Standard Thermodynamic Functions of Gaseous Polyatomic Ions at 100–1000 K

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The standard thermodynamic functions—heat capacity at constant pressure C_p°, its ratio to that at constant volume, the entropy S°, the enthalpy minus that at absolute zero $(H^\circ - H_0^\circ)$, and the Gibbs energy function $(G^\circ - H_0^\circ)/T$ were calculated for 131 gaseous ions in the temperature interval 100–1000 K, and are presented in tables. The input data included structural information (bond lengths and angles), vibrational spectroscopic information (vibrational frequencies and degeneracies), and electronic level occupation and degeneracies for ions having unpaired electrons. These were taken mainly from a recent review by the authors, and supplemented by further data from the literature, updated to the end of 1985.

Key words: enthalpy; entropy; Gibbs energy; heat capacity; polyatomic ions; thermodynamic functions (ideal gas).

Contents

List of Tables[a]

[a] Tables for which there are comments in Sec. 4 are marked with an asterisk after their number. The tables are numbered in concordance with Ref. 4, hence in some cases numbering such as 25, 25a, 25b, etc., occurs in order to accommodate ions which have not been included in the tables of Ref. 4.

1. Introduction

Thermodynamic properties of polyatomic ionic species which exist, with reasonable stability, in aqueous solutions are included in the standard tabulations to a limited extent only. In the JANAF Tables,[1] only a small number of them are covered, whereas Barin and Knacke[2] limit themselves to neutral species.[b] On the other hand, the thermodynamic functions of such ions may be considered as quantities of interest in their own right, as well as being important in relation to chemical processes they might undergo like decomposition, association to complex ions, solvation in general, or hydration[3] in particular.

With the above motivation in mind, we have recently[4] critically reviewed the available literature on structural and spectroscopic data of over a hundred polyatomic ions and calculated from them S°_{298}, their ideal gas standard state entropies at 298.15 K. In the present work, we extend the computation to a general tabulation of the thermodynamic functions, following the pattern of the standard compilations.[1,2] The molecular data chosen were given in our previous review,[4] along with the considerations that led to their selection when more than a single set (complete or partial) was available or to their estimation when certain data were not established experimentally. To facilitate reference to these data, the numbering of ions in this work is identical to that in Ref. 4.

In addition to the ionic species covered in the review[4] we have calculated in a similar manner the thermodynamic properties of the several actinyl ions MO_2^{n+} ($n = 1$ or 2)[5] and of some tetrahedral M-phenyl ionic species.[6] In the present study we have additionally included some 15 ions not discussed by us previously. For these the data are included in the text with specific comments on the data and their selection. In the selection of ions for our compilations we were guided by the availability of sufficient structural and spectroscopic data (which includes our ability to suggest reasonable estimates for the missing quantities) and the relevance of the calculation to hydration and solvation processes. A partial tabulation of the thermodynamic functions for several of the species is given in a recent book by Krestov.[7] The temperature range covered in the tables, similar to that in the standard compilations,[1,2] is somewhat arbitrary. No association or decomposition processes that may take place within this range were taken into consideration. Actually, the availability of the thermodynamic quantities may prove relevant to the stability of these ions relative to the products in the consideration of such processes. Similarly, the calculations do not include effects of anharmonicities in the vibration, rotation–vibration interactions, and nonrigidity of the molecular rotator. In the text below the basis of the calculation is summarized and then specific comments are given for several of the entries. In these we also point out the few deviations of our evaluations from JANAF[1] values that go beyond the estimated errors in the calculated quantities.

[b] One of the referees called our attention to the recent Russian IVTAN compilation of thermodynamic functions, which is presently unavailable to us. According to this information the only ion not also covered by JANAF (Ref. 1) is HO_2^-.

2. The Calculation

As pointed out in the previous section, the calculations of the thermodynamic functions in this, as well as in previous[1,2] compilations, are based upon the ideal gas approximation and assume the separability of the translational, rotational, vibrational, and electronic degrees of freedom and therefore also the additivity of their contributions to the calculated values. In addition, the ideal models of the rigid rotator for the molecular rotation and the harmonic oscillator for the internal vibrations are assumed. These assumptions also limit the temperature range for which these calculations may be considered to be valid. The expressions below and the tabulated values are all for the standard pressure of 0.101 325 MPa. The numerical constants in the expressions below include fundamental physical constants the values of which were taken from Ref. 1 (inconsistencies with more modern values lead to deviations that are far below the estimated error in the evaluated quantities).

The translational contributions are calculated by the following simple expressions. For the heat capacity at constant pressure:

$$C_{p\,\mathrm{trans}} = (5/2)R \ \mathrm{J/(K\ mol)}\,, \tag{1}$$

for the entropy:

$$S_{\mathrm{trans}} = R(1.5 \ln M + 2.5 \ln T) - 9.686\ \mathrm{J/(K\ mol)}\,, \tag{2}$$

for the enthalpy:

$$(H - H_0)_{\mathrm{trans}} = (5/2)RT\ \mathrm{kJ/mol}\,, \tag{3}$$

for the Gibbs energy function:

$$-[G - H_0)/T]_{\mathrm{trans}} = R\,[1.5 \ln M + 2.5 \ln T] - 30.472\ \mathrm{J/(K\ mol)}\,, \tag{4}$$

where $R = 8.3144\ \mathrm{J/(K\ mol)}$ is the ideal gas constant, M is the molecular mass in u, and T is the temperature in K. The numerical constants in the expressions are derived from the values of universal constants and the imposition of the standard pressure condition.

For the rotational contributions (nonlinear ions) the following expressions are applied. For the heat capacity at constant pressure:

$$C_{p\,\mathrm{rot}} = (3/2)R \ \mathrm{J/(K\ mol)}\,, \tag{5}$$

for the entropy:

$$S_{\mathrm{rot}} = R\,[0.5 \ln D + 1.5 \ln T - \ln \sigma] - 34.904\ \mathrm{J/(K\ mol)}\,, \tag{6}$$

for the enthalpy:

$$[H - H_0]_{\mathrm{rot}} = (3/2)RT\,\mathrm{kJ/mol}\,, \tag{7}$$

for the Gibbs energy function:

$$-[(G - H_0)/T]_{\mathrm{rot}} = R\,[0.5 \ln D + 1.5 \ln T - \ln \sigma] + 22.432\ \mathrm{J/(K\ mol)}\,. \tag{8}$$

Here D is the determinant of the moments of inertia,

$$D = \begin{vmatrix} I_x & -I_{xy} & -I_{xz} \\ -I_{yx} & I_y & -I_{yz} \\ -I_{zx} & -I_{zy} & I_z \end{vmatrix} \ (\mathrm{u\ nm^2})^3\,, \tag{9}$$

with components $I_x = \Sigma_i m_i(y_i^2 + z_i^2)$, $I_{xy} = \Sigma_i m_i x_i y_i$, and their respective analogs, with m_i the atomic masses in u and x_i, y_i, z_i their Cartesian coordinates in nm as measured from the molecular center of mass. The symmetry number σ denotes the number of equivalent molecular positions the ion passes through during one full rigid rotation.

For linear ions which have only two (as opposed to three) rotational degrees of freedom and a single moment of inertia, Eqs. (5)–(9) have to be replaced by

$$C_{p\,\mathrm{rot(lin)}} = R \ \mathrm{J(K\ mol)}\,, \tag{5a}$$

$$S_{\mathrm{rot(lin)}} = R(1 - \ln y - \ln \sigma) \ \mathrm{J/(K\ mol)} \tag{6a}$$

$$[H - H_0]_{\mathrm{rot(lin)}} = RT(1 - y/3) \ \mathrm{kJ/mol}\,, \tag{7a}$$

for the Gibbs energy function:

$$-[(G - H_0)/T]_{\mathrm{rot(lin)}} = R(-\ln y - \ln \sigma + y/3) \ \mathrm{J/(K\ mol)}\,, \tag{8a}$$

y is related to the moment of inertia I by:

$$y = 0.242\,54/(IT) \ (\mathrm{u\ nm^2\ K})^{-1}\,, \tag{9a}$$

with $I = \Sigma_i m_i x_i^2$ and, as before, m_i are the atomic masses in u and x_i their Cartesian coordinates in nm as measured from the molecular center of mass.

The vibrational contribution to the thermodynamic functions is the sum of the contributions of the $(3n - 6)$ vibrational degrees of freedom for nonlinear ions or the $(3n - 5)$ vibrational degrees of freedom for linear ions. The pertinent expressions below are written for the contribution of each normal mode and, therefore, the degeneracy factor $d(i)$ is included. For the heat capacity at constant pressure:

$$C_p(i)_{\mathrm{vib}} = d(i)R\,\frac{u(i)^2 e^{u(i)}}{[e^{u(i)} - 1]^2} \ \mathrm{J/(K\ mol)}\,, \tag{10}$$

for the entropy:

$$S(i)_{\mathrm{vib}} = d(i)R\left\{\frac{u(i)}{e^{u(i)} - 1} - \ln[1 - e^{-u(i)}]\right\} \ \mathrm{J/(K\ mol)}\,, \tag{11}$$

for the enthalpy:

$$[H(i) - H_0(i)]_{\mathrm{vib}} = d(i)RT\,\frac{u(i)e^{-u(i)}}{1 - e^{-u(i)}} \ \mathrm{kJ/mol}\,, \tag{12}$$

for the Gibbs energy function:

$$-\{[G(i) - H_0)]/T\}_{\mathrm{vib}} = -d(i)R\{\ln[1 - e^{-u(i)}]\} \ \mathrm{J/(K\ mol)}\,, \tag{13}$$

$u(i)$ is related to the frequency $v(i)$ of the vibrational normal mode (i) by:

$$u(i) = 1.4388v(i)/T \ \mathrm{cm^{-1}/K}\,. \tag{14}$$

In the case of three metal ammine complex ions, we assumed free rotations of the ammine groups against the rest of the molecule. Such an assumption has the effect of changing the value of the symmetry number σ to that appropriate when the rotating groups are considered as point masses. Additionally, for the torsional modes the vibrational contributions of Eqs. (10)–(14) are replaced by the following. For the heat capacity at constant pressure:

$$C_{p\ \mathrm{free\,rot}} = 0.5n(i)R \ \mathrm{J/(K\ mol)}\,, \tag{15}$$

for the entropy:

$$S_{\mathrm{free\,rot}} = 0.5n(i)R(\ln I_r - \ln \sigma' + \ln T) + 14.803 \ \mathrm{J/(K\ mol)}\,, \tag{16}$$

for the enthalpy:

$$(H - H_0)_{\mathrm{free\,rot}} = 0.5n(i)RT \ \mathrm{kJ/mol}\,, \tag{17}$$

for the Gibbs energy function:

$$-[(G - H_0)/T]_{\mathrm{free\,rot}} = 0.5n(i)R(\ln I_r - \ln \sigma' + \ln T) + 10.646 \ \mathrm{J/(K\ mol)}\,, \tag{18}$$

$n(i)$ is the number of freely rotating ammine groups, and I_r is the reduced moment of inertia:

$$I_r = I_A I_B/(I_A + I_B) \ \mathrm{u\ nm^2}\,, \tag{19}$$

with I_A and I_B being the moments of inertia of the parts A and B of the molecule rotating against each other. σ' is the symmetry number denoting the number of identical molecular orientations the ion attains during an internal rotation of part A against part B. In the other cases, where the complement of vibrational modes includes torsional motions, we found that the calculated[8] potential barrier for hindered rotation is high enough, relative to the temperature range considered here, for the regular expressions for the vibrational contributions of Eqs. (10)–(14) to be applicable.

For ions with unpaired electrons, we also included the contributions of the electronic energy levels to the computed thermodynamic functions. As there is no regularity in the energy and degeneracy of the electronic levels their contributions to the partition function have to be summed individually. Fortunately, only the lowest levels have to be considered, as the contribution of energy levels above 5000 $\mathrm{cm^{-1}}$ is negligible even at 1000 K. This evaluation of the electronic contributions improves slightly the simpler calculation employed for this term in our previous publication on the entropies at 298.15 K.[4]

The term in the partition function $q(i)$ related to an electronic level of energy $E(i)$ is

$$q(i) = [2j(i) + 1]e^{-u(i)}\,. \tag{20}$$

Here, $u(i)$ is defined by Eq. (14) but with $E(i)$ replacing $v(i)$. The preexponential term is the degeneracy as characterized by the quantum number of the total angular momentum (spin-orbit coupled) $j(i)$. The electronic partition function is then the sum

$$Q_{\mathrm{el}} = \sum_i q(i)\,. \tag{21}$$

The resulting electronic contributions to the thermodynamic functions are given by the following. For the heat capacity at constant pressure:

$$C_{p_{\mathrm{el}}} = R\sum_i [u(i)^2 q(i) - u(i)q(i)/Q_{\mathrm{el}}]/Q_{\mathrm{el}} \ \mathrm{J/(K\ mol)}\,, \tag{22}$$

for the entropy:

$$S_{\mathrm{el}} = R\sum_i [u(i)q(i)/Q_{\mathrm{el}}] + R\ln Q_{\mathrm{el}} \ \mathrm{J/(K\ mol)}\,, \tag{23}$$

for the enthalpy:

$$[(H-H_0)]_{el} = RT\sum_i [u(i)q(i)/Q_{el}] \text{ kJ/mol}, \quad (24)$$

for the Gibbs energy function:

$$-[(G-H_0)/T]_{el} = R \ln Q_{el} \text{ J/(K mol)}. \quad (25)$$

The ratio C_p/C_v is calculated by taking

$$C_v = C_p(\text{total}) - R. \quad (26)$$

3. Tables of Thermodynamic Functions

Table 1. Thermodynamic functions of hydroxide (OH^-)

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	29.10	1.400	140.5	2.83	112.2
150	29.10	1.400	152.3	4.29	123.7
200	29.10	1.400	160.7	5.74	132.0
250	29.10	1.400	167.2	7.20	138.4
273.15	29.10	1.400	169.8	7.87	140.9
298.15	29.10	1.400	172.3	8.60	143.5
300	29.10	1.400	172.5	8.65	143.6
350	29.10	1.400	177.0	10.11	148.1
400	29.10	1.400	180.9	11.56	151.9
450	29.11	1.400	184.3	13.02	155.3
500	29.12	1.400	187.3	14.48	158.4
550	29.15	1.399	190.1	15.93	161.2
600	29.19	1.398	192.7	17.39	163.7
650	29.25	1.397	195.0	18.85	166.0
700	29.34	1.395	197.2	20.32	168.2
750	29.45	1.393	199.2	21.79	170.2
800	29.58	1.391	201.1	23.26	172.0
850	29.72	1.388	202.9	24.74	173.8
900	29.89	1.385	204.6	26.23	175.5
950	30.07	1.382	206.2	27.73	177.0
1000	30.26	1.379	207.8	29.24	178.5

Table 2. Thermodynamic functions of hydrosulfide (SH^-)

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	29.10	1.400	154.4	2.87	125.7
150	29.10	1.400	166.2	4.33	137.4
200	29.10	1.400	174.6	5.78	145.7
250	29.10	1.400	181.1	7.24	152.1
273.15	29.10	1.400	183.7	7.91	154.7
298.15	29.10	1.400	186.2	8.64	157.2
300	29.11	1.400	186.4	8.69	157.4
350	29.12	1.400	190.9	10.15	161.9
400	29.16	1.399	194.8	11.61	165.7
450	29.24	1.397	198.2	13.07	169.2
500	29.37	1.395	201.3	14.53	172.2
550	29.54	1.392	204.1	16.00	175.0
600	29.74	1.388	206.7	17.49	177.5
650	29.99	1.384	209.1	18.98	179.9
700	30.26	1.379	211.3	20.48	182.0
750	30.54	1.374	213.4	22.00	184.1
800	30.84	1.369	215.4	23.54	185.9
850	31.14	1.364	217.2	25.09	187.7
900	31.44	1.360	219.0	26.65	189.4
950	31.73	1.355	220.7	28.23	191.0
1000	32.01	1.351	222.4	29.83	192.6

Table 3. Thermodynamic functions of hydroselenide (SeH^-)

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	29.10	1.400	172.0	2.89	143.1
150	29.10	1.400	183.8	4.33	154.8
200	29.11	1.400	192.2	5.80	163.2
250	29.14	1.399	198.7	7.26	169.6
273.15	29.18	1.398	201.2	7.93	172.2
298.15	29.25	1.397	203.8	8.66	174.7
300	29.25	1.397	204.0	8.72	174.9
350	29.47	1.393	208.5	10.19	179.4
400	29.78	1.387	212.5	11.67	183.3
450	30.16	1.381	216.0	13.16	186.7
500	30.60	1.373	219.2	14.68	189.8
550	31.05	1.366	222.1	16.22	192.6
600	31.50	1.359	224.8	17.79	195.2
650	31.94	1.352	227.4	19.37	197.6
700	32.35	1.346	229.8	20.98	199.8
750	32.74	1.340	232.0	22.61	201.9
800	33.10	1.335	234.1	24.26	203.8
850	33.42	1.331	236.2	25.92	205.7
900	33.72	1.327	238.1	27.60	207.4
950	34.00	1.324	239.9	29.29	209.1
1000	34.24	1.321	241.7	31.00	210.7

Table 4. Thermodynamic functions of superoxide (O_2^-)

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	29.10	1.400	171.7	2.91	142.6
150	29.13	1.399	183.5	4.36	154.4
200	29.30	1.396	191.9	5.82	162.8
250	29.72	1.388	198.5	7.30	169.3
273.15	29.99	1.384	201.1	7.99	171.9
298.15	30.31	1.378	203.8	8.74	174.5
300	30.33	1.378	204.0	8.80	174.6
350	31.03	1.366	208.7	10.33	179.2
400	31.74	1.355	212.9	11.90	183.1
450	32.39	1.345	216.6	13.50	186.6
500	32.98	1.337	220.1	15.14	189.8
550	33.50	1.330	223.3	16.80	192.7
600	33.95	1.324	226.2	18.49	195.4
650	34.33	1.320	228.9	20.19	197.8
700	34.66	1.316	231.5	21.92	200.2
750	34.95	1.312	233.9	23.66	202.3
800	35.19	1.309	236.1	25.41	204.4
850	35.41	1.307	238.3	27.18	206.3
900	35.60	1.305	240.3	28.95	208.1
950	35.76	1.303	242.2	30.74	209.9
1000	35.90	1.301	244.1	32.53	211.6

Table 5. Thermodynamic functions of peroxide (O_2^{2-})

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	29.10	1.400	167.5	2.91	138.5
150	29.13	1.399	179.3	4.36	150.3
200	29.31	1.396	187.7	5.82	158.6
250	29.74	1.388	194.3	7.30	165.1
273.15	30.01	1.383	197.0	7.99	167.7
298.15	30.34	1.377	199.6	8.74	170.3
300	30.37	1.377	199.8	8.80	170.5
350	31.08	1.365	204.5	10.34	175.0
400	31.78	1.354	208.7	11.91	179.0
450	32.44	1.345	212.5	13.51	182.5
500	33.03	1.336	215.9	15.15	185.7
550	33.54	1.330	219.1	16.81	188.6
600	33.99	1.324	222.1	18.50	191.2
650	34.37	1.319	224.8	20.21	193.7
700	34.70	1.315	227.4	21.94	196.0
750	34.98	1.312	229.8	23.68	198.2
800	35.22	1.309	232.0	25.44	200.2
850	35.44	1.307	234.2	27.20	202.2
900	35.62	1.304	236.2	28.98	204.0
950	35.78	1.303	238.1	30.76	205.7
1000	35.92	1.301	240.0	32.56	207.4

Table 6. Thermodynamic functions of hypochlorite (ClO^-)

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	29.13	1.399	182.7	2.91	153.6
150	29.52	1.392	194.6	4.37	165.4
200	30.41	1.376	203.2	5.87	173.8
250	31.49	1.359	210.1	7.42	180.4
273.15	31.98	1.351	212.9	8.15	183.0
298.15	32.47	1.344	215.7	8.96	185.7
300	32.50	1.344	215.9	9.02	185.8
350	33.35	1.332	221.0	10.66	190.5
400	34.04	1.325	225.5	12.35	194.6
450	34.59	1.316	229.5	14.06	198.3
500	35.02	1.311	233.2	15.81	201.6
550	35.37	1.307	236.5	17.57	204.6
600	35.65	1.304	239.6	19.34	207.4
650	35.88	1.302	242.5	21.13	210.0
700	36.07	1.300	245.2	22.93	212.4
750	36.23	1.298	247.7	24.74	214.7
800	36.36	1.296	250.0	26.55	216.8
850	36.47	1.295	252.2	28.37	218.8
900	36.57	1.294	254.3	30.20	220.7
950	36.65	1.293	256.3	32.03	222.6
1000	36.72	1.293	258.2	33.86	224.3

Table 7. Thermodynamic functions of hypobromite (BrO^-)

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	29.19	1.398	193.7	2.91	164.6
150	29.87	1.386	205.6	4.38	176.4
200	31.06	1.366	214.4	5.91	184.8
250	32.26	1.347	221.4	7.49	191.5
273.15	32.76	1.340	224.3	8.24	194.1
298.15	33.24	1.334	227.2	9.07	196.8
300	33.27	1.333	227.4	9.13	197.0
350	34.07	1.323	232.6	10.81	201.7
400	34.68	1.315	237.2	12.53	205.9
450	35.15	1.310	241.3	14.28	209.6
500	35.52	1.306	245.0	16.05	212.9
550	35.81	1.302	248.4	17.83	216.0
600	36.04	1.300	251.6	19.63	218.8
650	36.22	1.298	254.4	21.43	221.5
700	36.37	1.296	257.1	23.25	223.9
750	36.50	1.295	259.6	25.07	226.2
800	36.60	1.294	262.0	26.90	228.4
850	36.69	1.293	264.2	28.73	230.4
900	36.77	1.292	266.3	30.57	232.4
950	36.83	1.292	268.3	32.41	234.2
1000	36.88	1.291	270.2	34.25	236.0

Table 8. Thermodynamic functions of nitrosonium (NO^+)

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	29.10	1.400	166.6	2.90	137.6
150	29.10	1.400	178.4	4.36	149.4
200	29.10	1.400	186.8	5.81	157.7
250	29.10	1.400	193.3	7.27	164.2
273.15	29.10	1.400	195.9	7.94	166.8
298.15	29.11	1.400	198.4	8.67	169.3
300	29.11	1.400	198.6	8.72	169.5
350	29.15	1.399	203.1	10.18	174.0
400	29.22	1.398	207.0	11.64	177.9
450	29.34	1.395	210.4	13.10	181.3
500	29.52	1.392	213.5	14.57	184.4
550	29.74	1.388	216.3	16.05	187.2
600	30.01	1.383	218.9	17.55	189.7
650	30.31	1.378	221.4	19.06	192.0
700	30.62	1.373	223.6	20.58	194.2
750	30.95	1.367	225.7	22.12	196.2
800	31.28	1.362	227.7	23.67	198.1
850	31.60	1.357	229.6	25.25	199.9
900	31.91	1.352	231.5	26.83	201.6
950	32.21	1.348	233.2	28.44	203.3
1000	32.50	1.344	234.9	30.06	204.8

Table 9. Thermodynamic functions of oxovanadium(IV) (VO^{2+})

