hg(CN)_4$		cr	382.8656	—	-32.2	—	—	—	—
		ai	382.8656	—	21.8	51.9	—	510.	—
$K_2Hg(CN)_4$	in 600 H_2O		382.8656	—	27.2	—	—	—	—
$KCl{\cdot}Hg(CN)_2$		cr	327.1808	—	-179.9	—	—	—	—
$KCl{\cdot}Hg(CN)_2{\cdot}H_2O$		cr	345.1962	—	-473.6	—	—	—	—
$KBr{\cdot}Hg(CN)_2$		cr	371.6368	—	-148.5	—	—	—	—
$KBr{\cdot}Hg(CN)_2{\cdot}1.5H_2O$		cr	398.6599	—	-581.6	—	—	—	—
$KI{\cdot}Hg(CN)_2$		cr	418.6322	—	-91.6	—	—	—	—
$KI{\cdot}Hg(CN)_2{\cdot}0.25H_2O$		cr	423.1360	—	-164.4	—	—	—	—
$KCuF_3$		cr	159.6372	—	—	—	22.539	147.86	119.12
$KCuCl_3$		cr	209.0010	—	-671.5	—	—	—	—
K_2CuCl_3		cr	248.1030	—	-1016.7	—	—	—	—
K_2CuCl_3		ai	248.1030	—	—	-941.	—	—	—
K_2CuCl_4		cr	283.5560	—	-1110.9	-1010.4	—	270.7	—
	in 800 H_2O		283.5560	—	-1102.9	—	—	—	—
$K_2CuCl_4{\cdot}2H_2O$		cr	319.5868	-1694.06	-1707.1	-1492.7	50.141	355.43	253.232
$K_2Cu(SO_4)_2$	blue	cr	333.8672	—	-2209.6	—	—	—	—
$K_2Cu(SO_4)_2$	white, prepared at 180–200°C	cr2	333.8672	—	-2223.8	—	—	—	—
	fused	cr3	333.8672	—	-2215.0	—	—	—	—
$K_2Cu(SO_4)_2{\cdot}0.5H_2O$		cr	342.8749	—	-2361.4	—	—	—	—
$K_2Cu(SO_4)_2{\cdot}0.5D_2O$		cr	343.8810	—	-2363.1	—	—	—	—
$K_2Cu(SO_4)_2{\cdot}2H_2O$		cr	369.8980	—	-2826.7	—	—	—	—
$K_2Cu(SO_4)_2{\cdot}6H_2O$		cr	441.9596	—	-4023.8	—	—	—	—
$K_2Cu(CO_3)_2$	author's form 2, β	cr	261.7628	—	-1733.4	—	—	—	—
	author's form 4, β	cr2	261.7628	—	-1741.8	—	—	—	—
	author's form 5, α	cr3	261.7628	—	-1744.3	—	—	—	—
$K_2Cu(HCO_3)_4$		cr	385.8136	—	—	-2913.9	—	—	—
$KCu(CN)_2$		ai	154.6778	—	-25.5	—	—	—	—
	in $(CH_3)_2SO$:s in dimethylsulfoxide		154.6778	—	-80.8	—	—	—	—
$K_2Cu(CN)_3$		ai	219.7977	—	—	-162.7	—	—	—
$K_3Cu(CN)_4$		ai	284.9176	—	—	-283.2	—	—	—
	in $(CH_3)_2SO$:s in dimethylsulfoxide		284.9176	—	-348.5	—	—	—	—
$K_3Cu(CNS)_4$		ai	413.1736	—	-428.9	-485.7	—	950.	—
$KAgCl_2$		cr	217.8780	—	-563.2	—	—	—	—
		ai	217.8780	—	-497.5	-498.7	—	333.9	—
$KAgBr_2$		cr	306.7900	—	-492.5	—	—	—	—
		ai	306.7900	—	—	-455.6	—	—	—
K_2AgBr_3		ai	425.8010	—	—	-851.0	—	—	—
$K_3AgBr_4{\cdot}0.5H_2O$		cr	553.8197	—	-1418.4	—	—	—	—
$KAgI_2$		cr	400.7808	—	-382.4	—	—	—	—
		ai	400.7808	—	—	-370.3	—	—	—
K_2AgI_3		ai	566.7872	—	-686.6	-720.5	—	458.1	—

Table 100:**K** **POTASSIUM** (Prepared 1979) — Continued Table 100:**K**

Substance Formula and Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H_0^\circ$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H_0^\circ$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
K_3AgI_4	cr	732.7936	—	-1041.8	—	—	—	—
	ai	732.7936	—	—	-1059.4	—	—	—
$K_3AgI_4 \cdot 0.5H_2O$	cr	741.8013	—	-1180.7	—	—	—	—
$K_3Ag_2I_5 \cdot H_2O$	cr	985.5834	—	-1391.2	—	—	—	—
$KAg(CN)_2$	cr	199.0078	—	-16.7	—	—	—	—
$KAg(CN)_2$	ai	199.0078	—	18.0	22.2	—	297.	—
in $(CH_3)_2SO$:s in dimethylsulfoxide		199.0078	—	-2.5	—	—	—	—
$KNiF_3$	cr	154.8072	—	—	—	22.217	163.2	154.22
$KNiCl_3$	cr	204.1710	—	-750.19	—	—	—	—
$K_2Ni(CN)_4$	ai	240.9856	—	-136.8	-94.5	—	423.	—
$K_2Ni(CN)_4$	aq	240.9856	—	-128.4	—	—	—	—
$KCoF_3$	cr	155.0304	—	—	—	23.723	176.6	120.50
$K(Co(NH_3)_2(NO_2)_4)$	cr	316.1186	—	-969.9	—	—	—	—
	ai	316.1186	—	-911.7	—	—	—	—
in 30 000 H_2O		316.1186	—	-914.62	—	—	—	—
$K_2CO_3 \cdot CoCO_3$	cr	257.1560	—	-1875.3	—	—	—	—
$K_2CO_3 \cdot CoCO_3 \cdot 4H_2O$	cr	329.2176	—	-3066.0	—	—	—	—
$K_3(Co(C_2O_4)_3)$ oxalate	cr	440.2992	—	-3181.	—	—	—	—
in 20 000 H_2O		440.2992	—	-3147.	—	—	—	—
$K_3(Co(C_2O_4)_3) \cdot 3H_2O$	cr	494.3454	—	-4079.	—	—	—	—
$K_3Co(CN)_6$	cr	332.3466	—	—	—	—	401.66	308.78
	ai	332.3466	—	—	—	—	540.2	—
$K(Co(NH_3)_2(NO_2)_2C_2O_4)$	cr	312.1276	—	-1535.5	—	—	—	—
in 18 000 H_2O		312.1276	—	-1494.9	—	—	—	—
K_2FeO_4	ai	198.0486	—	-973.2	—	—	—	—
$KFeCl_3$	g	201.3080	—	-501.	—	—	—	—
$KFeCl_4$	cr	236.7610	—	-868.2	—	—	—	—
	g	236.7610	—	-691.	—	—	—	—
$K_3Fe(CN)_6$	cr	329.2604	—	-249.8	-129.6	—	426.06	—
from $Fe(CN)_6^{3-}$	ai	329.2604	—	-195.4	-120.4	—	577.8	—
$K_3Fe(CN)_6$ in 400 H_2O		329.2604	—	-194.17	—	—	—	—
in 500 H_2O		329.2604	—	-194.05	—	—	—	—
in 800 H_2O		329.2604	—	-193.76	—	—	—	—
in 1 000 H_2O		329.2604	—	-193.63	—	—	—	—
in 1 500 H_2O		329.2604	—	-193.55	—	—	—	—
$K_3Fe(CN)_6$ in 2 000 H_2O		329.2604	—	-193.51	—	—	—	—
in 2 500 H_2O		329.2604	—	-193.55	—	—	—	—
in 3 000 H_2O		329.2604	—	-193.55	—	—	—	—
in 4 000 H_2O		329.2604	—	-193.64	—	—	—	—
in 5 000 H_2O		329.2604	—	-193.72	—	—	—	—
$K_3Fe(CN)_6$ in 10 000 H_2O		329.2604	—	-193.97	—	—	—	—
in 20 000 H_2O		329.2604	—	-194.26	—	—	—	—
in 30 000 H_2O		329.2604	—	-194.43	—	—	—	—
in 50 000 H_2O		329.2604	—	-194.60	—	—	—	—
in 100 000 H_2O		329.2604	—	-194.81	—	—	—	—
$K_3Fe(CN)_6$ in 200 000 H_2O		329.2604	—	-194.97	—	—	—	—
in 500 000 H_2O		329.2604	—	-195.10	—	—	—	—
$K_4Fe(CN)_6$	cr	368.3624	-591.20	-594.1	-453.0	62.220	418.8	332.21
from $FeCN)_6^{4-}$	ai	368.3624	—	-554.0	-438.01	—	505.0	—

Substance Formula and Description		State	Molar mass $g\ mol^{-1}$	0 K: $\Delta_f H^\circ_0$ $kJ\ mol^{-1}$	298.15 K (25°C) and 0.1 MPa (1 bar): $\Delta_f H^\circ$ $kJ\ mol^{-1}$	$\Delta_f G^\circ$ $kJ\ mol^{-1}$	$H^\circ - H^\circ_0$ $kJ\ mol^{-1}$	S° $J\ mol^{-1}\ K^{-1}$	C_p $J\ mol^{-1}\ K^{-1}$
$K_4Fe(CN)_6$	in 400 H_2O		368.3624	—	-551.33	—	—	—	—
	in 500 H_2O		368.3624	—	-551.03	—	—	—	—
	in 700 H_2O		368.3624	—	-550.57	—	—	—	—
	in 800 H_2O		368.3624	—	-550.45	—	—	—	—
	in 1 000 H_2O		368.3624	—	-550.28	—	—	—	—
$K_4Fe(CN)_6$	in 1 500 H_2O		368.3624	—	-550.07	—	—	—	—
	in 2 000 H_2O		368.3624	—	-550.03	—	—	—	—
	in 2 500 H_2O		368.3624	—	-550.07	—	—	—	—
	in 3 000 H_2O		368.3624	—	-550.15	—	—	—	—
	in 5 000 H_2O		368.3624	—	-550.40	—	—	—	—
$K_4Fe(CN)_6$	in 7 000 H_2O		368.3624	—	-550.66	—	—	—	—
	in 10 000 H_2O		368.3624	—	-550.95	—	—	—	—
	in 15 000 H_2O		368.3624	—	-551.28	—	—	—	—
	in 20 000 H_2O		368.3624	—	-551.53	—	—	—	—
	in 30 000 H_2O		368.3624	—	-551.87	—	—	—	—
$K_4Fe(CN)_6$	in 50 000 H_2O		368.3624	—	-552.25	—	—	—	—
	in 100 000 H_2O		368.3624	—	-552.66	—	—	—	—
	in 200 000 H_2O		368.3624	—	-553.00	—	—	—	—
	in 500 000 H_2O		368.3624	—	-553.33	—	—	—	—
$K_4Fe(CN)_6\cdot 3H_2O$		cr	422.4086	-1452.68	-1466.5	-1168.8	89.780	593.7	482.42
$K_3FeCO(CN)_5$		cr	331.2531	—	-583.2	—	—	—	—
	in 2 500 H_2O		331.2531	—	-564.0	—	—	—	—
$K_3FeCO(CN)_5\cdot 3.5H_2O$		cr	394.3070	—	-1608.7	—	—	—	—
$KFe_3AlSi_3O_{10}(OH)_2$	annite	cr	511.8913	—	-5443.8	—	—	—	—
$KZn_{1.5}Fe(CN)_6$		cr	349.1114	—	—	70.8	—	—	—
$KZn_{1.5}Fe(CN)_6$	from $Fe(CN)_6^{4-}$	ai	349.1114	—	—	191.3	—	—	—
$K_2CdFe(CN)_6$		cr	402.5584	—	—	-46.8	—	—	—
	from $Fe(CN)_6^{4-}$	ai	402.5584	—	—	50.7	—	—	—
$K_{12}Cd_8(Fe(CN)_6)_7$		cr	2852.1047	—	—	155.	—	—	—
$K_2Cu_2Fe(CN)_6$		cr	417.2384	—	—	77.1	—	—	—
$K_2Cu_2Fe(CN)_6$	from $Fe(CN)_6^{4-}$	ai	417.2384	—	—	229.4	—	—	—
$K_2Ni_3(Fe(CN)_6)_2$		cr	678.2428	—	—	506.	—	—	—
$K_4Ni_4(Fe(CN)_6)_3$		cr	1027.1112	—	—	507.	—	—	—
$K_{12}Ni_8(Fe(CN)_6)_7$		cr	2422.5848	—	—	473.	—	—	—
$K_2Co_3(Fe(CN)_6)_2$		cr	678.9124	—	—	502.	—	—	—
$K_4Co_4(Fe(CN)_6)_3$		cr	1028.0040	—	—	477.	—	—	—
$KPdCl_3$		ai	251.8610	—	—	-559.4	—	—	—
K_2PdCl_4		cr	326.4160	—	-1109.6	—	—	—	—
		ai	326.4160	—	-1054.8	—	—	—	—
	in 1 500 H_2O		326.4160	—	-1054.4	—	—	—	—
K_2PdCl_6		cr	397.3220	—	-1226.3	—	—	—	—
		ai	397.3220	—	—	-996.5	—	—	—
$KPdBr_3$		ai	385.2290	—	—	-487.4	—	—	—
K_2PdBr_4		cr	504.2400	—	-938.1	—	—	—	—
		ai	504.2400	—	-889.5	-884.5	—	452.	—
K_2PdBr_4	in 800 H_2O		504.2400	—	-889.5	—	—	—	—
K_2PdBr_6		ai	664.0580	—	—	-901.7	—	—	—
K_2PdI_4		ai	692.2216	—	—	-725.5	—	—	—
K_2PdI_6		ai	946.0304	—	—	-736.8	—	—	—
K_2PtCl_4		cr	415.1060	—	-1054.4	—	—	—	180.3

Table 100:K — POTASSIUM (Prepared 1979) — Continued — Table 100:K

Substance Formula and Description		State	Molar mass g mol⁻¹	0 K $\Delta_f H_0^\circ$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H_0^\circ$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
K_2PtCl_4		ai	415.1060	—	−1003.7	−927.9	—	360.	—
	in 600 H_2O		415.1060	—	−1005.0	—	—	—	—
	in 16 000 H_2O		415.1060	—	−1003.7	—	—	—	—
K_2PtCl_6		cr	486.0120	—	−1229.3	−1078.5	—	333.9	205.60
		ai	486.0120	—	−1172.8	−1049.2	—	424.7	—
K_2PtCl_6	in 6 000 H_2O		486.0120	—	−1172.8	—	—	—	—
K_2PtBr_4		cr	592.9300	—	−915.0	—	—	—	—
		ai	592.9300	—	−872.8	−828.4	—	326.	—
	in 1 000 H_2O		592.9300	—	−872.8	—	—	—	—
K_2PtBr_6		cr	752.7480	—	−1021.3	—	—	—	—
K_2PtBr_6		ai	752.7480	—	−975.3	−898.7	—	368.	—
	in 1 500 H_2O		752.7480	—	−972.8	—	—	—	—
K_2PtI_6		cr	1034.7204	—	−762.	—	—	—	—
		ai	1034.7204	—	−718.0	−675.3	—	372.	—
		aq	1034.7204	—	−718.4	—	—	—	—
$K_2Pt(NO_2)_4$		cr	457.3160	—	—	—	—	—	271.5
$K_2Pt(NO_2)Cl_3$		cr	425.6585	—	—	—	—	—	210.9
$K_2Pt(NO_2)_2Cl_2$	cis	cr	436.2110	—	—	—	—	—	223.0
$K_2Pt(NO_2)_3Cl$		cr	446.7635	—	—	—	—	—	262.3
$KPt(NH_3)Cl_3$		cr	357.5817	—	−757.3	—	—	—	—
$KPt(NH_3)Cl_3$		ai	357.5817	—	−716.3	−586.5	—	301.	—
	in 15 000 H_2O		357.5817	—	−716.3	—	—	—	—
$KPtNH_3Cl_5$		cr	428.4877	—	—	—	—	—	203.8
		ai	428.4877	—	—	−715.7	—	—	—
K_2IrCl_6		cr	483.1220	—	−1130.	—	—	—	—
K_2IrCl_6	in 5 000 H_2O		483.1220	—	−1079.	—	—	—	—
K_3IrCl_6		cr	522.2240	—	−1506.	—	—	—	—
	in 5 000 H_2O		522.2240	—	−1481.	—	—	—	—
K_2OsCl_6		cr	481.1220	—	−1197.5	—	—	—	—
K_3OsCl_6		cr	520.2240	—	−1602.	—	—	—	—
$KMnO_4$		cr	158.0376	—	−837.2	−737.6	—	171.71	117.57
		ai	158.0376	—	−793.7	−730.5	—	292.0	−60.2
	in 150 H_2O		158.0376	—	−795.178	—	—	—	—
	in 200 H_2O		158.0376	—	−794.864	—	—	—	—
	in 300 H_2O		158.0376	—	−794.521	—	—	—	—
$KMnO_4$	in 400 H_2O		158.0376	—	−794.328	—	—	—	—
	in 500 H_2O		158.0376	—	−794.194	—	—	—	—
	in 700 H_2O		158.0376	—	−794.044	—	—	—	—
	in 1 000 H_2O		158.0376	—	−793.914	—	—	—	—
	in 1 500 H_2O		158.0376	—	−793.805	—	—	—	—
$KMnO_4$	in 2 000 H_2O		158.0376	—	−793.759	—	—	—	—
	in 3 000 H_2O		158.0376	—	−793.701	—	—	—	—
	in 5 000 H_2O		158.0376	—	−793.667	—	—	—	—
	in 10 000 H_2O		158.0376	—	−793.650	—	—	—	—
	in 20 000 H_2O		158.0376	—	−793.650	—	—	—	—
$KMnO_4$	in 50 000 H_2O		158.0376	—	−793.667	—	—	—	—
	in 100 000 H_2O		158.0376	—	−793.676	—	—	—	—
K_2MnO_4	in KOH + 11 H_2O:u		197.1396	—	−1154.4	—	—	—	—
$K_2Mn_2O_5$	in KOH + 11 H_2O:u		268.0770	—	−1743.9	—	—	—	—
$KMnF_3$		cr	151.0352	—	—	—	22.59	174.1	115.1

Table 100:K — POTASSIUM (Prepared 1979) — Continued — Table 100:K

Substance Formula and Description		State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
$KMnCl_3$		cr	200.3990	—	-935.12	—	—	—	—
		ai	200.3990	—	—	-903.3	—	—	—
	in 1 200 H_2O		200.3990	—	-973.6	—	—	—	—
$K_2Mn(SO_4)_2$		cr	325.2652	—	-2508.3	—	—	—	—
$K_2Mn(SO_4)_2{\cdot}2H_2O$		cr	361.2960	—	-3118.8	—	—	—	—
$K_2Mn(SO_4)_2{\cdot}4H_2O$		cr	397.3268	—	-3705.4	—	—	—	—
$K_2Mn_3(Fe(CN)_6)_2$		cr	666.9268	—	—	-29.	—	—	—
$K_8Mn_6(Fe(CN)_6)_5$		cr	1702.2159	—	—	-527.	—	—	—
$KTcO_4$		cr	202.0056	—	-1030.	—	24.502	164.77	123.30
		ai	202.0056	—	-976.	—	—	301.7	—
$KReO_4$		cr	289.2996	—	-1097.0	-994.5	—	167.82	122.55
		g	289.2996	—	-879.	—	—	—	—
		ai	289.2996	—	-1039.7	-977.7	—	303.8	8.4
$(KReO_4)_2$		g	578.5992	—	-1904.	—	—	—	—
K_2ReCl_6		cr	477.1220	-1310.68	-1310.4	-1172.7	47.36	371.71	214.68
K_2ReCl_6		ai	477.1220	—	-1266.92	-1155.9	—	460.	—
K_2ReBr_6		cr	743.8580	—	—	—	55.69	454.97	226.94
K_2CrO_4		cr	194.1976	-1396.602	-1403.7	-1295.7	28.472	200.12	145.98
		ai	194.1976	—	-1385.91	-1294.30	—	255.2	—
	in 18 H_2O		194.1976	—	-1392.10	—	—	—	—
K_2CrO_4	in 20 H_2O		194.1976	—	-1391.77	—	—	—	—
	in 25 H_2O		194.1976	—	-1390.59	—	—	—	—
	in 30 H_2O		194.1976	—	-1390.26	—	—	—	—
	in 40 H_2O		194.1976	—	-1389.42	—	—	—	—
	in 50 H_2O		194.1976	—	-1388.96	—	—	—	—
K_2CrO_4	in 75 H_2O		194.1976	—	-1388.38	—	—	—	—
	in 100 H_2O		194.1976	—	-1388.13	—	—	—	—
	in 200 H_2O		194.1976	—	-1387.54	—	—	—	—
	in 400 H_2O		194.1976	—	-1386.83	—	—	—	—
	in 500 H_2O		194.1976	—	-1386.58	—	—	—	—
K_2CrO_4	in 1 000 H_2O		194.1976	—	-1385.78	—	—	—	—
	in 2 000 H_2O		194.1976	—	-1385.32	—	—	—	—
$K_2Cr_2O_7$		cr	294.1918	—	-2061.5	-1881.8	—	291.2	219.24
		ai	294.1918	—	-1994.9	-1867.6	—	466.9	—
	in 30 H_2O		294.1918	—	-2009.62	—	—	—	—
$K_2Cr_2O_7$	in 40 H_2O		294.1918	—	-2007.11	—	—	—	—
	in 50 H_2O		294.1918	—	-2004.87	—	—	—	—
	in 75 H_2O		294.1918	—	-2002.13	—	—	—	—
	in 100 H_2O		294.1918	—	-2000.87	—	—	—	—
	in 150 H_2O		294.1918	—	-1999.70	—	—	—	—
$K_2Cr_2O_7$	in 200 H_2O		294.1918	—	-1998.95	—	—	—	—
	in 300 H_2O		294.1918	—	-1997.86	—	—	—	—
	in 400 H_2O		294.1918	—	-1996.86	—	—	—	—
	in 500 H_2O		294.1918	—	-1996.02	—	—	—	—
	in 750 H_2O		294.1918	—	-1994.43	—	—	—	—
$K_2Cr_2O_7$	in 1 000 H_2O		294.1918	—	-1993.22	—	—	—	—
	in 1 500 H_2O		294.1918	—	-1991.50	—	—	—	—
	in 2 000 H_2O		294.1918	—	-1990.3	—	—	—	—
$K_2Cr_3O_{10}$		cr	394.1860	—	-2540.	—	—	—	—
$KHCrO_4$		g	156.1036	—	-900.	—	—	—	—

Substance Formula	Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
$KHCrO_4$	from $HCrO_4^-$	ai	156.1036	—	-1130.5	-1048.0	—	286.6	—
K_3CrO_4F		cr	252.2980	—	-1969.4	—	—	—	—
		aq	252.2980	—	-1965.6	—	—	—	—
$KCrCl_3$		cr	197.4570	—	-856.0	—	—	—	—
		g	197.4570	—	-618.0	—	—	—	—
K_2CrCl_4		cr	272.0120	—	-1274.4	—	—	—	—
K_3CrCl_6		cr	382.0200	—	-1912.5	—	—	—	—
	in 44 000 H_2O		382.0200	—	-1969.8	—	—	—	—
$K_3Cr_2Cl_9$		cr	540.3750	—	-2476.5	—	—	—	—
$KOCrO_2Cl$		cr	174.5492	—	-980.3	—	—	—	—
$KCr(SO_4)_2$		ai	283.2212	—	-2316.3	—	—	—	—
	in 800 H_2O		283.2212	—	-2306.2	—	—	—	—
	in 2 800 H_2O		283.2212	—	-2316.3	—	—	—	—
$KCr(SO_4)_2 \cdot 1.5H_2O$		cr	310.2443	—	-2656.8	—	—	—	—
$KCr(SO_4)_2 \cdot 6H_2O$		cr	391.3136	—	-4006.6	—	—	—	—
$KCr(SO_4)_2 \cdot 12H_2O$		cr	499.4060	—	-5777.3	—	—	—	—
KNH_4CrO_4		cr	173.1343	—	-1287.8	—	—	—	—
	in 350 H_2O		173.1343	—	-1265.7	—	—	—	—
$K_3Cr(C_2O_4)_3$	oxalate	cr	433.3620	—	-3228.8	—	—	—	—
	in 5 000 H_2O		433.3620	—	-3193.6	—	—	—	—
$K_3Cr(C_2O_4)_3 \cdot 3H_2O$		cr	487.4082	—	-4124.2	—	—	—	—
K_2MoO_4		cr	238.1416	—	-1498.7	—	—	—	—
		ai	238.1416	—	-1502.5	-1402.8	—	232.2	—
$K_2Mo_2O_7$		cr	382.0798	—	-2291.7	—	—	—	—
$K_2Mo_3O_{10}$		cr	526.0180	—	-3041.8	—	—	—	—
$K_2Mo_4O_{13}$		cr	669.9562	—	-3818.7	—	—	—	—
$KHMoO_4$		g	200.0476	—	-1054.	—	—	—	—
$KMoF_6$		cr	249.0324	—	-2074.4	—	—	—	—
K_2MoCl_6		cr	386.8620	—	-1466.1	—	—	—	—
K_2WO_4		cr	326.0516	—	-1581.1	—	—	—	—
K_2WO_4		ai	326.0516	—	-1580.3	—	—	—	—
$K_5HW_6O_{21}$	from $HW_6O_{21}^{5-}$	ai	1635.6054	—	-7101.1	—	—	—	—
KWF_6		cr	336.9424	—	-2227.1	—	—	—	—
$KWCl_6$		cr	435.6700	—	-984.9	—	—	—	—
K_2WCl_7		cr	510.2250	—	-1415.9	—	—	—	—
KVO_3		cr	138.0422	—	-1154.8	—	—	—	—
		ai	138.0422	—	-1140.6	-1066.9	—	155.	—
	in 500 H_2O		138.0422	—	-1140.6	—	—	—	—
KVO_4		cr	154.0416	—	-1120.1	—	—	—	—
	in 250 H_2O		154.0416	—	-1105.4	—	—	—	—
KVO_4	in 500 H_2O		154.0416	—	-1105.4	—	—	—	—
	in 55 000 H_2O		154.0416	—	-1106.7	—	—	—	—
K_3VO_4		ai	232.2456	—	—	-1748.8	—	—	—
KH_2VO_4	from $H_2VO_4^-$	ai	156.0576	—	-1426.3	-1304.1	—	226.	—
$KH_3V_2O_7$	from $H_3V_2O_7^-$	ai	256.0058	—	—	-2147.1	—	—	—
$K_3HV_2O_7$	from $HV_2O_7^{3-}$	ai	332.1938	—	—	-2642.1	—	—	—
$K_4H_2V_{10}O_{28}$	from $H_2V_{10}O_{28}^{4-}$	ai	1115.8272	—	—	-8857.	—	—	—
$K_5HV_{10}O_{28}$	from $HV_{10}O_{28}^{5-}$	ai	1153.9212	—	-9958.	-9121.	—	736.	—
$KVCl_3$		cr	196.4030	—	-979.1	—	—	—	—

