Rate Data for Inelastic Collision Processes in the Diatomic Halogen Molecules

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A detailed compilation of rate data for inelastic collision processes involving the homonuclear and heteronuclear diatomic halogen molecules is presented. The literature has been surveyed through April 1983. Processes that are considered include exchange of energy between electronic, vibrational, rotational and translational degrees of freedom, electronic quenching, dephasing, depolarization, pressure broadening, and spontaneous radiation. Collision partners include rare-gas atoms, halogen and other diatomic molecules, and polyatomic species; a few measurements in liquids and cryogenic matrices are also included. Each data entry includes collision partner, temperature, method of measurement, and an error estimate where available. While a large mass of data is available for these systems, there still exist sizable gaps in our knowledge concerning these processes, particularly for the interhalogen species.

Key words: energy transfer; halogens; inelastic collisions; quenching; radiative lifetimes; rotational relaxation; vibrational relaxation.

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1. Introduction

Inelastic collision processes in the diatomic halogens have been studied for over 70 years, beginning with the observation by Franck and Wood[1] of quenching and intensity redistribution in the visible fluorescence spectrum of iodine, and continuing ever since. In large part, this is due to the experimental convenience of optical excitation in these systems, particularly narrowband laser excitation of the *B–X* fluorescence system in iodine, first demonstrated by the author in 1967.[2] The state-specific excitation produced by lasers has made possible the measurement of a large number of state-to-state rate coefficients; in some instances, hundreds or even thousands of individual rate coefficients may be available for a given system.

To date, this mass of data has not been reviewed or analyzed. Some early (i.e., prelaser) data on relaxation in diatomic halogens have been summarized by Stevens.[3] A partial tabulation of vibrational and rotational energy transfer cross sections for the I_2 *B* state was presented in a conference report by Steinfeld,[4] and experimental data for the interhalogens are available in a review article by Clyne.[5] Other than these, however, no critical review or intercomparison of the data is available.

The present review attempts to remedy this deficiency. Our principal objectives in organizing these data and preparing this review are as follows:

(1) To provide a systematic and critical evaluation of these data for general scientific use;

(2) To furnish a data base for modeling optically pumped (OPL) and chemical laser (CL) systems, particularly I_2 and IF;

(3) To test various scaling laws for energy transfer rate coefficients which have been proposed from time to time. This last subject is discussed in a separate report.[6]

2. Methodology

2.1. Scope

This review covers kinetic processes, including collisional and radiative relaxation, in the diatomic halogens: the four homonuclear species ($X_2 = Br_2$, Cl_2, F_2, and I_2) and the six heteronuclear species (XY = BrCl, BrF, BrI, ClF, ClI, and FI). All electronic states $\lesssim 6$ eV are included, with the following designations:

	X_2	XY
X	$^1\Sigma_g^+$	$^1\Sigma^+$
A	$^1\Pi_{1u}$	$^1\Pi_1$
B	$^3\Pi_{0u^+}$	$^3\Pi_{0^+}$
D	$^1\Sigma_u^+$	
E	$^3\Pi_{0g^+}$	

The scope of this review is specifically limited to those inelastic collision processes enumerated in Sec. 3; we do not consider spectroscopic properties of the halogen molecules (except as required in Appendix A) or chemically reactive collision processes.

The extent of available data varies widely from system to system, being most extensive for I_2 and much less so for the interhalogen species. On the following page is a checklist of the data included here for all the halogen systems. In only a few instances do duplicate, independent measurements of the same quantity exist. Therefore, it is not generally possible to supply recommended values for a given rate coefficient or cross section; each measurement must be evaluated in terms of its quoted error estimate and other measurements on related, but different, systems. For this reason, only a few experimental data have been eliminated from this compilation.