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	29.10	1.400	202.8	2.91	173.7
150	29.16	1.399	214.6	4.36	185.5
200	29.45	1.393	223.0	5.83	193.9
250	30.03	1.383	229.6	7.31	200.4
273.15	30.36	1.377	232.3	8.01	203.0
298.15	30.75	1.371	235.0	8.78	205.6
300	30.78	1.370	235.2	8.83	205.7
350	31.56	1.358	240.0	10.39	210.3
400	32.30	1.347	244.3	11.99	214.3
450	32.96	1.337	248.1	13.62	217.8
500	33.53	1.330	251.6	15.28	221.0
550	34.02	1.323	254.8	16.97	224.0
600	34.43	1.318	257.8	18.68	226.7
650	34.78	1.314	260.6	20.41	229.2
700	35.07	1.311	263.2	22.16	231.5
750	35.33	1.308	265.6	23.92	233.7
800	35.54	1.305	267.9	25.69	235.8
850	35.73	1.303	270.0	27.47	237.7
900	35.89	1.302	272.1	29.27	239.6
950	36.03	1.300	274.0	31.06	241.3
1000	36.15	1.299	275.9	32.87	243.0

Table 9a. Thermodynamic functions of antimonyl(III) (SbO^+)

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	29.10	1.400	199.3	2.91	170.2
150	29.18	1.398	211.1	4.36	182.0
200	29.54	1.392	219.6	5.83	190.4
250	30.19	1.380	226.2	7.32	196.9
273.15	30.55	1.374	228.9	8.03	199.5
298.15	30.96	1.367	231.6	8.80	202.1
300	30.99	1.367	231.8	8.85	202.3
350	31.81	1.354	236.6	10.42	206.9
400	32.55	1.343	240.9	12.03	210.8
450	33.20	1.334	244.8	13.68	214.4
500	33.76	1.327	248.3	15.35	217.6
550	34.23	1.321	251.6	17.05	220.6
600	34.63	1.316	254.6	18.77	223.3
650	34.96	1.312	257.3	20.51	225.8
700	35.24	1.309	260.0	22.27	228.1
750	35.48	1.306	262.4	24.04	230.3
800	35.68	1.304	264.7	25.82	232.4
850	35.86	1.302	266.9	27.60	234.4
900	36.01	1.300	268.9	29.40	236.2
950	36.14	1.299	270.9	31.20	238.0
1000	36.25	1.298	272.7	33.01	239.7

Table 10. Thermodynamic functions of cyanide (CN^-)

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	29.10	1.400	164.9	2.90	135.9
150	29.10	1.400	176.7	4.36	147.7
200	29.10	1.400	185.1	5.81	156.0
250	29.11	1.400	191.6	7.27	162.5
273.15	29.12	1.400	194.1	7.94	165.1
298.15	29.14	1.399	196.7	8.67	167.6
300	29.14	1.399	196.9	8.72	167.8
350	29.22	1.398	201.4	10.18	172.3
400	29.37	1.395	205.3	11.65	176.2
450	29.59	1.391	208.8	13.12	179.6
500	29.87	1.386	211.9	14.61	182.7
550	30.20	1.380	214.8	16.11	185.5
600	30.55	1.374	217.4	17.63	188.0
650	30.93	1.368	219.9	19.16	190.4
700	31.30	1.362	222.2	20.72	192.6
750	31.67	1.356	224.3	22.29	194.6
800	32.03	1.351	226.4	23.89	196.5
850	32.37	1.346	228.3	25.50	198.3
900	32.69	1.341	230.2	27.12	200.1
950	32.99	1.337	232.0	28.76	201.7
1000	33.27	1.333	233.7	30.42	203.3

Table 11. Thermodynamic functions of disulfide (S_2^{2-})

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	29.63	1.390	188.1	2.92	158.9
150	31.21	1.363	200.4	4.44	170.8
200	32.79	1.340	209.6	6.04	179.4
250	33.98	1.324	217.0	7.71	186.2
273.15	34.40	1.319	220.1	8.50	189.0
298.15	34.78	1.314	223.1	9.37	191.7
300	34.81	1.314	223.3	9.43	191.9
350	35.39	1.307	228.7	11.19	196.8
400	35.81	1.302	233.5	12.97	201.1
450	36.11	1.299	237.7	14.76	204.9
500	36.34	1.297	241.5	16.58	208.4
550	36.51	1.295	245.0	18.40	211.6
600	36.65	1.293	248.2	20.23	214.5
650	36.76	1.292	251.1	22.06	217.2
700	36.84	1.291	253.9	23.90	219.7
750	36.91	1.291	256.4	25.75	222.1
800	36.97	1.290	258.8	27.59	224.3
850	37.02	1.290	261.0	29.44	226.4
900	37.06	1.289	263.1	31.30	228.4
950	37.10	1.289	265.1	33.15	230.3
1000	37.13	1.289	267.1	35.01	232.1

Table 12. Thermodynamic functions of dimercury(I) (Hg_2^{2+})

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	33.99	1.324	233.9	3.08	203.0
150	35.62	1.304	248.0	4.83	215.8
200	36.34	1.297	258.4	6.63	225.2
250	36.71	1.293	266.5	8.46	232.7
273.15	36.82	1.292	269.8	9.31	235.7
298.15	36.91	1.291	273.0	10.23	238.7
300	36.92	1.291	273.2	10.30	238.9
350	37.05	1.289	278.9	12.15	244.2
400	37.13	1.289	283.9	14.00	248.9
450	37.19	1.288	288.3	15.86	253.0
500	37.23	1.288	292.2	17.72	256.7
550	37.26	1.287	295.7	19.59	260.1
600	37.29	1.287	299.0	21.45	263.2
650	37.31	1.287	302.0	23.31	266.1
700	37.32	1.287	304.7	25.18	268.8
750	37.33	1.287	307.3	27.05	271.2
800	37.34	1.286	309.7	28.91	273.6
850	37.35	1.286	312.0	30.78	275.8
900	37.36	1.286	314.1	32.65	277.8
950	37.36	1.286	316.1	34.52	279.8
1000	37.37	1.286	318.0	36.38	281.7

Table 13. Thermodynamic functions of azide (N_3^-)

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	29.26	1.397	177.0	2.91	147.9
150	30.54	1.374	189.0	4.40	159.7
200	32.91	1.338	198.1	5.98	168.2
250	35.53	1.306	205.7	7.69	175.0
273.15	36.79	1.293	208.9	8.53	177.7
298.15	37.90	1.281	212.2	9.46	180.5
300	37.99	1.280	212.4	9.53	180.7
350	40.21	1.261	218.5	11.49	185.6
400	42.19	1.245	224.0	13.55	190.1
450	43.96	1.233	229.0	15.70	194.1
500	45.56	1.223	233.8	17.94	197.9
550	46.99	1.215	238.2	20.26	201.3
600	48.29	1.208	242.3	22.64	204.6
650	49.46	1.202	246.2	25.08	207.6
700	50.51	1.197	249.9	27.58	210.5
750	51.47	1.193	253.4	30.13	213.3
800	52.33	1.189	256.8	32.73	215.9
850	53.10	1.186	260.0	35.36	218.4
900	53.81	1.183	263.0	38.04	220.8
950	54.44	1.180	266.0	40.74	223.1
1000	55.01	1.178	268.8	43.48	225.3

Table 14. Thermodynamic functions of trisulfide (S_3^{2-})

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	37.83	1.282	236.4	3.45	202.0
150	42.81	1.241	252.7	5.46	216.3
200	46.95	1.215	265.6	7.71	227.1
250	49.89	1.200	276.4	10.14	235.9
273.15	50.93	1.195	280.9	11.31	239.5
298.15	51.86	1.191	285.4	12.59	243.2
300	51.92	1.191	285.7	12.69	243.4
350	53.33	1.185	293.8	15.32	250.1
400	54.34	1.181	301.0	18.01	256.0
450	55.07	1.178	307.5	20.75	261.4
500	55.62	1.176	313.3	23.52	266.3
550	56.04	1.174	318.6	26.31	270.8
600	56.36	1.173	323.5	29.12	275.0
650	56.62	1.172	328.0	31.95	278.9
700	56.83	1.171	332.2	34.78	282.6
750	57.00	1.171	336.2	37.63	286.0
800	57.14	1.170	339.9	40.48	289.3
850	57.26	1.170	343.3	43.34	292.3
900	57.36	1.170	346.6	46.21	295.3
950	57.44	1.169	349.7	49.08	298.0
1000	57.51	1.169	352.6	51.95	300.7

Table 15. Thermodynamic functions of tribromide (Br_3^-)

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	51.12	1.194	266.5	4.25	224.0
150	54.53	1.180	288.0	6.90	242.0
200	56.01	1.174	303.9	9.67	255.5
250	56.76	1.172	316.5	12.49	266.5
273.15	56.98	1.171	321.5	13.81	271.0
298.15	57.17	1.170	326.5	15.23	275.4
300	57.18	1.170	326.9	15.34	275.7
350	57.45	1.169	335.7	18.20	283.7
400	57.62	1.169	343.4	21.08	290.7
450	57.74	1.168	350.2	23.97	296.9
500	57.83	1.168	356.3	26.85	302.5
550	57.89	1.168	361.8	29.75	307.7
600	57.94	1.168	366.8	32.64	312.4
650	57.98	1.167	371.4	35.54	316.8
700	58.01	1.167	375.7	38.44	320.8
750	58.03	1.167	379.7	41.34	324.6
800	58.05	1.167	383.5	44.24	328.2
850	58.07	1.167	387.0	47.15	331.5
900	58.08	1.167	390.3	50.05	334.7
950	58.10	1.167	393.5	52.96	337.7
1000	58.11	1.167	396.5	55.86	340.6

Table 16. Thermodynamic functions of triiodide (I_3^-)

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	57.48	1.169	268.9	4.59	223.0
150	60.00	1.161	292.8	7.54	242.5
200	60.99	1.158	310.2	10.57	257.3
250	61.47	1.156	323.8	13.63	269.3
273.15	61.61	1.156	329.3	15.06	274.2
298.15	61.73	1.156	334.7	16.60	279.0
300	61.74	1.156	335.1	16.71	279.4
350	61.90	1.155	344.6	19.80	288.0
400	62.01	1.155	352.9	22.90	295.6
450	62.08	1.155	360.2	26.00	302.4
500	62.13	1.154	366.7	29.11	308.5
550	62.17	1.154	372.7	32.22	314.1
600	62.20	1.154	378.1	35.33	319.2
650	62.22	1.154	383.0	38.44	323.9
700	62.24	1.154	387.7	41.55	328.3
750	62.26	1.154	392.0	44.66	332.4
800	62.27	1.154	396.0	47.77	336.3
850	62.28	1.154	399.8	50.89	339.9
900	62.29	1.154	403.3	54.00	343.3
950	62.29	1.154	406.7	57.12	346.6
1000	62.30	1.154	409.9	60.23	349.6

Table 17. Thermodynamic functions of hydrogen difluoride (HF_2^-)

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	29.10	1.400	178.3	2.91	149.2
150	29.26	1.397	190.1	4.37	161.0
200	30.07	1.382	198.6	5.85	169.4
250	31.77	1.354	205.5	7.39	176.0
273.15	32.80	1.340	208.4	8.14	178.6
298.15	34.03	1.323	211.3	8.97	181.2
300	34.13	1.322	211.5	9.03	181.4
350	34.78	1.292	217.0	10.81	186.1
400	39.44	1.267	222.1	12.71	190.3
450	41.94	1.247	226.8	14.75	194.1
500	44.21	1.232	231.4	16.90	197.6
550	46.22	1.219	235.7	19.16	200.9
600	47.98	1.210	239.8	21.52	203.9
650	49.52	1.202	243.7	23.96	206.8
700	50.85	1.195	247.4	26.47	209.6
750	52.01	1.190	251.0	29.04	212.2
800	53.01	1.186	254.4	31.67	214.8
850	53.89	1.182	257.6	34.34	217.2
900	54.66	1.179	260.7	37.05	219.5
950	55.33	1.177	263.7	39.80	221.8
1000	55.93	1.175	266.5	42.59	223.9

Table 18. Thermodynamic functions of hydroperoxide (HOO^-)

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	33.26	1.333	191.5	3.33	158.3
150	33.38	1.332	205.0	4.99	171.7
200	33.91	1.325	214.7	6.67	181.3
250	34.93	1.312	222.3	8.39	188.8
273.15	35.52	1.306	225.5	9.20	191.8
298.15	36.21	1.298	228.6	10.10	194.7
300	36.26	1.298	228.8	10.17	194.9
350	37.70	1.283	234.5	12.02	200.2
400	39.11	1.270	239.6	13.94	204.8
450	40.42	1.259	244.3	15.93	208.9
500	41.60	1.250	248.7	17.98	212.7
550	42.68	1.242	252.7	20.09	216.2
600	43.65	1.235	256.4	22.24	219.4
650	44.54	1.230	260.0	24.45	222.3
700	45.35	1.224	263.3	26.70	225.1
750	46.10	1.220	266.4	28.98	227.8
800	46.80	1.216	269.4	31.31	230.3
850	47.45	1.212	272.3	33.66	232.7
900	48.05	1.209	275.0	36.05	235.0
950	48.62	1.206	277.6	38.47	237.1
1000	49.15	1.204	280.1	40.91	239.2

Table 19. Thermodynamic functions of metaborate (BO_2^-)

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	29.30	1.396	180.3	2.91	151.1
150	30.76	1.370	192.4	4.41	163.0
200	33.28	1.333	201.5	6.00	171.5
250	35.77	1.301	209.3	7.74	178.3
273.15	37.16	1.288	212.5	8.58	181.1
298.15	38.37	1.277	215.8	9.53	183.8
300	38.46	1.276	216.0	9.60	184.0
350	40.64	1.257	222.1	11.58	189.1
400	42.54	1.243	227.7	13.66	193.5
450	44.20	1.232	232.8	15.83	197.6
500	45.66	1.223	237.5	18.07	201.4
550	46.97	1.215	241.9	20.39	204.9
600	48.14	1.209	246.1	22.77	208.1
650	49.20	1.203	250.0	25.20	211.2
700	50.17	1.199	253.7	27.69	214.1
750	51.04	1.195	257.2	30.22	216.9
800	51.85	1.191	260.5	32.79	219.5
850	52.58	1.188	263.6	35.40	222.0
900	53.25	1.185	266.7	38.05	224.4
950	53.86	1.183	269.6	40.73	226.7
1000	54.43	1.180	272.3	43.43	228.9

Table 20. Thermodynamic functions of metaaluminate (AlO_2^-)

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	30.90	1.368	188.3	2.94	158.9
150	35.15	1.310	201.6	4.59	171.0
200	39.54	1.266	212.3	6.46	180.1
250	43.37	1.237	221.6	8.53	187.5
273.15	44.92	1.227	225.5	9.55	190.5
298.15	46.44	1.218	229.5	10.70	193.6
300	46.55	1.217	229.8	10.78	193.9
350	49.14	1.204	237.2	13.18	199.5
400	51.24	1.194	243.9	15.69	204.7
450	52.93	1.186	250.0	18.29	209.4
500	54.30	1.181	255.7	20.98	213.7
550	55.41	1.177	260.9	23.72	217.8
600	56.33	1.173	265.7	26.51	221.6
650	57.08	1.170	270.3	29.35	225.1
700	57.71	1.168	274.5	32.22	228.5
750	58.24	1.167	278.5	35.12	231.7
800	58.68	1.165	282.3	38.04	234.8
850	59.06	1.164	285.9	40.99	237.7
900	59.39	1.163	289.3	43.95	240.4
950	59.67	1.162	292.5	46.92	243.1
1000	59.91	1.161	295.6	49.91	245.6

Table 21. Thermodynamic functions of nitronium (NO_2^+)

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	29.33	1.396	178.5	2.91	149.4
150	30.88	1.368	190.6	4.41	161.2
200	33.42	1.331	199.8	6.02	169.8
250	36.01	1.300	207.6	7.75	176.6
273.15	37.11	1.289	210.8	8.60	179.3
298.15	38.23	1.278	214.1	9.54	182.1
300	38.31	1.277	214.3	9.61	182.3
350	40.32	1.260	220.4	11.58	187.3
400	42.09	1.246	225.9	13.64	191.8
450	43.67	1.235	230.9	15.78	195.9
500	45.11	1.226	235.6	18.00	199.6
550	46.41	1.218	240.0	20.29	203.1
600	47.60	1.212	244.1	22.64	206.3
650	48.70	1.206	247.9	25.05	209.4
700	49.70	1.201	251.6	27.51	212.3
750	50.62	1.197	255.0	30.02	215.0
800	51.47	1.193	258.3	32.57	217.6
850	52.24	1.189	261.5	35.17	220.1
900	52.95	1.186	264.5	37.80	222.5
950	53.59	1.184	267.4	40.46	224.8
1000	54.18	1.181	270.1	43.15	227.0

Table 22. Thermodynamic functions of nitrite (NO_2^-)

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	33.27	1.333	198.9	3.33	165.7
150	33.46	1.331	212.4	4.99	179.2
200	34.18	1.321	222.2	6.68	188.8
250	35.40	1.306	229.7	8.42	196.2
273.15	36.24	1.298	233.1	9.25	199.2
298.15	37.14	1.288	236.3	10.17	202.2
300	37.21	1.288	236.5	10.24	202.4
350	39.12	1.270	242.4	12.14	207.7
400	41.05	1.254	247.8	14.15	212.4
450	42.87	1.241	252.7	16.25	216.6
500	44.53	1.230	257.3	18.43	220.4
550	46.01	1.221	261.6	20.70	224.0
600	47.32	1.213	265.7	23.03	227.3
650	48.46	1.207	269.5	25.43	230.4
700	49.46	1.202	273.1	27.87	233.3
750	50.33	1.198	276.6	30.37	236.1
800	51.08	1.194	279.9	32.91	238.7
850	51.75	1.191	283.0	35.48	241.2
900	52.33	1.189	285.9	38.08	243.6
950	52.84	1.187	288.8	40.71	245.9
1000	53.29	1.185	291.5	43.36	248.2

Table 23. Thermodynamic functions of chlorite (ClO_2^-)

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	34.15	1.322	215.2	3.34	181.8
150	36.43	1.296	229.4	5.10	195.4
200	39.25	1.269	240.3	6.99	205.3
250	42.13	1.246	249.4	9.03	213.2
273.15	43.39	1.237	253.1	10.02	216.5
298.15	44.66	1.229	257.0	11.12	219.7
300	44.75	1.228	257.3	11.20	219.9
350	46.96	1.215	264.3	13.50	225.8
400	48.78	1.205	270.7	15.89	231.0
450	50.25	1.198	276.6	18.37	235.8
500	51.43	1.193	281.9	20.91	240.1
550	52.39	1.189	286.9	23.51	244.1
600	53.17	1.185	291.5	26.15	247.9
650	53.82	1.183	295.8	28.82	251.4
700	54.35	1.181	299.8	31.53	254.7
750	54.79	1.179	303.5	34.26	257.9
800	55.17	1.177	307.1	37.00	260.8
850	55.48	1.176	310.4	39.77	263.6
900	55.76	1.175	313.6	42.55	266.3
950	55.99	1.174	316.6	45.35	268.9
1000	56.19	1.174	319.5	48.15	271.4

Table 23a. Thermodynamic functions of bromite (BrO_2^-)

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	35.07	1.311	225.1	3.36	191.5
150	38.14	1.279	239.9	5.19	205.3
200	41.50	1.251	251.3	7.18	215.4
250	44.60	1.229	260.9	9.34	225.6
273.15	45.86	1.221	264.9	10.38	226.9
298.15	47.10	1.214	269.0	11.55	230.3
300	47.18	1.214	269.3	11.63	230.5
350	49.23	1.203	276.7	14.05	236.6
400	50.82	1.196	283.4	16.55	242.0
450	52.07	1.190	289.5	19.12	247.0
500	53.04	1.186	295.0	21.75	251.5
550	53.81	1.183	300.1	24.42	255.7
600	54.43	1.180	304.8	27.13	259.6
650	54.93	1.178	309.2	29.86	263.2
700	55.34	1.177	313.3	32.62	266.7
750	55.68	1.176	317.1	35.40	269.9
800	55.97	1.174	320.7	38.19	273.0
850	56.20	1.174	324.1	40.99	275.9
900	56.41	1.173	327.3	43.81	278.6
950	56.58	1.172	330.4	46.63	281.3
1000	56.73	1.172	333.3	49.47	283.8

Table 23b. Thermodynamic functions of metaarsenite (AsO_2^-)

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	34.68	1.315	225.4	3.35	191.9
150	37.31	1.287	240.0	5.15	205.6
200	40.26	1.260	251.1	7.09	215.6
250	43.15	1.237	260.4	9.18	223.7
273.15	44.39	1.230	264.3	10.19	227.0
298.15	45.63	1.223	268.2	11.31	230.3
300	45.72	1.222	268.5	11.40	230.5
350	47.85	1.210	275.7	13.74	236.4
400	49.57	1.202	282.2	16.18	241.8
450	50.95	1.195	288.1	18.69	246.6
500	52.05	1.190	293.5	21.27	251.0
550	52.94	1.186	298.6	23.89	255.1
600	53.65	1.183	303.2	26.56	258.9
650	54.24	1.181	307.5	29.26	262.5
700	54.73	1.179	311.5	31.98	265.9
750	55.13	1.178	315.3	34.73	269.0
800	55.47	1.176	318.9	37.49	272.0
850	55.76	1.175	322.3	40.27	274.9
900	56.01	1.174	325.5	43.07	277.6
950	56.22	1.174	328.5	45.87	280.2
1000	56.40	1.173	331.4	48.69	282.7

Table 24. Thermodynamic functions of dioxovanadium(V) (VO_2^+)

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	33.44	1.331	219.5	3.33	186.2
150	34.57	1.317	233.2	5.02	199.7
200	36.66	1.293	243.4	6.80	209.4
250	39.20	1.269	251.9	8.70	217.1
273.15	40.40	1.259	255.4	9.62	220.2
298.15	41.66	1.249	259.0	10.64	223.3
300	41.75	1.249	259.3	10.72	223.5
350	44.09	1.232	265.9	12.87	229.1
400	46.11	1.220	271.9	15.12	234.1
450	47.82	1.210	277.4	17.47	238.6
500	49.25	1.203	282.5	19.90	242.7
550	50.43	1.197	287.3	22.39	246.6
600	51.42	1.193	291.7	24.94	250.2
650	52.24	1.189	295.9	27.53	253.5
700	52.93	1.186	299.8	30.16	256.7
750	53.52	1.184	303.4	32.83	259.7
800	54.01	1.182	306.9	35.51	262.5
850	54.44	1.180	310.2	38.23	265.2
900	54.81	1.179	313.3	40.96	267.8
950	55.12	1.178	316.3	43.71	270.3
1000	55.40	1.177	319.1	46.47	272.7

Table 25. Thermodynamic functions of dioxouranium(VI) UO_2^{2+}

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	36.77	1.292	211.5	3.14	180.1
150	40.94	1.255	227.3	5.09	193.3
200	43.73	1.235	239.4	7.21	203.4
250	46.21	1.219	249.5	9.46	211.6
273.15	47.30	1.213	253.6	10.55	215.0
298.15	48.42	1.207	257.8	11.74	218.4
300	48.50	1.207	258.1	11.83	218.7
350	50.54	1.197	265.7	14.31	224.9
400	52.28	1.189	272.6	16.88	230.4
450	53.74	1.183	278.8	19.53	235.4
500	54.94	1.178	284.6	22.25	240.1
550	55.94	1.175	289.9	25.02	244.4
600	56.77	1.172	294.8	27.84	248.4
650	57.46	1.169	299.3	30.70	252.1
700	58.03	1.167	303.6	33.59	255.6
750	58.52	1.166	307.6	36.50	259.0
800	58.93	1.164	311.4	39.44	262.1
850	59.28	1.163	315.0	42.39	265.1
900	59.58	1.162	318.4	45.36	268.0
950	59.84	1.161	321.6	48.35	270.7
1000	60.07	1.161	324.7	51.35	273.4