Table 100:K **POTASSIUM** (Prepared 1979) — Continued Table 100:K

Substance Formula and Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H_0^\circ$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H_0^\circ$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
K_3VCl_6	cr	380.9660	—	-1951.8	—	—	—	—
$K_3V_2Cl_9$	cr	538.2670	—	-2548.9	—	—	—	—
$KNbO_3$	cr	180.0062	—	—	-1250.5	—	—	—
$KNbCl_6$	cr	344.7260	—	-1262.3	—	—	—	—
$KNbOCl_4$	cr	289.8194	—	-1346.4	—	—	—	—
KNb_2OCl_9	cr	559.9904	—	-2170.2	—	—	—	—
K_2NbOCl_5	cr	364.3744	—	-1771.9	—	—	—	—
K_2NbOBr_5	cr	586.6544	—	-1523.8	—	—	—	—
$KTaCl_6$	cr	432.7680	—	-1337.2	—	—	—	—
K_2TaCl_6	cr	471.8700	—	-1683.6	—	—	—	—
$KTaO_2Cl_2$	cr	322.9548	—	-1401.6	—	—	—	—
K_2TiO_3	cr	174.1022	—	-1610.0	—	—	—	—
$KTiCl_3$	cr	193.3610	—	-971.5	—	—	—	—
K_2TiCl_6	cr	338.8220	—	-1761.	—	—	—	—
K_3TiCl_6	cr	377.9240	—	-2102.9	—	—	—	—
K_2ZrCl_6	cr	382.1420	—	-1954.	—	—	—	—
K_2ZrBr_6	cr	648.8780	—	-1607.5	—	—	—	—
K_2HfCl_6	cr	469.4120	—	-1966.	—	—	—	—
$KYCl_4$	cr	269.8190	—	-1452.	—	—	—	—
	g	269.8190	—	-1218.	—	—	—	—
$K_4Y_8(Fe(CN)_6)_7 \cdot 30H_2O$	cr	2891.7879	—	—	-9408.	—	—	—
$KErCl_4$	cr	348.1740	—	-1452.	—	—	—	—
	g	348.1740	—	-1146.	—	—	—	—
$KTb(SO_4)_2$	cr	390.1492	—	—	—	—	—	216.3
$KTb(SO_4)_2 \cdot H_2O$	cr	408.1646	—	—	—	—	—	231.0
$KGdFe(CN)_6$	cr	408.3064	—	—	-312.1	—	—	—
$KEu(SO_4)_2$	cr	383.1852	—	—	—	—	—	211.3
$KEu(SO_4)_2 \cdot H_2O$	cr	401.2006	—	—	—	—	—	226.8
$3K_2SO_4 \cdot 2Eu_2(SO_4)_3$	cr	1707.0064	—	—	—	—	—	841.4
$3K_2SO_4 \cdot 2Eu_2(SO_4)_3 \cdot 8H_2O$	cr	1851.1296	—	—	—	—	—	954.0
K_2SmCl_5	cr	405.8190	—	-1943.5	—	—	—	—
K_3SmCl_6	cr	480.3740	—	-2361.0	—	—	—	—
$KNdCl_4$	cr	325.1540	—	-1498.	—	—	—	—
	g	325.1540	—	-1201.	—	—	—	—
K_3NdCl_6	cr	474.2640	—	-2383.2	—	—	—	—
K_3NdCl_6	aq	474.2640	—	-2449.7	—	—	—	—
$K_3Nd_2Cl_9$	cr	724.8630	—	-3456.4	—	—	—	—
	aq	724.8630	—	-3638.4	—	—	—	—
$KPrCl_4$	cr	321.8210	—	-1582.	—	—	—	—
	g	321.8210	—	-1280.	—	—	—	—
K_2PrCl_5	cr	396.3760	—	-1958.1	—	—	—	—
	aq	396.3760	—	-2035.5	—	—	—	—
K_3PrCl_6	cr	470.9310	—	-2398.3	—	—	—	—
	aq	470.9310	—	-2453.1	—	—	—	—
$K_3Pr_2Cl_9$	cr	718.1970	—	-3482.8	—	—	—	—
$K_3Pr_2Cl_9$	aq	718.1970	—	-3659.7	—	—	—	—
$KCeCl_4$	cr	321.0340	—	-1540.	—	—	—	—
	g	321.0340	—	-1247.	—	—	—	—
KCe_3Cl_{10}	cr	813.9920	—	-3631.3	—	—	—	—
	aq	813.9920	—	-3992.4	—	—	—	—

Substance Formula and Description	State	Molar mass g mol^{-1}	0 K $\Delta_f H_0^\circ$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H_0^\circ$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
K_3CeCl_6	cr	470.1440	—	-2390.3	—	—	—	—
	aq	470.1440	—	-2449.3	—	—	—	—
$K_3Ce_2Cl_9$	cr	716.6230	—	-3470.2	—	—	—	—
	aq	716.6230	—	-4061.0	—	—	—	—
$KCeFe(CN)_6 \cdot 2H_2O$	cr	427.2072	—	—	-796.9	—	—	—
$KLaCl_4$	cr	319.8240	—	-1594.	—	—	—	—
	g	319.8240	—	-1310.	—	—	—	—
KLa_3Cl_{10}	cr	810.3620	—	-3677.7	—	—	—	—
	aq	810.3620	—	-4038.4	—	—	—	—
K_2LaCl_5	cr	394.3790	—	-1968.6	—	—	—	—
K_2LaCl_5	aq	394.3790	—	-2043.9	—	—	—	—
$KLaFe(CN)_6$	cr	389.9664	—	—	-320.8	—	—	—
K_2UO_4	cr	380.2306	—	-1921.3	—	—	—	—
KUF_6	cr	391.1214	—	-2715.0	—	—	—	—
$K(UO_2)_2F_5$	cr	674.1496	—	-3959.3	—	—	—	—
$K_3UO_2F_5$	cr	482.3258	—	-3523.8	—	—	—	—
$KUCl_5$	cr	454.3960	—	-1481.1	—	—	—	—
$KUCl_6$	cr	489.8490	—	-1527.2	—	—	—	—
K_2UCl_6	cr	528.9510	—	-1933.0	—	—	—	—
UO_2KPO_4	cr	404.1012	—	—	-2401.1	—	—	—
UO_2KAsO_4	cr	448.0490	—	—	-2012.0	—	—	—
$KThCl_5$	g	448.4051	—	-1377.	—	—	—	—
$KThCl_5 \cdot 9H_2O$	cr	610.5437	—	-4406.2	—	—	—	—
K_2ThCl_6	cr	522.9601	—	-2099.1	—	—	—	—
$KBeF_3$	g	105.1094	—	-1384.9	—	—	—	—
K_2BeF_4 γ	cr	163.2098	—	-2257.3	—	—	—	—
β	cr2	163.2098	—	-2248.5	—	—	—	—
β'	cr3	163.2098	—	-2250.2	—	—	—	—
	aq	163.2098	—	-2215.4	—	—	—	—
$(KBeF_3)_2$	g	210.2188	—	-2920.	—	—	—	—
K_2BeCl_4	cr	229.0282	—	-1408.8	—	—	—	—
$KMgCl_3$	cr	169.7730	—	-1086.6	—	—	—	—
$KMgCl_3 \cdot 2H_2O$	cr	205.8038	—	-1714.2	—	—	—	—
$KMgCl_3 \cdot 6H_2O$ carnellite	cr	277.8654	—	-2945.5	—	—	—	—
K_2MgCl_4 fused	cr	244.3280	—	-1525.9	—	—	—	—
K_2MgCl_4 aged 2 months	cr2	244.3280	—	-1528.0	—	—	—	—
$K_2MgCl_4 \cdot 2KCl$	cr	393.4380	—	-2408.3	—	—	—	—
$K_2Mg(SO_4)_2$ aged 3 weeks after fusion	cr	294.6392	—	-2754.7	—	—	—	—
fused	cr2	294.6392	—	-2753.1	—	—	—	—
$K_2Mg(SO_4)_2 \cdot 2H_2O$	cr	330.6700	—	-3351.4	—	—	—	—
$K_2Mg(SO_4)_2 \cdot 4H_2O$ leonite	cr	366.7008	—	-3947.6	—	—	—	—
$K_2Mg(SO_4)_2 \cdot 6H_2O$ schoenite	cr	402.7316	—	-4539.6	—	—	—	—
$K_2Mg(SO_4)_2 \cdot 6D_2O$	cr	414.8048	—	-4598.	—	—	—	—
$K_2SO_4 \cdot 2MgSO_4$ laugbenite	cr	415.0128	—	-4071.0	—	—	—	—
$KCl \cdot MgSO_4 \cdot 3H_2O$ kainite	cr	248.9748	—	-2640.1	—	—	—	—
$K_2Mg(SeO_4)_2$	cr	388.4312	—	-2086.98	—	—	—	—
$KMgPO_4 \cdot 6H_2O$	cr	266.4778	—	—	-3240.1	—	—	—
$KMg_3AlSi_3O_{10}(OH)_2$ phlogopite	cr	417.2863	—	—	-5831.8	—	—	—
$KMg_3AlSi_3O_{10}F_2$ fluorophlogopite	cr	421.2683	—	-6383.9	-6044.0	—	336.4	—

Substance Formula and Description	State	Molar mass g mol^{-1}	0 K $\Delta_f H^\circ_0$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H^\circ_0$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
$KCaCl_3$	cr	185.5410	—	–1245.6	—	—	—	—
	g	185.5410	—	–937.	—	—	—	—
$K_2SO_4 \cdot CaSO_4 \cdot H_2O$	cr	328.4226	—	–3177.3	—	—	—	—
$K_2SO_4 \cdot 5CaSO_4 \cdot H_2O$	cr	872.9890	—	–8823.2	—	—	—	—
$4KNO_3 \cdot Ca(NO_3)_2$	cr	568.5174	—	–2972.3	—	—	—	—
$K_2CaP_2O_7$	cr	292.2274	—	—	—	39.08	254.85	217.94
$K_2O \cdot 23CaO \cdot 12SiO_2$	cr	2105.0471	—	–27603.9	—	—	—	—
$KCaFe(CN)_6 \cdot 5H_2O$	cr	381.2134	—	–4063.	—	—	—	—
$KSrCl_3$	g	233.0810	—	–967.	—	—	—	—
KSr_2Cl_5	cr	391.6070	—	–2103.7	—	—	—	—
K_2SrCl_4 fused	cr	307.6360	—	–1697.9	—	—	—	—
aged 2 months	cr2	307.6360	—	–1698.7	—	—	—	—
$K_2SO_4 \cdot SrSO_4$ fused	cr	357.9472	—	–2881.9	—	—	—	—
aged 2 months	cr2	357.9472	—	–2887.4	—	—	—	—
$2K_2SO_4 \cdot SrSO_4$ fused	cr	532.2128	—	–4316.6	—	—	—	—
$2K_2SO_4 \cdot SrSO_4$ aged 2 months	cr2	532.2128	—	–4323.3	—	—	—	—
K_2BaCl_4 fused	cr	357.3560	—	–1726.11	—	—	—	—
$K_2SO_4 \cdot BaSO_4$ fused	cr	407.6672	—	–2906.2	—	—	—	—
aged 2 months	cr2	407.6672	—	–2907.9	—	—	—	—
$2K_2SO_4 \cdot BaSO_4$ fused	cr	581.9328	—	–4342.2	—	—	—	—
$2K_2SO_4 \cdot BaSO_4$ aged 2 months	cr2	581.9328	—	–4341.7	—	—	—	—
$KNO_2 \cdot 2Ba(NO_2)_2$	cr	543.8095	—	–1906.2	—	—	—	—
$2KNO_2 \cdot Ba(NO_2)_2$	cr	399.5660	—	–1538.5	—	—	—	—
$2KNO_3 \cdot Ba(NO_3)_2$	cr	463.5636	—	–1990.41	—	—	—	—
$K_2CO_3 \cdot BaCO_3$ aged 2 months	cr	335.5628	—	–2355.6	—	—	—	—
$K_2CO_3 \cdot BaCO_3$ fused	cr2	335.5628	—	–2358.1	—	—	—	—
KLiClI	cr	208.4004	—	–736.4	—	—	—	—
$K_2SO_4 \cdot Li_2SO_4$	cr	284.2092	—	–2883.99	—	—	—	—
$K_2O \cdot Li_2O \cdot 4B_2O_3$	cr	402.5656	—	–6720.8	—	—	—	—
$K_2O \cdot Li_2O \cdot 6B_2O_3$	cr	541.8060	—	–9355.0	—	—	—	—
$K_2O \cdot Li_2O \cdot 8B_2O_3$	cr	681.0464	—	–11932.3	—	—	—	—
$K_2O \cdot 3Li_2O \cdot 8B_2O_3$	cr	740.8092	—	–13518.9	—	—	—	—
$K_2O \cdot 3Li_2O \cdot 12B_2O_3$	cr	1019.2900	—	–18717.5	—	—	—	—
$K_2O \cdot 3Li_2O \cdot 16B_2O_3$	cr	1297.7708	—	–23893.6	—	—	—	—
$Li_2O \cdot 3K_2O \cdot 8B_2O_3$	cr	869.4532	—	–13431.5	—	—	—	—
$Li_2O \cdot 3K_2O \cdot 12B_2O_3$	cr	1147.9339	—	–18703.7	—	—	—	—
$Li_2O \cdot 3K_2O \cdot 16B_2O_3$	cr	1426.4148	—	–23901.9	—	—	—	—
NaK	l	62.0918	—	6.3	—	—	—	—
Na_2K	l	85.0816	—	8.4	—	—	—	—
NaK_2	l	101.1938	—	10.5	—	—	—	—
$KNa(OH)_2$	g	96.1066	—	–634.7	—	—	—	—
$KNaF_2$	g	100.0886	—	–842.7	—	—	—	—
$KNaCl_2$	cr	132.9978	—	–839.02	—	—	—	—
	g	132.9978	—	–597.9	—	—	—	—
$KNaBr_2$	cr	221.9098	—	–748.94	—	—	—	—
$KNaI_2$	cr	315.9006	—	–610.40	—	—	—	—
KNaClI	cr	224.4492	—	–736.72	—	—	—	—
$Na_2SO_4 \cdot K_2SO_4$ aged 2 months	cr	316.3068	—	–2821.3	—	—	—	—
fused	cr2	316.3068	—	–2820.4	—	—	—	—
$2Na_2SO_4 \cdot K_2SO_4$ aged 2 months	cr	458.3480	—	–4204.5	—	—	—	—

Table 100:K POTASSIUM (Prepared 1979) — Continued Table 100:K

Substance Formula and Description	State	Molar mass g mol^{-1}	0 K $\Delta_f H_0^\circ$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H_0^\circ$	S° J mol^{-1} K^{-1}	C_p
$2Na_2SO_4 \cdot K_2SO_4$ fused	cr2	458.3480	—	-4202.0	—	—	—	—
$Na_2SO_4 \cdot 2K_2SO_4$ aged 2 months	cr	490.5724	—	-4263.9	—	—	—	—
fused	cr2	490.5724	—	-4262.7	—	—	—	—
$Na_2SO_4 \cdot 3K_2SO_4$ glaserite	cr	664.8380	—	-5709.24	—	—	—	—
$Na_2CO_3 \cdot K_2CO_3$ aged 2 months	cr	244.2024	—	-2299.1	—	—	—	—
$Na_2CO_3 \cdot K_2CO_3$ fused	cr2	244.2024	—	-2297.0	—	—	—	—
$2Na_2CO_3 \cdot K_2CO_3$ aged 2 months	cr	350.1914	—	-3423.8	—	—	—	—
fused	cr2	350.1914	—	-3420.4	—	—	—	—
$3Na_2CO_3 \cdot K_2CO_3$ aged 2 months	cr	456.1804	—	-4549.7	—	—	—	—
fused	cr2	456.1804	—	-4544.7	—	—	—	—
$4Na_2CO_3 \cdot K_2CO_3$ aged 2 months	cr	562.1694	—	-5671.0	—	—	—	—
fused	cr2	562.1694	—	-5667.2	—	—	—	—
$Na_2CO_3 \cdot 2K_2CO_3$ aged 2 months	cr	382.4158	—	-3455.6	—	—	—	—
fused	cr2	382.4158	—	-3453.5	—	—	—	—
$Na_2CO_3 \cdot 3K_2CO_3$ aged 2 months	cr	520.6292	—	-4587.8	—	—	—	—
$Na_2CO_3 \cdot 3K_2CO_3$ fused	cr2	520.6292	—	-4583.2	—	—	—	—
$Na_2CO_3 \cdot 4K_2CO_3$ aged 2 months	cr	658.8426	—	-5737.5	—	—	—	—
fused	cr2	658.8426	—	-5731.2	—	—	—	—
NaCNS·KCNS	cr	178.2556	—	-370.3	—	—	—	—
NaCNS·3KCNS	cr	372.6234	—	-762.7	—	—	—	—
$K_2O \cdot Na_2O \cdot 4B_2O_3$	cr	434.6632	—	-6732.9	—	—	—	—
$K_2O \cdot Na_2O \cdot 6B_2O_3$	cr	573.9036	—	-9316.9	—	—	—	—
$K_2O \cdot Na_2O \cdot 8B_2O_3$	cr	713.1440	—	-11927.7	—	—	—	—
$K_2O \cdot 3Na_2O \cdot 8B_2O_3$	cr	837.1020	—	-13443.2	—	—	—	—
$K_2O \cdot 3Na_2O \cdot 12B_2O_3$	cr	1115.5828	—	-18598.3	—	—	—	—
$K_2O \cdot 3Na_2O \cdot 16B_2O_3$	cr	1394.0636	—	-23817.4	—	—	—	—
$Na_2O \cdot 3K_2O \cdot 8B_2O_3$	cr	901.5508	—	-13519.3	—	—	—	—
$Na_2O \cdot 3K_2O \cdot 12B_2O_3$	cr	1180.0316	—	-18652.7	—	—	—	—
$Na_2O \cdot 3K_2O \cdot 16B_2O_3$	cr	1458.5124	—	-23886.5	—	—	—	—
$Na_{0.7794}K_{0.2206}AlSiO_4$ nepheline	cr	145.6092	—	-2109.6	—	—	—	—
$Na_{0.7794}K_{0.2206}AlSiO_4$ nepheline	vit	145.6092	—	-2071.9	—	—	—	—
$KNaUCl_6$	cr	512.8388	—	-1892.4	—	—	—	—

Table 101:**Rb** **RUBIDIUM** (Prepared 1979) Table 101:**Rb**

Substance Formula and Description		State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
Rb		cr	85.4678	0	0	0	7.489	76.78	31.062
		g	85.4678	82.17	80.88	53.06	6.197	170.089	20.786
	in 185 Hg		85.4678	—	—	-105.65	—	—	—
Rb^+		g	85.4678	485.198	490.101	—	6.197	—	—
Rb^{2+}		g	85.4678	3117.83	3128.92	—	6.197	—	—
Rb^{3+}		g	85.4678	6945.	6962.	—	—	—	—
Rb^+		ao	85.4678	—	-251.17	-283.98	—	121.50	—
RbO_2		cr	117.4666	—	-278.7	—	—	—	—
Rb_2O		cr	186.9350	—	-339.	—	—	—	—
		g	186.9350	—	-50.	—	—	—	—
Rb_2O_2		cr	202.9344	—	-472.	—	—	—	—
RbH		cr	86.4758	—	-52.3	—	—	—	—
RbOH		cr	102.4752	—	-418.19	—	—	—	—
		g	102.4752	-234.	-238.	—	—	—	—
		ai	102.4752	—	-481.16	-441.21	—	110.75	—
RbOH	in 75 H_2O		102.4752	—	-480.53	—	—	—	—
	in 100 H_2O		102.4752	—	-480.41	—	—	—	—
	in 147 H_2O		102.4752	—	-480.37	—	—	—	—
	in 200 H_2O		102.4752	—	-480.32	—	—	—	—
$RbOH \cdot H_2O$		cr	120.4906	—	-748.85	—	—	—	—
$RbOH \cdot 2H_2O$		cr	138.5060	—	-1053.24	—	—	—	—
$RbHO_2$	from HO_2^-	ai	118.4746	—	-411.50	-351.4	—	145.2	—
$(RbOH)_2$		g	204.9504	—	-657.	—	—	—	—
RbF		cr	104.4662	—	-557.7	—	—	—	—
		g	104.4662	-329.07	-331.4	-349.0	9.590	237.09	35.69
RbF		ai	104.4662	—	-583.79	-562.77	—	107.5	—
	in 100 H_2O		104.4662	—	-583.21	—	—	—	—
	in 150 H_2O		104.4662	—	-583.25	—	—	—	—
	in 200 H_2O		104.4662	—	-583.283	—	—	—	—
	in 300 H_2O		104.4662	—	-583.329	—	—	—	—
RbF	in 400 H_2O		104.4662	—	-583.367	—	—	—	—
	in 500 H_2O		104.4662	—	-583.396	—	—	—	—
	in 600 H_2O		104.4662	—	-583.421	—	—	—	—
	in 800 H_2O		104.4662	—	-583.459	—	—	—	—
	in 1 000 H_2O		104.4662	—	-583.484	—	—	—	—
RbF	in 1 500 H_2O		104.4662	—	-583.530	—	—	—	—
	in 2 000 H_2O		104.4662	—	-583.565	—	—	—	—
	in 3 000 H_2O		104.4662	—	-583.593	—	—	—	—
	in 5 000 H_2O		104.4662	—	-583.630	—	—	—	—
	in 10 000 H_2O		104.4662	—	-583.672	—	—	—	—
RbF	in 20 000 H_2O		104.4662	—	-583.706	—	—	—	—
	in 50 000 H_2O		104.4662	—	-583.739	—	—	—	—
	in 100 000 H_2O		104.4662	—	-583.752	—	—	—	—
	in $HCONH_2$:s in formamide		104.4662	—	-579.78	—	—	—	—
$RbF \cdot 1.5H_2O$		cr	131.4893	—	-1013.8	—	—	—	—
Rb_2F_2		g	208.9324	-849.73	-854.	-849.	19.25	344.0	79.9
$RbHF_2$		cr	124.4726	-918.47	-922.6	-855.6	16.451	120.08	79.37
	from HF_2^-	ai	124.4726	—	-901.11	-862.06	—	213.8	—
RbCl		cr	120.9208	-435.471	-435.35	-407.80	12.205	95.90	52.38
		g	120.9208	-226.86	-228.9	-247.3	10.05	249.56	36.82

Table 101:**Rb** **RUBIDIUM** (Prepared 1979) — Continued Table 101:**Rb**

Substance Formula	Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
RbCl		ai	120.9208	—	-418.32	-415.20	—	177.99	—
	in 400 H_2O		120.9208	—	-418.028	—	—	—	—
	in 1 000 H_2O		120.9208	—	-418.078	—	—	—	—
	in 2 500 H_2O		120.9208	—	-418.11	—	—	—	—
	in 50 HCOOH in formic acid		120.9208	—	-431.4	—	—	—	—
RbCl	in $HCONH_2$:s in formamide		120.9208	—	-432.42	—	—	—	—
	in $HCONHCH_3$:s in N–methylformamide		120.9208	—	-431.83	—	—	—	—
	in $C_4H_8O_2$:s in aqueous dioxane (20%)		120.9208	—	-419.99	—	—	—	—
	in CH_3OH:u in methanol		120.9208	—	-426.18	—	—	—	—
$RbCl^+$		g	120.9208	593.3	597.5	—	—	—	—
$RbCl_3$	from Cl_3^-	ai	191.8268	—	—	-404.5	—	—	—
Rb_2Cl_2		g	241.8416	-616.76	-619.	-619.	20.67	373.3	81.2
RbClO		ai	136.9202	—	-358.2	-320.9	—	163.	—
$RbClO_2$		ai	152.9196	—	-317.6	-266.9	—	222.6	—
$RbClO_3$		cr	168.9190	—	-402.9	-300.3	—	151.9	103.18
$RbClO_3$		ai	168.9190	—	-355.14	-291.85	—	283.7	—
$RbClO_4$		cr	184.9184	—	-437.23	-306.90	—	161.1	—
		ai	184.9184	—	-380.49	-292.51	—	303.3	—
	in $HCONH_2$:s in formamide		184.9184	—	-419.91	—	—	—	—
	in $HCONHCH_3$:s in N–methylformamide		184.9184	—	-425.51	—	—	—	—
$RbClO_4$	in $HCON(CH_3)_2$:s in N,N–dimethylformamide		184.9184	—	-444.97	—	—	—	—
	in $CH_3CON(CH_3)_2$:s in N,N–dimethylacetamide		184.9184	—	-447.27	—	—	—	—
	in $C_4H_8SO_2$:u in sulfolane (tetramethylene sulfoxide)		184.9184	—	-427.81	—	—	—	—
RbBr		cr	165.3768	-387.915	-394.59	-381.79	13.071	109.96	52.84
		g	165.3768	-173.4	-182.8	-215.1	10.31	261.02	37.20
RbBr		ai	165.3768	—	-372.71	-387.94	—	203.93	—
	in 1 000 H_2O		165.3768	—	-372.476	—	—	—	—
	in $HCONH_2$:s in formamide		165.3768	—	-391.46	—	—	—	—
$RbBr^+$		g	165.3768	592.0	589.1	—	—	—	—
$RbBr_3$		cr	325.1948	—	-418.4	—	—	—	—
$RbBr_3$	from Br_3^-	ai	325.1948	—	-381.58	-391.04	—	336.8	—
$RbBr_5$	from Br_5^-	ai	485.0128	—	-393.3	-387.9	—	438.1	—
Rb_2Br_2		g	330.7536	—	—	—	21.71	398.8	82.0
RbBrO		ai	181.3762	—	-345.2	-317.5	—	163.	—
$RbBrO_3$		cr	213.3750	—	-367.27	-278.06	—	161.1	—
$RbBrO_3$		ai	213.3750	—	-318.24	-265.38	—	283.21	—
$RbBrO_4$		ai	229.3744	—	-238.1	-166.0	—	320.9	—
$RbBrCl_2$		cr	236.2828	—	-486.2	—	—	—	—
$RbBr_2Cl$		cr	280.7388	—	-472.4	—	—	—	—
	from Br_2Cl^-	ai	280.7388	—	-421.3	-412.5	—	310.0	—
RbI		cr	212.3722	-333.059	-333.80	-328.86	13.347	118.41	53.18
		g	212.3722	-130.67	-134.3	-174.1	10.465	268.81	37.36
		ai	212.3722	—	-306.35	-335.56	—	232.6	—
	in 2 000 H_2O		212.3722	—	-306.156	—	—	—	—