2.2. Search Procedures

Retrieval of literature references was carried out by first searching three fairly comprehensive data bases: the JILA Atomic Collisions Bibliography,[7] covering the period 1970–1979; the Molecular Spectroscopy Newsletter, published by the Berkeley Physics Department (1965–1983); and the Lockheed "Dialog" System. In addition, letters requesting references and unpublished data were sent to 40 scientists active in the field. Citations obtained by these methods were augmented by personal reprint files and secondary citations in published articles. The search is complete through April 1983.

2.3. Organization of Tables

Information from each referenced article has been entered in the NOAA CDC Cyber 750 computer. A separate file has been set up for each halogen species. Each entry includes initial and final halogen electronic state; kinetic process; collision partner; temperature; measurement method; initial and final vibrational and rotational state of the halogen (when specified); the data entry itself; and the citation corresponding to the numbered list of references in this article.

Data entries within each table have been ordered in the following manner: first, by initial and final electronic states, in order of increasing energy; second, by kinetic process, according to the listing (1)–(9) given in the following section; third, by collision partner, from monatomic gases to polyatomic molecules in increasing order of complexity; finally, by vibrational and rotational state (v_i, j_i, v_f, and j_f, in that order). In specifying the latter entries, the distinction has been made between a "thermal" population, typically of initial states, and "all" final states, which are not necessarily at Boltzmann equilibrium.

Whenever possible, we have attempted to present the datum in standardized rate coefficient (k) units of cm^3 molecule^{-1} s^{-1}. In some cases, the nature of the measurement involved different physical quantities. Shock-tube data, for example, are generally presented as a (pressure · time) product $p\tau$, which cannot be simply converted to a rate constant because the ideal-gas law is not valid at the pressures and temperatures used in shock-tube experiments. Radiative (τ) and other decay lifetimes (T_1, T_2) have time units (μs, ns, etc.). When a cross section σ is presented (units of $Å^2$ or 10^{-16} cm^2), it may be related to an effective rate coefficient by

Data Checklist: --, inapplicable process; S, sketchy or partial data; X or XX, substantial data.

Molecular Formula	and State	Quench $E \leftrightarrow E$	$E \leftrightarrow V$	$V \leftrightarrow T$	$V \leftrightarrow V$	$R \leftrightarrow T$	Deϕ	Depol	$\Delta\nu$	τ_{rad}
Br_2	$X(0_g^+)$		X	X	S	S				--
	$B(0_u^+)$	XX		S		S			X	XX
	others	X		X						X
BrCl	$X(0^+)$		X							--
	$B(0^+)$	X		X						X
BrF	$X(0^+)$									--
	$B(0^+)$	X		X	S	S				X
BrI	$X(0^+)$		X							--
	$B(0^+)$									X
Cl_2	$X(0_g^+)$	X	X	XX	X					--
	$B(0_u^+)$	X		X		S	X		X	XX
	others	X								X
ClF	$X(0^+)$			X					X	--
	$B(0^+)$									
ClI	$X(0^+)$		X		S				X	--
	A(1)	X	S							X
	$B(0^+)$	X							X	X
F_2	$X(0_g^+)$			X		X				--
	others	X								X
FI	$X(0^+)$									--
	A'(2)	X								X
	$B(0^+)$	X		X						X
I_2	$X(0_g^+)$	X	X	X	X	X				--
	$B(0_u^+)$	XX	S	XX		XX	X	X	X	XX
	$D(0_u^+)$	X								X
	others	X								X

$$k = \bar{v}\sigma, \quad (1)$$

where $\bar{v}$ is the mean thermal relative velocity. In some instances, a collision probability P is reported, which may be related to the cross section by multiplying by an effective gas-kinetic collision cross section πd^2. Interconversion and standardization of units is discussed in greater detail in Appendix B.

An error estimate is presented with each data entry, whenever possible. In most cases, this estimate is simply the standard error quoted in the original literature reference, converted to a percentage basis. The entry "?" in this column indicates that it is not possible to make a quantitative estimate of the error limit, or that there may be a significant systematic error in the experiment which compromises the value reported for that particular data entry. Also, "UL" denotes upper limit and "LL," lower limit.