Table 25a. Thermodynamic functions of dioxoneptunium(VI) NpO_2^{2+}

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	36.77	1.292	226.6	3.14	195.2
150	40.95	1.255	242.3	5.09	208.4
200	43.75	1.235	254.5	7.21	218.5
250	46.25	1.219	264.6	9.47	226.7
273.15	47.34	1.213	268.7	10.55	230.1
298.15	48.47	1.207	272.9	11.75	233.5
300	48.55	1.207	273.2	11.84	233.7
350	50.59	1.197	280.8	14.32	239.9
400	52.33	1.189	287.7	16.89	245.5
450	53.78	1.183	294.0	19.54	250.5
500	54.98	1.178	299.7	22.26	255.2
550	55.98	1.174	305.0	25.04	259.5
600	56.80	1.171	309.9	27.86	263.5
650	57.48	1.169	314.5	30.72	267.2
700	58.06	1.167	318.7	33.61	270.7
750	58.54	1.166	322.8	36.52	274.1
800	58.95	1.164	326.6	39.46	277.2
850	59.30	1.163	330.1	42.41	280.2
900	59.60	1.162	333.5	45.39	283.1
950	59.86	1.161	336.8	48.37	285.9
1000	60.08	1.161	339.8	51.37	288.5

Table 25b. Thermodynamic functions of dioxoplutonium(VI) PuO_2^{2+}

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	36.77	1.292	230.2	3.14	198.8
150	40.99	1.254	246.0	5.10	212.1
200	43.86	1.234	258.2	7.22	222.1
250	46.41	1.218	268.3	9.48	230.4
273.15	47.52	1.212	272.5	10.56	233.8
298.15	48.67	1.206	276.7	11.77	237.2
300	48.75	1.206	277.0	11.86	237.5
350	50.80	1.196	284.6	14.35	243.7
400	52.53	1.188	291.5	16.93	249.2
450	53.97	1.182	297.8	19.59	254.3
500	55.16	1.177	303.6	22.32	258.9
550	56.14	1.174	308.9	25.11	263.2
600	56.96	1.171	313.8	27.94	267.2
650	57.64	1.169	318.4	30.80	271.0
700	58.21	1.167	322.7	33.70	274.5
750	58.70	1.165	326.7	36.62	277.9
800	59.12	1.164	330.5	39.57	281.1
850	59.49	1.162	334.1	42.53	284.1
900	59.82	1.161	337.5	45.51	287.0
950	60.11	1.161	340.8	48.51	289.7
1000	60.37	1.160	343.9	51.53	292.3

Table 25c. Thermodynamic functions of dioxoamericium(VI) AmO_2^{2+}

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	36.98	1.290	231.4	3.15	199.9
150	41.20	1.253	247.3	5.12	213.2
200	44.15	1.232	259.6	7.25	223.3
250	46.78	1.216	269.7	9.53	231.6
273.15	47.91	1.210	273.9	10.62	235.0
298.15	49.07	1.204	278.1	11.83	238.5
300	49.15	1.204	278.4	11.92	238.7
350	51.20	1.194	286.2	14.43	244.9
400	52.91	1.186	293.1	17.04	250.5
450	54.33	1.181	299.5	19.72	255.6
500	55.48	1.176	305.2	22.47	260.3
550	56.43	1.173	310.6	25.27	264.6
600	57.21	1.170	315.5	28.11	268.7
650	57.85	1.168	320.1	30.98	272.5
700	58.39	1.166	324.4	33.89	276.0
750	58.84	1.165	328.5	36.82	279.4
800	59.22	1.163	332.3	39.77	282.6
850	59.54	1.162	335.9	42.74	285.6
900	59.82	1.161	339.3	45.73	288.5
950	60.06	1.161	342.5	48.72	291.2
1000	60.27	1.160	345.6	51.73	293.9

Table 26. Thermodynamic functions of dioxouranium(V) UO_2^+

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	37.24	1.287	227.0	3.16	195.4
150	41.47	1.251	243.0	5.14	208.7
200	44.50	1.230	255.4	7.29	218.9
250	47.20	1.214	265.6	9.59	227.2
273.15	48.35	1.208	269.8	10.69	230.7
298.15	49.52	1.202	274.1	11.92	234.1
300	49.60	1.201	274.4	12.01	234.4
350	51.64	1.192	282.2	14.54	240.7
400	53.33	1.185	289.2	17.17	246.3
450	54.71	1.179	295.6	19.87	251.4
500	55.83	1.175	301.4	22.63	256.1
550	56.74	1.172	306.8	25.45	260.5
600	57.49	1.169	311.7	28.30	264.6
650	58.10	1.167	316.4	31.19	268.4
700	58.62	1.165	320.7	34.11	272.0
750	59.04	1.164	324.8	37.05	275.3
800	59.40	1.163	328.6	40.02	278.6
850	59.71	1.162	332.2	42.99	281.6
900	59.98	1.161	335.6	45.99	284.5
950	60.20	1.160	338.9	48.99	287.3
1000	60.40	1.160	342.0	52.01	289.9

Table 26a. Thermodynamic functions of dioxoneptunium(V) NpO_2^+

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	38.58	1.275	231.7	3.24	199.3
150	42.48	1.243	248.1	5.27	213.0
200	45.41	1.224	260.8	7.47	223.4
250	48.12	1.209	271.2	9.81	231.9
273.15	49.27	1.203	275.5	10.94	235.5
298.15	50.43	1.197	279.9	12.18	239.0
300	50.51	1.197	280.2	12.28	239.3
350	52.51	1.188	288.1	14.86	245.7
400	54.13	1.181	295.2	17.58	251.4
450	55.43	1.176	301.7	20.26	256.7
500	56.48	1.173	307.6	23.06	261.5
550	57.33	1.170	313.0	25.91	265.9
600	58.03	1.167	318.0	28.79	270.1
650	58.60	1.165	322.7	31.71	273.9
700	59.09	1.164	327.1	34.65	277.6
750	59.50	1.162	331.2	37.62	281.0
800	59.86	1.161	335.0	40.60	284.3
850	60.18	1.160	338.7	43.60	287.4
900	60.46	1.159	342.1	46.62	290.3
950	60.71	1.159	345.4	49.65	293.1
1000	60.94	1.158	348.5	52.69	295.8

Table 26b. Thermodynamic functions of dioxoplutonium(V) PuO_2^+

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	38.53	1.275	232.7	3.24	200.4
150	42.47	1.243	249.2	5.27	214.0
200	45.46	1.224	261.8	7.47	224.5
250	48.20	1.208	272.3	9.81	233.0
273.15	49.36	1.203	276.6	10.94	236.5
298.15	50.52	1.197	280.9	12.19	240.1
300	50.60	1.197	281.3	12.28	240.3
350	52.60	1.188	289.2	14.86	246.7
400	54.22	1.181	296.3	17.54	252.5
450	55.51	1.176	302.8	20.28	257.7
500	56.55	1.172	308.7	23.08	262.5
550	57.39	1.169	314.1	25.93	267.0
600	58.06	1.167	319.2	28.82	271.1
650	58.62	1.165	323.8	31.74	275.0
700	59.08	1.164	328.2	34.68	278.7
750	59.46	1.163	332.3	37.64	282.1
800	59.78	1.162	336.1	40.62	285.4
850	60.05	1.161	339.8	43.62	288.5
900	60.28	1.160	343.2	46.63	291.4
950	60.48	1.159	346.5	49.65	294.2
1000	60.66	1.159	349.6	52.68	296.9

Table 26c. Thermodynamic functions of dioxoamericium(V) AmO_2^+

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	38.59	1.275	223.0	3.24	190.6
150	42.56	1.243	239.5	5.28	204.3
200	45.60	1.223	252.1	7.48	214.7
250	48.37	1.208	262.6	9.83	223.3
273.15	49.53	1.202	266.9	10.96	226.8
298.15	50.70	1.196	271.3	12.22	230.4
300	50.78	1.196	271.6	12.31	230.6
350	52.77	1.187	279.6	14.90	237.1
400	54.37	1.181	286.8	17.58	242.8
450	55.68	1.176	293.3	20.33	248.1
500	56.68	1.172	299.2	23.14	252.9
550	57.50	1.169	304.6	26.00	257.4
600	58.16	1.167	309.7	28.89	261.5
650	58.71	1.165	314.3	31.81	265.4
700	59.16	1.164	318.7	34.76	269.1
750	59.53	1.162	322.8	37.73	272.5
800	59.84	1.161	326.7	40.71	275.8
850	60.11	1.161	330.3	43.71	278.9
900	60.34	1.160	333.7	46.72	281.8
950	60.53	1.159	337.0	49.74	284.6
1000	60.70	1.159	340.1	52.77	287.3

Table 27. Thermodynamic functions of cyanate (NCO^-)

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	29.26	1.397	183.6	2.91	154.5
150	30.56	1.374	195.7	4.40	166.4
200	32.94	1.338	204.8	5.98	174.9
250	35.59	1.305	212.4	7.70	181.6
273.15	36.77	1.292	215.6	8.54	184.4
298.15	37.99	1.280	218.9	9.47	187.1
300	38.07	1.279	219.1	9.54	187.3
350	40.31	1.260	225.2	11.50	192.3
400	42.29	1.245	230.7	13.57	196.8
450	44.06	1.233	235.8	15.73	200.8
500	45.64	1.223	240.5	17.97	204.6
550	47.07	1.215	244.9	20.29	208.0
600	48.35	1.208	249.1	22.67	211.3
650	49.50	1.202	253.0	25.12	214.3
700	50.54	1.197	256.7	27.62	217.2
750	51.49	1.193	260.2	30.17	220.0
800	52.34	1.189	263.6	32.77	222.6
850	53.11	1.186	266.8	35.41	225.1
900	53.80	1.183	269.8	38.08	227.5
950	54.43	1.180	272.7	40.78	229.8
1000	55.00	1.178	275.5	43.52	232.0

Table 28. Thermodynamic functions of thiocyanate (NCS^-)

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	29.92	1.385	193.8	2.92	164.6
150	33.06	1.336	206.4	4.49	176.5
200	36.98	1.290	216.5	6.24	185.3
250	40.47	1.259	225.1	8.18	192.4
273.15	41.84	1.248	228.8	9.13	195.4
298.15	43.17	1.239	232.5	10.19	198.3
300	43.26	1.238	232.8	10.27	198.5
350	45.45	1.224	239.6	12.49	203.9
400	47.21	1.214	245.8	14.81	208.8
450	48.67	1.206	251.4	17.21	213.2
500	49.91	1.200	256.6	19.68	217.3
550	50.99	1.195	261.4	22.20	221.1
600	51.94	1.191	265.9	24.77	224.6
650	52.80	1.187	270.1	27.39	228.0
700	53.57	1.184	274.1	30.05	231.1
750	54.26	1.181	277.8	32.75	234.1
800	54.89	1.179	281.3	35.48	237.0
850	55.46	1.176	284.6	38.23	239.7
900	55.97	1.174	287.8	41.02	242.3
950	56.44	1.173	290.9	43.83	244.7
1000	56.86	1.171	293.8	46.66	247.1

Table 29. Thermodynamic functions of dichloroargentate(I) $AgCl_2^-$

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	48.02	1.209	231.0	3.84	192.6
150	53.48	1.184	251.6	6.39	209.0
200	56.60	1.172	267.5	9.15	221.7
250	58.40	1.166	280.3	12.03	232.2
273.15	58.97	1.164	285.5	13.39	236.5
298.15	59.46	1.163	290.7	14.87	240.8
300	59.49	1.162	291.1	14.98	241.1
350	60.20	1.160	300.3	17.97	249.0
400	60.68	1.159	308.4	20.99	255.9
450	61.01	1.158	315.5	24.04	262.1
500	61.26	1.157	322.0	27.09	267.8
550	61.45	1.156	327.8	30.16	273.0
600	61.59	1.156	333.2	33.24	277.8
650	61.70	1.156	338.1	36.32	282.2
700	61.79	1.155	342.7	39.41	286.4
750	61.86	1.155	347.0	42.50	290.3
800	61.92	1.155	350.9	45.59	294.0
850	61.97	1.155	354.7	48.69	297.4
900	62.01	1.155	358.2	51.79	300.7
950	62.05	1.155	361.6	54.89	303.8
000	62.08	1.155	364.8	57.99	306.8

Table 30. Thermodynamic functions of dibromoargentate(I) $AgBr_2^-$

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	52.92	1.186	252.0	4.22	209.8
150	57.16	1.170	274.4	6.99	227.8
200	59.17	1.163	291.1	9.90	241.6
250	60.23	1.160	304.4	12.89	252.9
273.15	60.55	1.159	309.8	14.29	257.5
298.15	60.83	1.158	315.1	15.81	262.1
300	60.84	1.158	315.5	15.92	262.4
350	61.23	1.157	324.9	18.97	270.7
400	61.49	1.156	333.1	22.04	278.0
450	61.66	1.156	340.3	25.12	284.5
500	61.79	1.155	346.8	28.20	290.4
550	61.89	1.155	352.7	31.30	295.8
600	61.96	1.155	358.1	34.39	300.8
650	62.02	1.155	363.1	37.49	305.4
700	62.07	1.155	367.7	40.60	309.7
750	62.10	1.155	372.0	43.70	313.7
800	62.13	1.154	376.0	46.81	317.5
850	62.16	1.154	379.7	49.91	321.0
900	62.18	1.154	383.3	53.02	324.4
950	62.20	1.154	386.7	56.13	327.6
1000	62.21	1.154	389.8	59.24	330.6

Table 31. Thermodynamic functions of diiodoargentate(I) (AgI_2^-)

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	55.20	1.177	265.9	4.45	221.4
150	58.60	1.165	289.0	7.31	240.3
200	60.10	1.161	306.1	10.28	254.7
250	60.87	1.158	319.6	13.31	266.4
273.15	61.10	1.158	325.0	14.72	271.2
298.15	61.29	1.157	330.4	16.25	275.9
300	61.31	1.157	330.8	16.36	276.2
350	61.58	1.156	340.3	19.44	284.7
400	61.76	1.156	348.5	22.52	292.2
450	61.88	1.155	355.8	25.61	298.9
500	61.97	1.155	362.3	28.71	304.9
550	62.04	1.155	368.2	31.81	310.4
600	62.09	1.155	373.6	34.91	315.4
650	62.13	1.155	378.6	38.02	320.1
700	62.16	1.154	383.2	41.12	324.4
750	62.18	1.154	387.5	44.23	328.5
800	62.20	1.154	391.5	47.34	332.3
850	62.22	1.154	395.3	50.45	335.9
900	62.24	1.154	398.8	53.56	339.3
950	62.25	1.154	402.2	56.68	342.5
1000	62.26	1.154	405.4	59.79	345.6

Table 32. Thermodynamic functions of oxonium (hydronium) (OH_3^+)

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	33.26	1.333	156.1	3.33	122.9
150	33.28	1.333	169.6	4.99	136.4
200	33.48	1.330	179.2	6.66	145.9
250	34.01	1.324	186.7	8.34	153.4
273.15	34.39	1.319	189.8	9.13	156.3
298.15	34.89	1.313	192.8	10.00	159.3
300	34.93	1.312	193.0	10.06	159.5
350	36.17	1.298	198.5	11.84	164.7
400	37.64	1.284	203.4	13.69	169.2
450	39.21	1.269	207.9	15.61	173.3
500	40.82	1.256	212.2	17.61	176.9
550	42.41	1.244	216.1	19.69	180.3
600	43.97	1.233	219.9	21.85	183.5
650	45.49	1.224	223.5	24.08	186.4
700	46.97	1.215	226.9	26.40	189.2
750	48.41	1.207	230.2	28.78	191.8
800	49.81	1.200	233.3	31.24	194.3
850	51.17	1.194	236.4	33.76	196.7
900	52.49	1.188	239.4	36.35	199.0
950	53.76	1.183	242.2	39.01	201.2
1000	55.00	1.178	245.0	41.73	203.3

Table 33. Thermodynamic functions of chlorate (ClO_3^-)

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	34.82	1.314	216.0	3.35	182.5
150	40.20	1.261	231.0	5.21	196.3
200	46.73	1.216	243.5	7.39	206.6
250	52.71	1.187	254.6	9.88	215.1
273.15	55.18	1.177	259.4	11.13	218.6
298.15	57.61	1.169	264.3	12.54	222.3
300	57.78	1.168	264.7	12.64	222.5
350	61.95	1.155	273.9	15.64	229.2
400	65.32	1.144	282.4	18.82	235.3
450	68.05	1.139	290.2	22.16	241.0
500	70.25	1.134	297.5	25.62	246.3
550	72.04	1.130	304.3	29.18	251.3
600	73.51	1.128	310.6	32.82	256.0
650	74.72	1.125	316.6	36.53	260.4
700	75.72	1.123	322.2	40.29	264.6
750	76.57	1.122	327.4	44.10	268.6
800	77.28	1.121	332.4	47.94	272.4
850	77.89	1.120	337.1	51.82	276.1
900	78.41	1.119	341.5	55.73	279.6
950	78.85	1.118	345.8	59.66	283.0
1000	79.24	1.117	349.9	63.61	286.2

Table 34. Thermodynamic functions of bromate (BrO_3^-)

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	36.61	1.294	227.3	3.39	193.5
150	43.19	1.238	243.4	5.38	207.5
200	49.78	1.201	256.7	7.71	218.2
250	55.62	1.176	268.5	10.34	227.1
273.15	58.01	1.167	273.5	11.66	230.8
298.15	60.35	1.160	278.7	13.14	234.6
300	60.52	1.159	279.1	13.25	234.9
350	64.48	1.148	288.7	16.38	241.9
400	67.63	1.140	297.5	19.69	248.3
450	70.13	1.135	305.6	23.13	254.2
500	72.12	1.130	313.1	26.69	259.8
550	73.71	1.127	320.1	30.34	264.9
600	75.00	1.125	326.6	34.06	269.8
650	76.06	1.123	332.6	37.83	274.4
700	76.93	1.121	338.3	41.66	278.8
750	77.66	1.120	343.6	45.52	282.9
800	78.26	1.119	348.6	49.42	286.9
850	78.78	1.118	353.4	53.35	290.6
900	79.22	1.117	357.9	57.30	294.3
950	79.60	1.117	362.2	61.27	297.7
1000	79.92	1.116	366.3	65.26	301.1

Table 35. Thermodynamic functions of iodate (IO_3^-)

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	38.19	1.278	234.7	3.43	200.4
150	45.40	1.224	251.5	5.52	214.7
200	51.89	1.191	265.5	7.96	225.7
250	57.48	1.169	277.7	10.69	234.9
273.15	59.74	1.162	282.9	12.05	238.8
298.15	61.95	1.155	288.2	13.57	242.7
300	62.10	1.155	288.6	13.69	243.0
350	65.82	1.145	298.4	16.89	250.2
400	68.77	1.138	307.4	20.26	256.8
450	71.10	1.132	315.7	23.76	262.9
500	72.95	1.129	323.3	27.36	268.6
550	74.44	1.126	330.3	31.04	273.8
600	75.63	1.124	336.8	34.80	278.8
650	76.61	1.122	342.9	38.60	283.5
700	77.42	1.120	348.6	42.46	288.0
750	78.09	1.119	354.0	46.34	292.2
800	78.65	1.118	359.0	50.26	296.2
850	79.12	1.117	363.8	54.21	300.1
900	79.53	1.117	368.4	58.17	303.7
950	79.88	1.116	372.7	62.16	307.2
1000	80.18	1.116	376.8	66.16	310.6

Table 36. Thermodynamic functions of sulfite (SO_3^{2-})

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	33.87	1.325	220.1	3.33	186.7
150	36.91	1.291	234.3	5.09	200.3
200	41.90	1.248	245.5	7.06	210.3
250	47.47	1.212	255.5	9.29	218.3
273.15	49.99	1.200	259.8	10.42	221.7
298.15	52.58	1.188	264.3	11.70	225.1
300	52.76	1.187	264.6	11.80	225.3
350	57.41	1.169	273.1	14.56	231.5
400	61.31	1.157	281.0	17.53	237.2
450	64.54	1.148	288.5	20.68	242.5
500	67.19	1.141	295.4	23.97	247.5
550	69.37	1.136	301.9	27.39	252.1
600	71.16	1.132	308.0	30.90	256.5
650	72.65	1.129	313.8	34.50	260.7
700	73.89	1.127	319.2	38.16	264.7
750	74.94	1.125	324.3	41.89	268.5
800	75.82	1.123	329.2	45.66	272.1
850	76.57	1.122	333.8	49.47	275.6
900	77.22	1.121	338.2	53.31	279.0
950	77.78	1.120	342.4	57.19	282.2
1000	78.26	1.119	346.4	61.09	285.3

Table 37. Thermodynamic functions of selenite (SeO_3^{2-})

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	36.28	1.297	232.7	3.38	198.9
150	42.91	1.240	248.6	5.35	212.9
200	49.89	1.200	261.9	7.68	223.5
250	56.06	1.174	273.7	10.33	232.4
273.15	58.54	1.166	278.8	11.66	236.1
298.15	60.95	1.158	284.0	13.15	239.9
300	61.12	1.157	284.4	13.26	240.2
350	65.13	1.146	294.1	16.42	247.2
400	68.27	1.139	303.0	19.76	253.6
450	70.73	1.133	311.2	23.24	259.6
500	72.67	1.129	318.8	26.83	265.1
550	74.22	1.126	325.8	30.50	270.3
600	75.46	1.124	332.3	34.24	275.2
650	76.47	1.122	338.4	38.04	279.8
700	77.30	1.121	344.1	41.89	284.2
750	77.99	1.119	349.4	45.77	288.4
800	78.57	1.118	354.5	49.68	292.4
850	79.05	1.118	359.3	53.62	296.2
900	79.47	1.117	363.8	57.59	299.8
950	79.82	1.116	368.1	61.57	303.3
1000	80.13	1.116	372.2	65.57	306.6

Table 38. Thermodynamic functions of tellurite (TeO_3^{2-})

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	37.99	1.280	240.4	3.42	206.2
150	45.54	1.223	257.3	5.51	220.5
200	52.62	1.188	271.4	7.97	231.5
250	58.60	1.165	283.8	10.75	240.8
273.15	60.94	1.158	288.1	12.14	244.6
298.15	63.23	1.151	294.5	13.69	248.6
300	63.38	1.151	294.9	13.81	248.9
350	67.10	1.141	305.0	17.07	256.2
400	69.97	1.135	314.1	20.50	262.9
450	72.20	1.130	322.5	24.06	269.0
500	73.94	1.127	330.2	27.72	274.8
550	75.32	1.124	337.3	31.45	280.1
600	76.42	1.122	343.9	35.24	285.2
650	77.32	1.120	350.1	39.09	289.9
700	78.05	1.119	355.8	42.97	294.4
750	78.65	1.118	361.2	46.89	298.7
800	79.16	1.117	366.3	50.83	302.8
850	79.59	1.117	371.1	54.80	306.7
900	79.95	1.116	375.7	58.79	310.4
950	80.26	1.116	380.0	62.80	313.9
1000	80.53	1.115	384.1	66.82	317.3

Table 39. Thermodynamic functions of nitrate (NO_3^-)

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	33.32	1.332	205.2	3.33	172.0
150	34.28	1.320	218.9	5.01	185.5
200	36.90	1.291	229.1	6.78	195.2
250	40.67	1.257	237.7	8.72	202.8
273.15	42.61	1.242	241.4	9.68	205.9
298.15	44.73	1.228	245.2	10.77	209.1
300	44.89	1.227	245.5	10.86	209.3
350	49.06	1.204	252.7	13.21	215.0
400	52.94	1.186	259.5	15.76	220.1
450	56.46	1.173	266.0	18.50	224.9
500	59.54	1.162	272.1	21.40	229.3
550	62.23	1.154	277.9	24.44	233.4
600	64.55	1.148	283.4	27.61	237.4
650	66.56	1.143	288.6	30.89	241.1
700	68.30	1.139	293.6	34.27	244.7
750	69.80	1.135	298.4	37.72	248.1
800	71.11	1.132	303.0	41.24	251.4
850	72.24	1.130	307.3	44.83	254.6
900	73.23	1.128	311.5	48.47	257.6
950	74.10	1.126	315.4	52.15	260.6
1000	74.87	1.125	319.3	55.87	263.4