Table 101:**Rb** — **RUBIDIUM** (Prepared 1979) — Continued — Table 101:**Rb**

Substance Formula	Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H_0^\circ$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H_0^\circ$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
RbI	in 1 000 $NH_2CH_2CH_2NH_2$ in ethylenediamine		212.3722	—	-352.63	—	—	—	—
	in $CH_3CONHCH_3$:s2 in N-methylacetamide		212.3722	—	-335.39	—	—	—	—
	in $HCONH_2$:s in formamide		212.3722	—	-332.84	—	—	—	—
	in $HCONHCH_3$:s in N-methylformamide		212.3722	—	-327.36	—	—	—	—
	in $HCON(CH_3)_2$:s in N,N-dimethylformamide		212.3722	—	-361.50	—	—	—	—
RbI	in CH_3CN:u in acetonitrile		212.3722	—	-341.75	—	—	—	—
RbI_3		cr	466.1810	—	-346.4	-338.9	—	225.5	—
	from I_3^-	ai	466.1810	—	-302.5	-335.6	—	360.7	—
Rb_2I_2		g	424.7444	—	—	—	22.13	415.6	82.4
RbIO		ai	228.3716	—	-358.6	-322.6	—	115.9	—
$RbIO_3$		cr	260.3704	—	—	-426.30	—	—	—
		ai	260.3704	—	-472.4	-412.1	—	239.7	—
$RbIO_4$		ai	276.3698	—	-402.5	-342.6	—	343.1	—
RbH_4IO_6		aq	312.4006	—	-1010.4	—	—	—	—
$Rb_2H_3IO_6$		aq	396.8604	—	-1258.5	—	—	—	—
$RbICl_2$		cr	283.2782	—	—	-443.9	—	—	—
	from ICl_2^-	ai	283.2782	—	—	-445.1	—	—	—
$RbICl_4$		cr	354.1842	—	-556.9	—	—	—	—
RbI_2Cl	from I_2Cl^-	ai	374.7296	—	-388.7	-400.4	—	342.7	—
$RbIBr_2$		cr	372.1902	—	—	-401.7	—	—	—
$RbIBr_2$	from IBr_2^-	ai	372.1902	—	—	-407.1	—	—	—
$RbBrI_2$	from BrI_2^-	ai	419.1856	—	-379.1	-394.1	—	318.8	—
RbIBrCl		cr	327.7342	—	—	-428.0	—	—	—
	from $IBrCl^-$	ai	327.7342	—	—	-430.5	—	—	—
Rb_2S		cr	202.9996	—	-360.7	—	—	—	—
Rb_2S		ai	202.9996	—	-469.4	-482.0	—	228.4	—
	in 500 H_2O		202.9996	—	-464.4	—	—	—	—
Rb_2S_2	from S_2^-	ai	235.0636	—	-472.4	-488.3	—	271.5	—
Rb_2S_3	from S_3^-	ai	267.1276	—	-476.6	-494.1	—	309.2	—
Rb_2S_4	from S_4^-	ai	299.1916	—	-479.5	-498.7	—	346.4	—
Rb_2S_5	from S_5^-	ai	331.2556	—	-481.2	-502.1	—	383.7	—
Rb_2SO_3		ai	250.9978	—	-1138.0	-1054.3	—	213.	—
Rb_2SO_4		cr	266.9972	-1425.886	-1435.61	-1316.89	27.020	197.44	134.06
		g	266.9972	—	-1068.6	—	—	—	—
		ai	266.9972	—	-1411.60	-1312.50	—	263.2	—
Rb_2SO_4	in 500 H_2O		266.9972	—	-1410.682	—	—	—	—
	in 800 H_2O		266.9972	—	-1410.661	—	—	—	—
	in 1 000 H_2O		266.9972	—	-1410.665	—	—	—	—
	in 1 500 H_2O		266.9972	—	-1410.694	—	—	—	—
	in 2 000 H_2O		266.9972	—	-1410.719	—	—	—	—
Rb_2SO_4	in 3 000 H_2O		266.9972	—	-1410.774	—	—	—	—
	in 5 000 H_2O		266.9972	—	-1410.862	—	—	—	—
	in 10 000 H_2O		266.9972	—	-1411.021	—	—	—	—
	in 20 000 H_2O		266.9972	—	-1411.163	—	—	—	—
	in 50 000 H_2O		266.9972	—	-1411.305	—	—	—	—
Rb_2SO_4	in 100 000 H_2O		266.9972	—	-1411.385	—	—	—	—

Table 101:**Rb** **RUBIDIUM** (Prepared 1979) — Continued Table 101:**Rb**

Substance Formula	Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
Rb_2SO_4	in 200 000 H_2O		266.9972	—	-1411.443	—	—	—	—
	in 500 000 H_2O		266.9972	—	-1411.498	—	—	—	—
$Rb_2S_2O_3$		ai	283.0618	—	-1154.8	-1090.3	—	310.	—
$Rb_2S_2O_6$		aq	331.0600	—	-1700.8	—	—	—	—
$Rb_2S_2O_7$		aq	347.0594	—	-1903.7	—	—	—	—
$Rb_2S_2O_8$		ai	363.0588	—	-1847.2	-1682.7	—	487.4	—
$Rb_2S_3O_6$		aq	363.1240	—	-1702.1	—	—	—	—
$Rb_2S_4O_6$		ai	395.1880	—	-1726.7	-1608.2	—	500.4	—
$Rb_2S_5O_6$		aq	427.2520	—	-1738.9	—	—	—	—
RbHS		cr	118.5398	—	-266.9	—	—	—	61.1
RbHS	from HS^-	ai	118.5398	—	-268.6	-271.90	—	184.1	—
	in 500 H_2O		118.5398	—	-269.9	—	—	—	—
	in 1 000 H_2O		118.5398	—	-269.9	—	—	—	—
$RbHSO_3$	from HSO_3^-	ai	166.5380	—	-877.38	-811.71	—	261.1	—
$RbHSO_4$		cr	182.5374	—	-1159.0	—	—	—	—
$RbHSO_4$	from HSO_4^-	ai	182.5374	—	-1138.51	-1039.89	—	253.1	—
	in 400 H_2O		182.5374	—	-1145.2	—	—	—	—
$RbHS_2O_4$	from $HS_2O_4^-$	ai	214.6014	—	—	-898.6	—	—	—
$RbSO_2F$		cr	168.5290	—	-944.3	—	—	—	—
$RbSO_3F$		ai	184.5284	—	-1122.6	—	—	—	—
$RbI\cdot 3SO_2$		cr	404.5606	—	-1352.3	—	—	—	—
Rb_2SeO_3		cr	297.8938	—	-974.16	—	—	—	—
		ai	297.8938	—	-1011.7	-937.6	—	255.	—
Rb_2SeO_4		cr	313.8932	—	-1114.20	—	—	—	—
		ai	313.8932	—	-1101.6	-1009.1	—	297.1	—
Rb_2SeO_4		aq	313.8932	—	-1101.6	—	—	—	—
RbHSe		cr	165.4358	—	-239.3	—	—	—	65.7
	from HSe^-	ai	165.4358	—	-235.1	-240.1	—	201.	—
		aq	165.4358	—	-234.3	—	—	—	—
$RbHSeO_3$	from $HSeO_3^-$	ai	213.4340	—	-765.71	-695.44	—	256.5	—
$RbHSeO_4$	from $HSeO_4^-$	ai	229.4334	—	-832.6	-736.3	—	270.7	—
Rb_2TeO_3		cr	346.5338	—	-1002.5	—	—	—	—
	in 6 000 H_2O		346.5338	—	-1053.5	—	—	—	—
$Rb_2TeO_3\cdot H_2O$		cr	364.5492	—	-1311.7	—	—	—	—
$Rb_2TeO_3\cdot 3H_2O$		cr	400.5800	—	-1903.7	—	—	—	—
RbH_5TeO_6	from $H_5TeO_6^-$	aq	314.1042	—	-1512.5	—	—	—	—
$Rb_2H_4TeO_6$	from $H_4TeO_6^{2-}$	aq	398.5640	—	-1724.6	—	—	—	—
Rb_2TeBr_6		cr	777.9896	—	-998.3	—	—	—	—
Rb_2PoCl_6		ai	593.6536	—	—	-1146.	—	—	—
RbN_3		cr	127.4879	—	-3.77	—	—	—	—
RbN_3		ai	127.4879	—	23.97	64.1	—	229.3	—
		aq	127.4879	—	24.18	—	—	—	—
$RbNO_2$		cr	131.4733	—	—	-306.2	—	—	—
		ai	131.4733	—	-355.6	-316.3	—	244.3	—
$RbONO_2$	peroxynitrite	aq2	147.4727	—	-295.8	—	—	—	—
$RbNO_3$		cr	147.4727	—	-495.05	-395.78	—	147.3	102.1
		ai	147.4727	—	-458.52	-395.24	—	267.8	—
	in 130 H_2O		147.4727	—	-460.03	—	—	—	—
	in 135 H_2O		147.4727	—	-459.99	—	—	—	—
	in 200 H_2O		147.4727	—	-459.445	—	—	—	—

Table 101:**Rb** **RUBIDIUM** (Prepared 1979) — Continued Table 101:**Rb**

Substance Formula	Description	State	Molar mass g mol^{-1}	0 K: $\Delta_f H_0^\circ$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar): $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H_0^\circ$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
$RbNO_3$	in 400 H_2O		147.4727	—	–458.909	—	—	—	—
	in 1 000 H_2O		147.4727	—	–458.566	—	—	—	—
	in 3 200 H_2O		147.4727	—	–458.391	—	—	—	—
	in 5 000 H_2O		147.4727	—	–458.433	—	—	—	—
	in 6 000 H_2O		147.4727	—	–458.445	—	—	—	—
$Rb_2N_2O_2$	hyponitrite	aq	230.9478	—	–519.7	—	—	—	—
$RbNH_2$		cr	101.4905	—	–113.0	—	—	—	—
$RbHN_2O_2$	hyponitrite, from $HN_2O_2^-$	aq	146.4880	—	–302.9	—	—	—	—
$RbPO_3$		cr	164.4398	—	–1237.2	—	—	—	—
		aq	164.4398	—	–1228.0	—	—	—	—
Rb_3PO_4		ai	351.3748	—	–2030.9	–1870.6	—	142.	—
$Rb_4P_2O_7$		ai	515.8146	—	–3275.7	–3055.0	—	368.	—
RbH_2PO_2	from $H_2PO_2^-$	aq	150.4564	—	–864.8	—	—	—	—
RbH_2PO_3	from $H_2PO_3^-$	aq	166.4558	—	–1220.5	—	—	—	—
RbH_2PO_4		cr	182.4552	—	–1562.26	—	—	—	—
RbH_2PO_4	from $H_2PO_4^-$	ai	182.4552	—	–1547.45	–1414.26	—	211.7	—
$RbH_3P_2O_7$	from $H_3P_2O_7^-$	ai	262.4352	—	–2527.6	–2307.3	—	335.	—
Rb_2HPO_3	from HPO_3^{2-}	aq	250.9156	—	–1471.5	—	—	—	—
Rb_2HPO_4	from $H_2PO_4^{2-}$	ai	266.9150	—	–1794.48	–1657.12	—	209.6	—
$Rb_2H_2P_2O_7$		cr	346.8950	—	–2807.5	—	—	—	—
$Rb_2H_2P_2O_7$	from $H_2P_2O_7^{2-}$	ai	346.8950	—	–2781.1	–2578.0	—	406.	—
$Rb_3HP_2O_7$	from $HP_2O_7^{3-}$	ai	431.3548	—	–3028.4	–2824.1	—	410.	—
$RbPF_6$		cr	230.4320	—	–2354.8	–2204.5	—	221.84	148.1
Rb_2PO_3F		ai	268.9060	—	—	–1742.6	—	—	—
$RbHPO_3F$	from HPO_3F^-	ai	184.4462	—	—	–1482.3	—	—	—
$RbAsO_2$		ai	192.3882	—	–680.19	–633.97	—	161.9	—
Rb_3AsO_4		ai	395.3226	—	–1641.63	–1500.36	—	201.7	—
RbH_2AsO_3	from $H_2AsO_3^-$	ai	210.4036	—	–965.96	–871.11	—	231.8	—
RbH_2AsO_4	from $H_2AsO_4^-$	ai	226.4030	—	–1160.73	–1037.16	—	238.	—
Rb_2HAsO_4	from $HAsO_4^{2-}$	ai	310.8628	—	–1408.67	–1282.57	—	241.4	—
Rb_2AsO_3F		ai	312.8538	—	—	–1595.42	—	—	—
$RbHAsO_3F$	from $HAsO_3F^-$	ai	228.3940	—	—	–1344.95	—	—	—
$RbSb$		cr	207.2178	—	–100.0	—	—	—	—
$RbSb_2$		cr	328.9678	—	–102.5	—	—	—	—
Rb_3Sb		cr	378.1534	—	–173.6	—	—	—	—
Rb_3Sb_7		cr	1108.6534	—	–310.	—	—	—	—
Rb_5Sb_4		cr	914.3390	—	–444.	—	—	—	—
$RbSbO_2$		ai	239.2166	—	—	–624.18	—	—	—
$SbCl_3 \cdot 3RbCl$		cr	590.8714	—	–1716.3	—	—	—	—
$7RbBr \cdot 3SbBr_3$		cr	2242.0685	—	–3701.2	—	—	—	—
$Rb_2Sb_2S_4$		ai	542.6916	—	–721.7	–667.3	—	190.8	—
$RbBiCl_4$		ai	436.2598	—	—	–765.6	—	—	—
Rb_3BiCl_6		ai	678.1014	—	—	–1598.69	—	—	—
$RbBiBr_4$		ai	614.0838	—	—	–661.5	—	—	—
$RbBiI_4$		ai	802.0654	—	—	–492.9	—	—	—
$Rb_2NH_4BiCl_6$	from $NH_4BiCl_6^{2-}$	ai	610.6723	—	—	–1394.3	—	—	—
RbC_8		cr	181.5574	—	–44.4	—	—	—	—
RbC_{10}		cr	205.5798	—	–33.1	—	—	—	—
RbC_{24}		cr	373.7366	—	–38.9	—	—	—	—

Table 101:**Rb** **RUBIDIUM** (Prepared 1979) — Continued Table 101:**Rb**

Substance Formula and Description	State	Molar mass g mol^{-1}	0 K $\Delta_f H_0^\circ$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H_0^\circ$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
RbC_{36}	cr	517.8710	—	-39.7	—	—	—	—
RbC_{48}	cr	662.0054	—	-37.2	—	—	—	—
RbC_{60}	cr	806.1398	—	-33.1	—	—	—	—
RbC_{72}	cr	950.2742	—	-28.5	—	—	—	—
Rb_2CO_3	cr	230.9450	-1131.40	-1136.0	-1051.0	24.481	181.33	117.61
Rb_2CO_3	ai	230.9450	—	-1179.47	-1095.78	—	186.2	—
in 5.76 H_2O		230.9450	—	-1171.9	—	—	—	—
in 200 H_2O		230.9450	—	-1176.5	—	—	—	—
in 2 000 H_2O		230.9450	—	-1178.6	—	—	—	—
$Rb_2CO_3 \cdot H_2O$	cr	248.9604	—	-1448.5	—	—	—	—
$Rb_2CO_3 \cdot 1.5H_2O$	cr	257.9681	—	-1604.5	—	—	—	—
$Rb_2CO_3 \cdot 3H_2O$	cr	284.9912	—	-2048.1	—	—	—	—
$Rb_2C_2O_4$, oxalate	ai	258.9556	—	-1327.6	-1241.7	—	288.7	—
HCOORb formate	ai	130.4858	—	-676.72	-635.1	—	213.	—
$RbHCO_3$	cr	146.4852	—	-963.2	-863.5	—	121.3	—
$RbHCO_3$	ai	146.4852	—	-943.16	-870.75	—	212.71	—
in 200 H_2O		146.4852	—	-940.1	—	—	—	—
in 2 000 H_2O		146.4852	—	-941.8	—	—	—	—
$RbHC_2O_4$ from $HC_2O_4^-$	ai	174.4958	—	-1069.4	-982.32	—	270.7	—
CH_3COORb acetate	ai	144.5130	—	-737.18	-653.29	—	207.9	—
$C_2H_5ORb \cdot C_2H_5OH$	cr	176.5994	—	-716.3	—	—	—	—
$3Rb_2CO_3 \cdot 2RbHCO_3 \cdot 4.5H_2O$	cr	1066.8747	—	-6722.0	—	—	—	—
CCl_3COORb trichloroacetate	ai	247.8480	—	-767.3	—	—	—	—
$CH_2ClCOORb$ chloroacetate	ai	178.9580	—	-752.45	—	—	—	—
$CHCl_2COORb$ dichloroacetate	ai	213.4030	—	-763.2	—	—	—	—
RbCN	cr	111.4857	—	—	—	17.401	140.88	67.78
	ai	111.4857	—	-100.4	-111.7	—	215.5	—
RbCNO cyanate	ai	127.4851	—	-397.1	-381.5	—	228.0	—
NH_2CH_2COORb glycinate	ai	159.5277	—	-720.95	-598.83	—	240.91	—
RbCNS thiocyanate	ai	143.5497	—	-174.72	-191.28	—	265.7	—
$RbHSi(OH)_6$ from $HSi(OH)_6^-$	ai	216.6062	—	—	-2018.6	—	—	—
Rb_2SiF_6	cr	313.0120	—	-2912.	—	—	—	—
	ai	313.0120	—	-2891.6	-2767.2	—	365.3	—
Rb_2GeCl_6	cr	456.2436	—	-1464.4	-1300.3	—	303.	—
Rb_2SnCl_6	cr	502.3436	—	-1523.0	-1374.8	—	377.61	227.07
Rb_2SnCl_6	aq	502.3436	—	-1472.8	—	—	—	—
Rb_2SnBr_6	cr	769.0796	—	—	—	—	445.18	228.20
$RbHPbO_2$ from $HPbO_2^-$	ai	325.6646	—	—	-622.40	—	—	—
$PbI_2 \cdot 2RbI$	cr	885.7432	—	-452.7	—	—	—	—
$PbI_2 \cdot 2RbI \cdot 4H_2O$	cr	957.8048	—	-2045.6	—	—	—	—
$RbBO_2$	cr	128.2776	-966.5	-970.7	-913.	13.309	94.31	74.06
	g	128.2776	-669.4	-672.4	-678.6	14.351	308.26	59.16
	ai	128.2776	—	-1023.53	-962.87	—	84.1	—
$Rb_2B_4O_7$	ai	326.1754	—	—	-3172.6	—	—	—
$RbBH_4$	ai	100.3108	—	-203.01	-169.64	—	231.8	—
$RbB(OH)_4$ from $B(OH)_4^-$	ai	164.3084	—	-1595.19	-1437.16	—	223.8	—
$RbHB_4O_7$ from $HB_4O_7^-$	ai	241.7156	—	—	-2969.3	—	—	—
$RbBF_4$	cr	172.2724	—	-1880.	—	—	—	95.0
	ai	172.2724	—	-1825.9	-1771.0	—	301.	—
$RbBF_2(OH)_2$ from $BF_2(OH)_2^-$	ai	168.2904	—	—	-1625.0	—	—	—

Table 101:Rb — **RUBIDIUM** (Prepared 1979) — Continued — Table 101:Rb

Substance Formula and Description	State	Molar mass g mol^{-1}	0 K $\Delta_f H^\circ_0$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H^\circ_0$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
$RbBF_3OH$ from BF_3OH^-	ai	170.2814	—	−1778.2	−1698.6	—	289.	—
$RbBCl_4$	cr	238.0908	—	−923.4	—	—	—	—
$RbB(ClO_4)_4$	cr	494.0812	—	−777.0	—	—	—	—
$RbAlO_2$	ai	144.4481	—	−1182.0	−1115.0	—	84.5	—
$RbAl(OH)_4$	ai	180.4789	—	−1753.5	−1589.4	—	224.3	—
Rb_3AlF_6	aq	397.3753	—	−3374.8	—	—	—	—
$RbAl(SeO_4)_2 \cdot 12H_2O$	cr	614.5493	—	−5453.	—	—	—	—
Rb_3GaO_3	ai	374.1216	—	—	−1473.	—	—	—
RbH_2GaO_3 from $H_2GaO_3^-$	ai	205.2020	—	—	−1029.	—	—	—
Rb_2HGaO_3 from $HGaO_3^{2-}$	ai	289.6618	—	—	−1255.	—	—	—
$RbGaBr_4$	ai	474.8238	—	−912.9	−834.3	—	157.3	—
Rb_2ZnO_2	ai	268.3044	—	—	−952.20	—	—	—
$RbHZnO_2$ from $HZnO_2^{2-}$	ai	183.8446	—	—	−741.06	—	—	—
$RbZn(OH)_3$ from $Zn(OH)_3^-$	ai	201.8600	—	—	−978.20	—	—	—
$Rb_2Zn(OH)_4$ from $Zn(OH)_4^{2-}$	ai	304.3352	—	—	−1426.49	—	—	—
$RbZnCl_3$	ai	257.1968	—	—	−824.6	—	—	—
Rb_2ZnCl_4	cr	378.1176	—	−1336.37	—	—	—	—
	ai	378.1176	—	—	−1233.8	—	—	—
$RbZnBr_3$	ai	390.5648	—	—	−733.0	—	—	—
Rb_2ZnBr_4	cr	555.9416	—	−1159.55	—	—	—	—
$RbZnI_3$	ai	531.5510	—	—	−575.7	—	—	—
Rb_2ZnI_4	ai	743.9232	—	−907.9	—	—	—	—
$RbCl \cdot ZnSO_4$	cr	282.3524	—	−1449.3	—	—	—	—
$Rb_2Zn(C_2O_4)_2$ from $Zn(C_2O_4)_2^{2-}$	ai	412.3456	—	−2304.5	−2105.3	—	372.	—
$Rb_2Zn(CN)_4$	ai	340.3772	—	−160.2	−120.9	—	469.	—
$Rb_2Zn(CNS)_4$	ai	468.6332	—	—	−351.4	—	—	—
Rb_2CdO_2	ai	315.3344	—	—	−852.2	—	—	—
$RbHCdO_2$ from $HCdO_2^-$	ai	230.8746	—	—	−647.6	—	—	—
$RbCd(OH)_3$ from $Cd(OH)_3^-$	ai	248.8900	—	—	−884.8	—	—	—
$Rb_2Cd(OH)_4$ from $Cd(OH)_4^{2-}$	ai	351.3652	—	—	−1326.2	—	—	—
$RbCdCl_3$	ai	304.2268	—	−812.1	−771.1	—	324.3	—
$RbCdBr_3$	ai	437.5948	—	—	−691.6	—	—	—
$RbCdI_3$	ai	578.5810	—	—	−543.5	—	—	—
Rb_2CdI_4	ai	790.9532	—	−844.3	−883.7	—	569.	—
$RbCd(N_3)_3$	ai	323.9281	—	—	665.0	—	—	—
$Rb_2CdP_2O_7$ from $CdP_2O_7^{2-}$	ai	457.2790	—	—	−2614.0	—	—	—
$Rb_2Cd(C_2O_4)_2$ from $Cd(C_2O_4)_2^{2-}$	ai	459.3756	—	—	−2026.2	—	—	—
$RbCd(CN)_3$	ai	275.9215	—	—	70.8	—	—	—
$Rb_2Cd(CN)_4$	ai	387.4072	—	−74.5	−60.2	—	565.	—
$RbCd(CNS)_3$	ai	372.1135	—	—	−94.5	—	—	—
$RbHgCl_3$	ai	392.4168	—	−639.7	−593.2	—	331.	—
Rb_2HgCl_4	ai	513.3376	—	−1056.5	−1014.6	—	536.	—
$RbHgBr_3$	ai	525.7848	—	−544.3	−543.5	—	381.	—
Rb_2HgBr_4	ai	691.1616	—	−933.5	−938.9	—	552.	—
$RbHgI_3$	ai	666.7710	—	−403.8	−432.6	—	423.	—
Rb_2HgI_4	ai	879.1432	—	−737.6	−779.5	—	602.	—
$RbHg(CN)_3$	ai	364.1115	—	146.0	179.1	—	346.4	—
$Rb_2Hg(CN)_4$	ai	475.5972	—	23.8	50.7	—	548.	—

Substance Formula and Description	State	Molar mass g mol^{-1}	0 K $\Delta_f H_0^\circ$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H_0^\circ$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
$RbHg(CNS)_3$	ai	460.3035	—	—	44.4	—	—	—
$Rb_2Hg(CNS)_4$	ai	603.8532	—	-176.1	-156.4	—	699.	—
Rb_2CuO_2	ai	266.4744	—	—	-751.4	—	—	—
$RbHCuO_2$ from $HCuO_2^-$	ai	182.0146	—	—	-542.6	—	—	—
$RbCuCl_2$	ai	219.9138	—	—	-524.2	—	—	—
Rb_2CuCl_3	ai	340.8346	—	—	-946.	—	—	—
$CuCl_2{\cdot}2RbCl$	cr	376.2876	—	-1114.20	—	—	—	—
$CuCl_2{\cdot}2RbCl{\cdot}4H_2O$	cr	448.3492	—	-2289.48	—	—	—	—
$Rb_2Cu(C_2O_4)_2$ from $Cu(C_2O_4)_2^{2-}$	ai	410.5156	—	-2094.5	-1903.6	—	389.	—
$RbCu(CN)_2$	ai	201.0436	—	—	-26.3	—	—	—
$Rb_2Cu(CN)_3$	ai	312.5293	—	—	-164.0	—	—	—
$Rb_3Cu(CN)_4$	ai	424.0150	—	—	-285.3	—	—	—
$Rb_3Cu(CNS)_4$	ai	552.2710	—	-425.1	-487.8	—	1008.	—
$RbAgCl_2$	ai	264.2438	—	-496.2	-499.5	—	352.7	—
$RbAgBr_2$	ai	353.1558	—	—	-456.5	—	—	—
Rb_2AgBr_3	ai	518.5326	—	—	-852.3	—	—	—
$RbAgI_2$	ai	447.1466	—	—	-371.1	—	—	—
$RbAg_4I_5$	cr	1151.4698	-580.82	-572.8	-598.3	71.513	623.	285.52
Rb_2AgI_3	cr	659.5188	—	-737.2	-733.0	—	356.	—
	ai	659.5188	—	-684.5	-721.7	—	496.2	—
Rb_3AgI_4	ai	871.8910	—	—	-1061.5	—	—	—
$RbAg(CN)_2$	ai	245.3736	—	19.2	21.4	—	314.	—
$RbAg(SCN)_2$	ai	309.5016	—	—	-69.0	—	—	—
$Rb_2Ag(SCN)_3$	ai	453.0513	—	—	-266.9	—	—	—
$Rb_3Ag(SCN)_4$	ai	596.6010	—	—	-459.8	—	—	—
$RbAuCl_2$	ai	353.3408	—	—	-435.10	—	—	—
$RbAuCl_4$	ai	424.2468	—	-573.2	-519.13	—	388.3	—
$RbAuBr_2$	ai	442.2528	—	-379.5	-398.99	—	341.0	—
$RbAuBr_4$	ai	602.0708	—	-442.7	-451.5	—	457.3	—
$RbAu(CN)_2$	ai	334.4706	—	-8.8	1.7	—	293.	—
$RbAu(SCN)_2$	ai	398.5986	—	—	-32.2	—	—	—
$RbAu(SCN)_4$	ai	514.7624	—	—	277.5	—	—	—
$RbNiCl_3$	cr	250.5368	—	-768.2	—	—	—	—
$Rb_2Ni(CN)_4$	ai	333.7172	—	-134.7	-95.7	—	460.	—
$RbCoCl_3$	cr	250.7600	—	-771.5	—	—	—	—
Rb_2CoCl_4	cr	371.6808	—	-1206.7	—	—	—	—
Rb_3CoCl_5	cr	492.6016	—	-1648.5	—	—	—	—
$Rb_2Co(C_2O_4)_2$ from $Co(C_2O_4)_2^{2-}$	ai	405.9088	—	-2211.7	-2010.3	—	351.	—
$Rb_3Co(CN)_6$	ai	471.4440	—	—	—	—	597.1	—
$RbFeCl_3$	cr	247.6738	—	-798.3	—	—	—	—
Rb_2FeCl_4	cr	368.5946	—	-1232.6	—	—	—	—
$RbFe(SO_4)_2$	ai	333.4380	—	—	-1808.6	—	—	—
$Rb_3Fe(CN)_6$	ai	468.3578	—	-191.6	-122.5	—	634.7	—
$Rb_4Fe(CN)_6$	ai	553.8256	—	-548.9	-440.85	—	581.2	—
$Rb_3FeCO(CN)_5$ from $FeCO(CN)_5^{3-}$	ai	470.3505	—	-560.7	—	—	—	—
$RbH_3Fe(CN)_6$ from $H_3Fe(CN)_6^-$	ai	300.4462	—	204.6	—	—	—	—
$Rb_2H_2Fe(CN)_6$ from $H_2Fe(CN)_6^{2-}$	ai	384.9060	—	-46.9	90.63	—	460.	—
$Rb_3HFe(CN)_6$ from $HFe(CN)_6^{3-}$	ai	469.3658	—	-297.9	-180.68	—	540.	—

Substance Formula and Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
$RbH_2FeCO(CN)_5$ from $H_2FeCO(CN)_5^-$	ai	301.4309	—	-57.3	—	—	—	—
$Rb_2HFeCO(CN)_5$ from $HFeCO(CN)_5^{2-}$	ai	385.8907	—	-310.0	—	—	—	—
$RbPdCl_3$	ai	298.2268	—	—	-560.2	—	—	—
Rb_2PdCl_4	ai	419.1476	—	-1052.7	-984.4	—	410.	—
Rb_2PdCl_6	ai	490.0536	—	—	-997.8	—	—	—
$RbPdBr_3$	ai	431.5948	—	—	-488.3	—	—	—
Rb_2PdBr_4	ai	596.9716	—	-887.4	-885.8	—	490.	—
Rb_2PdBr_6	ai	756.7896	—	—	-902.9	—	—	—
Rb_2PdI_4	ai	784.9532	—	—	-726.8	—	—	—
Rb_2PdI_6	ai	1038.7620	—	—	-738.1	—	—	—
$Rb_2Pd(NO_2)_4$ from $Pd(NO_2)_4^{2-}$	ai	461.3576	—	—	-635.8	—	—	—
$Rb_2Pd(CN)_4$	ai	381.4072	—	—	59.	—	—	—
$Rb_2Pd(CNS)_4$	ai	509.6632	—	—	-157.3	—	—	—
Rb_3RhCl_6	aq	572.0264	—	-1602.1	—	—	—	—
$RbRuO_4$	ai	250.5354	—	—	-529.6	—	—	—
Rb_2RuO_4	ai	336.0032	—	—	-871.5	—	—	—
$RbPtCl_3$	ai	386.9168	—	—	-505.8	—	—	—
Rb_2PtCl_4	cr	507.8376	—	-1064.4	—	—	—	—
	ai	507.8376	—	-1001.6	-929.2	—	397.	—
Rb_2PtCl_6	cr	578.7436	—	-1246.	-1109.5	—	406.	—
Rb_2PtCl_6	ai	578.7436	—	-1171.	-1050.5	—	464.	—
$RbPtBr_3$	ai	520.2848	—	—	-428.9	—	—	—
Rb_2PtBr_4	ai	685.6616	—	-872.8	-830.5	—	364.	—
Rb_2PtBr_6	ai	845.4796	—	-973.2	-900.0	—	406.	—
Rb_2PtI_6	ai	1127.4520	—	-715.9	-676.6	—	410.	—
$RbPtNH_3Cl_3$	cr	403.9475	—	-760.7	—	—	—	—
from $PtNH_3Cl_3^-$	ai	403.9475	—	-715.0	-587.3	—	318.	—
$RbPtNH_3Cl_5$ from $PtNH_3Cl_5^-$	ai	474.8535	—	—	-716.6	—	—	—
$Rb_2Pt(CN)_4$	ai	470.0972	—	—	142.7	—	—	—
Rb_2IrCl_6	cr	575.8536	—	-1180.	—	—	—	—
Rb_2IrCl_6	aq	575.8536	—	-1075.	—	—	—	—
Rb_3IrCl_6	aq	661.3214	—	-1477.	—	—	—	—
$RbMnO_4$	ai	204.4034	—	-792.4	-731.3	—	312.5	—
Rb_2MnO_4	ai	289.8712	—	-1155.	-1068.5	—	301.	—
$RbMnCl_3$	cr	246.7648	—	-942.66	—	—	—	—
$RbMnCl_3$	ai	246.7648	—	—	-904.1	—	—	—
$Rb_2Mn(C_2O_4)_2$ from $Mn(C_2O_4)_2^{2-}$	ai	401.9136	—	-2374.4	-2174.7	—	360.	—
$Rb_4Mn(CN)_6$	aq	552.9166	—	-448.	—	—	—	—
$RbReO_4$	cr	335.6654	—	-1102.9	-996.1	—	167.4	—
	ai	335.6654	—	-1038.5	-978.6	—	322.6	—
Rb_2ReCl_6	ai	569.8536	—	-1264.8	-1157.2	—	498.	—
Rb_2CrO_4	cr	286.9292	—	-1414.2	—	—	—	—
	ai	286.9292	—	-1383.48	-1295.72	—	293.21	—
$Rb_2Cr_2O_7$	ai	386.9234	—	-1992.8	-1868.9	—	505.0	—
$RbHCrO_4$ from $HCrO_4^-$	ai	202.4694	—	-1129.3	-1048.8	—	305.4	—
Rb_3CrO_4F	cr	391.3954	—	-1975.3	—	—	—	—
Rb_3CrCl_6	cr	521.1174	—	-1929.7	—	—	—	—
$Rb_3Cr_2Cl_9$	cr	679.4724	—	-2527.1	—	—	—	—

Substance Formula and Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
Rb_2MoO_4	ai	330.8732	—	-1500.4	-1404.1	—	270.3	—
$RbMoF_6$	cr	295.3982	—	-2088.	—	—	—	—
Rb_2WO_4	ai	418.7832	—	-1578.2	—	—	—	—
$Rb_5HW_6O_{21}$ from $HW_6O_{21}^{5-}$	aq	1867.4343	—	-7094.8	—	—	—	—
$RbWF_6$	cr	383.3082	—	-2238.	—	—	—	—
$RbVO_3$	ai	184.4080	—	-1139.3	-1067.7	—	172.	—
Rb_3VO_4	ai	371.3430	—	—	-1750.9	—	—	—
RbH_2VO_4	ai	202.4234	—	-1425.1	-1304.9	—	243.	—
$RbH_3V_2O_7$	ai	302.3716	—	—	-2147.9	—	—	—
$Rb_3HV_2O_7$	ai	471.2912	—	—	-2644.2	—	—	—
$Rb_4H_2V_{10}O_{28}$	ai	1301.2904	—	—	-8857.	—	—	—
$Rb_5HV_{10}O_{28}$	ai	1385.7502	—	-9950.	-9121.	—	828.	—
Rb_3VCl_6	cr	520.0634	—	-1970.2	—	—	—	—
$Rb_3V_2Cl_9$	cr	677.3644	—	-2579.9	—	—	—	—
$Rb_2VO(C_2O_4)_2$ from $VO(C_2O_4)_2^{2-}$	ai	413.9170	—	—	-2306.5	—	—	—
$RbNbO_3$	cr	226.3720	—	—	-1261.4	—	—	—
	ai	226.3720	—	—	-1216.2	—	—	—
$RbNbCl_6$	cr	391.0918	—	-1284.9	—	—	—	—
Rb_2NbOCl_5	cr	457.1060	—	-1797.4	—	—	—	—
$RbTaF_6$	ai	380.4062	—	—	-1159.3	—	—	—
Rb_2TaF_7	ai	484.8724	—	—	-1740.0	—	—	—
$RbTaCl_6$	cr	479.1338	—	-1367.7	—	—	—	—
$RbTiCl_3$	cr	239.7268	—	-1046.4	—	—	—	—
Rb_2TiCl_4	cr	360.6476	—	-1497.9	—	—	—	—
Rb_2TiCl_6	cr	431.5536	—	-1778.2	—	—	—	—
Rb_2TiBr_6	cr	698.2896	—	-1505.0	—	—	—	—
Rb_3TiBr_6	cr	783.7574	—	-1782.0	—	—	—	—
$Rb_3Ti_2Br_9$	cr	1071.3844	—	-2357.7	—	—	—	—
$Rb_2ZrO(SO_4)_2$ from $ZrO(SO_4)_2^{2-}$	aq	470.2782	—	-3138.8	—	—	—	—
$RbGd(Fe(CN)_6)$	cr	454.6722	—	—	-317.5	—	—	—
$RbCe(Fe(CN)_6)\cdot 2H_2O$	cr	473.5730	—	—	-806.5	—	—	—
$RbUF_6$	cr	437.4872	—	-2724.6	—	—	—	—
$Rb(UO_2)_2F_5$	cr	720.5154	—	-3951.4	—	—	—	—
$Rb_3UO_2F_5$	cr	621.4232	—	-3459.3	—	—	—	—
$Rb_5(UO_2)_2F_9$	cr	1138.3802	—	-6350.1	—	—	—	—
$RbUCl_5$	cr	500.7618	—	-1498.7	—	—	—	—
$RbUCl_6$	cr	536.2148	—	-1554.8	—	—	—	—
Rb_2UCl_6	cr	621.6826	—	-1957.7	—	—	—	—
Rb_4UCl_8	cr	863.5242	—	-2829.2	—	—	—	—
Rb_2UBr_6	cr	888.4186	—	-1653.9	—	—	—	—
Rb_2ThCl_6	cr	615.6917	—	-2141.8	—	—	—	—
$Rb_2ThCl_6\cdot 9H_2O$	cr	777.8303	—	-4830.4	—	—	—	—
Rb_4ThCl_8	cr	857.5333	—	-3045.5	—	—	—	—
Rb_2BeO_2	ai	211.9466	—	-1293.3	-1207.9	—	84.	—
$Rb_2Mg(SeO_4)_2$ in 6 400 H_2O		481.1628	—	-2164.8	—	—	—	—
$Rb_2Mg(SeO_4)_2\cdot 6H_2O$	cr	589.2552	—	-3922.9	—	—	—	—
$Rb_2MgP_2O_7$ from $MgP_2O_7^{2-}$	ai	369.1910	—	-3228.4	-2982.7	—	163.	—
$Rb_2Mg(C_2O_4)_2$ from $Mg(C_2O_4)_2^{2-}$	ai	371.2876	—	—	-2395.6	—	—	—

Substance Formula and Description	State	Molar mass g mol^{-1}	0 K	298.15 K (25°C) and 0.1 MPa (1 bar)				
			$\Delta_f H_0^\circ$ kJ mol^{-1}	$\Delta_f H^\circ$	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H_0^\circ$	S° J mol^{-1} K^{-1}	C_p
$RbMgFe(CN)_6$ from $MgFe(CN)_6^-$	ai	321.7342	—	—	-25.4	—	—	—
$Rb_2MgFe(CN)_6$ from $MgFe(CN)_6^{2-}$	ai	407.2020	—	—	-349.3	—	—	—
$RbCaCl_3$	cr	231.9068	—	-1253.1	—	—	—	—
$RbCaFe(CN)_6$ from $CaFe(CN)_6^-$	ai	337.5022	—	—	-124.6	—	—	—
$Rb_2CaFe(CN)_6$ from $CaFe(CN)_6^{2-}$	ai	422.9700	—	—	-448.0	—	—	—
$RbSrFe(CN)_6$ from $SrFe(CN)_6^-$	ai	385.0422	—	—	-130.4	—	—	—
$RbNO_2 \cdot 2Ba(NO_2)_2$	cr	590.1753	—	-1899.1	—	—	—	—
$Ba(NO_2)_2 \cdot 2RbNO_2$	cr	492.2976	—	-1532.6	—	—	—	—
$RbNaBr_2$	g	268.2756	—	-556.	—	—	—	—
$NaRb_2CrCl_6$	cr	458.6394	—	-1910.0	—	—	—	—
$RbKCl_2$	cr	195.4758	—	-873.91	—	—	—	—
	g	195.4758	—	-652.3	—	—	—	—

Table 102:Cs — CESIUM (Prepared 1979) — Table 102:Cs

Substance Formula	Description	State	Molar mass g mol⁻¹	0 K: $\Delta_fH^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar): Δ_fH° kJ mol⁻¹	Δ_fG° kJ mol⁻¹	$H^\circ-H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
Cs		cr	132.9054	0	0	0	7.711	85.23	32.17
		g	132.9054	77.580	76.065	49.121	6.197	175.595	20.786
	in 235 Hg		132.9054	—	—	-118.16	—	—	—
Cs^+		g	132.9054	453.282	457.964	—	6.197	—	—
Cs^{2+}		g	132.9054	2686.	2694.	—	6.197	—	—
Cs^+		ao	132.9054	—	-258.28	-292.02	—	133.05	-10.5
Cs_2		g	265.8108	111.7	107.3	73.5	11.00	283.83	37.95
Cs_2^+		g	265.8108	478.2	473.6	—	—	—	—
CsO_2		cr	164.9042	—	-286.2	—	—	—	—
Cs_2O		cr	281.8102	-343.682	-345.77	-308.14	17.677	146.86	75.98
Cs_2O		g	281.8102	—	-155.	—	—	—	—
Cs_2O_2		g	297.8096	—	-247.	—	—	—	—
CsH		cr	133.9134	—	-54.18	—	—	—	—
		g	133.9134	118.8	115.7	96.5	8.845	215.167	31.547
CsOH		cr	149.9128	—	-417.23	—	—	—	—
CsOH		g	149.9128	-242.3	-247.	-247.	11.832	254.83	49.71
		ai	149.9128	—	-488.27	-449.25	—	122.30	—
	in 75 H_2O		149.9128	—	-487.48	—	—	—	—
	in 100 H_2O		149.9128	—	-487.52	—	—	—	—
	in 170 H_2O		149.9128	—	-487.60	—	—	—	—
CsOH	in 250 H_2O		149.9128	—	-487.65	—	—	—	—
	in 300 H_2O		149.9128	—	-487.69	—	—	—	—
	in 500 H_2O		149.9128	—	-487.73	—	—	—	—
	in 900 H_2O		149.9128	—	-487.85	—	—	—	—
	in 1 000 H_2O		149.9128	—	-487.90	—	—	—	—
CsOH	in 1 500 H_2O		149.9128	—	-487.94	—	—	—	—
	in 2 700 H_2O		149.9128	—	-488.02	—	—	—	—
	in 2 733 H_2O		149.9128	—	-488.02	—	—	—	—
	in 3 000 H_2O		149.9128	—	-488.02	—	—	—	—
	in 50 000 H_2O		149.9128	—	-488.19	—	—	—	—
$CsOH{\cdot}H_2O$		cr	167.9282	—	-754.04	—	—	—	—
$CsHO_2$	from HO_2^-	ai	165.9122	—	-418.61	-359.4	—	156.9	—
$(CsOH)_2$		g	299.8256	—	-326.	—	—	—	—
CsF		cr	151.9038	-553.146	-553.5	-525.5	11.724	92.80	51.09
		g	151.9038	-356.52	-359.0	-375.7	9.648	243.24	35.86
CsF		ai	151.9038	—	-590.91	-570.81	—	119.2	—
	in 110 H_2O		151.9038	—	-590.24	—	—	—	—
	in 500 H_2O		151.9038	—	-590.57	—	—	—	—
	in $HCONH_2$:s in formamide		151.9038	—	-585.34	—	—	—	—
$CsF{\cdot}1.5H_2O$		cr	178.9269	—	-1013.8	—	—	—	—
Cs_2F_2		g	303.8076	-891.99	-897.0	-891.6	19.20	355.37	79.58
$CsHF_2$		cr	171.9102	-920.65	-923.8	-858.9	17.577	135.19	87.28
	from HF_2^-	ai	171.9102	—	-908.22	-870.10	—	225.5	—
CsCl		cr	168.3584	-443.194	-443.04	-414.53	12.452	101.17	52.47
		g	168.3584	-238.03	-240.20	-257.80	10.13	255.96	36.94
CsCl		ai	168.3584	—	-425.43	-423.24	—	189.54	-146.9
	in 11.10 H_2O		168.3584	—	-428.44	—	—	—	—
	in 12 H_2O		168.3584	—	-428.27	—	—	—	—
	in 12.33 H_2O		168.3584	—	-428.23	—	—	—	—
	in 13.88 H_2O		168.3584	—	-428.02	—	—	—	—

Table 102:Cs — **CESIUM** (Prepared 1979) — Continued — Table 102:Cs

Substance Formula	Description	State	Molar mass	0 K	298.15 K (25°C) and 0.1 MPa (1 bar)				
			g mol^{-1}	$\Delta_f H_0^\circ$ kJ mol^{-1}	$\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H_0^\circ$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
CsCl	in 15 H_2O		168.3584	—	-427.86	—	—	—	—
	in 15.86 H_2O		168.3584	—	-427.73	—	—	—	—
	in 18.50 H_2O		168.3584	—	-427.48	—	—	—	—
	in 20 H_2O		168.3584	—	-427.35	—	—	—	—
	in 22.2 H_2O		168.3584	—	-427.19	—	—	—	—
CsCl	in 25 H_2O		168.3584	—	-426.98	—	—	—	—
	in 27.75 H_2O		168.3584	—	-426.85	—	—	—	—
	in 30 H_2O		168.3584	—	-426.722	—	—	—	—
	in 37 H_2O		168.3584	—	-426.471	—	—	—	—
	in 40 H_2O		168.3584	—	-426.366	—	—	—	—
CsCl	in 50 H_2O		168.3584	—	-426.128	—	—	—	—
	in 55.51 H_2O		168.3584	—	-426.032	—	—	—	—
	in 75 H_2O		168.3584	—	-425.789	—	—	—	—
	in 100 H_2O		168.3584	—	-425.613	—	—	—	—
	in 110 H_2O		168.3584	—	-425.550	—	—	—	—
CsCl	in 150 H_2O		168.3584	—	-425.425	—	—	—	—
	in 200 H_2O		168.3584	—	-425.337	—	—	—	—
	in 300 H_2O		168.3584	—	-425.253	—	—	—	—
	in 400 H_2O		168.3584	—	-425.220	—	—	—	—
	in 500 H_2O		168.3584	—	-425.199	—	—	—	—
CsCl	in 555.1 H_2O		168.3584	—	-425.195	—	—	—	—
	in 700 H_2O		168.3584	—	-425.191	—	—	—	—
	in 800 H_2O		168.3584	—	-425.191	—	—	—	—
	in 1 000 H_2O		168.3584	—	-425.195	—	—	—	—
	in 1 110 H_2O		168.3584	—	-425.199	—	—	—	—
CsCl	in 1 200 H_2O		168.3584	—	-425.203	—	—	—	—
	in 1 500 H_2O		168.3584	—	-425.212	—	—	—	—
	in 1 600 H_2O		168.3584	—	-425.216	—	—	—	—
	in 2 000 H_2O		168.3584	—	-425.224	—	—	—	—
	in 2 500 H_2O		168.3584	—	-425.237	—	—	—	—
CsCl	in 3 000 H_2O		168.3584	—	-425.249	—	—	—	—
	in 3 300 H_2O		168.3584	—	-425.253	—	—	—	—
	in 4 000 H_2O		168.3584	—	-425.266	—	—	—	—
	in 5 000 H_2O		168.3584	—	-425.278	—	—	—	—
	in 7 000 H_2O		168.3584	—	-425.295	—	—	—	—
CsCl	in 10 000 H_2O		168.3584	—	-425.312	—	—	—	—
	in 20 000 H_2O		168.3584	—	-425.341	—	—	—	—
	in 50 000 H_2O		168.3584	—	-425.375	—	—	—	—
	in 100 000 H_2O		168.3584	—	-425.387	—	—	—	—
	in 500 000 H_2O		168.3584	—	-425.408	—	—	—	—
CsCl	in CH_3OH:s in methanol		168.3584	—	-431.0	—	—	—	—
	in $HCONH_2$:s in formamide		168.3584	—	-439.3		—	—	—
	in $HCONHCH_3$:s in N–methylformamide		168.3584	—	-439.3	-397.9	—	58.2	—
	in $HCON(CH_3)_2$:s in N,N–dimethylformamide		168.3584	—	—	-385.3	—	—	—
	in $C_4H_8O_2$:s in aqueous dioxane (20%)		168.3584	—	-427.52	—	—	—	—
$CsCl_3$	from Cl_3^-	ai	239.2644	—	—	-412.5	—	—	—

Substance Formula	Description	State	Molar mass g mol⁻¹	0 K: $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar): $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
Cs_2Cl_2		g	336.7168	-652.4	-656.1	-654.0	20.96	387.1	81.6
$CsClO$		ai	184.3578	—	-365.3	-328.8	—	176.	—
$CsClO_2$		ai	200.3572	—	-324.7	-274.8	—	234.3	—
$CsClO_3$		cr	216.3566	—	-411.7	-307.9	—	156.1	—
		ai	216.3566	—	-362.25	-299.97	—	295.4	—
$CsClO_4$		cr	232.3560	-435.705	-443.09	-314.26	22.280	175.06	108.28
		ai	232.3560	—	-387.61	-300.54	—	315.1	—
	in $HCONH_2$:s in formamide		232.3560	—	-423.8	—	—	—	—
	in $HCONHCH_3$:s in N–methylformamide		232.3560	—	-430.1	—	—	—	—
	in $HCON(CH_3)_2$:s in N,N–dimethylformamide		232.3560	—	-450.49	—	—	—	—
$CsClO_4$	in $CH_3CON(CH_3)_2$:s in N,N–dimethylacetamide		232.3560	—	-451.9	—	—	—	—
	in $C_4H_8SO_2$:s in sulfolane		232.3560	—	-433.9	—	—	—	—
$CsBr$		cr	212.8144	-398.978	-405.81	-391.41	13.138	113.05	52.93
		g	212.8144	-199.53	-209.2	-241.0	10.29	267.43	37.07
		ai	212.8144	—	-379.82	-395.97	—	215.48	—
$CsBr$	in 75 H_2O		212.8144	—	-380.16	—	—	—	—
	in 500 H_2O		212.8144	—	-379.74	—	—	—	—
	in 1 000 H_2O		212.8144	—	-379.66	—	—	—	—
	in 1 333 H_2O		212.8144	—	-379.61	—	—	—	—
	in 2 000 H_2O		212.8144	—	-379.66	—	—	—	—
$CsBr$	in $HCONH_2$:s in formamide		212.8144	—	-398.15	—	—	—	—
	in $HCON(CH_3)_2$:s in N,N–dimethylformamide		212.8144	—	-410.32	-370.7	—	27.6	—
$CsBr_3$		cr	372.6324	—	-432.6	-405.0	—	222.	—
	from Br_3^-	ai	372.6324	—	-388.69	-399.07	—	348.5	—
$CsBr_5$	from Br_5^-	ai	532.4504	—	-400.4	-395.8	—	449.8	—
Cs_2Br_2		g	425.6288	-527.60	-545.6	-572.4	21.97	412.2	82.4
$CsBrO$		ai	228.8138	—	-352.3	-325.5	—	176.	—
$CsBrO_3$		cr	260.8126	—	-375.81	-284.92	—	163.6	—
		ai	260.8126	—	-325.35	-273.42	—	294.76	—
$CsBrO_4$		ai	276.8120	—	-245.2	-174.0	—	332.6	—
$CsBrCl_2$		cr	283.7204	—	-489.5	—	—	—	—
$CsBr_2Cl$		cr	328.1764	—	-472.0	—	—	—	—
	from Br_2Cl^-	ai	328.1764	—	-428.4	-420.5	—	321.7	—
CsI		cr	259.8098	-345.816	-346.60	-340.58	13.523	123.05	52.80
		g	259.8098	-148.11	-151.9	-191.2	10.54	275.29	37.45
CsI		ai	259.8098	—	-313.47	-343.59	—	244.3	-152.7
	in 110 H_2O		259.8098	—	-313.67	—	—	—	—
	in 500 H_2O		259.8098	—	-313.403	—	—	—	—
	in 1 000 H_2O		259.8098	—	-313.310	—	—	—	—
	in 1 300 H_2O		259.8098	—	-313.30	—	—	—	—
CsI	in 2 600 H_2O		259.8098	—	-313.30	—	—	—	—
	in 400 CH_3OH		259.8098	—	-327.6	—	—	—	—
	in 4 000 CH_3OH in methanol in methanol		259.8098	—	-327.6	—	—	—	—
	in $HCONH_2$:s in formamide		259.8098	—	-339.3	—	—	—	—
	in $NH_2C_2H_4NH_2$:s in ethylenediamine		259.8098	—	-356.94	—	—	—	—

Substance Formula	Description	State	Molar mass g mol^{-1}	0 K: $\Delta_f H^\circ_0$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar): $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H^\circ_0$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
CsI	in $HCON(CH_3)_2$:s in N,N-dimethylformamide		259.8098	—	-364.38	—	—	—	—
	in C_2H_6SO:s in dimethylsulfoxide		259.8098	—	-358.49	—	—	—	—
CsI_3		cr	513.6186	—	-361.9	-354.33	—	235.1	—
	from I_3^-	ai	513.6186	—	-309.6	-343.5	—	372.4	—
CsI_4		cr	640.5230	—	-365.7	-357.7	—	290.8	—
Cs_2I_2		g	519.6196	-452.42	-458.6	-501.2	22.47	429.4	82.4
Cs_2I_8		cr	1281.0460	—	-731.8	—	—	—	—
CsIO		ai	275.8092	—	-365.7	-330.5	—	127.6	—
$CsIO_3$		cr	307.8080	—	—	-433.8	—	—	—
		ai	307.8080	—	-479.5	-420.0	—	251.5	—
$CsIO_4$		cr	323.8074	—	—	-380.7	—	—	—
		ai	323.8074	—	-409.6	-350.6	—	356.	—
Cs_2I_2O		ai	535.6190	—	—	-666.5	—	—	—
CsH_4IO_6	from $H_4IO_6^-$	aq	359.8382	—	-1017.5	—	—	—	—
CsI_2OH	from I_2OH^-	ai	403.7216	—	-522.2	—	—	—	—
$Cs_2H_3IO_6$	from $H_3IO_6^{2-}$	aq	491.7356	—	-1272.8	—	—	—	—
$CsICl_2$		cr	330.7158	—	-481.6	—	—	—	—
	from ICl_2^-	ai	330.7158	—	—	-453.1	—	—	—
$CsICl_4$		cr	401.6218	—	-574.5	—	—	—	—
CsI_2Cl	from I_2Cl^-	ai	422.1672	—	-395.8	-408.3	—	354.4	—
$CsIBr_2$		cr	419.6278	—	—	-422.6	—	—	—
	from IBr_2^-	ai	419.6278	—	—	-415.1	—	—	—
CsI_2Br		cr	466.6232	—	-397.1	-385.3	—	238.	—
	from BrI_2^-	ai	466.6232	—	-386.2	-402.1	—	330.5	—
CsIBrF		cr	358.7172	—	—	-546.0	—	—	—
CsIBrCl		cr	375.1718	—	—	-443.5	—	—	—
	from $IBrCl^-$	ai	375.1718	—	—	-438.5	—	—	—
Cs_2S		cr	297.8748	—	-359.8	—	—	—	—
		ai	297.8748	—	-483.7	-498.3	—	251.5	—
Cs_2S_2	from S_2^{2-}	ai	329.9388	—	-486.6	-504.6	—	294.6	—
Cs_2S_3	from S_3^{2-}	ai	362.0028	—	-490.8	-510.4	—	332.2	—
Cs_2S_4	from S_4^{2-}	ai	394.0668	—	-493.7	-515.1	—	369.4	—
Cs_2S_5	from S_5^{2-}	ai	426.1308	—	-495.4	-518.4	—	406.7	—
Cs_2SO_3		cr	345.8730	—	-1134.7	—	—	—	—
		ai	345.8730	—	-1152.3	-1070.6	—	236.8	—
Cs_2SO_3		aq	345.8730	—	-1154.4	—	—	—	—
Cs_2SO_4		cr	361.8724	-1433.56	-1443.02	-1323.58	27.74	211.92	134.89
		g	361.8724	—	-1102.9	—	—	—	—
		ai	361.8724	—	-1425.82	-1328.56	—	286.2	—
	in 200 H_2O		361.8724	—	-1425.656	—	—	—	—
Cs_2SO_4	in 400 H_2O		361.8724	—	-1425.363	—	—	—	—
	in 500 H_2O		361.8724	—	-1425.288	—	—	—	—
	in 1 000 H_2O		361.8724	—	-1425.158	—	—	—	—
	in 1 500 H_2O		361.8724	—	-1425.133	—	—	—	—
	in 1 760 H_2O		361.8724	—	-1425.125	—	—	—	—
Cs_2SO_4	in 2 000 H_2O		361.8724	—	-1425.116	—	—	—	—