Table 40. Thermodynamic functions of carbonate (CO_3^{2-})

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	33.33	1.332	206.2	3.33	173.0
150	34.30	1.320	219.9	5.01	186.5
200	36.84	1.291	230.0	6.78	196.1
250	40.46	1.259	238.6	8.71	203.8
273.15	42.32	1.245	242.3	9.67	206.9
298.15	44.36	1.231	246.1	10.75	210.0
300	44.51	1.230	246.4	10.84	210.3
350	48.55	1.207	253.5	13.16	215.9
400	52.34	1.189	260.3	15.69	221.1
450	55.78	1.175	266.6	18.39	225.8
500	58.85	1.165	272.7	21.26	230.2
550	61.53	1.156	278.4	24.27	234.3
600	63.88	1.150	283.9	27.41	238.2
650	65.91	1.144	289.1	30.65	241.9
700	67.68	1.140	294.0	33.99	245.5
750	69.22	1.137	298.7	37.42	248.9
800	70.56	1.134	303.3	40.91	252.1
850	71.73	1.131	307.6	44.47	255.3
900	72.75	1.129	311.7	48.08	258.3
950	73.65	1.127	315.7	51.74	261.2
1000	74.45	1.126	319.5	55.45	264.0

Table 41. Thermodynamic functions of metavanadate (VO_3^-)

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	35.97	1.301	217.9	3.38	184.2
150	41.36	1.252	233.5	5.31	198.1
200	47.04	1.215	246.2	7.52	208.6
250	52.41	1.189	257.3	10.00	217.2
273.15	54.71	1.179	262.0	11.24	220.8
298.15	57.03	1.171	266.9	12.64	224.5
300	57.19	1.170	267.3	12.75	224.8
350	61.28	1.157	276.4	15.71	231.5
400	64.66	1.148	284.8	18.86	237.6
450	67.44	1.141	292.6	22.17	243.3
500	69.70	1.135	299.8	25.60	248.6
550	71.55	1.131	306.5	29.13	253.6
600	73.08	1.128	312.8	32.75	258.3
650	74.33	1.126	318.7	36.43	262.7
700	75.38	1.124	324.3	40.18	266.9
750	76.24	1.122	329.5	43.97	270.9
800	77.01	1.121	334.5	47.80	274.7
850	77.64	1.120	339.1	51.67	278.4
900	78.19	1.119	343.6	55.56	281.9
950	78.65	1.118	347.8	59.49	285.2
1000	79.06	1.118	351.9	63.43	288.5

Table 42. Thermodynamic functions of formate (HCO_2^-)

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	33.27	1.333	200.4	3.33	167.1
150	33.59	1.329	213.9	5.00	180.6
200	34.63	1.316	223.7	6.70	190.2
250	36.46	1.295	231.6	8.47	197.7
273.15	37.52	1.285	234.9	9.33	200.7
298.15	38.78	1.273	238.2	10.28	203.7
300	38.88	1.272	238.4	10.35	203.9
350	41.66	1.249	244.6	12.37	209.3
400	44.57	1.229	250.4	14.52	214.1
450	47.45	1.212	255.8	16.82	218.4
500	50.19	1.199	261.0	19.26	222.4
550	52.75	1.187	265.9	21.84	226.2
600	55.11	1.178	270.5	24.54	229.7
650	57.27	1.170	275.0	27.35	233.0
700	59.23	1.163	279.4	30.26	236.1
750	61.02	1.158	283.5	33.27	239.2
800	62.64	1.153	287.5	36.36	242.1
850	64.12	1.149	291.3	39.53	244.8
900	65.46	1.145	295.1	42.77	247.5
950	66.68	1.142	298.6	46.07	250.1
1000	67.79	1.140	302.1	49.43	252.6

Table 43. Thermodynamic functions of trans-hyponitrite $N_2O_2^{2-}$

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	34.85	1.313	211.4	3.35	177.9
150	38.77	1.273	226.3	5.19	191.7
200	43.25	1.238	238.0	7.24	201.8
250	47.67	1.211	248.2	9.51	210.1
273.15	49.64	1.201	252.5	10.64	213.5
298.15	51.69	1.192	256.9	11.91	217.0
300	51.84	1.191	257.2	12.00	217.2
350	55.66	1.176	265.5	14.69	223.5
400	59.07	1.164	273.2	17.56	229.3
450	62.05	1.155	280.3	20.59	234.5
500	64.62	1.148	287.0	23.76	239.5
550	66.83	1.142	293.2	27.05	244.1
600	68.72	1.138	299.1	30.44	248.4
650	70.33	1.134	304.7	33.91	252.5
700	71.71	1.131	310.0	37.47	256.4
750	72.90	1.129	315.0	41.08	260.2
800	73.93	1.127	319.7	44.75	263.8
850	74.81	1.125	324.2	48.47	267.2
900	75.59	1.124	328.5	52.23	270.5
950	76.26	1.122	332.6	56.03	273.6
1000	76.85	1.121	336.5	59.86	276.7

Table 43a. Thermodynamic functions of cis-hyponitrite $N_2O_2^{2-}$

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	36.44	1.296	219.5	3.39	185.6
150	41.79	1.248	235.3	5.34	199.6
200	46.93	1.215	248.0	7.56	210.2
250	51.56	1.192	259.0	10.03	218.9
273.15	53.54	1.184	263.6	11.24	222.5
298.15	55.55	1.176	268.4	12.61	226.1
300	55.70	1.175	268.7	12.71	226.4
350	59.33	1.163	277.6	15.59	233.1
400	62.47	1.154	285.7	18.64	239.2
450	65.16	1.146	293.3	21.83	244.8
500	67.44	1.141	300.2	25.15	250.0
550	69.37	1.136	306.8	28.57	254.8
600	71.01	1.133	312.9	32.08	259.4
650	72.40	1.130	318.6	35.66	263.8
700	73.58	1.127	324.0	39.31	267.9
750	74.59	1.125	329.1	43.02	271.8
800	75.46	1.124	334.0	46.77	275.5
850	76.21	1.122	338.6	50.56	279.1
900	76.86	1.121	343.0	54.39	282.5
950	77.43	1.120	347.1	58.25	285.8
1000	77.92	1.119	351.1	62.13	289.0

Table 44. Thermodynamic functions of perchlorate (ClO_4^-)

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	34.50	1.318	214.1	3.34	180.6
150	39.70	1.265	228.9	5.18	194.4
200	47.19	1.214	241.3	7.35	204.6
250	55.00	1.178	252.7	9.91	213.1
273.15	58.46	1.166	257.7	11.22	216.7
298.15	62.02	1.155	263.0	12.73	220.3
300	62.28	1.154	263.4	12.84	220.6
350	68.71	1.138	273.5	16.12	227.4
400	74.23	1.124	283.0	19.70	233.8
450	78.89	1.118	292.0	23.53	239.8
500	82.80	1.112	300.6	27.57	245.4
550	86.06	1.107	308.6	31.80	250.8
600	88.79	1.103	316.2	36.17	255.9
650	91.08	1.100	323.4	40.67	260.9
700	93.02	1.098	330.2	45.27	265.6
750	94.66	1.096	336.7	49.97	270.1
800	96.06	1.095	342.9	54.74	274.5
850	97.27	1.093	348.7	59.57	278.7
900	98.30	1.092	354.3	64.46	282.7
950	99.21	1.091	359.7	69.40	286.6
1000	99.99	1.091	364.8	74.38	290.4

Table 45. Thermodynamic functions of perbromate (BrO_4^-)

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	38.93	1.272	222.2	3.43	187.8
150	49.34	1.203	239.9	5.64	202.3
200	59.17	1.163	255.5	8.36	213.7
250	67.59	1.140	269.6	11.53	223.5
273.15	71.61	1.133	275.9	13.14	227.6
298.15	74.36	1.126	282.1	14.95	231.9
300	74.60	1.125	282.6	15.09	232.3
350	80.29	1.116	294.5	18.97	240.3
400	84.86	1.109	305.5	23.10	247.8
450	88.52	1.104	315.7	27.44	254.8
500	91.45	1.100	325.2	31.94	261.4
550	93.82	1.097	334.1	36.58	267.6
600	95.74	1.095	342.3	41.32	273.5
650	97.32	1.093	350.0	46.14	279.1
700	98.63	1.092	357.3	51.04	284.4
750	99.72	1.091	364.1	56.00	289.5
800	100.64	1.090	370.6	61.01	294.3
850	101.42	1.089	376.7	66.06	299.0
900	102.09	1.089	382.6	71.15	303.5
950	102.66	1.088	388.1	76.27	307.8
1000	103.16	1.088	393.4	81.42	312.0

Table 46. Thermodynamic functions of periodate (IO_4^-)

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	44.81	1.228	230.2	3.60	194.2
150	56.56	1.172	250.7	6.15	209.7
200	65.45	1.146	268.3	9.21	222.2
250	72.72	1.129	283.7	12.67	233.0
273.15	75.66	1.123	290.2	14.39	237.6
298.15	78.56	1.118	297.0	16.31	242.3
300	78.76	1.118	297.5	16.46	242.6
350	83.70	1.110	310.0	20.53	251.4
400	87.69	1.105	321.5	24.81	259.4
450	90.88	1.101	332.0	29.28	266.9
500	93.45	1.098	341.7	33.89	273.9
550	95.53	1.095	350.7	38.62	280.5
600	97.22	1.094	359.1	43.44	286.7
650	98.61	1.092	366.9	48.34	292.6
700	99.76	1.091	374.3	53.30	298.1
750	100.72	1.090	381.2	58.31	303.4
800	101.53	1.089	387.7	63.37	308.5
850	102.22	1.089	393.9	68.46	313.4
900	102.80	1.088	399.8	73.58	318.0
950	103.31	1.088	405.3	78.74	322.4
1000	103.74	1.087	410.6	83.91	326.7

Table 47. Thermodynamic functions of permanganate (MnO_4^-)

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	37.92	1.281	219.7	3.41	185.6
150	47.69	1.211	236.9	5.54	199.9
200	57.28	1.170	251.9	8.17	211.1
250	65.61	1.145	265.4	11.25	220.6
273.15	69.03	1.137	271.6	12.81	224.7
298.15	72.41	1.130	277.8	14.58	228.9
300	72.65	1.129	278.2	14.71	229.2
350	78.45	1.119	289.9	18.49	237.1
400	83.17	1.111	300.7	22.54	244.3
450	86.98	1.106	310.7	26.80	251.2
500	90.07	1.102	320.0	31.23	257.6
550	92.59	1.099	328.8	35.79	263.7
600	94.64	1.096	336.9	40.48	269.4
650	96.34	1.094	344.5	45.25	274.9
700	97.75	1.093	351.7	50.11	280.2
750	98.93	1.092	358.5	55.02	285.2
800	99.92	1.091	364.9	59.99	289.9
850	100.77	1.090	371.0	65.01	294.5
900	101.50	1.089	376.8	70.07	299.0
950	102.12	1.089	382.3	75.16	303.2
1000	102.66	1.088	387.6	80.28	307.3

Table 48. Thermodynamic functions of pertechnetate (TcO_4^-)

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	41.30	1.252	226.0	3.49	191.0
150	52.51	1.188	244.9	5.84	205.9
200	61.55	1.156	261.3	8.70	217.7
250	68.96	1.137	275.8	11.97	227.9
273.15	71.99	1.131	282.1	13.60	232.5
298.15	74.99	1.125	288.5	15.44	236.7
300	75.20	1.124	289.0	15.58	237.0
350	80.41	1.115	301.0	19.48	245.3
400	84.71	1.109	312.0	23.61	253.0
450	88.21	1.104	322.2	27.93	260.1
500	91.07	1.100	331.6	32.42	266.8
550	93.41	1.098	340.4	37.03	273.1
600	95.33	1.096	348.6	41.75	279.0
650	96.93	1.094	356.3	46.56	284.7
700	98.25	1.092	363.6	51.44	290.1
750	99.37	1.091	370.4	56.38	295.2
800	100.31	1.090	376.8	61.37	300.1
850	101.11	1.090	382.9	66.41	304.8
900	101.80	1.089	388.7	71.48	309.3
950	102.39	1.088	394.2	76.59	313.6
1000	102.91	1.088	399.5	81.72	317.8

Table 49. Thermodynamic functions of perrhenate (ReO_4^-)

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	41.39	1.251	231.6	3.49	196.6
150	52.61	1.188	250.5	5.85	211.5
200	61.51	1.156	266.9	8.71	223.4
250	68.77	1.138	281.5	11.98	233.6
273.15	71.74	1.131	287.7	13.60	237.9
298.15	74.69	1.125	294.1	15.43	242.3
300	74.90	1.125	294.6	15.57	242.7
350	80.06	1.116	306.5	19.45	250.9
400	84.33	1.109	317.5	23.56	258.6
450	87.84	1.105	327.6	27.87	265.7
500	90.72	1.101	337.0	32.34	272.4
550	93.08	1.098	345.8	36.93	278.6
600	95.03	1.096	354.0	41.64	284.6
650	96.65	1.094	361.7	46.43	290.2
700	98.00	1.093	368.9	51.30	295.6
750	99.13	1.092	375.7	56.23	300.7
800	100.10	1.091	382.1	61.21	305.6
850	100.92	1.090	388.2	66.24	310.3
900	101.62	1.089	394.0	71.30	314.8
950	102.23	1.089	399.5	76.40	319.1
1000	102.76	1.088	404.8	81.52	323.2

Table 50. Thermodynamic functions of sulfate (SO_4^{2-})

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	34.63	1.316	214.2	3.35	180.8
150	40.09	1.262	229.2	5.20	194.5
200	47.67	1.211	241.7	7.39	204.8
250	55.46	1.176	253.2	9.97	213.4
273.15	58.89	1.164	258.3	11.29	216.9
298.15	62.42	1.154	263.6	12.81	220.6
300	62.68	1.153	264.0	12.93	220.9
350	69.05	1.137	274.1	16.22	227.8
400	74.52	1.126	283.7	19.82	234.2
450	79.14	1.117	292.8	23.66	240.2
500	83.01	1.111	301.3	27.72	245.9
550	86.24	1.107	309.4	31.95	251.3
600	88.95	1.103	317.0	36.33	256.5
650	91.23	1.100	324.2	40.84	261.4
700	93.15	1.098	331.1	45.45	266.1
750	94.78	1.096	337.5	50.15	270.7
800	96.17	1.095	343.7	54.92	275.1
850	97.36	1.093	349.6	59.76	279.3
900	98.39	1.092	355.2	64.66	283.3
950	99.28	1.091	360.5	69.60	287.3
1000	100.06	1.091	365.6	74.58	291.0

Table 51. Thermodynamic functions of selenate (SeO_4^{2-})

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	38.38	1.277	222.3	3.42	188.1
150	48.35	1.208	239.7	5.58	202.5
200	58.11	1.167	255.0	8.25	213.7
250	66.61	1.143	268.9	11.37	223.4
273.15	70.08	1.135	274.9	12.96	227.5
298.15	73.49	1.128	281.2	14.75	231.7
300	73.73	1.127	281.7	14.89	232.0
350	79.54	1.117	293.5	18.73	240.0
400	84.21	1.110	304.4	22.82	247.4
450	87.96	1.104	314.6	27.13	254.3
500	90.97	1.101	324.0	31.61	260.8
550	93.40	1.098	332.8	36.22	266.9
600	95.37	1.096	341.0	40.94	272.8
650	97.00	1.094	348.7	45.75	278.3
700	98.34	1.092	355.9	50.63	283.6
750	99.47	1.091	362.7	55.58	288.6
800	100.41	1.090	369.2	60.58	293.5
850	101.21	1.089	375.3	65.62	298.1
900	101.90	1.089	381.1	70.70	302.6
950	102.49	1.088	386.6	75.81	306.8
1000	103.00	1.088	391.9	80.94	311.0

Table 52. Thermodynamic functions of tellurate (TeO_4^{2-})

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	43.38	1.237	230.1	3.56	194.5
150	55.10	1.178	250.0	6.03	209.8
200	64.51	1.148	267.2	9.03	222.0
250	72.24	1.130	282.4	12.45	232.0
273.15	75.35	1.124	289.0	14.16	237.1
298.15	78.38	1.119	295.7	16.08	241.8
300	78.59	1.118	296.2	16.23	242.1
350	83.71	1.110	308.7	20.29	250.7
400	87.79	1.105	320.2	24.58	258.7
450	91.04	1.101	330.7	29.06	266.1
500	93.63	1.097	340.4	33.68	273.1
550	95.71	1.095	349.4	38.41	279.6
600	97.39	1.093	357.8	43.24	285.8
650	98.78	1.092	365.7	48.14	291.6
700	99.91	1.091	373.1	53.11	297.2
750	100.86	1.090	380.0	58.13	302.5
800	101.66	1.089	386.5	63.20	307.5
850	102.34	1.088	392.7	68.30	312.4
900	102.92	1.088	398.6	73.43	317.0
950	103.41	1.087	404.2	78.59	321.4
1000	103.84	1.087	409.5	83.77	325.7

Table 53. Thermodynamic functions of chromate (CrO_4^{2-})

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	39.65	1.265	220.5	3.45	186.0
150	50.53	1.197	238.6	5.70	200.6
200	60.17	1.160	254.5	8.48	212.1
250	68.25	1.139	268.8	11.69	222.0
273.15	71.52	1.132	275.0	13.31	226.3
298.15	74.75	1.125	281.4	15.14	230.6
300	74.98	1.125	281.9	15.28	230.9
350	80.49	1.115	293.8	19.17	239.1
400	84.94	1.109	304.9	23.31	246.6
450	88.53	1.104	315.1	27.65	253.7
500	91.42	1.100	324.6	32.15	260.3
550	93.77	1.097	333.4	36.78	266.5
600	95.68	1.095	341.7	41.52	272.5
650	97.26	1.093	349.4	46.35	278.1
700	98.56	1.092	356.7	51.24	283.4
750	99.66	1.091	363.5	56.20	288.6
800	100.58	1.090	370.0	61.21	293.4
850	101.36	1.089	376.1	66.26	298.1
900	102.03	1.089	381.9	71.34	302.6
950	102.61	1.088	387.4	76.46	306.9
1000	103.11	1.088	392.7	81.60	311.1

Table 54. Thermodynamic functions of molybdate (MoO_4^{2-})

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	42.43	1.244	226.8	3.52	191.5
150	54.06	1.182	246.2	5.95	206.6
200	63.32	1.151	263.1	8.89	218.7
250	70.92	1.133	278.1	12.25	229.1
273.15	73.98	1.127	284.5	13.93	233.5
298.15	77.01	1.121	291.1	15.82	238.1
300	77.22	1.121	291.6	15.96	238.4
350	82.38	1.112	303.9	19.95	246.9
400	86.56	1.106	315.2	24.18	254.7
450	89.90	1.102	325.6	28.59	262.0
500	92.60	1.099	335.2	33.16	268.9
550	94.79	1.096	344.1	37.85	275.3
600	96.57	1.094	352.4	42.63	281.4
650	98.04	1.093	360.2	47.50	287.2
700	99.25	1.091	367.5	52.43	292.6
750	100.27	1.090	374.4	57.42	297.9
800	101.12	1.090	380.9	62.45	302.9
850	101.85	1.089	387.1	67.53	307.6
900	102.47	1.088	392.9	72.64	312.2
950	103.01	1.088	398.5	77.78	316.6
1000	103.47	1.087	403.8	82.94	320.8

Table 55. Thermodynamic functions of tungstate (WO_4^{2-})

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	41.98	1.247	232.8	3.51	197.7
150	53.53	1.184	252.0	5.91	212.7
200	62.85	1.152	268.8	8.82	224.6
250	70.59	1.134	283.6	12.16	235.0
273.15	73.59	1.127	290.0	13.83	239.4
298.15	76.63	1.122	296.6	15.71	243.9
300	76.84	1.121	297.1	15.85	244.2
350	82.04	1.113	309.3	19.83	252.7
400	86.25	1.107	320.6	24.04	260.5
450	89.63	1.102	330.9	28.44	267.7
500	92.36	1.099	340.5	32.99	274.5
550	94.58	1.096	349.4	37.67	280.9
600	96.38	1.094	357.7	42.44	287.0
650	97.87	1.093	365.5	47.30	292.7
700	99.10	1.092	372.8	52.23	298.2
750	100.13	1.091	379.7	57.21	303.4
800	101.00	1.090	386.2	62.24	308.4
850	101.74	1.089	392.3	67.31	313.1
900	102.37	1.088	398.2	72.41	317.7
950	102.92	1.088	403.7	77.54	322.1
1000	103.39	1.087	409.0	82.70	326.3

Table 56. Thermodynamic functions of manganate(VI) MnO_4^{2-}

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	41.62	1.250	232.9	3.50	197.9
150	53.29	1.185	252.1	5.88	212.9
200	63.06	1.152	268.8	8.80	224.8
250	71.12	1.132	283.7	12.16	235.1
273.15	74.34	1.126	290.2	13.84	239.5
298.15	77.49	1.120	296.8	15.74	244.0
300	77.71	1.120	297.3	15.88	244.4
350	83.09	1.111	309.7	19.91	252.8
400	87.22	1.105	321.1	24.17	260.7
450	90.56	1.101	331.5	28.61	268.0
500	93.23	1.098	341.2	33.21	274.8
550	95.37	1.096	350.2	37.93	281.3
600	97.10	1.094	358.6	42.74	287.4
650	98.52	1.092	366.4	47.63	293.1
700	99.70	1.091	373.8	52.59	298.6
750	100.67	1.090	380.7	57.60	303.9
800	101.49	1.089	387.2	62.65	308.9
850	102.19	1.089	393.4	67.75	313.7
900	102.78	1.088	399.2	72.87	318.3
950	103.29	1.088	404.8	78.02	322.7
1000	103.73	1.087	410.1	83.20	326.9

Table 57. Thermodynamic functions of phosphate (PO_4^{3-})

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	35.19	1.309	214.9	3.36	181.4
150	41.69	1.249	230.3	5.26	195.2
200	50.03	1.199	243.5	7.55	205.7
250	58.26	1.166	255.5	10.26	214.5
273.15	61.82	1.155	260.8	11.65	218.2
298.15	65.43	1.146	266.4	13.25	222.0
300	65.68	1.145	266.8	13.37	222.3
350	72.07	1.130	277.4	16.81	229.4
400	77.43	1.120	287.4	20.56	236.0
450	81.88	1.113	296.8	24.54	242.3
500	85.54	1.108	305.6	28.73	248.2
550	88.56	1.104	313.9	33.09	253.8
600	91.06	1.100	321.7	37.58	259.1
650	93.15	1.098	329.1	42.19	264.2
700	94.89	1.096	336.1	46.89	269.1
750	96.37	1.094	342.7	51.67	273.8
800	97.62	1.093	348.9	56.52	278.3
850	98.68	1.092	354.9	61.43	282.6
900	99.60	1.091	360.6	66.39	286.8
950	100.39	1.090	366.0	71.39	290.8
1000	101.08	1.090	371.1	76.42	294.7

Table 58. Thermodynamic functions of arsenate (AsO_4^{3-})