Substance Formula	Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
Cs_2SO_4	in 3 000 H_2O		361.8724	—	-1425.154	—	—	—	—
	in 5 000 H_2O		361.8724	—	-1425.196	—	—	—	—
	in 10 000 H_2O		361.8724	—	-1425.300	—	—	—	—
	in 20 000 H_2O		361.8724	—	-1425.413	—	—	—	—
	in 50 000 H_2O		361.8724	—	-1425.539	—	—	—	—
Cs_2SO_4	in 100 000 H_2O		361.8724	—	-1425.614	—	—	—	—
	in 200 000 H_2O		361.8724	—	-1425.669	—	—	—	—
$Cs_2S_2O_3$		ai	377.9370	—	-1169.0	-1106.6	—	335.	—
$Cs_2S_2O_4$		ai	393.9364	—	-1270.3	-1184.4	—	360.	—
$Cs_2S_2O_5$		cr	409.9358	—	-1561.1	—	—	—	—
$Cs_2S_2O_6$		aq	425.9352	—	-1715.0	—	—	—	—
$Cs_2S_2O_7$		aq	441.9346	—	-1917.9	—	—	—	—
$Cs_2S_2O_8$		ai	457.9340	—	-1861.5	-1699.0	—	510.4	—
$Cs_2S_3O_6$		aq	457.9992	—	-1716.3	—	—	—	—
$Cs_2S_4O_6$		ai	490.0632	—	-1741.0	-1625.4	—	523.4	—
$Cs_2S_5O_6$		aq	522.1272	—	-1753.1	—	—	—	—
CsHS		cr	165.9774	—	-274.5	—	—	—	—
	from HS^-	ai	165.9774	—	-275.7	-279.94	—	195.8	—
		aq	165.9774	—	-275.7	—	—	—	—
$CsHSO_3$	from HSO_3^-	ai	213.9756	—	-884.50	-819.75	—	272.8	—
$CsHSO_4$		cr	229.9750	—	-1158.1	—	—	—	—
	from HSO_4^-	ai	229.9750	—	-1145.62	-1047.93	—	264.8	—
$CsHS_2O_4$	from $HS_2O_4^-$	ai	262.0390	—	—	-906.6	—	—	—
$CsSO_2F$		cr	215.9666	—	-949.8	—	—	—	—
$CsSO_3F$		ai	231.9660	—	-1129.7	—	—	—	—
$CsI{\cdot}3SO_2$		cr	451.9982	—	-1359.0	—	—	—	—
Cs_2Se		ai	344.7708	—	—	-454.8	—	—	—
Cs_2SeO_3		ai	392.7690	—	-1025.9	-953.9	—	280.	—
$Cs_2SeO_3{\cdot}H_2O$		cr	410.7844	—	-1314.61	—	—	—	—
Cs_2SeO_4		cr	408.7684	—	-1139.5	—	—	—	—
Cs_2SeO_4		ai	408.7684	—	-1115.9	-1025.4	—	320.1	—
	in 1 000 H_2O		408.7684	—	-1122.1	—	—	—	—
CsHSe		cr	212.8734	—	-251.5	—	—	—	—
	from HSe^-	ai	212.8734	—	-242.3	-248.1	—	213.	—
		aq	212.8734	—	-242.3	—	—	—	—
$CsHSeO_3$	from $HSeO_3^-$	ai	260.8716	—	-772.83	-703.47	—	268.2	—
$CsHSeO_4$	from $HSeO_4^-$	ai	276.8710	—	-839.7	-744.3	—	282.4	—
Cs_2TeO_3		cr	441.4090	—	-1000.8	—	—	—	—
	in 6 000 H_2O		441.4090	—	-1068.6	—	—	—	—
$Cs_2TeO_3{\cdot}5H_2O$		cr	531.4860	—	-2512.9	—	—	—	—
CsH_5TeO_6	from $H_5TeO_6^-$	aq	361.5418	—	-1519.6	—	—	—	—
$Cs_2H_4TeO_6$	from $H_4TeO_6^{2-}$	aq	493.4392	—	-1738.9	—	—	—	—
Cs_2TeBr_6		cr	872.8648	—	-1051.0	—	—	—	—
Cs_2PoCl_6		ai	688.5288	—	—	-1163.	—	—	—
CsN_3		cr	174.9255	—	-19.66	—	—	—	—
CsN_3		ai	174.9255	—	16.86	56.1	—	241.0	—
	in 2 000 H_2O		174.9255	—	16.7	—	—	—	—
$CsNO_2$		ai	178.9109	—	-362.8	-324.2	—	256.1	—
		aq	178.9109	—	-362.8	—	—	—	—
$CsNO_3$		cr	194.9103	—	-505.97	-406.54	—	155.2	—

Substance Formula	Substance Description	State	Molar mass g mol^{-1}	0 K: $\Delta_f H^\circ_0$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar): $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H^\circ_0$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
$CsNO_3$		g	194.9103	—	-374.0	—	—	—	—
		ai	194.9103	—	-465.64	-403.27	—	279.5	-99.
	in 55.51 H_2O		194.9103	—	-469.114	—	—	—	—
	in 75 H_2O		194.9103	—	-468.365	—	—	—	—
	in 100 H_2O		194.9103	—	-467.763	—	—	—	—
$CsNO_3$	in 150 H_2O		194.9103	—	-467.118	—	—	—	—
	in 200 H_2O		194.9103	—	-466.750	—	—	—	—
	in 300 H_2O		194.9103	—	-466.361	—	—	—	—
	in 400 H_2O		194.9103	—	-466.152	—	—	—	—
	in 500 H_2O		194.9103	—	-466.014	—	—	—	—
$CsNO_3$	in 600 H_2O		194.9103	—	-465.930	—	—	—	—
	in 700 H_2O		194.9103	—	-465.872	—	—	—	—
	in 800 H_2O		194.9103	—	-465.821	—	—	—	—
	in 900 H_2O		194.9103	—	-465.784	—	—	—	—
	in 1 000 H_2O		194.9103	—	-465.759	—	—	—	—
$CsNO_3$	in 1 500 H_2O		194.9103	—	-465.671	—	—	—	—
	in 2 000 H_2O		194.9103	—	-465.629	—	—	—	—
	in 3 000 H_2O		194.9103	—	-465.591	—	—	—	—
	in 4 000 H_2O		194.9103	—	-465.579	—	—	—	—
	in 5 000 H_2O		194.9103	—	-465.570	—	—	—	—
$CsNO_3$	in 6 000 H_2O		194.9103	—	-465.566	—	—	—	—
	in 7 000 H_2O		194.9103	—	-465.566	—	—	—	—
	in 10 000 H_2O		194.9103	—	-465.566	—	—	—	—
	in 20 000 H_2O		194.9103	—	-465.575	—	—	—	—
	in 50 000 H_2O		194.9103	—	-465.587	—	—	—	—
$CsNO_3$	in 100 000 H_2O		194.9103	—	-465.600	—	—	—	—
	in 500 000 H_2O		194.9103	—	-465.621	—	—	—	—
$CsONO_2$	from ONO_2^-, peroxynitrite	aq2	194.9103	—	-302.9	—	—	—	—
$Cs_2N_2O_2$	from $N_2O_2^{2-}$, hyponitrite	aq	325.8230	—	-533.9	—	—	—	—
$CsNH_2$	tetragonal	cr	148.9281	—	-118.4	—	—	—	—
$CsHN_2O_2$	from $HN_2O_2^-$, hyponitrite	aq	193.9256	—	-310.0	—	—	—	
$CsPO_3$		cr	211.8774	—	-1241.4	—	—	—	—
		aq	211.8774	—	-1235.1	—	—	—	—
Cs_3PO_4		ai	493.6876	—	-2052.3	-1894.9	—	176.	—
$Cs_4P_2O_7$		ai	705.5650	—	-3304.1	-3087.3	—	415.1	—
CsH_2PO_2	from $H_2PO_2^-$	aq	197.8940	—	-872.07	—	—	—	—
CsH_2PO_3	from $H_2PO_3^-$	aq	213.8934	—	-1227.6	—	—	—	—
CsH_2PO_4		cr	229.8928	—	-1564.8	—	—	—	—
	from $H_2PO_4^-$	ai	229.8928	—	-1554.57	—	—	—	—
$CsH_3P_2O_7$	from $H_3P_2O_7^-$	ai	309.8728	—	-2534.7	-2315.3	—	346.4	—
Cs_2HPO_3	from HPO_3^{2-}	aq	345.7908	—	-1485.7	—	—	—	—
Cs_2HPO_4	from HPO_4^{2-}	ai	361.7902	—	-1808.70	-1673.18	—	232.6	—
$Cs_2H_2P_2O_7$	from $H_2P_2O_7^{2-}$	ai	441.7702	—	-2795.3	-2594.4	—	431.	—
$Cs_3HP_2O_7$	from $HP_2O_7^{3-}$	ai	573.6676	—	-3049.7	-2848.3	—	445.2	—
$CsPF_6$		cr	277.8696	—	-2379.9	—	—	—	—
Cs_2PO_3F		ai	363.7812	—	—	-1758.9	—	—	—
$CsHPO_3F$	from HPO_3F^-	ai	231.8838	—	—	-1490.3	—	—	—
$CsAsO_2$		ai	239.8258	—	-687.31	-642.00	—	173.6	—
Cs_3AsO_4		ai	537.6354	—	-1662.97	-1524.46	—	236.4	—

Table 102:Cs | CESIUM (Prepared 1979) — Continued | Table 102:Cs

Substance Formula and Description		State	Molar mass g mol⁻¹	0 K $\Delta_f H_0^\circ$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H_0^\circ$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
CsH_2AsO_3	from $H_2AsO_3^-$	ai	257.8412	—	-973.07	-879.14	—	243.5	—
CsH_2AsO_4	from $H_2AsO_4^-$	ai	273.8406	—	-1167.84	-1045.19	—	251.	—
Cs_2HAsO_4	from $HAsO_4^{2-}$	ai	405.7380	—	-1422.89	-1298.63	—	264.4	—
Cs_2AsO_3F		ai	407.7290	—	—	-1611.49	—	—	—
$CsHAsO_3F$	from $HAsO_3F^-$	ai	275.8316	—	—	-1352.98	—	—	—
$CsSbO_2$		ai	286.6542	—	—	-632.21	—	—	—
$Cs_2Sb_2S_4$		ai	637.5668	—	-736.0	-683.7	—	213.8	—
$CsBiCl_4$		ai	483.6974	—	—	-773.6	—	—	—
Cs_3BiCl_6		ai	820.4142	—	—	-1622.79	—	—	—
$CsBiBr_4$		ai	661.5214	—	—	-669.4	—	—	—
$CsBiI_4$		ai	849.5030	—	—	-500.8	—	—	—
CsC_8		cr	228.9950	—	-61.9	—	—	—	—
CsC_{10}		cr	253.0174	—	-49.8	—	—	—	—
CsC_{24}		cr	421.1742	—	-45.6	—	—	—	—
CsC_{36}		cr	565.3086	—	-35.6	—	—	—	—
CsC_{48}		cr	709.4430	—	-23.4	—	—	—	—
CsC_{60}		cr	853.5774	—	-10.5	—	—	—	—
CsC_{72}		cr	997.7118	—	3.3	—	—	—	—
Cs_2CO_3		cr	325.8202	-1135.948	-1139.7	-1054.3	25.727	204.47	123.85
	G–H–S constraint has been relaxed; see Introduction								
		ai	325.8202	—	-1193.70	-1111.85	—	209.2	—
$Cs_2CO_3{\cdot}3H_2O$		cr	379.8664	—	-2048.1	—	—	—	—
$Cs_2C_2O_4$	oxalate	cr	353.8308	—	—	—	31.171	238.15	—
		ai	353.8308	—	-1341.8	-1258.1	—	311.7	—
	in 800 H_2O		353.8308	—	-1398.3	—	—	—	—
$CsHC_2$	cesium acetylide	cr	157.9358	—	78.70	—	—	—	—
$HCOOCs$	formate	ai	177.9234	—	-683.83	-642.99	—	226.	—
$CsHCO_3$		cr	193.9228	—	-966.1	—	—	—	—
	from HCO_3^-	ai	193.9228	—	-950.27	-878.78	—	224.3	—
$CsHC_2O_4$	from $HC_2O_4^-$	ai	221.9334	—	-1076.5	-990.35	—	282.4	—
CH_3COOCs	acetate	ai	191.9506	—	-744.29	-661.33	—	219.7	—
$C_2H_5OCs{\cdot}C_2H_5OH$		cr	224.0370	—	-727.2	—	—	—	—
$5Cs_2CO_3{\cdot}2CsHCO_3{\cdot}10H_2O$		cr	2197.1005	—	-10674.6	—	—	—	—
$5Cs_2CO_3{\cdot}2CsHCO_3{\cdot}17.5H_2O$		cr	2332.2160	—	-12963.7	—	—	—	—
CCl_3COOCs	trichloroacetate	aq	295.2856	—	-774.5	—	—	—	—
$CH_2ClCOOCs$	chloroacetate	aq	226.3956	—	-759.56	—	—	—	—
$CHCl_2COOCs$	dichloroacetate	aq	260.8406	—	-770.3	—	—	—	—
$CsCN$		cr	158.9233	—	—	—	18.117	139.75	65.69
		ai	158.9233	—	-107.5	-119.6	—	227.2	—
$CsCNO$		ai	174.9227	—	-404.2	-389.5	—	239.7	—
NH_2CH_2COOCs	glycinate	ai	206.9653	—	-728.06	-606.86	—	252.3	—
$CsCNS$	thiocyanate	ai	190.9873	—	-181.84	-199.31	—	277.4	—
$NH_2C_2H_4SO_3Cs$	from $NH_2C_2H_4SO_3^-$	ai	257.0447	—	-977.59	-801.28	—	333.0	—
Cs_2SiF_6		ai	407.8872	—	-2905.8	-2783.5	—	388.3	—
Cs_2GeCl_6		cr	551.1188	—	-1496.2	—	—	—	—
Cs_2SnCl_6		cr	597.2188	—	-1598.3	—	—	—	—
Cs_2SnCl_6		aq	597.2188	—	-1487.0	—	—	—	—

Substance Formula and Description	State	Molar mass g mol^{-1}	0 K $\Delta_f H_0^\circ$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H_0^\circ$	S° J mol^{-1} K^{-1}	C_p
$CsHPbO_2$ from $HPbO_2^-$	ai	373.1022	—	—	−630.44	—	—	—
$CsBO_2$	cr	175.7152	−969.0	−972.4	−915.1	14.368	104.35	80.58
	g	175.7152	−700.0	−703.3	−708.8	14.48	314.41	59.41
	ai	175.7152	—	−1030.64	−970.91	—	95.8	—
$Cs_2B_4O_7$	ai	421.0506	—	—	−3188.9	—	—	—
$CsBH_4$	ai	147.7484	—	−210.12	−177.67	—	243.5	—
$CsB(OH)_4$ from $B(OH)_4^-$	ai	211.7460	—	−1602.30	−1445.19	—	235.6	—
$CsHB_4O_7$ from $HB_4O_7^-$	ai	289.1532	—	—	−2977.2	—	—	—
$CsBF_4$	cr	219.7100	—	−1887.8	—	—	—	—
	ai	219.7100	—	−1833.0	−1779.0	—	314.	—
$CsBF_2(OH)_2$ from $BF_2(OH)_2^-$	ai	215.7280	—	—	−1632.9	—	—	—
$CsBF_3OH$ from BF_3OH^-	ai	217.7190	—	−1785.3	−1706.6	—	301.	—
$CsBCl_4$	cr	285.5284	—	−941.8	−826.7	—	151.0	—
$CsB(ClO_4)_4$	cr	541.5188	—	−790.4	—	—	—	—
$CsAlO_2$	ai	191.8857	—	−1189.1	−1123.0	—	96.2	—
$CsAlH_4$	cr	163.9189	—	−175.7	—	—	—	—
$CsAl(OH)_4$ from $Al(OH)_4^-$	ai	227.9165	—	−1760.6	−1597.3	—	236.0	—
Cs_3AlF_6	aq	539.6881	—	−3396.2	—	—	—	—
$CsAl(SO_4)_2$	ai	352.0101	—	−2608.3	−2266.3	—	−148.5	—
$CsAl(SO_4)_2 \cdot 12H_2O$	cr	568.1949	−5988.1	−6094.8	−5167.4	103.01	686.09	614.6
Cs_3GaO_3	ai	516.4344	—	—	−1494.	—	—	—
CsH_2GaO_3 from $H_2GaO_3^-$	ai	252.6396	—	—	−1036.7	—	—	—
Cs_2HGaO_3 from $HGaO_3^{2-}$	ai	384.5370	—	—	−1272.	—	—	—
$CsGaBr_4$	ai	522.2614	—	−920.1	−842.2	—	169.0	—
Cs_2ZnO_2	ai	363.1796	—	—	−968.27	—	—	—
$CsHZnO_2$ from $HZnO_2^-$	ai	231.2822	—	—	−749.10	—	—	—
$CsZn(OH)_3$ from $Zn(OH)_3^-$	ai	249.2976	—	—	−986.24	—	—	—
$Cs_2Zn(OH)_4$ from $Zn(OH)_4^{2-}$	ai	399.2104	—	—	−1442.55	—	—	—
$CsZnCl_3$	ai	304.6344	—	—	−832.6	—	—	—
Cs_2ZnCl_4	cr	472.9928	—	−1369.00	—	—	—	—
Cs_2ZnCl_4	ai	472.9928	—	—	−1250.1	—	—	—
$CsZnBr_3$	ai	438.0024	—	—	−741.0	—	—	—
Cs_2ZnBr_4	cr	650.8168	—	−1119.18	—	—	—	—
$CsZnI_3$	ai	578.9886	—	—	−583.7	—	—	—
Cs_2ZnI_4	cr	838.7984	—	−922.86	—	—	—	—
Cs_2ZnI_4	ai	838.7984	—	—	−924.2	—	—	—
$CsCl \cdot ZnSO_4$	cr	329.7900	—	−1460.22	—	—	—	—
$Cs_2Zn(C_2O_4)_2$ from $Zn(C_2O_4)_2^{2-}$	ai	507.2208	—	−2318.8	−2121.6	—	397.	—
$Cs_2Zn(CN)_4$	ai	435.2524	—	−174.5	−137.2	—	494.	—
$Cs_2Zn(CNS)_4$	ai	563.5084	—	—	−367.7	—	—	—
Cs_2CdO_2	ai	410.2096	—	—	−868.6	—	—	—
$CsHCdO_2$ from $HCdO_2^-$	ai	278.3122	—	—	−655.6	—	—	—
$CsCd(OH)_3$ from $Cd(OH)_3^-$	ai	296.3276	—	—	−892.8	—	—	—
$Cs_2Cd(OH)_4$ from $Cd(OH)_4^{2-}$	ai	446.2404	—	—	−1342.5	—	—	—
$CsCdCl_3$	ai	351.6644	—	−819.2	−779.0	—	336.0	—
$CsCdBr_3$	ai	485.0324	—	—	−699.6	—	—	—
$CsCdI_3$	ai	626.0186	—	—	−551.5	—	—	—
Cs_2CdI_4	ai	885.8284	—	−858.6	−900.0	—	594.	—
$CsCd(N_3)_3$	ai	371.3657	—	—	657.0	—	—	—

Table 102:Cs CESIUM (Prepared 1979) — Continued Table 102:Cs

Substance Formula and Description	State	Molar mass g mol⁻¹	0 K $\Delta_f H^\circ_0$ kJ mol⁻¹	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol⁻¹	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$ kJ mol⁻¹	S° J mol⁻¹ K⁻¹	C_p J mol⁻¹ K⁻¹
$Cs_2Cd(N_3)_4$	ai	546.2912	—	—	711.1	—	—	—
$Cs_2Cd(C_2O_4)_2$ from $Cd(C_2O_4)_2^{2-}$	ai	554.2508	—	—	-2042.5	—	—	—
$CsCd(CN)_3$	ai	323.3591	—	—	62.8	—	—	—
$Cs_2Cd(CN)_4$	ai	482.2824	—	-88.7	-76.5	—	590.	—
$CsCd(CNS)_3$	ai	419.5511	—	—	-102.5	—	—	—
$CsHgCl_3$	ai	439.8544	—	-646.8	-601.2	—	343.	—
Cs_2HgCl_4	ai	608.2128	—	-1070.7	-1030.9	—	561.	—
$CsHgBr_3$	ai	573.2224	—	-551.5	-551.5	—	393.	—
Cs_2HgBr_4	ai	786.0368	—	-947.7	-955.2	—	577.	—
$CsHgI_3$	ai	714.2086	—	-410.9	-440.6	—	435.	—
Cs_2HgI_4	ai	974.0184	—	-751.9	-795.8	—	628.	—
$CsHg(CN)_3$	ai	411.5491	—	138.9	171.2	—	358.2	—
$Cs_2Hg(CN)_4$	ai	570.4724	—	9.6	34.4	—	573.	—
$CsHg(CNS)_3$	ai	507.7411	—	—	36.4	—	—	—
$Cs_2Hg(CNS)_4$	ai	698.7284	—	-190.4	-172.7	—	724.	—
Cs_2CuO_2	ai	361.3496	—	—	-767.7	—	—	—
$CsHCuO_2$	ai	229.4522	—	—	-550.6	—	—	—
$CsCuCl_2$	ai	267.3514	—	—	-532.2	—	—	—
$CsCuCl_3$	cr	302.8044	-699.94	-698.7	-627.1	27.686	213.38	127.82
Cs_2CuCl_3	ai	435.7098	—	—	-962.	—	—	—
Cs_2CuCl_4	cr	471.1628	—	-1136.8	—	—	—	—
$Cs_2CuCl_4 \cdot 2H_2O$	cr	507.1936	—	-1727.2	—	—	—	—
Cs_3CuCl_5	cr	639.5212	—	-1584.5	—	—	—	—
$Cs_2Cu(C_2O_4)_2$ from $Cu(C_2O_4)_2^{2-}$	ai	505.3908	—	-2108.7	-1919.9	—	414.	—
$CsCu(CN)_2$	ai	248.4812	—	—	-34.3	—	—	—
$Cs_2Cu(CN)_3$	ai	407.4045	—	—	-180.3	—	—	—
$Cs_3Cu(CN)_4$	ai	566.3278	—	—	-309.6	—	—	—
$Cs_3Cu(CNS)_4$	ai	694.5838	—	-446.4	-512.1	—	1042.	—
$CsAgCl_2$	ai	311.6814	—	-503.3	-507.5	—	364.4	—
$CsAgBr_2$	ai	400.5934	—	—	-464.4	—	—	—
Cs_2AgBr_3	ai	613.4078	—	—	-868.6	—	—	—
$CsAgI_2$	ai	494.5842	—	—	-379.1	—	—	—
Cs_2AgI_3	ai	754.3940	—	-698.7	-738.1	—	519.2	—
Cs_3AgI_4	ai	1014.2038	—	—	-1085.7	—	—	—
$CsAg(CN)_2$	ai	292.8112	—	12.1	13.4	—	326.	—
$CsAg(SCN)_2$	ai	356.9392	—	—	-77.0	—	—	—
$Cs_2Ag(SCN)_3$	ai	547.9265	—	—	-283.2	—	—	—
$Cs_3Ag(SCN)_4$	ai	738.9138	—	—	-484.0	—	—	—
$CsAuCl_2$	ai	400.7784	—	—	-443.14	—	—	—
$CsAuCl_4$	ai	471.6844	—	-580.3	-527.16	—	400.0	—
$CsAuBr_2$	ai	489.6904	—	-386.6	-407.02	—	352.7	—
$CsAuBr_4$	ai	649.5084	—	-449.8	-459.4	—	469.0	—
$CsAu(CN)_2$	ai	381.9082	—	-15.9	-6.2	—	305.	—
$CsAu(SCN)_2$	ai	446.0362	—	—	-40.1	—	—	—
$CsAu(SCN)_4$	ai	562.2000	—	—	269.5	—	—	—
$CsNiCl_3$	cr	297.9744	—	-786.17	—	—	—	—
Cs_3NiCl_5	cr	634.6912	—	-1640.1	—	—	—	—
$Cs_2Ni(CN)_4$	ai	428.5924	—	-149.0	-112.1	—	485.	—

Table 102:Cs — **CESIUM** (Prepared 1979) — Continued — Table 102:Cs

Substance Formula and Description	State	Molar mass g mol^{-1}	0 K: $\Delta_f H^\circ_0$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar): $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H^\circ_0$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
$CsCoCl_3$	cr	298.1976	—	-795.8	—	—	—	—
Cs_2CoCl_4	cr	466.5560	—	-1242.2	—	—	—	—
Cs_3CoCl_5	cr	634.9144	—	-1687.4	—	—	—	—
$Cs_2Co(C_2O_4)_2$ from $Co(C_2O_4)_2^{2-}$	ai	500.7840	—	-2225.9	-2026.6	—	377.	—
$Cs_3Co(CN)_6$	ai	613.7568	—	—	—	—	631.8	—
$CsFeCl_3$	cr	295.1114	—	-824.2	—	—	—	—
Cs_2FeCl_4	cr	463.4698	—	-1259.4	—	—	—	—
Cs_3FeCl_5	cr	631.8282	—	-1703.7	—	—	—	—
$CsFe(SO_4)_2$	ai	380.8756	—	—	-1816.6	—	—	—
$Cs_3Fe(CN)_6$	ai	610.6706	—	-213.0	-146.8	—	669.4	—
$Cs_4Fe(CN)_6$	ai	743.5760	—	-577.4	-472.99	—	627.2	—
$Cs_3FeCO(CN)_5$ from $FeCO(CN)_5^{3-}$	ai	612.6633	—	-582.0	—	—	—	—
$CsH_3Fe(CN)_6$ from $H_3Fe(CN)_6^{-}$	ai	347.8838	—	197.5	—	—	—	—
$Cs_2H_2Fe(CN)_6$ from $H_2Fe(CN)_6^{2-}$	ai	479.7812	—	-61.1	74.56	—	485.	—
$Cs_3HFe(CN)_6$ from $HFe(CN)_6^{3-}$	ai	611.6786	—	-319.2	-204.78	—	573.	—
$CsH_2FeCO(CN)_5$ from $H_2FeCO(CN)_5^{-}$	ai	348.8685	—	-64.4	—	—	—	—
$Cs_2HFeCO(CN)_5$ from $HFeCO(CN)_5^{2-}$	ai	480.7659	—	-324.3	—	—	—	—
$CsPdCl_3$	ai	345.6644	—	—	-568.1	—	—	—
Cs_2PdCl_4	ai	514.0228	—	-1066.9	-1000.7	—	435.	—
Cs_2PdCl_6	ai	584.9288	—	—	-1014.1	—	—	—
$CsPdBr_3$	ai	479.0324	—	—	-496.2	—	—	—
Cs_2PdBr_4	ai	691.8468	—	-901.7	-902.1	—	515.	—
Cs_2PdBr_6	ai	851.6648	—	—	-919.2	—	—	—
Cs_2PdI_4	ai	879.8284	—	—	-743.1	—	—	—
Cs_2PdI_6	ai	1133.6372	—	—	-754.4	—	—	—
$Cs_2Pd(NO_2)_4$ from $Pd(NO_2)_4^{2-}$	ai	556.2328	—	—	-652.1	—	—	—
$Cs_2Pd(CN)_4$	ai	476.2824	—	—	43.6	—	—	—
$Cs_2Pd(CNS)_4$	ai	604.5384	—	—	-173.6	—	—	—
Cs_3RhCl_6	aq	714.3392	—	-1623.4	—	—	—	—
$CsRuO_4$	ai	297.9730	—	—	-537.6	—	—	—
Cs_2RuO_4	ai	430.8784	—	—	-887.8	—	—	—
$CsPtCl_3$	ai	434.3544	—	—	-513.7	—	—	—
Cs_2PtCl_4	cr	602.7128	—	-1078.2	—	—	—	—
	ai	602.7128	—	-1015.5	-945.5	—	423.	—
Cs_2PtCl_6	ai	673.6188	—	-1184.9	-1066.8	—	485.8	—
$CsPtBr_3$	ai	567.7224	—	—	-436.8	—	—	—
Cs_2PtBr_4	ai	780.5368	—	-884.9	-846.8	—	389.	—
Cs_2PtBr_6	ai	940.3548	—	-987.4	-916.3	—	431.	—
Cs_2PtI_6	ai	1222.3272	—	-730.	-692.9	—	435.	—
$CsPtNH_3Cl_3$	cr	451.3851	—	-769.0	—	—	—	—
$CsPtNH_3Cl_3$ from $PtNH_3Cl_3^{-}$	ai	451.3851	—	-722.2	-595.3	—	331.	—
$CsPtNH_3Cl_5$ from $PtNH_3Cl_5^{-}$	ai	522.2911	—	—	-724.5	—	—	—
$Cs_2Pt(CN)_4$	ai	564.9724	—	—	126.4	—	—	—
Cs_2IrCl_6	ai	670.7288	—	-1088.	—	—	—	—
Cs_3IrCl_6	ai	803.6342	—	-1510.	—	—	—	—
$CsMnO_4$	ai	251.8410	—	-799.6	-739.2	—	324.3	—
$CsMnCl_3$	cr	294.2024	—	-965.04	—	—	—	—
	ai	294.2024	—	—	-912.1	—	—	—