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	38.59	1.275	222.6	3.42	188.4
150	49.26	1.203	240.2	5.61	202.8
200	59.72	1.162	255.9	8.34	214.1
250	68.67	1.138	270.2	11.56	223.9
273.15	72.24	1.130	276.4	13.19	228.1
298.15	75.71	1.123	282.9	15.04	232.5
300	75.95	1.123	283.4	15.18	232.8
350	81.73	1.113	295.5	19.13	240.9
400	86.28	1.107	306.8	23.34	248.4
450	89.85	1.102	317.1	27.74	255.5
500	92.67	1.099	326.7	32.31	262.1
550	94.93	1.096	335.7	37.00	268.4
600	96.75	1.094	344.0	41.79	274.4
650	98.23	1.092	351.8	46.67	280.0
700	99.45	1.091	359.2	51.61	285.4
750	100.46	1.090	366.1	56.61	290.6
800	101.31	1.089	372.6	61.65	295.5
850	102.03	1.089	378.7	66.74	300.2
900	102.64	1.088	384.6	71.86	304.7
950	103.17	1.088	390.1	77.00	309.1
1000	103.62	1.087	395.4	82.17	313.3

Table 59. Thermodynamic functions of antimonate (SbO_4^{3-})

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	44.93	1.227	230.5	3.60	194.4
150	57.19	1.170	251.1	6.17	210.0
200	66.98	1.142	268.9	9.28	222.5
250	74.91	1.125	284.9	12.84	233.4
273.15	78.03	1.119	291.5	14.61	238.1
298.15	81.03	1.114	298.5	16.60	242.8
300	81.24	1.114	299.0	16.75	243.2
350	86.19	1.107	311.9	20.94	252.1
400	90.04	1.102	323.7	25.35	260.3
450	93.05	1.098	334.5	29.93	268.0
500	95.42	1.095	344.4	34.64	275.1
550	97.29	1.093	353.6	39.46	281.8
600	98.80	1.092	362.1	44.36	288.2
650	100.03	1.091	370.1	49.34	294.2
700	101.03	1.090	377.5	54.36	299.9
750	101.87	1.089	384.5	59.44	305.3
800	102.56	1.088	391.1	64.55	310.4
850	103.15	1.088	397.4	69.69	315.4
900	103.65	1.087	403.3	74.86	320.1
950	104.08	1.087	408.9	80.05	324.6
1000	104.46	1.086	414.2	85.27	329.0

Table 60. Thermodynamic functions of vanadate (VO_4^{3-})

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	40.89	1.255	221.4	3.48	186.6
150	52.56	1.188	240.2	5.82	201.4
200	62.75	1.153	256.7	8.71	213.2
250	71.18	1.132	271.7	12.06	223.4
273.15	74.52	1.126	278.1	13.75	227.8
298.15	77.76	1.120	284.8	15.66	232.3
300	77.99	1.119	285.3	15.80	232.6
350	83.39	1.111	297.7	19.84	241.0
400	87.63	1.105	309.1	24.12	248.9
450	90.98	1.101	319.7	28.59	256.1
500	93.62	1.097	329.4	33.21	263.0
550	95.73	1.095	338.4	37.94	269.4
600	97.44	1.093	346.8	42.77	275.5
650	98.83	1.092	354.7	47.68	281.3
700	99.97	1.091	362.1	52.65	286.8
750	100.92	1.090	369.0	57.67	292.1
800	101.72	1.089	375.5	62.74	297.1
850	102.39	1.088	381.7	67.84	301.9
900	102.97	1.088	387.6	72.98	306.5
950	103.46	1.087	393.2	78.14	310.9
1000	103.89	1.087	398.5	83.32	315.2

Table 61. Thermodynamic functions of ammonium (NH_4^+)

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	33.26	1.333	149.7	3.33	116.4
150	33.26	1.333	163.2	4.99	129.9
200	33.38	1.332	172.8	6.65	139.5
250	33.87	1.325	180.3	8.33	146.9
273.15	34.30	1.320	183.3	9.12	149.9
298.15	34.92	1.313	186.3	9.99	152.8
300	34.97	1.312	186.5	10.05	153.0
350	36.70	1.293	192.0	11.84	158.2
400	38.93	1.272	197.1	13.73	162.7
450	41.48	1.251	201.8	15.74	166.8
500	44.21	1.232	206.3	17.88	170.6
550	47.00	1.215	210.7	20.16	174.0
600	49.80	1.200	214.9	22.58	177.2
650	52.56	1.188	219.0	25.14	180.3
700	55.26	1.177	223.0	27.84	183.2
750	57.87	1.168	226.9	30.66	186.0
800	60.38	1.160	230.7	33.62	188.6
850	62.80	1.153	234.4	36.70	191.2
900	65.11	1.146	238.1	39.90	193.7
950	67.30	1.141	241.6	43.21	196.2
1000	69.39	1.136	245.1	46.63	198.5

Table 62. Thermodynamic functions of phosphonium (PH_4^+)

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	33.26	1.333	165.1	3.33	131.9
150	33.48	1.330	178.6	4.99	145.3
200	34.67	1.315	188.4	6.69	154.9
250	37.22	1.288	196.4	8.48	162.4
273.15	38.75	1.273	199.7	9.36	165.5
298.15	40.57	1.258	203.2	10.35	168.5
300	40.71	1.257	203.5	10.43	168.7
350	44.60	1.229	210.0	12.56	174.1
400	48.54	1.207	216.2	14.89	179.0
450	52.35	1.189	222.2	17.41	183.5
500	55.98	1.174	227.9	20.12	187.6
550	59.42	1.163	233.4	23.01	191.5
600	62.65	1.153	238.7	26.06	195.3
650	65.69	1.145	243.8	29.27	198.8
700	68.54	1.138	248.8	32.62	202.2
750	71.20	1.132	253.6	36.12	205.5
800	73.67	1.127	258.3	39.74	208.6
850	75.96	1.123	262.8	43.48	211.7
900	78.08	1.119	267.2	47.33	214.6
950	80.04	1.116	271.5	51.29	217.5
1000	81.85	1.113	275.7	55.34	220.3

Table 63. Thermodynamic functions of tetrahydroborate (BH_4^-)

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	33.26	1.333	150.3	3.33	117.0
150	33.35	1.332	163.8	4.99	130.5
200	34.01	1.324	173.4	6.67	140.1
250	35.75	1.303	181.2	8.41	147.6
273.15	36.91	1.291	184.4	9.25	150.5
298.15	38.38	1.276	187.7	10.19	153.5
300	38.50	1.275	187.9	10.26	153.7
350	41.91	1.247	194.1	12.27	159.1
400	45.45	1.223	200.0	14.44	163.8
450	49.49	1.202	205.6	16.84	168.1
500	53.28	1.185	211.0	19.41	172.2
550	56.96	1.171	216.2	22.16	175.9
600	60.47	1.159	221.3	25.10	179.5
650	63.78	1.150	226.3	28.21	182.9
700	66.89	1.142	231.1	31.47	186.2
750	69.78	1.135	235.9	34.89	189.3
800	72.46	1.130	240.4	38.45	192.4
850	74.94	1.125	244.9	42.13	195.3
900	77.22	1.121	249.3	45.94	198.2
950	79.31	1.117	253.5	49.85	201.0
1000	81.23	1.114	257.6	53.87	203.8

Table 64. Thermodynamic functions of tetrahydroaluminate AlH_4^-

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	33.34	1.332	165.7	3.33	132.4
150	34.72	1.315	179.4	5.02	146.0
200	38.46	1.276	189.9	6.84	155.7
250	43.54	1.234	199.6	8.99	163.4
273.15	46.06	1.220	203.0	9.92	166.6
298.15	48.75	1.206	207.1	11.11	169.8
300	48.94	1.205	207.4	11.20	170.1
350	54.13	1.181	215.3	13.78	176.0
400	58.98	1.164	222.9	16.61	181.4
450	63.46	1.151	230.1	19.67	186.4
500	67.56	1.140	237.0	22.95	191.1
550	71.29	1.132	243.6	26.42	195.6
600	74.66	1.125	250.0	30.07	199.9
650	77.69	1.120	256.1	33.88	203.9
700	80.40	1.115	261.9	37.83	207.9
750	82.83	1.112	267.6	41.92	211.7
800	84.99	1.108	273.0	46.11	215.3
850	86.93	1.106	278.2	50.41	218.9
900	88.65	1.103	283.2	54.80	222.3
950	90.20	1.102	288.0	59.27	225.6
1000	91.58	1.100	292.7	63.82	228.9

Table 65. Thermodynamic functions of tetrafluoroborate (BF_4^-)

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	36.50	1.295	213.7	3.38	179.9
150	44.28	1.231	229.9	5.39	194.0
200	52.97	1.186	243.9	7.83	204.7
250	60.99	1.158	256.6	10.68	213.9
273.15	64.38	1.148	262.1	12.13	217.7
298.15	67.77	1.140	267.9	13.78	221.7
300	68.01	1.139	268.3	13.91	222.0
350	73.99	1.127	279.3	17.46	229.4
400	78.99	1.118	289.5	21.29	236.3
450	83.14	1.111	299.0	25.35	242.7
500	86.58	1.106	308.0	29.59	248.8
550	89.42	1.103	316.4	33.99	254.6
600	91.78	1.100	324.3	38.53	260.0
650	93.76	1.097	331.7	43.17	265.3
700	95.41	1.095	338.7	47.90	270.3
750	96.81	1.094	345.3	52.70	275.1
800	98.00	1.093	351.6	57.57	279.6
850	99.02	1.092	357.6	62.50	284.1
900	99.90	1.091	363.3	67.47	288.3
950	100.66	1.090	368.7	72.49	292.4
1000	101.32	1.089	373.9	77.54	296.3

Table 66. Thermodynamic functions of tetrahydroxyborate $B(OH)_4^-$

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	36.17	1.298	210.5	3.37	176.8
150	45.82	1.222	226.8	5.40	190.8
200	59.13	1.164	241.8	8.01	201.7
250	73.28	1.128	256.5	11.33	211.2
273.15	79.65	1.117	263.2	13.10	215.3
298.15	86.26	1.107	270.5	15.17	219.6
300	86.74	1.106	271.0	15.33	219.9
350	98.80	1.092	285.3	19.98	228.3
400	109.25	1.082	298.2	25.18	234.3
450	118.15	1.076	312.6	30.87	244.0
500	125.69	1.071	325.5	36.98	251.5
550	132.09	1.067	337.8	43.43	258.8
600	137.57	1.064	349.5	50.17	265.9
650	142.31	1.062	360.7	57.17	272.7
700	146.47	1.060	371.4	64.39	279.4
750	150.16	1.059	381.6	71.81	285.9
800	153.47	1.057	391.4	79.40	292.2
850	156.48	1.056	400.8	87.15	298.3
900	159.24	1.055	409.8	95.05	304.2
950	161.79	1.054	418.5	103.07	310.0
1000	164.15	1.053	426.9	111.22	315.7

Table 67. Thermodynamic functions of tetrahydroxyaluminate $Al(OH)_4^-$

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	43.16	1.239	214.2	3.52	179.0
150	61.30	1.157	235.1	6.12	194.3
200	79.85	1.116	255.3	9.66	207.0
250	96.20	1.095	274.9	14.07	218.4
273.15	102.83	1.088	283.7	16.37	223.8
298.15	109.34	1.082	293.0	19.03	229.2
300	109.80	1.082	293.7	19.23	229.6
350	120.81	1.074	311.5	25.01	240.0
400	129.65	1.069	328.2	31.28	250.0
450	136.77	1.065	343.9	37.94	259.6
500	142.55	1.062	358.6	44.93	268.8
550	147.34	1.060	372.4	52.18	277.6
600	151.38	1.058	385.4	59.65	286.0
650	154.88	1.057	397.7	67.31	294.1
700	157.96	1.056	409.3	75.13	301.9
750	160.73	1.055	420.3	83.10	309.5
800	163.25	1.054	430.7	91.20	316.7
850	165.58	1.053	440.7	99.42	323.7
900	167.74	1.052	450.2	107.76	330.5
950	169.77	1.051	459.3	116.19	337.0
1000	171.67	1.051	468.1	124.73	343.4

Table 67a. Thermodynamic functions of tetracyanomercurate(II) $Hg(CN)_4^{2-}$

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	110.59	1.081	316.6	7.13	245.3
150	135.91	1.065	366.8	13.36	277.7
200	149.80	1.059	407.9	20.53	305.3
250	157.67	1.056	442.3	28.24	329.4
273.15	160.17	1.055	456.4	31.92	339.5
298.15	162.35	1.054	470.5	35.95	349.9
300	162.50	1.054	471.5	36.25	350.7
350	165.79	1.053	496.8	44.46	369.8
400	168.34	1.052	519.1	52.82	387.1
450	170.54	1.051	539.1	61.29	402.9
500	172.59	1.051	557.2	69.87	417.4
550	174.58	1.050	573.7	78.55	430.9
600	176.52	1.049	589.0	87.32	443.4
650	178.41	1.049	603.2	96.20	455.2
700	180.23	1.048	616.5	105.16	466.2
750	181.98	1.048	629.0	114.22	476.7
800	183.64	1.047	640.8	123.36	486.6
850	185.20	1.047	651.9	132.58	496.0
900	186.66	1.047	662.6	141.88	504.9
950	188.02	1.046	672.7	151.25	513.5
1000	189.28	1.046	682.4	160.68	521.7

Table 68. Thermodynamic functions of hydrogensulfite (HSO_3^-)

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	33.94	1.324	222.3	3.33	189.0
150	37.20	1.288	236.6	5.10	202.6
200	42.10	1.246	248.0	7.08	212.6
250	47.61	1.212	257.9	9.32	220.7
273.15	50.23	1.198	262.3	10.46	224.0
298.15	53.05	1.186	266.8	11.75	227.4
300	53.26	1.185	267.1	11.85	227.6
350	58.71	1.165	275.8	14.65	233.9
400	63.74	1.150	283.9	17.71	239.7
450	68.26	1.139	291.7	21.01	245.0
500	72.25	1.130	299.1	24.53	250.1
550	75.76	1.123	306.2	28.23	254.8
600	78.83	1.118	312.9	32.09	259.4
650	81.52	1.114	319.3	36.10	263.8
700	83.89	1.110	325.4	40.24	267.9
750	85.98	1.107	331.3	44.49	272.0
800	87.83	1.105	336.9	48.84	275.9
850	89.47	1.102	342.3	53.27	279.6
900	90.94	1.101	347.4	57.78	283.2
950	92.25	1.099	352.4	62.36	286.7
1000	93.43	1.098	357.1	67.00	290.1

Table 69. Thermodynamic functions of fluorosulfate (FSO_3^-)

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	34.99	1.312	229.0	3.35	195.4
150	40.94	1.255	244.1	5.24	209.2
200	48.63	1.206	257.0	7.47	219.6
250	54.15	1.174	268.6	10.10	228.3
273.15	59.38	1.163	273.8	11.43	231.9
298.15	62.68	1.153	279.1	12.96	235.6
300	62.91	1.152	279.5	13.08	235.9
350	68.84	1.137	289.6	16.37	242.9
400	73.95	1.127	299.2	19.95	249.3
450	78.33	1.119	308.1	23.76	255.4
500	82.05	1.113	316.6	27.77	261.1
550	85.21	1.108	324.6	31.95	266.5
600	87.90	1.104	332.1	36.28	271.6
650	90.18	1.102	339.2	40.74	276.6
700	92.13	1.099	346.0	45.29	281.3
750	93.80	1.097	352.4	49.94	285.8
800	95.24	1.096	358.5	54.67	290.2
850	96.48	1.094	364.3	59.46	294.4
900	97.56	1.093	369.9	64.32	298.4
950	98.51	1.092	375.2	69.22	302.3
1000	99.33	1.091	380.2	74.16	306.1

Table 70. Thermodynamic functions of chlorosulfate ($ClSO_3^-$)

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	38.63	1.274	235.9	3.44	201.6
150	47.83	1.210	253.3	5.59	216.0
200	56.59	1.172	268.3	8.21	227.2
250	63.92	1.150	281.7	11.23	236.8
273.15	66.88	1.142	287.5	12.74	240.9
298.15	69.82	1.135	293.5	14.45	245.0
300	70.02	1.135	293.9	14.58	245.3
350	75.16	1.124	305.1	18.21	253.1
400	79.50	1.117	315.5	22.08	260.2
450	83.19	1.111	325.0	26.15	266.9
500	86.31	1.107	334.0	30.39	273.2
550	88.95	1.103	342.3	34.78	279.1
600	91.19	1.100	350.2	39.28	284.7
650	93.10	1.098	357.5	43.89	290.0
700	94.73	1.096	364.5	48.59	295.1
750	96.13	1.095	371.1	53.36	299.9
800	97.33	1.093	377.3	58.20	304.6
850	98.37	1.092	383.3	63.09	309.0
900	99.27	1.091	388.9	68.03	313.3
950	100.06	1.091	394.3	73.01	317.4
1000	100.75	1.090	399.4	78.04	321.4

Table 71. Thermodynamic functions of thiosulfate $S_2O_3^{2-}$

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	42.60	1.242	230.4	3.64	194.1
150	50.91	1.195	249.3	5.97	209.5
200	58.89	1.164	265.0	8.72	221.4
250	65.98	1.144	279.0	11.85	231.6
273.15	68.95	1.137	284.9	13.41	235.8
298.15	71.93	1.131	291.1	15.17	240.2
300	72.14	1.130	291.5	15.30	240.5
350	77.40	1.120	303.1	19.04	248.7
400	81.82	1.113	313.7	23.03	256.1
450	85.51	1.108	323.6	27.21	263.1
500	88.58	1.104	332.7	31.57	269.6
550	91.13	1.100	341.3	36.06	275.7
600	93.25	1.098	349.3	40.67	281.5
650	95.03	1.096	356.9	45.38	287.0
700	96.53	1.094	364.0	50.17	292.3
750	97.79	1.093	370.7	55.03	297.3
800	98.88	1.092	377.0	59.95	302.1
850	99.80	1.091	383.0	64.92	306.7
900	100.60	1.090	388.8	69.93	311.1
950	101.29	1.089	394.2	74.98	315.3
1000	101.90	1.089	399.4	80.06	319.4

Table 72. Thermodynamic functions of hydrogencarbonate (HCO_3^-)

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	33.47	1.331	215.5	3.33	182.2
150	35.43	1.307	229.3	5.04	195.7
200	39.68	1.265	240.1	6.91	205.5
250	45.11	1.224	249.8	9.03	213.4
273.15	47.74	1.211	253.6	10.10	216.6
298.15	50.56	1.197	257.9	11.33	219.9
300	50.77	1.196	258.2	11.42	220.1
350	56.16	1.174	266.4	14.10	226.2
400	61.08	1.158	274.3	17.03	231.7
450	65.47	1.145	281.7	20.20	236.8
500	69.35	1.136	288.8	23.57	241.7
550	72.75	1.129	295.6	27.13	246.3
600	75.73	1.123	302.1	30.84	250.7
650	78.36	1.119	308.2	34.69	254.9
700	80.68	1.115	314.1	38.67	258.9
750	82.74	1.112	319.8	42.76	262.8
800	84.58	1.109	325.2	46.94	266.5
850	86.23	1.107	330.3	51.21	270.1
900	87.71	1.105	335.3	55.56	273.6
950	89.05	1.103	340.1	59.98	277.0
1000	90.27	1.101	344.7	64.46	280.2

Table 73. Thermodynamic functions of hydrogenselenite ($HSeO_3^-$)

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	37.42	1.286	229.2	3.41	195.1
150	44.80	1.228	245.7	5.46	209.3
200	52.31	1.189	259.6	7.89	220.2
250	59.25	1.163	272.0	10.68	229.3
273.15	62.19	1.154	277.4	12.09	233.2
298.15	65.14	1.146	283.0	13.68	237.1
300	65.36	1.146	283.4	13.80	237.4
350	70.57	1.134	293.9	17.20	244.7
400	74.96	1.125	303.6	20.84	251.5
450	78.65	1.118	312.6	24.69	257.8
500	81.76	1.113	321.1	28.70	263.7
550	84.41	1.109	329.0	32.85	269.3
600	86.69	1.106	336.5	37.13	274.6
650	88.66	1.103	343.5	41.52	279.6
700	90.38	1.101	350.1	46.00	284.4
750	91.89	1.099	356.4	50.55	289.0
800	93.23	1.098	362.4	55.18	293.4
850	94.42	1.097	368.1	59.87	297.6
900	95.48	1.095	373.5	64.62	301.7
950	96.43	1.094	378.7	69.42	305.6
1000	97.29	1.093	383.7	74.26	309.4

Table 74. Thermodynamic functions of dicyanoargentate(I) $Ag[CN]_2^-$

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	52.54	1.188	202.7	3.67	166.0
150	67.72	1.140	227.1	6.70	182.4
200	77.09	1.121	248.0	10.34	196.2
250	82.71	1.112	265.8	14.35	208.4
273.15	84.54	1.109	273.2	16.29	213.6
298.15	86.15	1.107	280.7	18.42	218.9
300	86.25	1.107	281.2	18.58	219.3
350	88.66	1.103	294.7	22.96	229.1
400	90.46	1.101	306.7	27.44	238.1
450	91.93	1.099	317.4	32.00	246.3
500	93.23	1.098	327.2	36.63	253.9
550	94.43	1.097	336.1	41.32	261.0
600	95.56	1.095	344.4	46.07	267.6
650	96.62	1.094	352.1	50.87	273.8
700	97.64	1.093	359.3	55.73	279.7
750	98.59	1.092	366.0	60.64	285.2
800	99.49	1.091	372.4	65.59	290.5
850	100.32	1.090	378.5	70.58	295.5
900	101.10	1.090	384.3	75.62	300.2
950	101.83	1.089	389.7	80.69	304.8
1000	102.50	1.088	395.0	85.80	309.2

Table 75. Thermodynamic functions of dicyanoaurate(I) $Au(CN)_2^-$

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	48.93	1.205	211.5	3.64	175.1
150	62.33	1.154	234.0	6.44	191.1
200	72.24	1.130	253.4	9.82	204.3
250	78.80	1.118	270.2	13.60	215.8
273.15	81.03	1.114	277.3	15.45	220.7
298.15	83.03	1.111	284.5	17.51	225.8
300	83.16	1.111	285.0	17.66	226.1
350	86.20	1.107	298.1	21.90	235.5
400	88.47	1.104	309.7	26.27	244.1
450	90.33	1.101	320.3	30.74	252.0
500	91.92	1.099	329.9	35.30	259.3
550	93.34	1.098	338.7	39.93	266.1
600	94.64	1.096	346.9	44.63	272.5
650	95.85	1.095	354.5	49.39	278.5
700	96.98	1.094	361.6	54.21	284.2
750	98.03	1.093	368.4	59.09	289.6
800	99.00	1.092	374.7	64.01	294.7
850	99.90	1.091	380.8	68.99	299.6
900	100.74	1.090	386.5	74.00	304.3
950	101.51	1.089	392.0	79.06	308.7
1000	102.21	1.089	397.2	84.15	313.0

Table 76. Thermodynamic functions of tetrachloroaurate(III) $AuCl_4^-$

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	66.66	1.143	270.5	4.57	224.9
150	82.01	1.113	300.7	8.31	245.3
200	90.97	1.101	325.6	12.66	262.4
250	96.22	1.095	346.6	17.35	277.2
273.15	97.91	1.093	355.2	19.60	283.4
298.15	99.37	1.091	363.8	22.06	289.8
300	99.46	1.091	364.4	22.25	290.3
350	101.57	1.089	379.9	27.28	302.0
400	103.00	1.088	393.6	32.39	312.6
450	104.02	1.087	405.8	37.57	322.3
500	104.76	1.086	416.8	42.79	331.2
550	105.32	1.086	426.8	48.04	339.4
600	105.75	1.085	436.0	53.32	347.1
650	106.08	1.085	444.4	58.62	354.3
700	106.35	1.085	452.3	63.93	361.0
750	106.57	1.085	459.7	69.25	367.3
800	106.75	1.084	466.5	74.59	373.3
850	106.90	1.084	473.0	79.93	379.0
900	107.03	1.084	479.1	85.27	384.4
950	107.14	1.084	484.9	90.63	389.5
1000	107.23	1.084	490.4	95.99	394.4