Table 102:Cs — CESIUM (Prepared 1979) — Continued — Table 102:Cs

Substance Formula and Description		State	Molar mass g mol^{-1}	0 K $\Delta_f H_0^\circ$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H_0^\circ$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
Cs_2MnCl_4		cr	462.5608	—	-1414.28	—	—	—	—
Cs_3MnCl_5		cr	630.9192	—	-1851.46	—	—	—	—
$Cs_2Mn(C_2O_4)_2$	from $Mn(C_2O_4)_2^{2-}$	ai	496.7888	—	-2388.6	-2191.0	—	385.	—
$Cs_4Mn(CN)_6$		ai	742.6670	—	-477.	—	—	—	—
$CsReO_4$		cr	383.1030	—	-1103.7	-1005.8	—	205.0	—
$CsReO_4$		ai	383.1030	—	-1045.6	-986.5	—	334.3	—
Cs_2ReCl_6		cr	664.7288	—	-1351.	—	—	—	—
		ai	664.7288	—	-1279.0	-1173.5	—	523.	—
Cs_2CrO_4		cr	381.8044	—	-1429.13	—	—	—	—
		ai	381.8044	—	-1397.71	-1311.79	—	316.3	—
Cs_2CrO_4	in 800 H_2O		381.8044	—	-1398.17	—	—	—	—
$Cs_2Cr_2O_7$		cr	481.7986	-2079.53	-2088.82	-1908.17	44.647	330.08	231.54
		ai	481.7986	—	-2007.1	-1885.2	—	528.0	—
$CsHCrO_4$	from $HCrO_4^-$	ai	249.9070	—	-1136.4	-1056.8	—	317.1	—
Cs_3CrCl_6		cr	663.4302	—	-1962.3	—	—	—	—
Cs_3CrCl_6		aq	663.4302	—	-1988.7	—	—	—	—
$Cs_3Cr_2Cl_9$		cr	821.7852	—	-2587.4	—	—	—	—
Cs_2MoO_4		cr	425.7484	—	-1514.6	—	—	—	—
		ai	425.7484	—	-1514.6	-1420.4	—	293.3	—
$Cs_2Mo_2O_7$		cr	569.6866	—	-2302.9	—	—	—	—
$CsMoF_6$		cr	342.8358	—	-2103.3	—	—	—	—
Cs_2WO_4		ai	513.6584	—	-1592.4	—	—	—	—
$Cs_5HW_6O_{21}$	from $HW_6O_{21}^{5-}$	aq	2104.6224	—	-7130.4	—	—	—	—
$CsWF_6$		cr	430.7458	—	-2255.2	—	—	—	—
$CsVO_3$		ai	231.8456	—	-1146.4	-1075.7	—	184.	—
Cs_3VO_4		ai	513.6558	—	—	-1775.2	—	—	—
$Cs_4V_2O_7$		ai	745.5014	—	—	-2887.	—	—	—
CsH_2VO_4	from $H_2VO_4^-$	ai	249.8610	—	-1432.2	-1312.8	—	255.	—
$CsH_3V_2O_7$	from $H_3V_2O_7^-$	ai	349.8092	—	—	-2155.9	—	—	—
Cs_2HVO_4	from HVO_4^{2-}	ai	381.7584	—	-1675.7	-1558.9	—	285.	—
$Cs_3HV_2O_7$	from $HV_2O_7^{3-}$	ai	613.6040	—	—	-2668.4	—	—	—
$Cs_4H_2V_{10}O_{28}$	from $H_2V_{10}O_{28}^{4-}$	ai	1491.0408	—	—	-8891.	—	—	—
$Cs_5HV_{10}O_{28}$	from $HV_{10}O_{28}^{5-}$	ai	1622.9382	—	-9987.	-9162.	—	887.	—
Cs_3VCl_6		cr	662.3762	—	-1996.6	—	—	—	—
$Cs_3V_2Cl_9$		cr	819.6772	—	-2644.7	—	—	—	—
$Cs_2VO(C_2O_4)_2$	from $(VO(C_2O_4)_2)^{2-}$	ai	508.7922	—	—	-2322.8	—	—	—
$CsNbO_3$		cr	273.8096	—	—	-1270.6	—	—	—
		ai	273.8096	—	—	-1224.2	—	—	—
$CsNbCl_6$		cr	438.5294	—	-1337.6	—	—	—	—
$CsNb_2OCl_9$		cr	653.7938	—	-2230.1	—	—	—	—
Cs_2NbOCl_5		cr	551.9812	—	-1834.7	—	—	—	—
$CsTaF_6$		ai	427.8438	—	—	-1167.2	—	—	—
Cs_2TaF_7		ai	579.7476	—	—	-1756.3	—	—	—
$CsTaCl_6$		cr	526.5714	—	-1419.6	—	—	—	—
$CsTiCl_3$		cr	287.1644	—	-1047.7	—	—	—	—
Cs_2TiCl_4		cr	455.5228	—	-1512.1	—	—	—	—

Substance Formula and Description	State	Molar mass g mol⁻¹	0 K	298.15 K (25°C) and 0.1 MPa (1 bar)				
			$\Delta_f H^\circ_0$ kJ mol⁻¹	$\Delta_f H^\circ$	$\Delta_f G^\circ$ kJ mol⁻¹	$H^\circ - H^\circ_0$	S° J mol⁻¹ K⁻¹	C_p
Cs_2TiCl_6	cr	526.4288	—	-1810.	—	—	—	—
$CsTiBr_3$	cr	420.5324	—	-877.4	—	—	—	—
Cs_2TiBr_6	cr	793.1648	—	-1543.9	—	—	—	—
Cs_3TiBr_6	cr	926.0702	—	-1826.3	—	—	—	—
$Cs_3Ti_2Br_9$	cr	1213.6972	—	-2438.0	—	—	—	—
Cs_2ZrCl_6	cr	569.7488	—	-1929.	—	—	—	—
Cs_2ZrBr_6	cr	836.4848	—	-1687.8	—	—	—	—
$Cs_2ZrO(SO_4)_2$ from $ZrO(SO_4)_2^{2-}$	aq	565.1534	—	-3153.1	—	—	—	—
Cs_2HfCl_6	cr	657.0188	—	-1971.	—	—	—	—
$CsY(Fe(CN)_6)\cdot 2H_2O$	cr	469.7956	—	—	-838.3	—	—	—
$CsLuCl_4$	g	449.6874	—	-1121.	—	—	—	—
$CsGd(Fe(CN)_6)$	cr	502.1098	—	—	-318.	—	—	—
$CsCe(Fe(CN)_6)\cdot 2H_2O$	cr	521.0106	—	—	-808.	—	—	—
Cs_2PuCl_6	cr	717.5788	—	-1973.2	—	—	—	—
Cs_2NpCl_6	cr	715.5788	—	-1978.2	—	—	—	—
Cs_2NpBr_6	cr	982.3148	—	-1682.8	—	—	—	—
Cs_2UO_4	cr	567.8374	-1920.50	-1928.8	-1806.2	30.815	219.66	152.76
$Cs_2U_2O_7$	cr	853.8646	—	-3221.7	—	—	—	—
$CsUF_6$	cr	484.9248	—	-2739.7	—	—	—	—
$Cs(UO_2)_2F_5$	cr	767.9530	—	-3963.9	—	—	—	—
$Cs_3UO_2F_5$	cr	763.7360	—	-3454.7	—	—	—	—
$Cs_5(UO_2)_2F_9$	cr	1375.5682	—	-6349.2	—	—	—	—
$CsUCl_5$	cr	548.1994	—	-1519.2	—	—	—	—
$CsUCl_6$	cr	583.6524	—	-1575.3	—	—	—	—
CsU_2Cl_9	cr	928.0404	—	-2536.8	—	—	—	—
Cs_2UCl_6	cr	716.5578	—	-2015.0	—	—	—	—
Cs_2UBr_6	cr	983.2938	—	-1710.4	—	—	—	—
Cs_2PaCl_6	cr	709.5647	—	-2028.4	—	—	—	—
Cs_2ThCl_6	cr	710.5669	—	-2149.7	—	—	—	—
$Cs_2ThCl_6\cdot 8H_2O$	cr	854.6901	—	-4546.3	—	—	—	—
Cs_4ThCl_8	cr	1047.2837	—	-3032.6	—	—	—	—
Cs_2BeO_2	ai	306.8218	—	-1307.5	-1224.2	—	109.	—
$Cs_2MgP_2O_7$ from $MgP_2O_7^{2-}$	ai	464.0662	—	-3242.6	-2999.0	—	188.	—
$Cs_2Mg(C_2O_4)_2$ from $Mg(C_2O_4)_2^{2-}$	ai	466.1628	—	—	-2411.9	—	—	—
$CsMgFe(CN)_6$ from $MgFe(CN)_6^{-}$	ai	369.1718	—	—	-33.4	—	—	—
$Cs_2MgFe(CN)_6$ from $MgFe(CN)_6^{2-}$	ai	502.0772	—	—	-365.6	—	—	—
$CsCaCl_3$	cr	279.3444	—	-1275.3	—	—	—	—
$CsCaFe(CN)_6$ from $CaFe(CN)_6^{-}$	ai	384.9398	—	—	-132.5	—	—	—
$Cs_2CaFe(CN)_6$ from $CaFe(CN)_6^{2-}$	ai	517.8452	—	—	-464.3	—	—	—
$CsSrFe(CN)_6$ from $SrFe(CN)_6^{-}$	ai	432.4798	—	—	-138.4	—	—	—
$CsNO_2\cdot 2Ba(NO_2)_2$	cr	637.6129	—	-1785.3	—	—	—	—
$Ba(NO_2)_2\cdot 2CsNO_2$	cr	587.1728	—	-1410.8	—	—	—	—
LiCsClI	cr	302.2038	—	-754.8	—	—	—	—
$CsNaCl_2$	g	226.8012	—	-636.	—	—	—	—
$CsNaBr_2$	g	315.7132	—	-481.	—	—	—	—
CsNaClI	cr	318.2526	—	-756.9	—	—	—	—
$NaCs_2CrCl_6$	cr	553.5146	—	-1941.4	—	—	—	—
	aq	553.5146	—	-1970.7	—	—	—	—
Cs_2NaYCl_6	cr	590.4236	—	-2405.0	—	—	—	—

Table 102:Cs CESIUM (Prepared 1979) — Continued Table 102:Cs

Substance Formula and Description	State	Molar mass g mol^{-1}	0 K $\Delta_f H^\circ_0$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H^\circ_0$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
$Cs_2NaLuCl_6$	cr	676.4886	—	-2352.7	—	—	—	—
$Cs_2NaErCl_6$	cr	668.7786	—	-2393.2	—	—	—	—
$Cs_2NaDyCl_6$	cr	664.0186	—	-2384.9	—	—	—	—
$Cs_2NaGdCl_6$	cr	658.7686	—	-2376.1	—	—	—	—
$Cs_2NaNdCl_6$	cr	645.7586	—	-2384.9	—	—	—	—
$Cs_2NaCeCl_6$	cr	641.6386	—	-2382.0	—	—	—	—
$Cs_2NaLaCl_6$	cr	640.4286	—	-2383.6	—	—	—	—
$Cs_2NaPuCl_6$	cr	740.5686	—	-2295.3	—	—	—	—
$CsKCl_2$	g	242.9134	—	-519.	—	—	—	—
$CsKBr_2$	g	331.8254	—	-510.	—	—	—	—
CsKClI	cr	334.3648	—	-780.3	—	—	—	—

Table 103:**Fr** **FRANCIUM** (Prepared 1980) Table 103:**Fr**

Substance Formula and Description	State	Molar mass g mol^{-1}	0 K $\Delta_f H_0^\circ$ kJ mol^{-1}	298.15 K (25°C) and 0.1 MPa (1 bar) $\Delta_f H^\circ$ kJ mol^{-1}	$\Delta_f G^\circ$ kJ mol^{-1}	$H^\circ - H_0^\circ$ kJ mol^{-1}	S° J mol^{-1} K^{-1}	C_p J mol^{-1} K^{-1}
Fr	cr	223.0000	0	0	0	—	95.4	—
FrF	cr	241.9984	—	—	—	11.7	108.8	52.7
FrCl	cr	258.4530	—	—	—	13.0	113.0	53.6
FrBr	cr	302.9090	—	—	—	13.8	129.7	54.0
FrI	cr	349.9044	—	—	—	14.2	138.1	54.0

Appendices: Revised Values and Additions

Three appendices contain all revisions and additions made to the NBS Technical Note 270 series [1] since the publication of Technical Note 270–8. (An earlier list in NBS Technical Note 270–8 summarized all changes made in the original tables up to the date of its publication.) These appendices divide the substances into three categories: (1) condensed phase and neutral gaseous molecules, (2) gaseous atomic ions, and (3) gaseous molecular ions.

The values given in these appendices are in calorie units and are for a standard state pressure of one atmosphere. In this form they should simplify the task of revising copies of Technical Note 270 and data banks based on it. All of these values are also incorporated into the main tables in SI units, at a standard state pressure of 0.1 MPa. (The change in standard pressure affects only S° (for gases) and some $\Delta_f G^\circ$'s. See sec. 6.)

In all three appendices the substances are listed in the standard order of arrangement with the Technical Note number and page shown at the left. New substances are signaled by the word "add" before the formula. The conventions used here for phases and symbols for properties are those used in Technical Note 270, not those of the main tables in this volume. The correspondence should be clear.

Copies of these three appendices and the revision list in NBS Technical Note 270–8 can be obtained from the authors.

Appendix 1. Condensed Phases and Neutral Gaseous Species

Prepared by
Vivian B. Parker

Some of these changes are the result of a shift in a "key" value; in particular, $Al_2O_3 \cdot 3H_2O$(c, gibbsite) which had been previously selected in 1965. More recent data indicate that earlier measurements were significantly in error. A substantial number of selections depend upon the value for gibbsite; they have been changed. See section 4.1.3 of the introductory material on the effect of new data on selected values.

In other cases, more recent data have enabled us to fill in gaps in the tables or to provide information not available earlier. Errata that have come to our attention are also included. All values are in kcal/mol or cal/mol K units.

TN	P.	Substance	Revision		
3	11	O_3(aq)	Add std. state, $m=1$		
			$\Delta Gf°$	=	41.6
			$S°$	=	35.
3	12	HO_2(g)	$\Delta Hf_0°$	=	3.2
			$\Delta Hf°$	=	2.5
			$\Delta Gf°$	=	5.4
			$H_{298}°-H_0°$	=	2.39
			$C_p°$	=	8.34
			$S°$	=	54.7
3	13	Add H_2O(c)	$\Delta Hf_0°$	=	-68.431
		H_2O(l)	$H_{298}°-H_0°$	=	3.177
3	15	He(aq), std. state, m=1	$\Delta Gf°$	=	4.7
			$S°$	=	13.0
3	21	FO(g)	$\Delta Hf_0°$	=	26.00
			$\Delta Hf°$	=	26.
			$\Delta Gf°$	=	25.
			$H_{298}°-H_0°$	=	2.10
			$S°$	=	51.8
			$C_p°$	=	7.3
		F_2O(g)	$\Delta Hf_0°$	=	6.40
			$\Delta Hf°$	=	5.9
			$\Delta Gf°$	=	10.0
3	25	Add ClOO(g) chlorine peroxy	$\Delta Hf_0°$	=	21.7
			$\Delta Hf°$	=	21.3
			$\Delta Gf°$	=	25.1
			$H_{298}°-H_0°$	=	2.78
			$S°$	=	63.0
			$C_p°$	=	11.0
3	27	HClO(g)	$\Delta Hf_0°$	=	-18.10
			$\Delta Hf°$	=	-18.8
			$\Delta Gf°$	=	-15.8
3	34	Add $HBrO_4$(aq), std. state, $m=1$	$\Delta Hf°$	=	3.1
			$\Delta Gf°$	=	28.2
			$S°$	=	47.7
3	36	I_2 in CCl_2FClF_2, std. state, $x_2=1$	Should be "in CCl_2FCClF_2, etc."		
3	46	SO_3(c)I,β	$\Delta Gf°$	=	-89.45
			$S°$	=	16.9
		SO_3(l)	$\Delta Gf°$	=	-89.34
			$S°$	=	27.2
3	48	H_2SO_3(aq), undiss. std. state, $m=1$	Add "equivalent to SO_2(aq), undiss., etc. + H_2O(liq)"		

TN	P.	Substance	Revision		
3	52	H_2SO_4 in 500 000H_2O	$\Delta Hf°$	=	-217.189
3	55	Add $SOBr_2$(l)	$\Delta Hf°$	=	-40.3
		$SOBr_2$(g)	$\Delta Hf_0°$	=	-24.49
			$\Delta Hf°$	=	-29.4
			$\Delta Gf°$	=	-32.7
			$H_{298}°-H_0°$	=	3.040
			$S°$	=	79.55
			$C_p°$	=	16.66
3	61	NO(g)	$H_{298}°-H_0°$	=	2.197
3	62	NH(g)	$\Delta Hf_0°$	=	84.
			$\Delta Hf°$	=	84.0
			$\Delta Gf°$	=	82.6
			$H_{298}°-H_0°$	=	2.056
			$S°$	=	43.29
			$C_p°$	=	6.977
		NH_2(g)	$\Delta Hf_0°$	=	44.88
			$\Delta Hf°$	=	44.2
			$\Delta Gf°$	=	46.5
			$H_{298}°-H_0°$	=	2.375
			$S°$	=	46.58
			$C_p°$	=	8.09
3	65	NH_4OH(aq), undiss. std. state, $m=1$	Add "equivalent to NH_3(aq), undiss., etc. + H_2O(liq)"		
3	71	$NH_4F \cdot H_2O$(c)	Omit all values		
3	89	PH_4OH(aq), undiss. std. state, $m=1$	Add "equivalent to PH_3(aq)undiss., etc. + H_2O(liq)"		
3	96	$H_2AsO_3^-$(aq), undiss. std. state, $m=1$	Add "equivalent to AsO_2^-(aq), std. state, $m=1$ + H_2O(liq)"		
		H_3AsO_3(aq), undiss. std. state, $m=1$	Add "equivalent to $HAsO_2$(aq)undiss., etc. + H_2O(liq)"		
3	100	$Sb(OH)_3$(aq), undiss. std. state, $m=1$	Add "equivalent to $HSbO_2$(aq) undiss., etc. + H_2O(liq)"		
3	106	CO(g)	$C_p°$	=	6.965
3	107	CH(g)	$\Delta Hf°$	=	142.40
			$H_{298}°-H_0°$	=	2.061
		CH_2(g)	$\Delta Hf_0°$	=	93.2
			$\Delta Hf°$	=	93.30
			$\Delta Gf°$	=	89.13
			$H_{298}°-H_0°$	=	2.375
			$S°$	=	46.55
			$C_p°$	=	8.07
		CH_3(g)	$\Delta Hf_0°$	=	35.62
			$\Delta Hf°$	=	34.82
			$\Delta Gf°$	=	35.35
			$H_{298}°-H_0°$	=	2.49
			$S°$	=	46.4
			$C_p°$	=	9.25
		HCO(g)	$\Delta Hf_0°$	=	10.2
			$\Delta Hf°$	=	10.5
			$\Delta Gf°$	=	6.7
		HCHO(g)	$\Delta Hf_0°$	=	-25.032
			$\Delta Hf°$	=	-25.95

TN	P.	Substance	Revision
3	107	$HCHO(g)$	ΔGf° = –24.51
		(aq), unhydrolyzed	ΔHf° = –33.9
		in 60 H_2O	ΔHf° = –40.8
3	108	HCHO in 40CH_3OH	ΔHf° = –41.0
		H_2CO_3(aq), undiss. std. state, $m=1$	Add "equivalent to CO_2(aq) undiss., etc. + H_2O(liq)"
3	112	$CH_2(OH)_2(g)$	ΔHf° = –96.
		(aq)	ΔHf° = –109.1
		$CF_3(g)$	ΔHf_0° = –113.3
			ΔGf° = –111.
			$H_{298}^\circ - H_0^\circ$ = 2.74
			S° = 63.2
			C_p° = 11.85
3	122	CN(g)	ΔHf_0° = 103.8
			ΔHf° = 104.6
			ΔGf° = 97.4
3	123	C=NH$(NH_2)_2$(c), guanidine	ΔHf° = –13.4
3	125	$CO(NH_2)_2$, urea in 3.0 H_2O	ΔHf° = –76.760
		in 3.5 H_2O	ΔHf° = –76.716
		in 4.0 H_2O	ΔHf° = –76.678
		in 4.5 H_2O	ΔHf° = –76.644
		in 5.0 H_2O	ΔHf° = –76.616
		in 5.5 H_2O	ΔHf° = –76.590
		in 6 H_2O	ΔHf° = –76.568
		in 7 H_2O	ΔHf° = –76.526
		in 8 H_2O	ΔHf° = –76.490
		in 9 H_2O	ΔHf° = –76.460
		in 10 H_2O	ΔHf° = –76.436
		in 15 H_2O	ΔHf° = –76.350
		in 20 H_2O	ΔHf° = –76.300
		in 25 H_2O	ΔHf° = –76.267
		in 50 H_2O	ΔHf° = –76.192
3	126	$CO(NH_2)_2$, urea in 75 H_2O	ΔHf° = –76.164
		in 100 H_2O	ΔHf° = –76.15
		in 150 H_2O	ΔHf° = –76.135
		in 200 H_2O	ΔHf° = –76.128
		in 400 H_2O	ΔHf° = –76.116
		in ∞ H_2O	ΔHf° = –76.104
		in 125 CH_3OH	ΔHf° = –77.52
		in 85 C_2H_5OH	ΔHf° = –76.65
		in 65 C_3H_7OH	ΔHf° = –76.97
3	127	$CO(NH_2)_2NH_3$, urea ammine	ΔHf° = –98.7
3	131	$C_2(g)$	ΔHf_0° = 196.8
			ΔHf° = 198.83
			ΔGf° = 185.45
			$H_{298}^\circ - H_0^\circ$ = 2.530
			S° = 47.636
			C_p° = 10.327
		$C_2H_5(g)$	ΔHf_0° = 28.5
			ΔHf° = 25.7
			ΔGf° = 31.8
			$H_{298}^\circ - H_0^\circ$ = 2.84
			S° = 60.2
			C_p° = 11.16
3	132	$CH_2CO(g)$, ketene	ΔHf_0° = –10.66
			ΔHf° = –11.4
			ΔGf° = –11.6
		$(CHO_2)(c)$	Omit entry
		in 200 H_2O	Omit entry
		Add $(CHO)_2(g)$	ΔHf° = –50.66
3	141	$(CH_2OH)_2O(g)$	ΔHf° = –134.
		(aq)	ΔHf° = –151.1
3	154	CH_3CN(liq)	ΔHf° = 7.50
			ΔGf° = 18.44

TN	P.	Substance	Revision
3	154	$CH_3CN(g)$	ΔHf_0° = 17.272
			ΔHf° = 15.59
			ΔGf° = 19.73
			S° = 58.56
		in 2 C_2H_5OH	ΔHf° = 7.821
		in 10 C_2H_5OH	ΔHf° = 7.621
3	169	$[CO(NH_2)(NH_3)]_2C_2O_4$(c) urea oxalate	ΔHf° = –365.6
		(aq) in 500 H_2O	ΔHf° = –348.4
3	172	H_4SiO_4(aq), undiss. std. state, $m=1$	Add "equivalent to H_2SiO_3(aq) undiss., etc. + H_2O(liq)"
		$H_2[Si(OH)_6]$(aq), undiss. std. state, $m=1$	Add "equivalent to H_2SiO_3(aq) undiss., etc. + $2H_2O$(liq)"
3	174	$SiBr_4(g)$	ΔHf_0° = –92.130
		$SiHBr_3(g)$	ΔHf_0° = –69.613
3	181	Sn(c)II, grey.	Add comment: $H_{298}^\circ - H_0^\circ$ value refers to grey Sn at 0 K.
		SnO(g)	ΔHf_0° = 4.02
			ΔHf° = 3.6
			ΔGf° = –2.0
		Add $Sn_2O_2(g)$	ΔHf° = –60.
		Add $Sn_3O_3(g)$	ΔHf° = –126.
		Add $Sn_4O_4(g)$	ΔHf° = –193.
3	183	$SnBr_4(g)$	ΔHf_0° = –67.869
3	188	$Pb(OH)_3^-$(aq) std. state, $m=1$	Add "equivalent to $HPbO_2^-$(aq) undiss., etc. + H_2O(liq)"
3	198	H_3BO_3(c)	$H_{298}^\circ - H_0^\circ$ = 3.200
		$B(OH)_4^-$(aq), undiss.	Add "equivalent to BO_2^-(aq) std. state, $m=1$ + $2H_2O$(liq)"
3	203	$B(C_2H_5)_3$(liq)	ΔHf_0° is for the crystal
		$BH(OCH_3)_2(g)$	ΔHf_0° = –133.20
		Add $B(OCH_3)_3$(c)	ΔHf_0° = –221.45
3	207	AlO_2^-(aq), std. state, $m=1$	ΔHf° = –222.5
			ΔGf° = –198.6
			S° = –8.8
3	208	Al_2O_3(c)	The second, third, fourth and fifth lines should read:
		(c)δ	ΔHf° = –398.3
		(c)ρ	ΔHf° = –396. (supersedes revised value in 270–8 Appendix)
		(c)κ	ΔHf° = –397.3
			Omit ΔGf° (supersedes revised value in 270–8 Appendix)
		(c)γ	ΔHf° = –396.0
		$Al_2O_3 \cdot H_2O$(c) boehmite	ΔHf_0° = –469.27
			ΔHf° = –473.4
			ΔGf° = –437.8
			$H_{298}^\circ - H_0^\circ$ = 4.219
		diaspore	ΔHf_0° = –472.65
			ΔHf° = –477.75
			ΔGf° = –440.22
			$H_{298}^\circ - H_0^\circ$ = 3.25
			S° = 16.89
			C_p° = 25.38
		$Al_2O_3 \cdot 3H_2O$(c) gibbsite	ΔHf_0° = –609.698
			ΔHf° = –618.23
			ΔGf° = –552.20
			$H_{298}^\circ - H_0^\circ$ = 5.954
			S° = 32.72