Table 76a. Thermodynamic functions of tetrabromoaurate(III) $AuBr_4^-$

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	84.73	1.109	308.3	5.78	250.6
150	95.67	1.095	345.1	10.33	276.2
200	100.60	1.090	373.4	15.25	297.1
250	103.13	1.088	396.1	20.35	314.7
273.15	103.89	1.087	405.3	22.74	322.0
298.15	104.54	1.086	414.4	25.35	329.4
300	104.58	1.086	415.0	25.54	329.9
350	105.48	1.086	431.2	30.80	343.3
400	106.07	1.085	445.4	36.09	355.2
450	106.49	1.085	457.9	41.40	365.9
500	106.79	1.084	469.1	46.73	375.7
550	107.01	1.084	479.3	52.08	384.6
600	107.18	1.084	488.6	57.43	392.9
650	107.31	1.084	497.2	62.79	400.6
700	107.42	1.084	505.2	68.16	407.8
750	107.50	1.084	512.6	73.54	414.5
800	107.57	1.084	519.5	78.91	420.9
850	107.63	1.084	526.0	84.29	426.9
900	107.68	1.084	532.2	89.68	432.6
950	107.72	1.084	538.0	95.06	438.0
1000	107.76	1.084	543.6	100.45	443.1

Table 76b. Thermodynamic functions of Silver diammine $Ag(NH_3)_2^-$

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	45.46	1.224	172.0	3.66	135.4
150	57.15	1.170	192.7	6.23	151.2
200	67.91	1.140	210.6	9.36	163.8
250	77.22	1.121	226.8	13.00	174.8
273.15	81.09	1.114	233.8	14.83	179.5
298.15	85.00	1.108	241.1	16.91	184.4
300	85.28	1.108	241.6	17.06	184.7
350	92.45	1.099	255.3	21.51	193.9
400	98.98	1.092	268.1	26.30	202.4
450	105.01	1.086	280.1	31.40	210.3
500	110.63	1.081	291.5	36.79	217.9
550	115.90	1.077	302.3	42.46	225.1
600	120.87	1.074	312.6	48.38	231.9
650	125.56	1.071	322.4	54.54	238.5
700	130.00	1.068	331.9	60.93	244.9
750	134.20	1.066	341.0	67.54	251.0
800	138.19	1.064	349.8	74.35	256.9
850	141.96	1.062	358.3	81.35	262.6
900	145.53	1.061	366.5	88.54	268.1
950	148.90	1.059	374.5	95.90	273.5
1000	152.07	1.058	382.2	103.43	278.8

Table 77.* Thermodynamic functions of palladium(II) tetraammine $Pd(NH_3)_4^{2+}$

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	90.97	1.101	285.2	6.07	224.4
150	112.31	1.080	322.9	10.76	251.2
200	130.69	1.068	355.3	16.43	273.2
250	147.37	1.060	384.5	22.97	292.6
273.15	154.65	1.057	397.1	26.27	300.9
298.15	153.94	1.057	410.3	30.02	309.6
300	154.48	1.057	411.2	30.31	310.2
350	168.77	1.052	436.1	38.39	326.4
400	182.05	1.046	459.5	47.17	341.6
450	194.36	1.045	481.7	56.58	355.9
500	205.78	1.042	502.8	66.59	369.6
550	216.39	1.040	522.9	77.15	382.6
600	226.28	1.038	542.1	88.22	395.1
650	235.54	1.037	560.6	99.77	407.1
700	244.24	1.035	578.4	111.76	418.7
750	252.42	1.034	595.5	124.18	429.9
800	260.12	1.033	612.1	137.00	440.8
850	267.36	1.032	628.1	150.19	451.4
900	274.18	1.031	643.5	163.73	461.6
950	280.59	1.031	658.5	177.60	471.6
1000	286.61	1.030	673.1	191.78	481.3

Table 78.* Thermodynamic functions of platinum(II) tetraammine $Pt(NH_3)_4^{2+}$

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	88.51	1.104	293.7	5.93	234.4
150	109.83	1.082	330.4	10.49	260.4
200	119.62	1.075	362.1	16.03	282.0
250	136.11	1.065	390.6	22.43	300.9
273.15	143.38	1.062	403.0	25.66	309.0
298.15	151.00	1.058	415.9	29.34	317.4
300	151.56	1.058	416.8	29.62	318.1
350	166.05	1.053	441.3	37.57	333.9
400	179.60	1.049	464.3	46.21	348.8
450	192.20	1.045	486.2	55.51	362.9
500	203.90	1.043	507.1	65.42	376.2
550	214.76	1.040	527.0	75.89	389.0
600	224.87	1.038	546.1	86.88	401.4
650	234.32	1.037	564.5	98.36	413.2
700	243.18	1.035	582.2	110.30	424.6
750	251.49	1.034	599.3	122.67	435.7
800	259.30	1.033	615.8	135.44	446.5
850	266.64	1.032	631.7	148.59	456.9
900	273.54	1.031	647.1	162.10	467.0
950	280.02	1.031	662.1	175.94	476.9
1000	286.11	1.030	676.6	190.10	486.5

Table 79. Thermodynamic functions of hydrogensulfate (HSO_4^-)

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	35.73	1.303	228.5	3.36	194.9
150	43.72	1.235	244.4	5.33	208.8
200	53.48	1.184	258.3	7.76	219.5
250	62.80	1.153	271.2	10.67	228.5
273.15	66.80	1.142	277.0	12.17	232.4
298.15	70.87	1.133	283.0	13.90	236.4
300	71.16	1.132	283.4	14.03	236.7
350	78.47	1.119	295.0	17.77	244.2
400	84.76	1.109	305.9	21.86	251.2
450	90.13	1.102	316.2	26.23	257.9
500	94.69	1.096	325.9	30.86	264.2
550	98.57	1.092	335.1	35.69	270.2
600	101.89	1.089	343.8	40.70	276.0
650	104.75	1.086	352.1	45.87	281.5
700	107.24	1.084	360.0	51.17	286.9
750	109.41	1.082	367.4	56.59	292.0
800	111.32	1.081	374.6	62.11	296.9
850	113.00	1.079	381.4	67.72	301.7
900	114.51	1.078	387.9	73.41	306.3
950	115.86	1.077	394.1	79.17	310.8
1000	117.06	1.076	400.1	84.99	315.1

Table 80. Thermodynamic functions of hydrogenselenate ($HSeO_4^-$)

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	39.66	1.265	233.8	3.45	199.3
150	50.62	1.197	251.9	5.71	213.9
200	61.12	1.157	268.0	8.50	225.4
250	70.65	1.133	282.6	11.80	235.4
273.15	74.69	1.125	289.1	13.49	239.7
298.15	78.76	1.118	295.8	15.40	244.1
300	79.05	1.118	296.3	15.55	244.5
350	86.20	1.107	309.0	19.69	252.8
400	92.15	1.099	320.9	24.15	260.6
450	97.05	1.094	332.1	28.88	267.9
500	101.10	1.090	342.5	33.84	274.8
550	104.46	1.086	352.3	38.98	281.4
600	107.28	1.084	361.5	44.28	287.7
650	109.68	1.082	370.2	49.70	293.8
700	111.74	1.080	378.4	55.24	299.5
750	113.52	1.079	386.2	60.87	305.0
800	115.08	1.078	393.6	66.59	310.3
850	116.46	1.077	400.6	72.38	315.4
900	117.69	1.076	407.3	78.23	320.4
950	118.79	1.075	413.7	84.15	325.1
1000	119.77	1.075	419.8	90.11	329.7

Table 81. Thermodynamic functions of hydrogenphosphate HPO_4^{2-}

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	35.93	1.301	229.6	3.37	195.9
150	43.42	1.237	245.5	5.34	209.9
200	52.14	1.190	259.2	7.73	220.5
250	60.48	1.159	271.7	10.55	229.5
273.15	64.10	1.149	277.2	11.99	233.3
298.15	67.80	1.140	283.0	13.64	237.3
300	68.06	1.139	283.4	13.77	237.5
350	74.77	1.125	294.4	17.34	244.9
400	80.59	1.115	304.8	21.23	251.7
450	85.62	1.108	314.6	25.39	258.2
500	89.96	1.102	323.8	29.78	264.3
550	93.73	1.097	332.6	34.37	270.1
600	97.02	1.094	340.9	39.14	275.7
650	99.92	1.091	348.8	44.07	281.0
700	102.50	1.088	356.3	49.13	286.1
750	104.81	1.086	363.4	54.31	291.0
800	106.88	1.084	370.3	59.61	295.8
850	108.74	1.083	376.8	65.00	300.3
900	110.43	1.081	383.1	70.48	304.8
950	111.97	1.080	389.1	76.04	309.0
1000	113.37	1.079	394.9	81.67	313.2

Table 82. Thermodynamic functions of dihydrogenphosphate $H_2PO_4^-$

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	34.52	1.317	233.2	3.35	199.8
150	38.37	1.277	247.9	5.16	213.5
200	44.63	1.229	259.7	7.22	223.6
250	53.14	1.185	270.5	9.64	231.9
273.15	57.58	1.169	275.4	10.94	235.4
298.15	62.54	1.153	280.7	12.44	239.0
300	62.91	1.152	281.1	12.56	239.2
350	72.82	1.129	291.5	15.95	246.0
400	82.17	1.113	301.9	19.83	252.3
450	90.60	1.101	312.1	24.15	258.4
500	98.04	1.093	322.0	28.87	264.2
550	104.52	1.086	331.6	33.94	269.9
600	110.15	1.082	341.0	39.31	275.5
650	115.03	1.078	350.0	44.95	280.9
700	119.26	1.075	358.7	50.80	286.1
750	122.95	1.073	367.0	56.86	291.2
800	126.17	1.071	375.1	63.09	296.2
850	129.00	1.069	382.8	69.47	301.1
900	131.49	1.068	390.3	75.99	305.8
950	133.68	1.066	397.4	82.62	310.5
1000	135.63	1.065	404.3	89.35	315.0

Table 83. Thermodynamic functions of hydrogenarsenate $HAsO_4^{2-}$

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	40.88	1.255	238.8	3.48	204.0
150	52.53	1.188	257.6	5.82	218.8
200	63.24	1.151	274.2	8.72	230.6
250	72.78	1.129	289.4	12.12	240.9
273.15	76.77	1.121	296.0	13.85	245.3
298.15	80.76	1.115	302.9	15.82	249.8
300	81.04	1.114	303.4	15.97	250.2
350	87.98	1.104	316.4	20.20	258.7
400	93.72	1.097	328.6	24.75	266.7
450	98.43	1.092	339.9	29.56	274.2
500	102.31	1.088	350.5	34.58	281.3
550	105.54	1.086	360.4	39.78	288.0
600	108.25	1.083	369.7	45.13	294.5
650	110.56	1.081	378.4	50.60	300.6
700	112.54	1.080	386.7	56.18	306.4
750	114.27	1.078	394.5	61.85	312.1
800	115.78	1.077	401.9	67.60	317.5
850	117.12	1.076	409.0	73.42	322.6
900	118.31	1.076	415.7	79.31	327.6
950	119.37	1.075	422.2	85.25	332.4
1000	120.33	1.074	428.3	91.25	337.1

Table 84. Thermodynamic functions of hydrogenvanadate HVO_4^{2-}

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	38.25	1.278	235.8	3.42	201.7
150	48.68	1.206	253.2	5.58	216.0
200	59.59	1.162	268.8	8.29	227.3
250	69.47	1.136	283.1	11.52	237.0
273.15	73.60	1.127	289.5	13.18	241.2
298.15	77.73	1.120	296.1	15.07	245.5
300	78.02	1.119	296.6	15.22	245.9
350	85.21	1.108	309.2	19.30	254.0
400	91.19	1.100	320.9	23.72	261.7
450	96.13	1.095	332.0	28.41	268.9
500	100.24	1.090	342.3	33.32	275.7
550	103.66	1.087	352.0	38.42	282.2
600	106.56	1.085	361.2	43.68	288.4
650	109.03	1.083	369.8	49.07	294.3
700	111.16	1.081	378.0	54.57	300.0
750	113.02	1.079	385.7	60.18	305.5
800	114.64	1.078	393.1	65.87	310.7
850	116.08	1.077	400.1	71.64	315.8
900	117.36	1.076	406.7	77.48	320.7
950	118.51	1.075	413.1	83.37	325.4
1000	119.53	1.075	419.2	89.32	329.9

Table 85. Thermodynamic functions of oxalate ($C_2O_4^{2-}$)

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	44.98	1.227	231.2	3.76	193.6
150	53.71	1.183	251.1	6.23	209.6
200	61.91	1.155	267.7	9.12	222.1
250	69.46	1.134	282.3	12.41	232.7
273.15	72.63	1.129	288.6	14.05	237.1
298.15	75.98	1.123	295.1	15.91	241.7
300	76.22	1.122	295.6	16.05	242.1
350	82.42	1.112	307.8	20.02	250.6
400	88.02	1.104	319.2	24.28	258.5
450	93.01	1.098	329.8	28.81	265.8
500	97.43	1.093	339.9	33.58	272.7
550	101.30	1.089	349.3	38.55	279.3
600	104.68	1.086	358.3	43.70	285.5
650	107.62	1.084	366.8	49.01	291.4
700	110.19	1.082	374.9	54.45	297.1
750	112.43	1.080	382.5	60.02	302.5
800	114.38	1.078	389.9	65.69	307.8
850	116.09	1.077	396.9	71.45	312.8
900	117.59	1.076	403.5	77.30	317.7
950	118.92	1.075	409.9	83.21	322.3
1000	120.09	1.074	416.1	89.19	326.9

Table 86. Thermodynamic functions of dithionite $S_2O_4^{2-}$

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	52.53	1.188	242.7	4.00	202.6
150	64.29	1.149	266.2	6.93	220.0
200	74.38	1.126	286.2	10.41	234.1
250	83.14	1.111	303.7	14.35	246.3
273.15	86.78	1.106	311.2	16.32	251.5
298.15	90.42	1.101	319.0	18.53	256.8
300	90.68	1.101	319.6	18.70	257.2
350	97.07	1.094	334.0	23.40	267.2
400	102.39	1.088	347.4	28.39	276.4
450	106.80	1.084	359.7	33.62	285.0
500	110.44	1.081	371.1	39.06	293.0
550	113.44	1.079	381.8	44.65	300.6
600	115.94	1.077	391.8	50.39	307.8
650	118.02	1.076	401.1	56.24	314.6
700	119.76	1.075	410.0	62.19	321.1
750	121.23	1.074	418.3	68.21	327.3
800	122.48	1.073	426.1	74.31	333.2
850	123.55	1.072	433.6	80.46	338.9
900	124.47	1.072	440.7	86.66	344.4
950	125.27	1.071	447.4	92.90	349.6
1000	125.96	1.071	453.9	99.18	354.7

Table 87. Thermodynamic functions of disulfite $S_2O_5^{2-}$

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	49.69	1.201	258.0	3.83	219.7
150	63.39	1.151	280.7	6.66	236.3
200	76.21	1.122	300.7	10.15	250.0
250	87.70	1.105	319.0	14.26	262.0
273.15	92.53	1.099	327.0	16.34	267.2
298.15	97.40	1.093	335.3	18.72	272.5
300	97.75	1.093	335.9	18.90	272.9
350	106.37	1.085	351.6	24.01	283.0
400	113.66	1.079	366.3	29.51	292.5
450	119.77	1.075	380.1	35.35	301.5
500	124.88	1.071	393.0	41.47	310.0
550	129.14	1.069	405.1	47.83	318.1
600	132.71	1.067	416.5	54.38	325.8
650	135.70	1.065	427.2	61.09	333.2
700	138.23	1.064	437.4	67.94	340.3
750	140.38	1.063	447.0	74.91	347.1
800	142.21	1.062	456.1	81.97	353.6
850	143.79	1.061	464.8	89.12	359.9
900	145.14	1.061	473.0	96.35	366.0
950	146.32	1.060	480.9	103.63	371.8
1000	147.35	1.060	488.4	110.98	377.5

Table 88. Thermodynamic functions of dithionate $S_2O_6^{2-}$

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	54.12	1.182	249.9	3.96	210.4
150	71.58	1.131	275.2	7.11	227.8
200	86.84	1.106	298.0	11.08	242.6
250	99.85	1.091	318.9	15.75	255.6
273.15	105.23	1.086	327.8	18.13	261.5
298.15	110.64	1.081	337.3	20.83	267.5
300	111.03	1.081	338.0	21.03	267.9
350	120.66	1.074	355.8	26.83	279.2
400	128.92	1.069	372.5	33.07	289.8
450	135.95	1.065	388.1	39.70	299.9
500	141.92	1.062	402.8	46.65	309.4
550	146.97	1.060	416.5	53.88	318.6
600	151.25	1.058	429.5	61.34	327.3
650	154.87	1.057	441.8	68.99	335.6
700	157.96	1.056	453.3	76.81	343.6
750	160.60	1.055	464.3	84.78	351.3
800	162.87	1.054	474.8	92.87	358.7
850	164.83	1.053	484.7	101.06	365.8
900	166.53	1.053	494.2	109.35	372.7
950	168.01	1.052	503.2	117.71	379.3
1000	169.30	1.052	511.9	126.14	385.7

Table 89. Thermodynamic functions of peroxydisulfate $S_2O_8^{2-}$

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	41.78	1.248	261.9	3.51	225.9
150	59.47	1.163	281.0	6.01	241.0
200	81.05	1.114	301.1	9.52	253.5
250	102.04	1.089	321.4	14.10	265.0
273.15	111.03	1.081	330.9	16.57	270.2
298.15	120.10	1.074	341.0	19.46	275.7
300	120.75	1.074	341.7	19.68	276.1
350	136.79	1.065	361.6	26.13	286.9
400	150.31	1.059	380.8	33.32	297.5
450	161.62	1.054	399.1	41.13	307.8
500	171.06	1.051	416.7	49.45	317.8
550	178.94	1.049	433.4	58.21	327.5
600	185.54	1.047	449.2	67.33	337.0
650	191.09	1.045	464.3	76.74	346.2
700	195.78	1.044	478.6	86.42	355.2
750	199.77	1.043	492.3	96.31	363.9
800	203.18	1.043	505.3	106.39	372.3
850	206.12	1.042	517.7	116.62	380.5
900	208.66	1.042	529.6	126.99	388.5
950	210.86	1.041	540.9	137.48	396.2
1000	212.79	1.041	551.8	148.07	403.7

Table 90. Thermodynamic functions of tetrathionate $S_4O_6^{2-}$

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	46.73	1.216	271.9	3.72	234.7
150	64.40	1.148	294.0	6.48	250.8
200	84.46	1.109	315.3	10.20	264.3
250	103.86	1.087	336.2	14.91	276.6
273.15	112.26	1.080	345.8	17.42	282.0
298.15	120.83	1.074	356.0	20.33	287.8
300	121.45	1.073	356.7	20.55	288.2
350	136.85	1.065	376.7	27.02	299.5
400	150.06	1.059	395.8	34.20	310.3
450	161.23	1.054	414.2	41.99	320.8
500	170.62	1.051	431.6	50.30	331.1
550	178.51	1.049	448.3	59.03	341.0
600	185.13	1.047	464.1	68.13	350.6
650	190.72	1.046	479.2	77.53	359.9
700	195.45	1.044	493.5	87.18	368.9
750	199.47	1.043	507.1	97.06	377.7
800	202.92	1.043	520.1	107.12	386.2
850	205.88	1.042	532.5	117.34	394.4
900	208.44	1.042	544.3	127.70	402.4
950	210.67	1.041	555.6	138.18	410.2
1000	212.61	1.041	566.5	148.76	417.7

Table 91. Thermodynamic functions of hypophosphate $P_2O_6^{4-}$

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	55.49	1.176	251.0	4.03	210.7
150	73.66	1.127	277.0	7.26	228.5
200	89.57	1.102	300.4	11.35	243.6
250	103.10	1.088	321.9	16.18	257.1
273.15	108.66	1.083	331.2	18.63	263.0
298.15	114.24	1.078	341.0	21.42	269.2
300	114.63	1.078	341.7	21.63	269.6
350	124.44	1.072	360.1	27.61	281.2
400	132.71	1.067	377.3	34.05	292.2
450	139.63	1.063	393.4	40.86	302.5
500	145.42	1.061	408.4	47.99	312.4
550	150.25	1.059	422.5	55.39	321.8
600	154.29	1.057	435.7	63.00	330.7
650	157.68	1.056	448.2	70.81	339.3
700	160.54	1.055	460.0	78.76	347.5
750	162.98	1.054	471.2	86.85	355.4
800	165.05	1.053	481.7	95.06	362.9
850	166.84	1.052	491.8	103.35	370.2
900	168.38	1.052	501.4	111.73	377.2
950	169.71	1.052	510.5	120.19	384.0
1000	170.88	1.051	519.3	128.70	390.6

Table 92. Thermodynamic functions of diphosphate $P_2O_7^{4-}$

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	47.19	1.214	256.8	3.67	220.2
150	66.99	1.142	279.6	6.51	236.2
200	86.99	1.106	301.7	10.37	249.8
250	104.86	1.086	323.0	15.17	262.3
273.15	112.28	1.080	332.6	17.69	267.9
298.15	119.70	1.075	342.8	20.59	273.8
300	120.23	1.074	343.5	20.81	274.2
350	133.21	1.067	363.1	27.15	285.5
400	144.05	1.061	381.6	34.09	296.4
450	153.05	1.057	399.1	41.53	306.8
500	160.51	1.055	415.6	49.37	316.9
550	166.70	1.052	431.2	57.56	326.6
600	171.86	1.051	446.0	66.03	335.9
650	176.17	1.050	459.9	74.73	344.9
700	179.80	1.048	473.1	83.63	353.6
750	182.88	1.048	485.6	92.70	362.0
800	185.50	1.047	497.5	101.91	370.1
850	187.74	1.046	508.8	111.24	377.9
900	189.68	1.046	519.6	120.68	385.5
950	191.36	1.045	529.9	130.21	392.8
1000	192.82	1.045	539.7	139.81	399.9

Table 93. Thermodynamic functions of dichromate $Cr_2O_7^{2-}$

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	61.38	1.157	271.0	4.18	229.2
150	88.23	1.104	301.1	7.93	248.2
200	110.06	1.082	329.6	12.91	265.0
250	127.36	1.070	356.1	18.86	280.6
273.15	134.18	1.066	367.7	21.89	287.5
298.15	140.81	1.063	379.7	25.33	294.7
300	141.27	1.063	380.6	25.59	295.3
350	152.45	1.058	403.2	32.95	309.1
400	161.41	1.054	424.2	40.80	322.2
450	168.60	1.052	443.6	49.06	334.6
500	174.39	1.050	461.7	57.64	346.4
550	179.09	1.049	478.6	66.48	357.7
600	182.92	1.048	494.3	75.53	368.4
650	186.07	1.047	509.1	84.76	378.7
700	188.69	1.046	523.0	94.13	388.5
750	190.88	1.046	536.1	103.62	397.9
800	192.73	1.045	548.4	113.21	406.9
850	194.30	1.045	560.2	122.89	415.6
900	195.65	1.044	571.3	132.64	423.9
950	196.81	1.044	581.9	142.45	432.0
1000	197.81	1.044	592.0	152.32	439.7

Table 94. Thermodynamic functions of hydrazinium ($N_2H_5^+$)