TN	P.	Substance	Revision
3	208	$Al_2O_3 \cdot 3H_2O$(c) gibbsite	C_p° = 43.85
		bayerite	ΔHf° = –615.8
		$Al(OH)_4^-$(aq), std. state, $m=1$	Add "equivalent to AlO_2^-(aq), std. state, $m=1$ + $2H_2O$(liq)"
			ΔHf° = –359.1
			ΔGf° = –312.0
			S° = 24.6
3	208	AlF_2^+(aq), std. state, $m=1$	FW = 64.9783
			ΔGf° = –266.
			Omit ΔHf
3	209	Add AlF_3 in $HF+8H_2O$	ΔHf° = –369.8
3	210	$AlCl_3 \cdot 6H_2O$(c)	Add values
			ΔHf_0° = –632.31
			ΔGf° = –540.5
			$H_{298}^\circ - H_0^\circ$ = 11.74
			S° = 76.0
			C_p° = 70.8
3	216	Al_2SiO_5(c) andalusite	ΔHf_0° = –615.033
			ΔHf° = –619.09
			ΔGf° = –583.83
		kyanite	ΔHf_0° = –615.741
			ΔHf° = –620.05
			ΔGf° = –584.12
		sillimanite	ΔHf_0° = –614.509
			ΔHf° = –618.49
			ΔGf° = –583.43
			S° = 22.97
			C_p° = 29.76
3	216	$Al_2Si_2O_7 \cdot 2H_2O$(c), kaolinite	ΔHf_0° = –984.6
			ΔGf° = –908.2
			S° = 49.0
			C_p° = 58.83
		halloysite	ΔHf° = –980.2
			ΔGf° = –903.6
		third form	Add name "dickite"
			ΔHf° = –984.3
			ΔGf° = –907.3
3	216	$Al_6Si_2O_{13}$(c) mullite	ΔHf_0° = –1629.1
			ΔGf° = –1537.5
			S° = 61.
			(supersedes revised values in 270–8 Appendix)
		Add $Al_2Si_4O_{11} \cdot H_2O$(c) pyrophyllite	ΔHf° = –1348.48
			ΔGf° = –1259.17
			S° = 57.22
			C_p° = 70.35
3	247	$ZnAl_2O_4$(c)	ΔHf° = –493.6
4	2	HgF(g)	ΔGf° = –4.1
			S° = 59.38
4	8	$Hg(CH_3)_2$(g)	ΔHf_0° = 27.07
4	28	$CuAl_2O_4$(c)	ΔHf° = –433.3
		$Cu_2Al_2O_4$(c)	ΔHf° = –448.
4	33	Ag_3N(c)	ΔHf° = 64.6
4	53	$NiAl_2O_4$(c)	ΔHf° = –457.9
4	74	FeO_2^{2-}(aq), std. state, $m=1$	ΔGf° = –70.6
4	75	FeF_2(c)	ΔHf_0° = –169.87
			ΔHf° = –170.0
			ΔGf° = –159.8
		$Fe(OH)_3^-$(aq), std. state, $m=1$	Add "equivalent to $HFeO_2^-$(aq) std. state, $m=1$ + H_2O(liq)"

TN	P.	Substance	Revision
4	75	$Fe(OH)_4^{2-}$(aq), std. state, $m=1$	Add "equivalent to FeO_2^{2-}(aq) std. state, $m=1$ + $2H_2O$(liq)"
4	88	$FeAl_2O_4$(c)	ΔHf_0° = –476.9
			ΔGf° = –449.3
4	101	$[Pt(NH_3)Cl_2(H_2O)]$(aq), cis, undiss., std. state, $m=1$	ΔHf° = –137.2
			ΔGf° = –93.9
			S° = 43.
			(supersedes revised values in 270–8 Appendix)
4	106	Mn(c)β	Add comment: $H_{298}^\circ - H_0^\circ$ value refers to β form at 0 K
		Mn(c)γ	Add comment: $H_{298}^\circ - H_0^\circ$ value refers to γ form at 0 K
		MnO_4^-(aq), std. state, $m=1$	C_p° = –19.6
4	118	$ReCl_6^{2-}$(aq), std. state, $m=1$	ΔHf° = –182.2
			ΔGf° = –140.9
			S° = 61.
4	127	$(NH_4)_2Cr_2O_7$ in $5000H_2O + 0.05HClO_4$	Should read "in $5000H_2O$ +0.05N $HClO_4$"
	130	H_2MoO_4(aq)	Add "equivalent to MoO_3(aq) + H_2O(liq)"
4	136	$SnWO_4$(g)	ΔHf_0° = –208.
		Sn_2WO_5(g)	ΔHf_0° = –269.
5	2	$H_2VO_4^-$(aq), std. state, $m=1$	Add "equivalent to VO_3^-(aq), std. state, $m=1$ + H_2O(liq)"
5	4	V_2S_3(c)	Omit entry
6	9	Mg_2(g)	ΔHf° = 68.77
			$H_{298}^\circ - H_0^\circ$ = 2.28
6	17	$MgSO_3$(c)	ΔGf° = –220.8
			S° = 21.0
		$MgSO_3 \cdot 3H_2O$(c)	ΔGf° = –400.3
			S° = 50.0
		$MgSO_3 \cdot 6H_2O$(c)	ΔGf° = –570.2
			S° = 77.0
6	25	$MgO \cdot Al_2O_3$(c) spinel	ΔHf_0° = –545.85
			ΔHf° = –549.7
			ΔGf° = –519.9
6	25	$Mg_2Al_4Si_5O_{18}$(c), corderite	ΔHf° = –2189.7
			ΔGf° = –2067.8
6	37	Add $CaSO_3 \cdot 0 \cdot 5H_2O$(c)	ΔHf° = –313.5
			ΔGf° = –286.64
			S° = 29.0
		$CaSO_3 \cdot 2H_2O$(c)	Omit all values
6	50	$CaO \cdot 2Al_2O_3$(c)	ΔHf_0° = –956.48
			ΔHf° = –962.2
			ΔGf° = –912.7
		$3CaCl_2 \cdot 4AlCl_3$(c)	ΔHf° = –1262.4
6	51	Add $CaO \cdot Al_2O_3 \cdot SiO_2$(c), clinopyroxene, monoclinic	ΔHf° = –788.3
			ΔGf° = –746.2
			S° = 33.8
			C_p° = 39.6
		$CaO \cdot Al_2O_3 \cdot 2SiO_2$(c) anorthite, triclinic	ΔHf_0° = –1005.08
			ΔHf° = –1010.5
			ΔGf° = –956.6
			S° = 47.63
			$H_{298}^\circ - H_0^\circ$ = 7.967
			C_p° = 50.53
		anorthite, hexagonal	ΔHf° = –1006.1
			ΔGf° = –953.3
			S° = 51.3

TN	P.	Substance	Revision	
6	51	$CaO\cdot Al_2O_3\cdot 2SiO_2(c)$		
		glassy	ΔHf°	= −993.1
			ΔGf°	= −941.9
			S°	= 56.7
		$2CaO\cdot Al_2O_3\cdot SiO_2(c)$,	ΔHf°	= −951.6
		gehlenite	ΔGf°	= −904.2
			S°	= 50.2
		glassy	ΔHf°	= −939.7
		$2CaO\cdot 2Al_2O_3\cdot 8SiO_2\cdot 7H_2O(c)$	ΔHf°	= −3405.6
		leonhardite	ΔGf°	= −3155.0
6	72	$SrSi(c)$	Omit ΔHf°	
		$SrSi_2(c)$	Omit ΔHf°	
		$Sr_2Si(c)$	Omit ΔHf°	
6	73	$2SrO\cdot Al_2O_3\cdot SiO_2(c)$	ΔHf°	= −940.1
6	79	$BaH(g)$	ΔHf_0°	= 53.58
6	96	$BaSi_3(c)$	Omit ΔHf°	
		$Ba_2Si_2(c)$	Omit ΔHf°	
7	1	$Lu(g)$	ΔGf°	= 92.7
7	4	$Yb(g)$	ΔHf_0°	= 36.52
7	21	$Dy(cs)$	$H_{298}^\circ-H_0^\circ$	= 2.119
7	29	$Gd(cs)$	$H_{298}^\circ-H_0^\circ$	= 2.172
7	33	$Eu(g)$	ΔHf_0°	= 42.33
7	34	$EuF_3(c)$	Omit entry	
		$EuF_3(g)$	Omit entry	
7	35	$EuI^+(aq)$	Change to $EuI^{2+}(aq)$	
7	41	$Sm_2(C_2O_4)\cdot 10H_2O(c)$	Should be $Sm_2(C_2O_4)_3\cdot 10H_2O(c)$	
7	42	Add $Pm(c)$	ΔHf_0°	= 0.
			ΔHf°	= 0.
			ΔGf°	= 0.
7	46	$Nd_2(SeO_3)_3\cdot 8H_2O$,amorp(c)	Omit (c)	
8	1	$UF(g)$	ΔHf_0°	= −9.7
			ΔHf°	= −10.
			ΔGf°	= −17.
		$UF_2(g)$	ΔHf_0°	= −126.6
			ΔHf°	= −127.
			ΔGf°	= −130.
		$UF_3(c)$	ΔHf_0°	= −358.7
			ΔHf°	= −359.0
			ΔGf°	= −342.6
		$UF_4(c)$ monoclinic	ΔHf_0°	= −457.15
			ΔHf°	= −457.5
			ΔGf°	= −435.8
		(g)	ΔHf_0°	= −381.12
			ΔHf°	= −382.1
			ΔGf°	= −375.9
		$UF_{4.25}(c)$	ΔHf°	= −469.0
			ΔGf°	= −445.9
		$UF_4.2.5H_2O(c)$	ΔHf°	= −638.5
		orthorhombic	ΔGf°	= −582.4
		$UF_5(g)$	ΔHf_0°	= −461.8
			ΔHf°	= −463.
			ΔGf°	= −451.
8	6	$UB_4(c)$	ΔHf°	= −58.
		$UB_{12}(c)$	ΔHf°	= −95.
8	10	ThC_{35}	Omit compound and ΔGf°	
8	13	$Li_2(g)$	ΔHf_0°	= 51.50
			$H_{298}^\circ-H_0^\circ$	= 2.312
			Cp	= 8.629
8	19	$LiOC_2H_5(c)$	ΔHf°	= −109.1
8	20	$LiBH_4\cdot(CH(CH_3)_2)_2O(c)$ in isopropylether	Omit "in"	
		$LiBO_2(l)$	Omit entry	
8	22	$Li_2WO_4(c)$	ΔHf°	= −383.2
8	25	NaF in $2500H_2O$	ΔHf°	= −136.829
8	28	NaBr in $HCON(CH_3)_2$	Omit entry	
8	38	Na_2CO_3 in 800 H_2O	Omit entry	
8	39	$Na_2CO_3\cdot 7H_2O$	S°	= 100.9
		$Na_2CO_3\cdot 10H_2O$	S°	= 134.5

TN	P.	Substance	Revision	
8	43	$Na_2SiF_6(c)$	ΔHf_0°	= −697.88
			ΔGf°	= −658.3
			$H_{298}^\circ-H_0^\circ$	= 7.70
			S°	= 49.5
			C_p°	= 44.71
8	45	$NaAlO_2(a)$	ΔHf°	= −279.9
			ΔGf°	= −261.2
			S°	= 5.3
		$NaAl(OH)_4(a)$	ΔHf°	= −416.5
			ΔGf°	= −374.6
			S°	= 38.7
		$NaAlSi_3O_8(c2)$ analbite	ΔHf_0°	= −933.05
			ΔHf°	= −938.3
			ΔGf°	= −886.3
8	49	$Na_2ReCl_6(a)$	ΔHf°	= −297.0
			ΔGf°	= −266.1
			S°	= 89.
8	58	$KBrO_3(c)$	ΔHf_0°	= −83.367
			$H_{298}^\circ-H_0^\circ$	= 5.005
			C_p°	= 25.14
8	62	K_2SO_4 in $700H_2O$	ΔHf°	= −337.706
8	65	KNO_3 in $(CH_3)_2$:SO in dimethylsulfoxide	Should be in $(CH_3)_2$SO:U	
8	66	$KC_{10}(c)$	ΔHf°	= −6.0
		$KC_{24}(c)$	FW	= 327.3708
			ΔHf°	= −9.1
		$KC_{36}(c)$	ΔHf°	= −10.2
		Add $KC_{48}(c)$	FW	= 615.6396
			ΔHf°	= −10.5
		Add $KC_{60}(c)$	FW	= 759.7740
			ΔHf°	= −10.7
8	71	$K_3AlF_6(c)$	ΔHf°	= −802.6
		(a)	Change to (au)	
			ΔHf°	= −792.3
		$K_3AlF_6\cdot 3.5H_2O(c)$	ΔHf°	= −1058.1
		$KAlSi_3O_8(c)$	ΔHf_0°	= −941.13
		sanidine	$H_{298}^\circ-H_0^\circ$	= 8.12
		$KAlSi_3O_8(c2)$	ΔHf_0°	= −943.13
		microcline	$H_{298}^\circ-H_0^\circ$	= 8.12
8	72	$K_2CdCl_4(c)$	Omit entry	
8	76	$KMnO_4(a)$	ΔHf°	= −189.7
			ΔGf°	= −174.6
			S°	= 69.8
8	77	$K_2Cr_2O_7$ in $150H_2O$	ΔHf°	= −477.94
		$K_2Cr_2O_7$ in $1500H_2O$	ΔHf°	= −475.98
8	81	K_2CaCl_4	Omit entry	
8	90	$RbAlO_2(a)$	ΔHf°	= −282.5
			ΔGf°	= −266.5
			S°	= 20.2
		$RbAl(OH)_4(a)$	ΔHf°	= −419.1
			ΔGf°	= −379.9
			S°	= 53.6
		$Rb_3AlF_6(au)$	ΔHf°	= −806.6
8	91	$RbCd(N_3)_4(a)$	Should be $RbCd(N_3)_3(a)$	
			FW	= 323.9281
8	93	$Rb_2ReCl_6(a)$	ΔHf°	= −302.3
			ΔGf°	= −276.6
			S°	= 119.
8	101	$Cs_2H_2P_2O_7(a)$	S°	= 103.
8	102	$CsAlO_2(a)$	ΔHf°	= −284.2
			ΔGf°	= −268.4
			S°	= 23.0
		$CsAl(OH)_4(a)$	ΔHf°	= −420.8
			ΔGf°	= −381.8
			S°	= 56.4
		$Cs_3AlF_6(au)$	ΔHf°	= −811.7

Appendix 2. Revised values: Gaseous Atomic Ions

Prepared by
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The values given in this appendix cover all the gaseous atomic ions in the main tables. They include major revisions from those published in the NBS Technical Note 270 series. All values for gaseous ions have been reexamined and revised where necessary. They take into account the substantial number of evaluations and experiments made during the past decade. Enthalpies of formation, $\Delta Hf°(0)$ and $\Delta Hf°(298.15\ K)$ are based on ionization potentials from the publications of the NBS Atomic Energy Levels Data Center, recommendations of Dr. Wm. C. Martin and, in the absence of newer data, Moore's "Ionization potentials" [56]. Enthalpy differences for the ions, $[H°(298.15\ K)-H°(0)]$, have been calculated from energy levels in the same publications or in Moore's "Atomic Energy Levels" series [57].

The calculation of values for $\Delta Hf°(298.15\ K)$ makes use of these enthalpy differences (this was not done in NBS Technical Note 270) and also the conventions that the electron is a classical particle with thermal energy for which $[H°(298.15\ K)-H°(0)] = 6.197\ kJ\ mol^{-1}(1.481\ kcal\ mol^{-1})$, $\Delta Hf°(0) = 0$, and $\Delta Hf°(298.15\ K) = 0$. If no value for the enthalpy difference is given for an ion, that ion is assumed to have the enthalpy difference of the next lowest ion of the same element. All values are in kilocalories per mole.

TN	P.	Substance	$\Delta Hf_0°$	$\Delta Hf°$	$H°-H_0°$
3	11	$O^{+}(g)$	373.020	374.945	1.481
3	11	$O^{+2}(g)$	1182.84	1186.65	1.884
3	11	$O^{+3}(g)$	2449.68	2454.83	1.743
3	11	$O^{+4}(g)$	4234.87	4241.24	1.481
3	11	$O^{+5}(g)$	6861.42	6869.27	1.481
3	11	$O^{+6}(g)$	10046.5	10055.8	1.481
3	11	$O^{+7}(g)$	27095.	27106.	1.481
3	11	$O^{+8}(g)$	47190.	47202.	1.481
3	11	$O^{-}(g)$	25.20	24.29	
3	12	$H^{+}(g)$	365.211	367.161	1.481
3	12	$H^{-}(g)$	34.23	33.22	1.481
3	15	$He^{+}(g)$	566.994	568.475	1.481
3	15 omit	$He^{+2}(g)$			
3	16	$Ne^{+}(g)$	497.286	498.793	1.507
3	16	$Ne^{+2}(g)$	1441.92	1444.91	1.514
3	16	$Ne^{+3}(g)$	2905.2	2909.7	1.481
3	16	$Ne^{+4}(g)$	5145.	5152.	1.869
3	16	$Ne^{+5}(g)$	8056.	8064.	1.481
3	17	$Ar^{+}(g)$	363.422	364.905	1.483
3	17	$Ar^{+2}(g)$	1000.57	1003.54	1.491
3	17	$Ar^{+3}(g)$	1940.1	1944.5	1.481
3	17	$Ar^{+4}(g)$	3319.3	3325.3	1.633
3	17	$Ar^{+5}(g)$	5049.	5057.	1.481
3	17	$Ar^{+6}(g)$	7148.	7157.	1.481
3	17	$Ar^{+7}(g)$	10015.	10026.	1.481
3	17 omit	$Ar^{+8}(g)$			
3	18	$Kr^{+}(g)$	322.836	324.317	1.481
3	18	$Kr^{+2}(g)$	884.59	887.55	1.481
3	18	$Kr^{+3}(g)$	1736.7	1741.1	1.481

TN	P.	Substance	$\Delta Hf_0°$	$\Delta Hf°$	$H°-H_0°$
3	19	$Xe^{+}(g)$	279.719	281.200	1.481
3	19	$Xe^{+2}(g)$	768.8	771.8	1.481
3	19	$Xe^{+3}(g)$	1509.6	1514.1	1.481
3	20	$Rn^{+}(g)$	247.864	249.345	1.481
3	21	$F^{+}(g)$	420.16	422.19	1.604
3	21	$F^{+2}(g)$	1226.60	1229.98	1.481
3	21	$F^{+3}(g)$	2672.7	2678.0	1.965
3	21	$F^{+4}(g)$	4682.2	4688.7	1.592
3	21	$F^{+5}(g)$	7316.7	7324.5	1.481
3	21	$F^{+6}(g)$	10941.0	10950.3	1.481
3	21	$F^{+7}(g)$	15211.5	15222.3	1.481
3	21	$F^{+8}(g)$	37209.	37222.	
3	21	$F^{-}(g)$	−59.98	−61.04	1.481
3	24	$Cl^{+}(g)$	327.72	329.63	1.526
3	24	$Cl^{+2}(g)$	876.9	880.2	1.481
3	24	$Cl^{+3}(g)$	1790.4	1795.5	1.810
3	24	$Cl^{+4}(g)$	3023.3	3029.6	1.488
3	24	$Cl^{+5}(g)$	4587.	4595.	1.481
3	24	$Cl^{+6}(g)$	6825.	6835.	1.481
3	24	$Cl^{+7}(g)$	9458.	9469.	1.481
3	24	$Cl^{+8}(g)$	17490.	17502.	1.481
3	24 omit	$Cl^{+9}(g)$			
3	24 omit	$Cl^{+10}(g)$			
3	24	$Cl^{-}(g)$	−54.64	−55.72	
3	31	$Br^{+}(g)$	300.620	300.653	1.481
3	31	$Br^{+2}(g)$	803.4	804.9	1.481
3	31	$Br^{+3}(g)$	1631.	1634.	1.481
3	31	$Br^{+4}(g)$	2722.	2727.	1.481
3	31	$Br^{+5}(g)$	4099.	4105.	1.481
3	31	$Br^{-}(g)$	−49.43	−52.36	1.481
3	36	$I^{+}(g)$	266.641	268.026	1.481
3	36	$I^{+2}(g)$	707.81	710.68	1.481
3	36	$I^{-}(g)$	−45.	−47.	
3	43	$S^{+}(g)$	305.003	306.910	1.481
3	43	$S^{+2}(g)$	843.1	846.9	1.922
3	43	$S^{+3}(g)$	1646.2	1651.1	1.535
3	43	$S^{+4}(g)$	2737.1	2743.5	1.481
3	43	$S^{+5}(g)$	4413.	4421.	1.481
3	43	$S^{+6}(g)$	6443.	6452.	1.481
3	43	$S^{+7}(g)$	12921.	12932.	1.481
3	43	$S^{+8}(g)$	20490.	20502.	1.481
3	43	$S^{+9}(g)$	29232.	29246.	1.481
3	43	$S^{-}(g)$	18.	17.	
3	56 add	$Se^{+}(g)$	279.00	280.64	1.481
3	56 add	$Se^{+2}(g)$	767.6	770.7	1.481
3	56 add	$Se^{+3}(g)$	1478.3	1482.9	1.481
3	56 add	$Se^{+4}(g)$	2468.6	2474.7	1.481
3	56 add	$Se^{+5}(g)$	4044.	4051.	1.481
3	58	$Te^{+}(g)$	254.76	256.26	1.481
3	58	$Te^{+2}(g)$	684.	687.	1.481
3	58	$Te^{+3}(g)$	1329.	1333.	1.481
3	58	$Te^{+4}(g)$	2192.	2198.	1.481
3	58	$Te^{+5}(g)$	3547.	3554.	1.481
3	58	$Te^{+6}(g)$	5177.	5186.	1.481
3	58 omit	$Te^{+7}(g)$			
3	61	$N^{+}(g)$	447.695	449.842	1.702
3	61	$N^{+2}(g)$	1130.311	1133.949	1.712
3	61	$N^{+3}(g)$	2224.509	2229.396	1.481
3	61	$N^{+4}(g)$	4011.075	4017.444	1.481

TN	P.	Substance	ΔHf_0°	ΔHf°	$H^\circ - H_0^\circ$
3	61	N^{+5}(g)	6268.457	6276.307	1.481
3	61	N^{+6}(g)	18999.43	19008.76	1.481
3	61	N^{+7}(g)	34381.7	34392.5	1.481
3	84	P^{+}(g)	316.82	318.97	1.948
3	84	P^{+2}(g)	771.7	775.1	1.671
3	84	P^{+3}(g)	1467.6	1472.3	1.481
3	84	P^{+4}(g)	2652.2	2658.3	1.481
3	84	P^{+5}(g)	4151.7	4159.3	1.481
3	84	P^{+6}(g)	9235.	9244.	1.481
3	84	P^{+7}(g)	15305.	15315.	1.481
3	84	P^{+8}(g)	22440.	22452.	1.481
3	84 omit	P^{+9}(g)			
3	84 omit	P^{+10}(g)			
3	84 omit	P^{+11}(g)			
3	84 omit	P^{+12}(g)			
3	84 omit	P^{+13}(g)			
3	95	As^{+}(g)	298.3	300.1	1.535
3	95	As^{+2}(g)	728.0	731.3	1.481
3	95	As^{+3}(g)	1381.8	1386.5	1.481
3	95	As^{+4}(g)	2538.	2544.	1.481
3	95	As^{+5}(g)	3982.	3990.	1.481
3	95	As^{+6}(g)	6933.	6942.	
3	95	Sb^{+}(g)	261.9	263.5	1.481
3	95	Sb^{+2}(g)	643.	646.	1.481
3	95	Sb^{+3}(g)	1227.	1231.	1.481
3	95	Sb^{+4}(g)	2245.	2251.	1.481
3	95	Sb^{+5}(g)	3530.	3537.	
3	95 omit	Sb^{+6}(g)			
3	103	Bi^{+}(g)	217.7	219.1	1.481
3	103	Bi^{+2}(g)	603.	606.	1.481
3	103	Bi^{+3}(g)	1192.	1196.	1.481
3	103	Bi^{+4}(g)	2237.	2243.	1.481
3	103	Bi^{+5}(g)	3528.	3535.0	1.481
3	103 omit	Bi^{+6}(g)			
3	106	C^{+}(g)	429.647	432.467	1.590
3	106	C^{+2}(g)	991.934	996.126	1.481
3	106	C^{+3}(g)	2096.24	2101.92	1.481
3	106	C^{+4}(g)	3583.50	3590.65	1.481
3	106	C^{+5}(g)	12625.2	12633.8	1.481
3	106 omit	C^{+6}(g)			
3	171	Si^{+}(g)	295.84	298.31	1.755
3	171	Si^{+2}(g)	672.78	676.46	1.481
3	171	Si^{+3}(g)	1445.14	1450.30	1.481
3	171	Si^{+4}(g)	2486.13	2492.77	1.481
3	171	Si^{+5}(g)	6331.9	6340.1	1.481
3	171	Si^{+6}(g)	11060.6	11070.2	1.481
3	171	Si^{+7}(g)	16746.	16757.	1.481
3	171	Si^{+8}(g)	23737.	23750.	1.481
3	171	Si^{+9}(g)	31834.	31848.	1.481
3	171	Si^{+10}(g)	41091.	41107.	1.481
3	171	Si^{+11}(g)	52070.	52087.	1.481
3	171 omit	Si^{+12}(g)			
3	177	Ge^{+}(g)	271.51	273.36	1.483
3	177	Ge^{+2}(g)	638.97	642.30	1.481
3	177	Ge^{+3}(g)	1428.19	1433.00	1.481
3	177	Ge^{+4}(g)	2482.3	2488.6	1.481
3	177	Ge^{+5}(g)	4638.	4645.	
3	181	Sn^{+}(g)	241.53	243.03	1.481
3	181	Sn^{+2}(g)	578.96	581.93	1.481
3	181	Sn^{+3}(g)	1282.36	1286.82	1.481
3	181	Sn^{+4}(g)	2221.7	2227.7	1.481
3	181	Sn^{+5}(g)	3888.6	3896.0	1.481
3	187	Pb^{+}(g)	217.791	219.112	1.481
3	187	Pb^{+2}(g)	564.44	567.24	1.481
3	187	Pb^{+3}(g)	1300.93	1305.21	1.481
3	187	Pb^{+4}(g)	2276.89	2282.65	1.481