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	33.49	1.330	190.6	3.33	157.3
150	34.71	1.315	204.4	5.03	170.8
200	36.88	1.291	214.6	6.82	180.5
250	39.93	1.263	223.2	8.73	188.2
273.15	41.60	1.250	226.8	9.68	191.4
298.15	43.54	1.236	230.5	10.74	194.5
300	43.69	1.235	230.8	10.82	194.7
350	47.86	1.210	237.8	13.11	200.4
400	52.16	1.190	244.5	15.61	205.5
450	56.42	1.173	250.9	18.32	210.2
500	60.57	1.159	257.0	21.25	214.5
550	64.61	1.148	263.0	24.38	218.7
600	68.55	1.138	268.8	27.71	222.6
650	72.40	1.130	274.4	31.23	226.4
700	76.17	1.123	279.9	34.95	230.0
750	79.86	1.116	285.3	38.85	233.5
800	83.46	1.111	290.6	42.93	236.9
850	86.95	1.106	295.8	47.19	240.2
900	90.34	1.101	300.8	51.62	243.5
950	93.60	1.097	305.8	56.22	246.6
1000	96.73	1.094	310.7	60.98	249.7

Table 95. Thermodynamic functions of hydrazinium $N_2H_6^{2+}$

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	33.77	1.327	184.2	3.33	150.9
150	35.47	1.306	198.2	5.06	164.4
200	37.98	1.280	208.7	6.89	174.2
250	41.48	1.251	217.5	8.88	182.0
273.15	43.41	1.237	221.3	9.86	185.2
298.15	45.67	1.223	225.2	10.97	188.4
300	45.84	1.222	225.5	11.06	188.6
350	50.68	1.196	232.9	13.47	194.4
400	55.64	1.176	240.0	16.13	199.7
450	60.55	1.159	246.8	19.03	204.5
500	65.33	1.146	253.5	22.18	209.1
550	69.99	1.135	259.9	25.56	213.4
600	74.55	1.126	266.2	29.18	217.6
650	79.04	1.118	272.3	33.02	221.6
700	83.47	1.111	278.4	37.08	225.4
750	87.82	1.105	284.3	41.36	229.1
800	92.09	1.099	290.1	45.86	232.8
850	96.25	1.095	295.8	50.57	236.3
900	100.30	1.090	301.4	55.48	239.8
950	104.22	1.087	306.9	60.60	243.1
1000	107.99	1.083	312.4	65.90	246.5

Table 96. Thermodynamic functions of hexafluoroaluminate AlF_6^{3-}

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	54.20	1.181	231.4	3.84	193.1
150	79.70	1.116	258.3	7.19	216.3
200	100.44	1.090	284.2	11.72	235.6
250	115.22	1.078	308.3	17.14	239.8
273.15	120.43	1.074	318.7	19.87	246.0
298.15	125.16	1.071	329.5	22.94	252.6
300	125.48	1.071	330.3	23.17	253.0
350	132.67	1.067	350.2	29.63	265.5
400	137.82	1.064	368.3	36.40	277.3
450	141.60	1.062	384.7	43.39	288.3
500	144.44	1.061	399.8	50.55	298.7
550	146.62	1.060	413.7	57.83	308.5
600	148.32	1.059	426.5	65.20	317.8
650	149.67	1.059	438.4	72.65	326.7
700	150.76	1.058	449.6	80.16	335.0
750	151.65	1.058	460.0	87.72	343.0
800	152.39	1.058	469.8	95.33	350.7
850	153.01	1.057	479.1	102.96	357.9
900	153.53	1.057	487.8	110.63	364.9
950	153.97	1.057	496.1	118.31	371.6
1000	154.35	1.057	504.0	126.02	378.0

Table 97. Thermodynamic functions of hexafluorosilicate SiF_6^{2-}

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	44.81	1.228	226.5	3.56	190.9
150	65.48	1.145	248.5	6.31	206.4
200	85.43	1.108	270.1	10.09	219.7
250	101.39	1.089	291.0	14.78	231.9
273.15	107.41	1.084	300.2	17.20	237.3
298.15	113.05	1.079	309.9	19.96	243.0
300	113.44	1.079	310.6	20.17	243.4
350	122.41	1.073	328.8	26.08	254.3
400	129.12	1.069	345.6	32.37	264.7
450	134.21	1.066	361.1	38.96	274.5
500	138.12	1.064	375.5	45.77	283.9
550	141.18	1.063	388.8	52.76	292.9
600	143.60	1.061	401.2	59.88	301.4
650	145.55	1.061	412.7	67.11	309.5
700	147.14	1.060	423.6	74.43	317.3
750	148.44	1.059	433.8	81.82	324.7
800	149.53	1.059	443.4	89.27	331.8
850	150.45	1.058	452.5	96.77	338.7
900	151.22	1.058	461.1	104.31	345.2
950	151.89	1.058	469.3	111.89	351.5
1000	152.46	1.058	477.1	119.50	357.6

Table 98. Thermodynamic functions of hexafluorostannate(IV) SnF_6^{2-}

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	65.14	1.146	246.8	4.27	204.1
150	89.63	1.102	278.1	8.17	223.6
200	107.77	1.084	306.5	13.13	240.8
250	120.54	1.074	332.0	18.86	256.6
273.15	125.05	1.071	342.9	21.70	263.4
298.15	129.15	1.069	354.0	24.88	270.6
300	129.42	1.069	354.8	25.12	271.1
350	135.68	1.065	375.2	31.75	284.5
400	140.19	1.063	393.7	38.66	297.0
450	143.50	1.062	410.4	45.75	308.7
500	146.00	1.060	425.6	52.99	319.7
550	147.91	1.060	439.7	60.34	329.9
600	149.41	1.059	452.6	67.78	339.6
650	150.61	1.058	464.6	75.28	348.8
700	151.57	1.058	475.8	82.83	357.5
750	152.36	1.058	486.3	90.43	365.7
800	153.02	1.057	496.1	98.07	373.5
850	153.56	1.057	505.4	105.73	381.0
900	154.02	1.057	514.2	113.42	388.2
950	154.42	1.057	522.6	121.14	395.0
1000	154.76	1.057	530.5	128.86	401.6

Table 99. Thermodynamic functions of hexachlororhodate(III) $RhCl_6^{3-}$

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	90.32	1.101	276.1	5.28	223.4
150	117.08	1.076	310.5	10.65	249.2
200	132.49	1.067	354.7	16.85	270.4
250	140.64	1.063	385.2	23.69	290.4
273.15	143.19	1.062	397.8	26.98	299.0
298.15	145.37	1.061	410.4	30.59	307.8
300	145.52	1.061	411.3	30.86	308.4
350	148.63	1.059	434.0	38.22	324.8
400	150.72	1.058	454.0	45.70	339.7
450	152.18	1.058	471.8	53.28	353.4
500	153.25	1.057	487.9	60.92	366.1
550	154.05	1.057	502.6	68.60	377.8
600	154.66	1.057	516.0	76.32	388.8
650	155.14	1.057	528.4	84.06	399.1
700	155.53	1.056	539.9	91.83	408.7
750	155.84	1.056	550.6	99.61	417.8
800	156.09	1.056	560.7	107.41	426.4
850	156.31	1.056	570.2	115.22	434.6
900	156.48	1.056	579.1	123.04	442.4
950	156.63	1.056	587.6	130.87	449.8
1000	156.76	1.056	595.6	138.71	456.9

Table 100. Thermodynamic functions of hexachloropalladate(IV) $PdCl_6^{2-}$

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	91.03	1.101	278.3	5.41	224.3
150	117.40	1.076	320.7	10.68	249.5
200	131.87	1.067	356.7	16.95	272.0
250	140.09	1.063	387.1	23.77	292.0
273.15	142.68	1.062	399.6	27.04	300.6
298.15	144.91	1.061	412.2	30.64	309.5
300	145.06	1.061	413.1	30.90	310.1
350	148.25	1.059	435.7	38.24	326.5
400	150.41	1.059	455.7	45.71	341.4
450	151.93	1.058	473.5	53.27	355.1
500	153.04	1.057	489.5	60.90	367.7
550	153.87	1.057	504.2	68.57	379.5
600	154.51	1.057	517.6	76.28	390.4
650	155.01	1.057	530.0	84.02	400.7
700	155.41	1.057	541.5	91.78	410.4
750	155.74	1.056	552.2	99.56	419.5
800	156.00	1.056	562.3	107.35	428.1
850	156.23	1.056	571.7	115.16	436.2
900	156.41	1.056	580.7	122.98	444.0
950	156.57	1.056	589.1	130.80	451.4
1000	156.71	1.056	597.2	138.63	458.5

Table 101. Thermodynamic functions of hexachlorostannate(IV) $SnCl_6^{2-}$

T	C_p	C_p/C_v	S	$H-H_0$	$-(G-H_0)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	101.14	1.090	289.0	5.98	229.3
150	125.22	1.071	335.1	11.70	257.1
200	137.42	1.064	373.0	18.30	281.5
250	144.08	1.061	404.5	25.36	303.0
273.15	146.14	1.060	417.3	28.72	312.2
298.15	147.91	1.060	430.2	32.39	321.6
300	148.02	1.060	431.1	32.67	322.2
350	150.52	1.058	454.1	40.13	339.5
400	152.19	1.058	474.3	47.71	355.1
450	153.37	1.057	492.3	55.35	369.4
500	154.22	1.057	508.6	63.04	382.5
550	154.86	1.057	523.3	70.76	394.6
600	155.34	1.057	536.8	78.52	405.9
650	155.73	1.056	549.2	86.30	416.5
700	156.03	1.056	560.8	94.09	426.4
750	156.28	1.056	571.6	101.90	435.7
800	156.48	1.056	581.6	109.72	444.5
850	156.65	1.056	591.1	117.55	452.9
900	156.79	1.056	600.1	125.38	460.8
950	156.91	1.056	608.6	133.23	468.3
1000	157.01	1.056	616.6	141.07	475.6

Table 102.* Thermodynamic functions of hexachlororhenate(IV) $ReCl_6^{2-}$

T	C_p	C_p/C_v	S	$H-H_0$	$-(G-H_0)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	97.52	1.093	300.1	5.82	241.8
150	122.07	1.073	344.8	11.38	268.9
200	133.10	1.066	381.7	17.84	292.7
250	142.38	1.062	412.9	24.79	313.7
273.15	144.67	1.061	425.6	28.12	322.6
298.15	146.63	1.060	438.3	31.76	331.8
300	146.75	1.060	439.2	32.03	332.5
350	149.54	1.059	462.1	39.44	349.4
400	151.42	1.058	482.2	46.97	364.8
450	152.75	1.058	500.1	54.58	378.8
500	153.71	1.057	516.2	62.24	391.8
550	154.43	1.057	530.9	69.94	403.8
600	154.98	1.057	544.4	77.68	414.9
650	155.42	1.057	556.8	85.44	425.4
700	155.76	1.056	568.3	93.22	435.2
750	156.04	1.056	579.1	101.01	444.4
800	156.27	1.056	589.2	108.82	453.2
850	156.47	1.056	598.7	116.64	461.4
900	156.63	1.056	607.6	124.47	469.3
950	156.76	1.056	616.1	132.30	476.8
1000	156.88	1.056	624.1	140.14	484.0

Table 103. Thermodynamic functions of hexachloroiridate(III) $IrCl_6^{3-}$

T	C_p	C_p/C_v	S	$H-H_0$	$-(G-H_0)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	92.03	1.099	281.6	5.39	227.6
150	118.75	1.075	324.5	10.73	253.0
200	133.01	1.067	360.8	17.06	275.5
250	140.98	1.063	391.4	23.93	295.7
273.15	143.47	1.062	404.0	27.22	304.4
298.15	145.61	1.061	416.7	30.84	313.3
300	145.75	1.060	417.6	31.11	313.9
350	148.79	1.059	440.3	38.48	330.4
400	150.84	1.058	460.3	45.97	345.4
450	152.28	1.058	478.2	53.55	359.2
500	153.33	1.057	494.3	61.19	371.9
550	154.12	1.057	508.9	68.88	383.7
600	154.72	1.057	522.4	76.60	394.7
650	155.19	1.057	534.8	84.35	405.0
700	155.57	1.056	546.3	92.12	414.7
750	155.87	1.056	557.0	99.90	423.8
800	156.12	1.056	567.1	107.70	432.5
850	156.33	1.056	576.6	115.52	440.7
900	156.51	1.056	585.5	123.34	448.5
950	156.66	1.056	594.0	131.17	455.9
1000	156.78	1.056	602.0	139.00	463.0

Table 104.* Thermodynamic functions of hexachloroiridate(IV) $IrCl_6^{2-}$

T	C_p	C_p/C_v	S	$H-H_0$	$-(G-H_0)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	92.64	1.099	279.6	5.40	225.6
150	119.17	1.075	322.8	10.77	251.0
200	133.23	1.067	359.2	17.11	273.6
250	141.10	1.063	389.8	23.99	293.9
273.15	143.56	1.061	402.4	27.29	302.5
298.15	145.68	1.061	415.1	30.90	311.5
300	145.82	1.060	416.0	31.17	312.1
350	148.84	1.059	438.7	38.54	328.6
400	150.87	1.058	458.7	46.04	343.6
450	152.31	1.058	476.6	53.62	357.4
500	153.35	1.057	492.7	61.26	370.2
550	154.13	1.057	507.4	68.95	382.0
600	154.73	1.057	520.8	76.67	393.0
650	155.20	1.057	533.2	84.42	403.3
700	155.57	1.056	544.7	92.19	413.0
750	155.88	1.056	555.5	99.98	422.2
800	156.13	1.056	565.5	107.78	430.8
850	156.34	1.056	575.0	115.59	439.0
900	156.51	1.056	583.9	123.41	446.8
950	156.66	1.056	592.4	131.24	454.3
1000	156.79	1.056	600.4	139.08	461.4

Table 105. Thermodynamic functions of hexachloroplatinate(IV) $PtCl_6^{2-}$

T	C_p	C_p/C_v	S	$H-H_0$	$-(G-H_0)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	94.51	1.096	290.5	5.84	232.0
150	118.72	1.075	333.8	11.23	259.0
200	132.45	1.067	370.1	17.54	282.3
250	140.38	1.063	400.5	24.38	303.0
273.15	142.91	1.062	413.1	27.66	311.8
298.15	145.09	1.061	425.7	31.26	320.9
300	145.23	1.061	426.6	31.53	321.5
350	148.36	1.059	449.2	38.88	338.2
400	150.48	1.058	469.2	46.35	353.3
450	151.98	1.058	487.0	53.91	367.2
500	153.08	1.057	503.1	61.54	380.0
550	153.90	1.057	517.7	69.22	391.9
600	154.54	1.057	531.1	76.93	402.9
650	155.03	1.057	543.5	84.67	413.3
700	155.43	1.057	555.0	92.43	423.0
750	155.75	1.056	565.8	100.21	432.2
800	156.02	1.056	575.8	108.00	440.8
850	156.24	1.056	585.3	115.81	449.0
900	156.42	1.056	594.2	123.63	456.9
950	156.58	1.056	602.7	131.45	464.3
1000	156.71	1.056	610.7	139.28	471.4

Table 106. Thermodynamic functions of hexabromostannate(IV) $SnBr_6^{2-}$

T	C_p	C_p/C_v	S	$H-H_0$	$-(G-H_0)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	123.51	1.072	337.7	7.66	261.1
150	140.11	1.063	391.4	14.31	296.0
200	147.30	1.060	432.8	21.52	325.2
250	150.94	1.058	466.1	28.98	350.2
273.15	152.03	1.058	479.5	32.49	360.6
298.15	152.95	1.057	492.9	36.30	371.1
300	153.01	1.057	493.8	36.58	371.9
350	154.29	1.057	517.5	44.27	391.1
400	155.13	1.057	538.2	52.01	408.2
450	155.72	1.056	556.5	59.78	423.7
500	156.14	1.056	572.9	67.58	437.8
550	156.46	1.056	587.8	75.39	450.8
600	156.70	1.056	601.5	83.22	462.8
650	156.88	1.056	614.0	91.06	473.9
700	157.03	1.056	625.6	98.91	484.3
750	157.15	1.056	636.5	106.76	494.1
800	157.25	1.056	646.6	114.62	503.3
850	157.33	1.056	656.2	122.49	512.1
900	157.40	1.056	665.2	130.36	520.3
950	157.46	1.056	673.7	138.23	528.2
1000	157.51	1.056	681.7	146.10	535.6

Table 107. Thermodynamic functions of hexacyanocobaltate(III) $Co(CN)_6^{3-}$

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	106.37	1.085	292.1	6.57	226.5
150	143.07	1.062	342.3	12.81	256.9
200	173.55	1.050	387.8	20.77	284.0
250	195.40	1.044	429.0	30.02	309.0
273.15	203.14	1.043	446.7	34.64	319.9
298.15	210.19	1.041	464.8	39.81	331.3
300	210.66	1.041	466.1	40.20	332.1
350	221.62	1.039	499.4	51.02	353.7
400	229.92	1.038	529.6	62.31	373.8
450	236.60	1.036	557.1	73.98	392.7
500	242.26	1.036	582.3	85.96	410.4
550	247.24	1.035	605.6	98.20	427.1
600	251.74	1.034	627.3	110.67	442.9
650	255.83	1.034	647.7	123.36	457.9
700	259.60	1.033	666.8	136.25	472.1
750	263.05	1.033	684.8	149.32	485.7
800	266.23	1.032	701.9	162.55	498.7
850	269.15	1.032	718.1	175.94	511.1
900	271.83	1.032	733.6	189.46	523.0
950	274.28	1.031	748.3	203.12	534.5
1000	276.53	1.031	762.4	216.89	545.6

Table 108. Thermodynamic functions of hexacyanoferrate(III) $Fe(CN)_6^{3-}$

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	112.07	1.080	309.6	6.74	242.2
150	152.64	1.058	362.9	13.38	273.7
200	183.16	1.048	411.3	21.82	302.1
250	203.71	1.043	454.5	31.53	328.4
273.15	210.76	1.041	472.9	36.33	339.9
298.15	217.10	1.040	491.6	41.68	351.8
300	217.53	1.040	492.9	42.08	352.7
350	227.25	1.038	527.2	53.22	375.2
400	234.56	1.037	558.1	64.77	396.2
450	240.49	1.036	586.1	76.65	415.7
500	245.56	1.035	611.7	88.80	434.1
550	250.08	1.034	635.3	101.20	451.3
600	254.20	1.034	657.2	113.81	467.6
650	258.00	1.033	677.7	126.61	482.9
700	261.51	1.033	697.0	139.60	497.6
750	264.76	1.032	715.1	152.76	511.5
800	267.77	1.032	732.3	166.07	524.7
850	270.54	1.032	748.6	179.53	537.4
900	273.09	1.031	764.2	193.12	549.6
950	275.43	1.031	779.0	206.84	561.3
1000	277.59	1.031	793.2	220.66	572.5

Table 109. Thermodynamic functions of hexacyanoferrate(II) $Fe(CN)_6^{4-}$

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	108.16	1.083	295.8	6.73	228.6
150	144.62	1.061	346.6	13.06	259.6
200	174.55	1.050	392.6	21.07	287.2
250	196.01	1.044	434.0	30.37	312.5
273.15	203.63	1.043	451.7	35.00	323.5
298.15	210.61	1.041	469.8	40.18	335.0
300	211.08	1.041	471.1	40.57	335.9
350	222.01	1.039	504.5	51.41	357.6
400	230.39	1.037	534.7	62.73	377.9
450	237.21	1.036	562.3	74.42	396.9
500	243.04	1.035	587.6	86.43	414.7
550	248.18	1.035	611.0	98.71	431.5
600	252.81	1.034	632.8	111.24	447.4
650	257.02	1.033	653.2	123.99	462.4
700	260.86	1.033	672.4	136.94	476.7
750	264.37	1.032	690.5	150.07	490.4
800	267.58	1.032	707.6	163.37	503.4
850	270.51	1.032	724.0	176.82	515.9
900	273.18	1.031	739.5	190.41	527.9
950	275.62	1.031	754.3	204.14	539.5
1000	277.84	1.031	768.5	217.97	550.6

Table 110. Thermodynamic functions of cobalt(III) hexaammine $Co(NH_3)_6^{3+}$

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	91.09	1.100	293.9	6.42	229.7
150	121.33	1.074	333.2	11.32	257.8
200	141.36	1.062	369.6	17.69	281.2
250	167.32	1.052	404.0	25.41	302.4
273.15	178.60	1.049	419.3	29.42	311.6
298.15	190.28	1.046	435.5	34.03	321.3
300	191.12	1.045	436.7	34.38	322.1
350	212.84	1.041	467.8	44.49	340.7
400	232.62	1.037	497.5	55.63	358.4
450	250.71	1.034	526.0	67.72	375.5
500	267.38	1.032	553.3	80.68	391.9
550	282.91	1.030	579.5	94.44	407.8
600	297.55	1.029	604.7	108.96	423.1
650	311.45	1.027	629.1	124.18	438.0
700	324.72	1.026	652.7	140.09	452.5
750	337.44	1.025	675.5	156.65	466.6
800	349.63	1.024	697.7	173.83	480.4
850	361.30	1.024	719.2	191.60	493.8
900	372.45	1.023	740.2	209.95	506.9
950	383.09	1.022	760.6	228.84	519.7
1000	393.21	1.022	780.5	248.25	532.3

Table 111. Thermodynamic functions of acetate $(CH_3CO_2^-)$

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	38.13	1.279	227.5	3.47	192.8
150	42.93	1.240	243.8	5.49	207.2
200	48.64	1.206	257.0	7.78	218.1
250	54.96	1.178	268.5	10.37	227.0
273.15	58.02	1.167	273.5	11.68	230.7
298.15	61.35	1.157	278.7	13.17	234.5
300	61.60	1.156	279.1	13.28	234.8
350	68.27	1.139	289.1	16.53	241.9
400	74.71	1.125	298.6	20.10	248.4
450	80.78	1.115	307.8	23.99	254.5
500	86.38	1.107	316.6	28.17	260.2
550	91.52	1.100	325.1	32.62	265.7
600	96.21	1.095	333.2	37.32	271.0
650	100.48	1.090	341.1	42.24	276.1
700	104.38	1.087	348.7	47.36	281.0
750	107.95	1.083	356.0	52.67	285.8
800	111.22	1.081	363.1	58.15	290.4
850	114.22	1.079	369.9	63.79	294.9
900	116.99	1.077	376.5	69.57	299.2
950	119.53	1.075	382.9	75.48	303.5
1000	121.87	1.073	389.1	81.52	307.6

Table 112. Thermodynamic functions of trifluoroacetate $CF_3CO_2^-$

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	49.58	1.201	258.3	4.10	217.3
150	60.18	1.160	280.4	6.85	234.8
200	70.76	1.133	299.2	10.12	248.6
250	80.62	1.115	316.0	13.91	260.4
273.15	84.89	1.109	323.4	15.83	265.4
298.15	89.28	1.103	331.0	18.00	270.6
300	89.59	1.102	331.6	18.17	271.0
350	97.63	1.093	346.0	22.85	280.7
400	104.74	1.086	359.5	27.92	289.7
450	110.97	1.081	372.2	33.31	298.2
500	116.37	1.077	384.2	39.00	306.2
550	121.06	1.074	395.5	44.94	313.8
600	125.10	1.071	406.2	51.09	321.0
650	128.60	1.069	416.4	57.44	328.0
700	131.62	1.067	426.0	63.95	334.6
750	134.24	1.066	435.2	70.59	341.0
800	136.52	1.065	443.9	77.36	347.2
850	138.51	1.064	452.2	84.24	353.1
900	140.26	1.063	460.2	91.21	358.9
950	141.79	1.062	467.8	98.26	364.4
1000	143.14	1.062	475.1	105.39	369.8

Table 113. Thermodynamic functions of hydroxyammonium (NH_3OH^+)