TN	P.	Substance	ΔHf_0°	ΔHf°	$H^\circ - H_0^\circ$
3	187	Pb^{+5}(g)	3864.	3871.	1.481
3	196	B^{+}(g)	324.64	327.31	1.481
3	196	B^{+2}(g)	904.7	908.9	1.481
3	196	B^{+3}(g)	1779.4	1785.0	1.481
3	196	B^{+4}(g)	7760.7	7767.8	1.481
3	196 omit	B^{+5}(g)			
3	207	Al^{+}(g)	215.474	217.342	1.481
3	207	Al^{+2}(g)	649.667	653.016	1.481
3	207	Al^{+3}(g)	1305.68	1310.51	1.481
3	207	Al^{+4}(g)	4072.75	4079.06	1.481
3	207	Al^{+5}(g)	7620.0	7627.8	1.481
3	207	Al^{+6}(g)	12012.5	12021.8	1.481
3	207	Al^{+7}(g)	17580.0	17590.8	1.485
3	207	Al^{+8}(g)	24143.	24155.	1.481
3	207	Al^{+9}(g)	31755.	31769.	1.481
3	207	Al^{+10}(g)	40951.	40966.	1.481
3	207	Al^{+11}(g)	51146.	51162.	1.481
3	218	Ga^{+}(g)	204.35	205.94	1.481
3	218	Ga^{+2}(g)	677.4	680.5	1.481
3	218	Ga^{+3}(g)	1385.6	1390.2	1.481
3	218	Ga^{+4}(g)	2865.	2872.	
3	223	In^{+}(g)	185.967	187.348	1.481
3	223	In^{+2}(g)	621.1	624.0	1.481
3	223	In^{+3}(g)	1268.	1272.	1.481
3	223	In^{+4}(g)	2523.	2529.	1.481
3	227	Tl^{+}(g)	184.560	185.890	1.481
3	227	Tl^{+2}(g)	655.643	658.454	1.481
3	227	Tl^{+3}(g)	1343.5	1347.8	1.481
3	227 omit	Tl^{+4}(g)			
3	233	Zn^{+}(g)	247.744	249.356	1.481
3	233	Zn^{+2}(g)	662.01	665.10	1.481
3	233	Zn^{+3}(g)	1578.0	1582.6	1.481
3	248	Cd^{+}(g)	234.18	235.65	1.481
3	248	Cd^{+2}(g)	624.09	627.04	1.481
4	1	Hg^{+}(g)	256.10	256.83	1.481
4	1	Hg^{+2}(g)	688.63	690.84	1.481
4	1	Hg^{+3}(g)	1478.	1480.	1.481
4	13	Cu^{+}(g)	258.752	260.513	1.481
4	13	Cu^{+2}(g)	726.70	729.94	1.481
4	13	Cu^{+3}(g)	1576.1	1580.9	
4	29	Ag^{+}(g)	242.61	244.20	1.481
4	29	Ag^{+2}(g)	738.1	741.2	1.481
4	29	Ag^{+3}(g)	1541.2	1545.8	
4	39	Au^{+}(g)	300.21	301.73	1.481
4	39	Au^{+2}(g)	772.	775.	1.481
4	43	Ni^{+}(g)	278.335	280.155	1.483
4	43	Ni^{+2}(g)	697.315	700.619	1.486
4	43	Ni^{+3}(g)	1511.9	1516.7	
4	54	Co^{+}(g)	282.47	284.32	1.504
4	54	Co^{+2}(g)	676.45	679.78	1.516
4	54	Co^{+3}(g)	1449.0	1453.8	
4	74	Fe^{+}(g)	280.44	282.50	1.658
4	74	Fe^{+2}(g)	653.73	657.25	1.628
4	74	Fe^{+3}(g)	1360.6	1365.4	1.481
4	90	Pd^{+}(g)	282.436	284.117	1.481
4	90	Pd^{+2}(g)	730.5	733.6	1.481
4	90	Pd^{+3}(g)	1490.	1494.	
4	93	Rh^{+}(g)	306.67	308.46	1.481
4	93	Rh^{+2}(g)	723.5	726.8	1.481
4	93	Rh^{+3}(g)	1440.	1444.	
4	94	Ru^{+}(g)	320.86	322.73	1.483
4	94	Ru^{+2}(g)	707.4	710.8	1.491
4	94	Ru^{+3}(g)	1364.	1369.	
4	96	Pt^{+}(g)	333.5	335.1	1.481
4	96	Pt^{+2}(g)	761.6	764.6	
4	103	Ir^{+}(g)	367.	368.	
4	104	Os^{+}(g)		381.42	1.481

TN	P.	Substance	ΔHf_0°	ΔHf°	$H^\circ - H_0^\circ$
4	104	Os^{+2}(g)		775.	
4	106	Mn^{+}(g)	238.263	240.074	1.481
4	106	Mn^{+2}(g)	598.93	602.22	1.481
4	106	Mn^{+3}(g)	1375.3	1380.6	2.027
4	116	Tc^{+}(g)		331.3	1.481
4	117	Re^{+}(g)	362.8	364.4	1.481
4	120	Cr^{+}(g)	250.31	252.30	1.481
4	120	Cr^{+2}(g)	630.75	634.73	1.995
4	120	Cr^{+3}(g)	1344.7	1350.0	1.854
4	120	Cr^{+4}(g)	2477.	2483.	1.656
4	120	Cr^{+5}(g)	4079.	4087.	1.521
4	120	Cr^{+6}(g)	6169.	6178.	1.481
4	120	Cr^{+7}(g)	9862.	9873.	1.481
4	120	Cr^{+8}(g)	14122.	14135.	
4	129	Mo^{+}(g)	320.63	322.49	1.481
4	129	Mo^{+2}(g)	693.18	696.52	
4	129	Mo^{+3}(g)	1319.6	1324.5	1.558
4	129	Mo^{+4}(g)	2389.	2396.	1.484
4	129	Mo^{+5}(g)	3800.	3808.	1.481
4	129	Mo^{+6}(g)	5370.	5379.	1.481
4	129	Mo^{+7}(g)	8268.	8278.	1.481
4	129	Mo^{+8}(g)	11590.	11602.	
4	134	W^{+}(g)	378.0	379.7	1.487
5	1	V^{+}(g)	277.54	279.80	1.888
5	1	V^{+2}(g)	615.49	619.23	1.891
5	1	V^{+3}(g)	1291.41	1296.51	1.764
5	1	V^{+4}(g)	2368.5	2374.9	1.605
5	1	V^{+5}(g)	3873.9	3881.7	1.481
5	1	V^{+6}(g)	6829.	6838.	1.481
5	1	V^{+7}(g)	10302.	10313.	1.481
5	1	V^{+8}(g)	14302.	14315.	1.481
5	1	V^{+9}(g)	19048.	19062.	1.481
5	1	V^{+10}(g)	24364.	24379.	
5	6	Nb^{+}(g)	324.73	327.01	2.053
5	6	Nb^{+2}(g)	654.96	658.33	1.664
5	6	Nb^{+3}(g)	1232.5	1237.2	1.504
5	6	Nb^{+4}(g)	2114.8	2121.0	1.482
5	6	Nb^{+5}(g)	3280.	3288.	1.481
5	6	Nb^{+6}(g)	5634.	5643.	1.481
5	6	Nb^{+7}(g)	8376.	8387.	
5	10	Ta^{+}(g)	357.41	359.06	1.514
5	12	Ti^{+}(g)	268.93	271.15	1.888
5	12	Ti^{+2}(g)	582.00	585.62	1.804
5	12	Ti^{+3}(g)	1215.97	1220.95	1.690
5	12	Ti^{+4}(g)	2213.7	2220.0	1.481
5	12	Ti^{+5}(g)	4503.6	4511.3	1.481
5	12	Ti^{+6}(g)	7260.1	7269.3	1.481
5	12	Ti^{+7}(g)	10508.	10519.	1.481
5	12	Ti^{+8}(g)	14436.	14449.	1.481
5	18	Zr^{+}(g)	297.2	299.1	1.786
5	18	Zr^{+2}(g)	327.4	330.7	1.583
5	18	Zr^{+3}(g)	857.5	862.1	1.494
5	18	Zr^{+4}(g)	1651.2	1657.3	1.481
5	18	Zr^{+5}(g)	3504.	3512.	
5	22	Hf^{+}(g)	304.3	305.9	1.481
5	22	Hf^{+2}(g)	647.	650.	1.481
5	22	Hf^{+3}(g)	1184.	1189.	1.481
5	22	Hf^{+4}(g)	1952.	1958.	
5	24	Sc^{+}(g)	241.180	243.129	1.712
5	24	Sc^{+2}(g)	536.348	539.754	1.688
5	24	Sc^{+3}(g)	1107.249	1111.929	1.481
5	24	Sc^{+4}(g)	2801.9	2808.1	1.481
5	24	Sc^{+5}(g)	4920.5	4928.2	1.481
5	24	Sc^{+6}(g)	7473.	7482.	1.481
5	24	Sc^{+7}(g)	10655.	10666.	1.481
5	24	Sc^{+8}(g)	14300.	14313.	1.481
5	24	Sc^{+9}(g)	18452.	18465.	1.481
5	24	Sc^{+10}(g)	23643.	23658.	1.481
5	24	Sc^{+11}(g)	29404.	29421.	1.481
5	24	Sc^{+12}(g)	45255.	45273.	1.481
5	24	Sc^{+13}(g)	62704.	62724.	1.481
5	24	Sc^{+14}(g)	81863.	81884.	1.481
5	24	Sc^{+15}(g)	103252.	103275.	
5	28	Y^{+}(g)	243.86	245.62	1.709
5	28	Y^{+2}(g)	526.02	529.13	1.571
5	28	Y^{+3}(g)	999.21	1003.79	
5	28	Y^{+4}(g)	2397.	2403.	1.481
5	28	Y^{+5}(g)	4173.	4180.	
5	28	Y^{+6}(g)	6318.	6327.	
5	28 omit	Y^{+7}(g)			
5	28 omit	Y^{+8}(g)			
5	28 omit	Y^{+9}(g)			
5	28 omit	Y^{+10}(g)			
5	28 omit	Y^{+11}(g)			
5	28 omit	Y^{+12}(g)			
6	1	Be^{+}(g)	291.47	293.96	1.481
6	1	Be^{+2}(g)	711.43	715.40	1.481
6	1	Be^{+3}(g)	4260.34	4265.79	1.481
6	1	Be^{+4}(g)	9281.01	9287.94	1.481
6	9	Mg^{+}(g)	211.339	213.106	1.481
6	9	Mg^{+2}(g)	558.058	561.306	1.481
6	9	Mg^{+3}(g)	2406.20	2410.93	1.481
6	9	Mg^{+4}(g)	4925.90	4932.11	1.482
6	9	Mg^{+5}(g)	8183.64	8191.33	1.481
6	9	Mg^{+6}(g)	12484.6	12493.8	1.523
6	9	Mg^{+7}(g)	17671.9	17682.6	1.481
6	9	Mg^{+8}(g)	23805.0	23817.1	1.481
6	9	Mg^{+9}(g)	31366.5	31380.1	1.481
6	9	Mg^{+10}(g)	39840.9	39856.0	1.481
6	9	Mg^{+11}(g)	80469.5	80486.0	
6	30	Ca^{+}(g)	183.45	185.05	1.481
6	30	Ca^{+2}(g)	457.22	460.30	1.481
6	30	Ca^{+3}(g)	1631.3	1635.9	1.481
6	30	Ca^{+4}(g)	3182.7	3188.7	1.481
6	30	Ca^{+5}(g)	5131.4	5139.0	1.481
6	30	Ca^{+6}(g)	7640.0	7649.0	1.487
6	30	Ca^{+7}(g)	10573.	10584.	1.481
6	30	Ca^{+8}(g)	13969.	13981.	1.481
6	57	Sr^{+}(g)		172.11	1.481
6	57	Sr^{+2}(g)		427.95	1.481
6	57	Sr^{+3}(g)		1418.11	1.481
6	57	Sr^{+4}(g)		2717.4	
6	57	Sr^{+5}(g)		4371.	
6	57	Sr^{+6}(g)		6467.	
6	57	Sr^{+7}(g)		8913.	
6	57	Sr^{+8}(g)		11736.	
6	78	Ba^{+}(g)	163.38	164.66	1.481
6	78	Ba^{+2}(g)	394.08	396.84	
6	78	Ba^{+3}(g)	1219.5	1223.7	
7	1	Lu^{+}(g)	227.36	228.80	1.481
7	1	Lu^{+2}(g)	547.6	550.5	1.481
7	1	Lu^{+3}(g)	1031.	1035.	1.481
7	1	Lu^{+4}(g)	2074.	2080.	1.481
7	4	Yb^{+}(g)	180.70	182.10	1.481
7	4	Yb^{+2}(g)	461.66	464.54	1.481
7	4	Yb^{+3}(g)	1039.4	1043.8	1.481
7	4 omit	Yb^{+4}(g)			
7	9	Tm^{+}(g)	198.4	199.7	1.616
7	9	Tm^{+2}(g)	476.3	479.1	1.616
7	9	Tm^{+3}(g)	1022.	1027.	
7	9 omit	Tm^{+4}(g)			
7	13	Er^{+}(g)	216.9	218.2	1.598
7	13	Er^{+2}(g)	492.	495.	1.481
7	13	Er^{+3}(g)	1016.	1020.	1.481

TN	P.	Substance	ΔHf_0°	ΔHf°	$H^\circ - H_0^\circ$
7	13 omit	$Er^{+4}(g)$			
7	16	$Ho^{+}(g)$	211.2	212.3	1.552
7	16	$Ho^{+2}(g)$	483.	486.	1.481
7	16	$Ho^{+3}(g)$	1010.	1014.	1.481
7	16 omit	$Ho^{+4}(g)$			
7	21	$Dy^{+}(g)$	207.0	207.9	1.519
7	21	$Dy^{+2}(g)$	476.0	478.4	
7	21	$Dy^{+3}(g)$	1002.	1005.	
7	21 omit	$Dy^{+4}(g)$			
7	25	$Tb^{+}(g)$	228.6	229.3	1.500
7	25	$Tb^{+2}(g)$	494.	496.	1.481
7	25	$Tb^{+3}(g)$	999.	1003.	1.481
7	25 omit	$Tb^{+4}(g)$			
7	29	$Gd^{+}(g)$	235.2	238.3	1.789
7	29	$Gd^{+2}(g)$	514.	518.	1.782
7	29	$Gd^{+3}(g)$	990.	995.	1.481
7	29 omit	$Gd^{+4}(g)$			
7	33	$Eu^{+}(g)$	172.99	174.14	1.481
7	33	$Eu^{+2}(g)$	432.	435.	1.481
7	33	$Eu^{+3}(g)$	1007.	1011.	1.894
7	33 omit	$Eu^{+4}(g)$			
7	37	$Sm^{+}(g)$	179.4	181.4	1.841
7	37	$Sm^{+2}(g)$	435.	438.	1.952
7	37	$Sm^{+3}(g)$	975.	980.	1.504
7	37 omit	$Sm^{+4}(g)$			
7	43	$Nd^{+}(g)$	205.9	207.3	1.625
7	43	$Nd^{+2}(g)$	453.	456.	1.498
7	43	$Nd^{+3}(g)$	964.	968.	1.482
7	43 omit	$Nd^{+4}(g)$			
7	48	$Pr^{+}(g)$	211.3	212.6	1.644
7	48	$Pr^{+2}(g)$	454.6	457.3	1.487
7	48	$Pr^{+3}(g)$	953.2	957.4	1.481
7	48	$Pr^{+4}(g)$	1852.	1858.	1.481
7	48	$Pr^{+5}(g)$	3179.	3186.	
7	53	$Ce^{+}(g)$	228.9	230.1	1.517
7	53	$Ce^{+2}(g)$	479.1	481.7	1.485
7	53	$Ce^{+3}(g)$	944.9	949.0	1.481
7	53	$Ce^{+4}(g)$	1792.	1798.	1.481
7	60	$La^{+}(g)$	231.690	233.095	1.517
7	60	$La^{+2}(g)$	487.	490.	1.484
7	60	$La^{+3}(g)$	929.0	933.3	1.481
7	60	$La^{+4}(g)$	2081.	2087.	1.481
8	1	$U^{+}(g)$	270.81	272.46	1.694
8	1	$U^{2+}(g)$	520.		
8	1	$U^{3+}(g)$	960.		
8	8	$Th^{+}(g)$	282.1	283.5	
8	8	$Th^{+2}(g)$	548.0	550.9	
8	8	$Th^{+3}(g)$	1008.4	1012.7	
8	8	$Th^{+4}(g)$	1672.	1678.	
8	12	$Ac^{+}(g)$		208.	
8	13	$Li^{+}(g)$	162.050	163.906	1.481
8	13	$Li^{+2}(g)$	1906.339	1909.676	1.481
8	13	$Li^{+3}(g)$	4730.18	4735.00	
8	23	$Na^{+}(g)$	144.218	145.640	1.481
8	23	$Na^{+2}(g)$	1234.43	1237.33	1.484
8	23	$Na^{+3}(g)$	2886.0	2890.4	1.491
8	23	$Na^{+4}(g)$	5167.0	5172.9	1.481
8	23	$Na^{+5}(g)$	8359.	8366.	1.540
8	54	$K^{+}(g)$	121.64	122.91	1.481
8	54	$K^{+2}(g)$	851.0	853.8	1.481
8	54	$K^{+3}(g)$	1907.3	1911.5	1.482
8	54	$K^{+4}(g)$	3312.0	3317.7	1.481
8	84	$Rb^{+}(g)$	115.965	117.137	1.481
8	84	$Rb^{+2}(g)$	745.18	747.83	1.481
8	84	$Rb^{+3}(g)$	1660.	1664.	
8	95	$Cs^{+}(g)$	108.337	109.456	1.481
8	95	$Cs^{+2}(g)$	642.	644.	1.481

Appendix 3. Revised Values: Gaseous Diatomic and Polyatomic Ions

Prepared by
Sharon G. Lias and Vivian B. Parker

The values given in this appendix (and included in the main tables) are enthalpies of formation of gaseous diatomic and polyatomic ions. The values represent a major revision from those published in the NBS Technical Note 270 series and an expansion of data for this class of substances. The new values reflect the substantial experimental improvements in the past decade.

Ionization potentials, appearance potentials and electron affinities have been selected by one of us (SGL) from the work of the NBS Ion Kinetics and Energetics Data Center. Recommendations made by Rosenstock et al. [39] were used in the absence of newer, definitive data. All values in the Technical Note 270 series for enthalpies of formation of diatomic and polyatomic ions were examined. Those not superseded by values listed below remain valid, even if some must be classed as crude approximations based on old technology.

Values for $\Delta Hf°(298.15\ K)$ are calculated using the convention that the electron is a classical particle with thermal energy for which $[H°(298.15\ K)-H°(0)] = 6.197$ kJ mol^{-1} (1.481 kcal mol^{-1}), $\Delta Hf°(0) = 0$, and $\Delta Hf°(298.15\ K) = 0$. If no enthalpy difference value is tabulated for an ion, that ion is assumed to have the same $[H°-H°(0)]$ as the next lower ion of the same molecule (or that of the neutral molecule itself). Because there is very limited enthalpy difference data for the ions tabulated here, this approximation is used often. All values are in kilocalories per mole.

TN	P.	Substance	ΔHf(0)	ΔHf	H–H(0)
3	11	O_2^+(g)	278.37	280.00	2.225
3	12	OH^+(g)	306.7	308.2	2.056
3	12	OH^-(g)	–32.9	–34.3	2.057
3	13	H_2O^+(g)	233.81	234.60	
3	14	$H_2O_2^+$(g)	212.0	212.0	
3	21	F_2^+(g)	361.73	363.21	
3	21	F_2O^+(g)	309.2	310.2	
3	25 add	HCl^+(g)	271.8	273.2	
3	30	ClF_3^+(g)	253.7	254.2	
3	31	Br_2^+(g)	254.4	252.4	
3	34	HBr^+(g)	262.1	261.7	
3	35	$BrCl^+$(g)	260.	260.	
3	39 add	HI^+(g)	246.36	247.32	
3	40 add	IF^+(g)	220.7	221.7	
3	40	IF_5^+(g)	104.2	103.4	
3	40	ICl^+(g)	237.3	238.4	
3	41	IBr^+(g)	237.67	237.01	
3	44	S_2^+(g)	246.5	248.0	
3	44	S_3^+(g)		256.4	
3	44	S_4^+(g)		270.9	
3	44	S_5^+(g)		229.4	
3	44	S_6^+(g)		233.5	
3	45	S_7^+(g)		228.5	
3	45	S_8^+(g)	233.8	234.4	
3	45 add	SO^+(g)	239.4	240.8	
3	47 add	HS^+(g)	273.6	275.2	
3	48 omit	$H_2S_2^+$(g)			
3	58 add	Te_2^+(g)	226.4	227.3	
3	58	H_2Te^+(g)		236.01	
3	61 add	N_2^+(g)	359.316	360.797	
3	61	NO^+(g)	235.095	236.574	2.072
3	61	NO_2^+(g)	230.4	231.3	
3	62 add	N_2O^+(g)	317.78	318.44	
3	62 add	NH_2^+(g)	302.7	303.5	
3	63	HN_3^+(g)	319.49	319.46	
3	70	NF_2^+(g)	278.9	279.7	
3	83 add	P_2^+(g)	257.	259.	
3	83 add	P_4^+(g)	225.2	225.0	
3	83	PH_3^+(g)	232.9	232.5	
3	90	PCl_3^+(g)	160.7	161.4	
3	96 add	AsH_3^+(g)	249.3	249.0	
3	105 omit	BiS^+(g)			
3	106	CO^+(g)	295.977	298.241	2.072
3	106	CO^{+2}(g)	914.	918.	
3	107	CO_2^+(g)	223.7	225.4	2.523
3	107 add	CO_2^{+2}(g)	762.	765.	
3	107	CH^+(g)	387.0	389.2	2.062
3	107	CH_2^+(g)	332.94	334.52	
3	107	CH_3^+(g)	262.19	262.87	
3	107	CH_4^+(g)	274.9	274.5	
3	108	$HCHO^+$(g)	225.73	226.30	
3	108	$HCOOH^+$(g)		172.26	
3	112	CF_3^+(g)	95.9	96.7	
3	113	CCl_3^+(g)	202.	203.	
3	115 omit	CCl_4^+(g)			
3	115	CH_3Cl^+(g)	241.3	240.9	
3	118 omit	CF_3Cl^+(g)			
3	118 omit	$CF_2Cl_2^+$(g)			
3	118 omit	$CFCl_3^+$(g)			
3	118	CBr_3^+(g)	239.3	235.8	
3	119	CF_3Br^+(g)	122.6	121.2	
3	121	COS^+(g)	223.9	225.4	
3	122	CN^+(g)	428.5	430.8	
3	122	HCN^+(g)	346.18	347.57	
3	122	$CH_3NH_2^+$(g)		198.9	
3	131 add	C_2^+(g)	476.1	479.1	2.076
3	131	$C_2H_3^+$(g)	268.4	268.9	
3	131	$C_2H_4^+$(g)	256.82	256.27	
3	131	$C_2H_5^+$(g)	218.	217.	
3	131	$C_2H_6^+$(g)	249.16	246.93	
3	132 add	CH_2CO^+(g)	211.0	211.8	
3	133	CH_3COOH^+(g)	145.6	143.8	
3	144	$CH_2ClCH_2Cl^+$(g)	226.4	225.2	
3	146	CH_3COCl^+(g)	194.2	193.5	
3	153	$(CH_3)_2S_2^+$(g)	190.	187.	
3	155	CH_3CN^+(g)	299.1	298.9	
3	158 omit	$C_2H_5ONO_2^+$(g)			
3	172 add	SiH_3^+(g)	242.5	242.5	
3	172 add	SiH_4^+(g)	279.4	278.6	
3	172 add	$Si_2H_6^+$(g)	254.	251.	
3	173 add	SiF_4^+(g)	–34.4	–34.2	

TN	P.	Substance	ΔHf(0)	ΔHf	H–H(0)
3	177	GeH_4^+(g)	285.5	284.3	
3	178 add	$GeCl_4^+$(g)	155.9	156.9	
3	181	SnH_4^+(g)	289.7	288.3	
3	182 add	$SnCl_4^+$(g)	161.8	162.7	
3	196 add	BH^+(g)	332.0	334.2	
3	197 add	$B_2H_6^+$(g)	274.7	272.4	
3	207 add	AlO^+(g)	241.6	243.1	
3	223 add	$InCl^+$(g)		203.	
3	228 add	$TlCl^+$(g)		209.0	
3	228 add	$TlBr^+$(g)		203.3	
3	234 add	$ZnCl_2^+$(g)		207.7	
3	245 add	CH_3Zn^+(g)		215.	
3	245 add	$(CH_3)_2Zn^+$(g)		221.7	
3	259 add	CH_3Cd^+(g)		214.	
3	259 add	$(CH_3)_2Cd^+$(g)		223.2	
4	1 add	Hg_2^+(g)	244.6	244.3	
4	8 add	CH_3Hg^+(g)	224.4	222.1	
4	8 add	$(CH_3)_2Hg^+$(g)	236.9	233.9	
4	13 add	Cu_2^+(g)	296.	297.	
4	29 add	Ag_2^+(g)	267.8	269.0	
4	39 add	Au_2^+(g)	343.	344.	
4	50 add	$Ni(CO)_4^+$(g)	47.0	49.2	
4	75 add	$FeCl_2^+$(g)		204.	
4	84 add	$Fe(CO)_5^+$(g)		9.6	
4	93	RhO_2^+(g)		276.	
4	104	OsO_4^+(g)		205.7	
4	107 add	MnF^+(g)	191.	193.	
4	118 add	$ReCl_5^+$(g)		145.	
4	128 add	$Cr(CO)_6^+$(g)		-51.2	
4	129 add	MoO_3^+(g)		200.	
4	132 add	$Mo(CO)_6^+$(g)	-28.9	-26.8	
4	134 add	WO_2^+(g)		234.	
4	134 add	WO_3^+(g)		205.	
4	136 add	$W(CO)_6^+$(g)		-16.75	
5	3 add	$VOCl_3^+$(g)	107.5	108.3	
5	13 add	$TiCl_4^+$(g)	87.	88.	
5	18 add	ZrO^+(g)		155.	
5	18 add	ZrO_2^+(g)		146.	
5	29 omit	YF^+(g)			
5	29 omit	YCl^+(g)			
5	31 add	YC_2^+(g)	297.	299.	
6	10 add	MgF^+(g)	124.	126.	
6	31 add	CaH^+(g)	190.	191.	
6	58 add	SrF^+(g)		48.	
6	59 add	$SrCl_2^+$(g)		109.	
6	76 add	BaO^+(g)		132.8	
6	80 add	BaF^+(g)	34.	35.	
6	80 add	$BaCl^+$(g)	76.	77.	
6	80 add	$BaCl_2^+$(g)	86.	87.	
7	9 add	TmO^+(g)	130.		
7	13 add	ErO^+(g)	132.		
7	16 add	HoO^+(g)	120.		
7	21 add	DyO^+(g)	121.		
7	25 add	TbO^+(g)	111.		
7	29 add	GdO^+(g)	116.		
7	33 add	EuO^+(g)	118.		
7	37 add	SmO^+(g)	97.		
7	43 add	NdO^+(g)	84.		
7	47 add	NdC_2^+(g)	282.	283.	
7	48 add	PrO^+(g)	75.		
7	53 add	CeO^+(g)	83.	84.	
7	60 add	LaO^+(g)	85.1	86.0	
8	8	ThO^+(g)	135.	136.	
8	8	ThO_2^+(g)	82.	83.	
8	8	ThF_3^+(g)	-102.	-101.	
8	10 add	ThC_2^+(g)		323.	
8	13	Li_2^+(g)	170.8	172.4	
8	23	Na_2^+(g)	146.8	147.6	
8	25 add	$NaCl^+$(g)	164.0	165.2	
8	27 add	$NaBr^+$(g)	160.	159.	
8	29 add	NaI^+(g)	157.9	158.7	
8	54 add	K_2^+(g)	124.01	124.67	
8	54 add	K_2O^+(g)		161.	
8	58 add	KBr^+(g)	140.	139.	
8	59 add	KI^+(g)	137.	138.	
8	85 add	$RbCl^+$(g)	141.8	142.8	
8	85 add	$RbBr^+$(g)	141.5	140.8	

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