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	33.48	1.330	195.6	3.33	162.3
150	34.67	1.315	209.3	5.03	175.8
200	36.79	1.292	219.6	6.81	185.5
250	39.82	1.264	228.1	8.72	193.2
273.15	41.52	1.250	231.7	9.66	196.3
298.15	43.51	1.236	235.4	10.73	199.4
300	43.67	1.235	235.7	10.81	199.6
350	48.04	1.209	242.7	13.10	205.3
400	52.61	1.188	249.4	15.61	210.4
450	57.16	1.170	255.9	18.36	215.1
500	61.55	1.156	262.1	21.33	219.5
550	65.72	1.145	268.2	24.51	223.7
600	69.64	1.136	274.1	27.89	227.6
650	73.33	1.128	279.8	31.47	231.4
700	76.79	1.121	285.4	35.22	235.1
750	80.03	1.116	290.8	39.15	238.6
800	83.07	1.111	296.1	43.22	242.0
850	85.92	1.107	301.2	47.45	245.4
900	88.60	1.104	306.2	51.81	248.6
950	91.10	1.100	311.0	56.31	251.8
1000	93.44	1.098	315.8	60.92	254.8

Table 114. Thermodynamic functions of methylammonium $CH_3NH_3^+$

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	36.07	1.300	188.5	3.40	154.6
150	38.47	1.276	203.6	5.26	168.5
200	40.88	1.255	215.0	7.25	178.8
250	44.39	1.230	224.5	9.37	187.0
273.15	46.48	1.218	228.5	10.42	190.4
298.15	49.03	1.204	232.7	11.62	193.7
300	49.23	1.203	233.0	11.71	194.0
350	55.07	1.178	241.0	14.31	200.1
400	61.44	1.157	248.8	17.22	205.7
450	67.95	1.139	256.4	20.46	210.9
500	74.36	1.126	263.9	24.02	215.9
550	80.52	1.115	271.3	27.89	220.6
600	86.39	1.106	278.5	32.06	225.1
650	91.95	1.099	285.7	36.52	229.5
700	97.19	1.094	292.7	41.25	233.7
750	102.11	1.089	299.6	46.24	237.9
800	106.75	1.084	306.3	51.46	242.0
850	111.10	1.081	312.9	56.91	245.9
900	115.18	1.078	319.4	62.56	249.8
950	119.00	1.075	325.7	68.42	253.7
1000	122.58	1.073	331.9	74.46	257.4

Table 115. Thermodynamic functions of tetramethylammonium $(CH_3)_4N^+$

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	42.86	1.241	254.6	3.51	219.5
150	60.56	1.159	275.2	6.09	234.6
200	77.49	1.120	295.0	9.55	247.3
250	93.66	1.097	314.1	13.83	258.7
273.15	101.24	1.089	322.7	16.08	263.8
298.15	109.57	1.082	331.9	18.72	269.1
300	110.19	1.082	332.6	18.92	269.5
350	127.15	1.070	350.8	24.85	279.8
400	144.10	1.061	368.9	31.64	289.8
450	160.55	1.055	386.9	39.25	299.6
500	176.23	1.050	404.6	47.68	309.2
550	190.98	1.046	422.1	56.86	318.7
600	204.79	1.042	439.3	66.76	328.0
650	217.66	1.040	456.2	77.33	337.2
700	229.64	1.038	472.8	88.51	346.3
750	240.79	1.036	489.0	100.28	355.3
800	251.16	1.034	504.9	112.58	364.2
850	260.79	1.033	520.4	125.38	372.9
900	269.74	1.032	535.6	138.65	381.5
950	278.05	1.031	550.4	152.34	390.0
1000	285.76	1.030	564.8	166.44	398.4

Table 116. Thermodynamic functions of methylsulfonate $CH_3SO_3^-$

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	39.71	1.265	231.9	3.47	197.2
150	49.76	1.201	249.8	5.70	211.8
200	60.11	1.161	265.6	8.45	223.3
250	70.09	1.135	280.1	11.70	233.2
273.15	74.57	1.125	286.5	13.38	237.5
298.15	79.27	1.117	293.2	15.30	241.9
300	79.61	1.117	293.7	15.45	242.2
350	88.49	1.104	306.6	19.65	250.5
400	96.59	1.094	319.0	24.28	258.3
450	103.86	1.087	330.8	29.30	265.7
500	110.33	1.082	342.1	34.66	272.8
550	116.07	1.077	352.9	40.32	279.6
600	121.17	1.074	363.2	46.25	286.1
650	125.72	1.071	373.1	52.43	292.4
700	129.81	1.068	382.5	58.82	298.5
750	133.50	1.066	391.6	65.40	304.4
800	136.84	1.065	400.4	72.16	310.2
850	139.89	1.063	408.7	79.08	315.7
900	142.66	1.062	416.8	86.15	321.1
950	145.21	1.061	424.6	93.34	326.3
1000	147.54	1.060	432.1	100.66	331.4

Table 117. Thermodynamic functions of trifluoromethylsulfonate $CF_3SO_3^-$

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	54.59	1.180	260.7	4.19	218.8
150	69.89	1.135	285.7	7.31	237.0
200	84.20	1.110	307.8	11.16	252.0
250	96.87	1.094	328.0	15.70	265.2
273.15	102.20	1.089	336.8	18.00	270.9
298.15	107.61	1.084	346.0	20.63	276.8
300	108.00	1.083	346.7	20.83	277.3
350	117.72	1.076	364.1	26.47	288.4
400	126.16	1.071	380.3	32.58	298.9
450	133.40	1.066	395.6	39.07	308.8
500	139.58	1.063	410.0	45.90	318.2
550	144.83	1.061	423.6	53.01	327.2
600	149.30	1.059	436.4	60.37	335.8
650	153.11	1.057	448.5	67.93	344.0
700	156.36	1.056	459.9	75.67	351.8
750	159.14	1.055	470.8	83.56	359.4
800	161.54	1.054	481.2	91.58	366.7
850	163.61	1.054	491.0	99.71	373.7
900	165.41	1.053	500.4	107.93	380.5
950	166.99	1.052	509.4	116.25	387.1
1000	168.36	1.052	518.0	124.63	393.4

Table 118. Thermodynamic functions of tetraphenylborate $B(C_6H_5)_4^-$

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	147.44	1.060	404.5	9.45	310.1
150	194.24	1.045	473.0	17.98	353.2
200	246.82	1.035	536.0	28.97	391.1
250	305.32	1.028	597.2	42.76	426.2
273.15	333.36	1.026	625.5	50.15	441.9
298.15	363.68	1.023	656.0	58.86	458.6
300	365.91	1.023	658.3	59.54	459.8
350	424.98	1.020	719.1	79.32	492.5
400	480.29	1.018	779.5	101.97	524.6
450	530.86	1.016	839.1	127.27	556.3
500	576.52	1.015	897.4	154.98	587.5
550	617.55	1.014	954.3	184.85	618.2
600	654.38	1.013	1009.7	216.66	648.6
650	687.53	1.012	1063.4	250.22	678.4
700	717.44	1.012	1115.4	285.36	707.8
750	744.54	1.011	1165.9	321.92	736.7
800	769.15	1.011	1214.7	359.77	765.0
850	791.59	1.011	1262.0	398.80	792.9
900	812.09	1.010	1307.9	438.90	820.2
950	830.86	1.010	1352.3	479.98	847.1
1000	848.08	1.010	1395.4	521.96	873.4

Table 119.* Thermodynamic functions of tetraphenylphosphonium $(C_6H_5)_4P^+$

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	145.48	1.061	398.8	9.18	307.0
150	194.33	1.045	466.9	17.66	349.2
200	248.45	1.035	530.1	28.70	386.5
250	307.68	1.028	591.8	42.59	421.4
273.15	335.87	1.025	620.3	50.04	437.1
298.15	366.26	1.023	651.0	58.82	453.7
300	368.50	1.023	653.3	59.50	454.9
350	427.53	1.020	714.5	79.41	487.7
400	482.69	1.018	775.3	102.19	519.8
450	533.07	1.016	835.1	127.60	551.5
500	578.52	1.015	893.7	155.41	582.8
550	619.35	1.014	950.7	185.37	613.7
600	654.61	1.013	1006.2	217.28	644.1
650	688.99	1.012	1060.1	250.91	674.1
700	718.76	1.012	1112.2	286.12	703.5
750	745.73	1.011	1162.8	322.74	732.4
800	770.23	1.011	1211.7	360.65	760.9
850	792.57	1.011	1259.1	399.73	788.8
900	812.98	1.010	1304.9	439.88	816.2
950	831.67	1.010	1349.4	481.00	843.1
1000	848.83	1.010	1392.5	523.02	869.5

Table 120.* Thermodynamic functions of tetraphenylarsonium $(C_6H_5)_4As^+$

T	C_p	C_p/C_v	S	$H-H_o$	$-(G-H_o)/T$
K	J/K·mol		J/K·mol	kJ/mol	J/K·mol
100	148.47	1.059	394.6	9.11	303.5
150	197.43	1.044	464.0	17.75	345.6
200	251.32	1.034	528.0	28.95	383.3
250	310.29	1.028	590.4	42.97	418.5
273.15	338.36	1.025	619.1	50.48	434.3
298.15	368.62	1.023	650.0	59.32	451.1
300	370.85	1.023	652.3	60.00	452.3
350	429.64	1.020	713.9	80.03	485.3
400	484.57	1.017	774.9	102.90	517.7
450	534.74	1.016	834.9	128.40	549.6
500	580.01	1.015	893.7	156.29	581.1
550	620.68	1.014	950.9	186.33	612.1
600	657.19	1.013	1006.5	218.29	642.7
650	690.05	1.012	1060.4	251.99	672.7
700	719.71	1.012	1112.6	287.24	702.3
750	746.58	1.011	1163.2	323.91	731.4
800	771.00	1.011	1212.2	361.86	759.9
850	793.27	1.011	1259.6	400.97	787.9
900	813.62	1.010	1305.6	441.15	815.4
950	832.26	1.010	1350.1	482.31	842.4
1000	849.36	1.010	1393.2	524.35	868.8

4. Specific Comments

The accuracy of the data employed for the calculations was commented on in Ref. 4 for the individual ions. The entropies at 298.15 K may be taken as generally having an uncertainty of two to ten times the unit of the last digit reported.[3] The other thermodynamic functions are no more accurate than this limit (except, of course, C_p/C_v).

The following comments pertain to the tables marked with an asterisk.

Table 4: O_2^-. The ion is in its ground electronic state $^2\Pi_{gi}$ at all temperatures of interest, the first excited state being[9] at 25 300 cm^{-1}. The discrepancies between the tabulated and JANAF[1] values exceed the estimated error and are related to the difference in vibrational frequencies and interatomic distance used in the computation, ours being the more modern values of Ref. 9.

Table 9: VO^{2+}. The ground state of this $3d^1$ ion is $^2\Gamma_{t3}$ with $J = 5/2$. The first excited state is[10] at about 14 000 cm^{-1}, and need not be taken into account at the temperatures of interest.

Table 9a: SbO^+. This ion was not included in the previous review.[4] The Sb–O bond length was taken as 0.1807 nm and the vibration frequency as 942 cm^{-1}.[11]

Table 19: BO_2^-. The input data have not been specified in the previous review,[4] since the standard molar entropy at 298.15 K was taken from the review by Srivastava and Farber.[12] For the present calculations the B–O distance for this symmetrical linear ion was taken as 0.1291 nm, and the vibration frequencies were taken as $\nu_1 = 1220$ cm^{-1}, $\nu_2 = 610$ cm^{-1} (doubly degenerate), and $\nu_3 = 2440$ cm^{-1}. These values are consisent with both the S° and C_p° values given by Srivastava and Farber.[12] The discrepancies between the tabulated and JANAF[1] values which exceed the estimated error, are related to the small differences in vibrational frequencies and bond length used here[12] and those estimated for the JANAF tabulation.[1]

Table 23a: BrO_2^-. Although this ion was discussed in the previous review,[4] it was inadvertently not included in the relevant table there but only in the text. Hence the vibrational frequencies employed were left out, and are now listed here for the sake of completeness: $\nu_1 = 709$, $\nu_2 = 324$, and $\nu_3 = 680$, all in cm^{-1}.[13]

Table 23b: AsO_2^-. This ion was not included in the previous review.[4] Solid meta-arsenites consist[14] of pyramidal AsO_3 entities sharing corners, with an As–O bond length of 0.180 nm and O–As–O angles of 100 and 126°. For the isolated AsO_2^- ion, a bent structure was assumed, with the same As–O distance and with the mean value of the O–As–O angle. The Raman frequencies assigned to this ion are[13] $\nu_1 = 753$ cm^{-1}, $\nu_2 = 350$ cm^{-1}, and $\nu_3 = 533$ cm^{-1}. However, the value for the stretching frequency ν_3 seems to be too low, in view of the value reported[15] for the isoelectronic SeO_2. Replacement of this value by 800 cm^{-1} as was done here, changes the entropy at 298.15 K by -1.5 $J\,K^{-1}\,mol^{-1}$.

Table 25a: NpO_2^{2+}. This ion was discussed only briefly in the previous review,[4] but was accorded a full treatment in a subsequent paper,[5] where the sources of the data were given and their selection was discussed. The calculations are based on the ^{237}Np isotope, on a symmetrical linear ion with an Np–O distance of 0.180 nm, and on the following vibrational frequencies: $\nu_1 = 863$ cm^{-1}, $\nu_2 = 220$ cm^{-1} (doubly degenerate), and $\nu_3 = 934$ cm^{-1}. The ground state for the odd electron has $j = 5/2$, the first excited level at 6752 cm^{-1} has $j = 7/2$, but is not effectively involved in the temperature range of interest.

Table 25b: PuO_2^{2+}. The same general comment applies as for Table 25a. The calculations are based on the ^{239}Pu isotope, the Pu–O distance of 0.182 nm, the frequencies $\nu_1 = 835$, $\nu_2 = 220$, and $\nu_3 = 930$ cm^{-1}, and on $j = 4$ for the ground electronic state, $j = 0$ for the first excited state at 2445 cm^{-1}, and $j = 1$ for the second one at 4258 cm^{-1}, both of the latter making small contributions to the thermodynamic functions at the higher temperatures.

Table 25c: AmO_2^{2+}. The same general comment applies as for Table 25a. The calculations are based on the ^{241}Am isotope, the Am–O distance of 0.183 nm, the frequencies

$\nu_1 = 796$, $\nu_2 = 216$, and $\nu_3 = 914$ cm^{-1}, and on $j = 9/2$ for the ground electronic state. The first excited state at 8889 cm^{-1} is not of significance for the temperature range of interest.

Table 26: UO_2^+. The same general comment applies as for Table 25a. The calculations are based on the U–O distance of 0.181 nm, the frequencies $\nu_1 = 759$, $\nu_2 = 211$, and $\nu_3 = 892$ cm^{-1}, and on $j = 5/2$ for the ground electronic state. The first excited state at 6800 cm^{-1} with $j = 7/2$ is not significant for the temperature range of interest.

Table 26a: NpO_2^+. The same general comment applied as for Table 25a. The calculations are based on the ^{237}Np isotope, the Np–O distance of 0.183 nm, the frequencies $\nu_1 = 767$, $\nu_2 = 186$, and $\nu_3 = 787$ cm^{-1}, and on $j = 4$ for the ground electronic state, $j = 0$ for the first excited state at 2475 cm^{-1}, and $j = 1$ for the second one at 3893 cm^{-1}.

Table 26b: PuO_2^+. The same general comment applies as Table 25a. The calculations are based on the ^{239}Pu isotope, the Pu–O distance of 0.185 nm, the frequencies $\nu_1 = 748$, $\nu_2 = 187$, and $\nu_3 = 792$ cm^{-12}, and on $j = 9/2$ for the ground electronic state. The first excited state at 8143 cm^{-1} with $j = 11/2$ is not contributing in the temperature range of interest.

Table 26c: AmO_2^+. The same general comment applies as for Table 25a. The calculations are based on the ^{241}Am isotope, the Am–O distance of 0.186 nm, the frequencies $\nu_1 = 730$, $\nu_2 = 186$, and $\nu_3 = 788$ cm^{-1}, and on $j = 1$ for the ground electronic state. No information is available on the low-lying excited states, hence the calculations provide only a lower limit for the thermodynamic functions. The systematics of the resulting values for the actinide -yl ions indicates[5] that some contribution from the excited electronic states should be expected.

Table 31: AgI_2^-. Only the linear configuration of this ion was used for the present calculations.

Table 56: MnO_4^{2-}. The ground state for the odd electron is ^{2}E, with $j = 3/2$. The first excited state is at 16 500 cm^{-1},[16] and is not relevant at the temperature range of interest.

Table 67a: $Hg(CN)_4^{2-}$. This ion was not included in the previous review.[4] It is regularly tetrahedral (T_d, symmetry number 12), with linear Hg–C–N groupings, Hg–C distances of 0.222 nm and C–N distances of 0.115 nm according to Griffiths.[17] The following vibration frequencies (in cm^{-1}) have been adopted from Jones[18]: $\nu_1 = 2148$, $\nu_2 = 335$ (non-degenerate), $\nu_3 = 245$, $\nu_4 = 63$ (doubly degenerate), $\nu_5 = 2146$, $\nu_6 = 330$, $\nu_7 = 235$, $\nu_8 = 54$, and $\nu_9 = 180$ (triply degenerate). The lines corresponding to ν_3 and ν_4 are not observed in the spectra, but their frequencies were estimated by Jones.[18]

Table 76a: $AuBr_4^-$. This ion was not included in the previous review.[4] It is square planar (D_{4h}, symmetry number 8), with an Au–Br distance of 0.257 nm and the following vibration frequencies (in cm^{-1}) according to Goggin and Mink[19]: $\nu_1 = 214$, $\nu_2 = 99$, $\nu_3 = 196$, $\nu_4 = 106$, $\nu_5 = 61$ (non-degenerate), $\nu_6 = 222$, and $\nu_7 = 106$ (doubly degenerate). The ν_5 vibration was not observed in the spectrum, and its frequency was estimated.[19]

Table 76b: $Ag(NH_3)_2^+$. This ion was not included in the previous review.[4] According to Miles *et al.*[20] and to Geddes *et al.*,[21] it has a linear N–Ag–N grouping with Ag–N distances of 0.188 nm, and regular tetrahedral Ag–NH_3 groupings with N–H distances of 0.103 nm. The –NH_3 groups were not taken as rotating freely around the Ag–N bonds, since a torsion frequency has been assigned to the corresponding vibration. Hence the ion has a D_{3d} symmetry and a symmetry number of 6. The skeletal vibrations are at 400 and 476 cm^{-1} (Ag–N stretches) and 211 nd 221 cm^{-1} (N–Ag–N bends), and the ammonia-group vibrations are at 265 cm^{-1} (torsion), 648 and 653 cm^{-1} (rockings, both doubly degenerate), 1283 and 1300 cm^{-1} (H–N–H bends), and further vibrations at > 1600 cm^{-1}, which are of no concern for the present purpose.[20,21]

Table 77: $Pd(NH_3)_4^{2+}$. No values for possible torsion frequencies of the –NH_3 groups around the Pd–N bonds were reported. Free rotation of these groups around the bonds was therefore assumed for this ion. The uncertainty introduced in consequence was discussed in the previous review.[4]

Table 78: $Pt(NH_3)_4^{2+}$. Free rotation of the –NH_3 groups around the Pt–N bonds was assumed also for this ion, since no values for possible torsion frequencies were reported. The uncertainty introduced in consequence was discussed in the previous review.[4]

Table 102: $ReCl_6^{3-}$. The ground state for this $5d^3$ ion $^4\Gamma_2$ with $j = 3/2$. The first excited electronic state is at about 14 500 cm^{-1},[22] and is not significant at the temperature range of interest.

Table 104: $IrCl_6^{2-}$. The ground state of this $5d^5$ ion is $^2T_{2g}$ with $j = 5/2$. The first excited electronic state is at about 17 000 cm^{-1}, and is not significant in the temperature range of interest.[23]

Table 108: $Fe(CN)_6^{3-}$. The ground state of this $3d^5$ ion is $^2T_{2g}$ with $j = 5/2$. No information was presented concerning the first excited electronic level, but it is expected to be located sufficiently high for it not be involved in the present calculations.[23]

Table 110: $Co(NH_3)_6^{3+}$. Free rotation of the –NH_3 groups around the Co–N bonds was assumed for this ion, in view of the absence of assigned values for torsion frequencies. Octahedral O_h symmetry, with a symmetry number of 24 was therefore assumed. The uncertainty introduced thereby was discussed in the previous review.[4]

Table 116: $CH_3SO_3^-$. This ion was not included in the previous review.[4] The structural data are from Wei and Hingerty[24] for the sodium salt: both parts of the ion are tetrahedral, with the regular tetrahedral angles for H–C–H and 112.0° and 106.8° for O–S–O and O–S–C ones, respectively. The average S–O bond distance is 0.1448 nm, the C–H one is 0.097 nm, and the S–C one is 0.1754 nm. Similar data were given for the silver and the cesium salts by Charbonnier *et al.*[25] and by Brandon and Brown.[26] Since there is spectroscopic evidence (see below) for hindered (rather than free) rotation around the C–S bond, the symmetry number was taken as 3. The vibration frequencies and their assignments are from a Raman spectroscopic study of an aqueous solution by Gillespie and Robinson,[27] and were confirmed by Raman and infrared studies by Miles *et al.*,[28] Burger *et al.*,[29]

and Campbell *et al.*.[30] For the torsion mode ν_6, however, the value obtained from nonelastic neutron scattering experiments by Ratcliffe *et al.*[31] was used. The frequencies in cm^{-1} are: $\nu_1 = 2943$, $\nu_2 = 1368$, $\nu_3 = 1050$, $\nu_4 = 778$, $\nu_5 = 560$, $\nu_6 = 261$ (nondegenerate), $\nu_7 = 3020$, $\nu_8 = 1435$, $\nu_9 = 1177$, $\nu_{10} = 960$, $\nu_{11} = 533$, $\nu_{12} = 344$ (doubly degenerate).

Table 117: $CF_3SO_3^-$. This ion was not included in the previous review.[4] The structural data are from Olofson *et al.*[32,33] for the hydronium salt (i.e., the monohydrated acid). Both parts of the ion are tetrahedral, with the regular tetrahedral angles for F–C–F and 114.2° and 104.1° for O–S–O and O–S–C ones, respectively. The average S–O bond distance is 0.1440 nm, the C–F one is 0.1312 nm, and the S–C one is 0.1825 nm. The symmetry number was taken as 3, as for the analogous $CH_3SO_3^-$ ion, see comment on Table 116. The vibration frequencies and their assignments are from a Raman spectroscopic study of an aqueous solution by Miles *et al.*,[28] which were confirmed by Raman and infrared studies by Gansewein and Behm,[34] Burger *et al.*,[28] and Balycheva *et al.*[35] However, no value for the torsion mode ν_6 was reported, so that it was estimated to be 65 ± 15 cm^{-1}, on the basis of the corresponding torsion frequencies of the acetate and trifluoroacetate anions, see the previous review.[4] The other frequencies used, in cm^{-1}, are: $\nu_1 = 1230$, $\nu_2 = 766$, $\nu_3 = 1038$, $\nu_4 = 321$, $\nu_5 = 580$ (nondegenerate), $\nu_7 = 1285$, $\nu_8 = 520$, $\nu_9 = 1188$, $\nu_{10} = 208$, $\nu_{11} = 635$, and $\nu_{12} = 353$ (doubly degenerate). The uncertainty caused by that in ν_6 amounts to ± 4 J K^{-1} mol^{-1} in the entropy at 298.15 K.

Table 118: $B(C_6H_5)_4^-$. This ion was not included in the previous review,[4] but was discussed in detail in the authors' subsequent paper,[6] where details of the structural data and the vibrational frequencies are given.

Table 119: $(C_6H_5)_4P^+$. See the comment on Table 118.

Table 120: $(C_6H_5)_4As^+$. See the comment on Table 118.

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6. References

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