3. Inelastic Processes and Collision Partners

For the purpose of this survey, the following categories of collision processes have been defined.

(1) Quenching represents net electronic deactivation of the electronically excited halogen. In most cases, particularly for the $B\,^3\Pi$ states, this process has been established as a collision-induced predissociation, or curve crossing. Other processes which lead to a change in electronic state of the halogen ($E \rightarrow E'$) are included in this category as well.

(2) E↔V, or conversion of electronic energy into vibrational excitation in the halogen. The quenching of excited halogen atoms (I* or Br*, $5\,^2P_{1/2}$) by halogen molecules is assigned to this category on the basis of recent work by Houston and co-workers.[131]

(3) V↔T, or exchange of energy between vibrational and translational degrees of freedom, with or without accompanying exchange of rotational energy. The "collisional release" process, i.e.,

$$I_2^*(v^\ddagger) + M \rightarrow I + I^* + M,$$

where $v^\ddagger$ is a high vibrational level near the dissociation limit of an electronically excited state, has been discussed from time to time in the literature as a variety of V–T process. However, since purported measurements of this process appear to include significant contributions from direct photodissociation of excited vibrational levels in the electronic ground state, we have not included those measurements here.

(4) V↔V, or exchange of vibrational energy between the halogen and a collision partner.

(5) R↔T, or exchange of energy between rotational and translation degrees of freedom, with no net change in the vibrational state of the halogen.

(6) Dephasing represents loss of coherence in coherently excited ensembles or superposition states. These time constants (T_2) are measured by coherent transient experiments, such as photon echo or free-induction decay.

(7) Depolarization can be measured when a polarized laser source is used to excite the sample. Data for this process are generally expressed as a mean reorientation angle $\langle \sin^2 \theta \rangle$ or change in M_J state.

(8) Line broadening generally includes contributions from dephasing, radiative, and collisional relaxation processes. The line-broadening coefficient (frequency/pressure) can be related to a relaxation time by

$$\left(\frac{\Delta\nu}{p}\right) = \frac{1}{2\pi p \tau_{\rm eff}}. \quad (2)$$

(9) Radiative lifetimes, although not a collision phenomenon, are included in this survey for several related reasons. First, these data are generally reported along with quenching or other inelastic cross sections, and thus are easily retrieved. Furthermore, an accurate value for the radiative lifetime is generally required in order to determine absolute values for the other rate coefficients. Finally, lifetimes are needed in the OPL and CL modeling codes, so it is convenient to include them in this compilation of data.

We have also included, in each data file, a list of the theoretical papers retrieved in our literature search. No calculated rates or cross sections are actually cited, but a brief comment is included for each paper describing the nature of the calculation performed (classical trajectory, distorted wave, etc.).

Collision partners include all gas-phase species (self-collisions, rare gases, diatomic and polyatomc molecules); a small number of measurements in liquids or cryogenic matrices are also included, when kinetic data are given.

4. Summary of Experimental Techniques

A wide variety of experimental techniques have been brought to bear on measurement of inelastic collision rates in the halogens. Those cited in this summary are summarized briefly below.

BS (molecular-beam scattering) has been used to measure translational energy loss or gain in scattered particles; the recently developed techniques of state-specific molecular beam detection do not appear to have been extensively applied so far to scattering experiments involving the halogen systems.

CT (coherent transient spectroscopy), which includes techniques such as optical nutation, photon echo, and free-induction decay, is used to measure both decay times (T_1) and dephasing times (T_2). Recent comprehensive reviews of these techniques have been published.[8]

DP (depolarization) of fluorescence, following excitation using polarized laser radiation, is used to measure angular momentum reorientation in the excited molecules.

FP (flash photolysis) is used to produce an initial concentration of reactive species such as I* atoms.

LIF (laser-induced fluorescence) has been the most widely used technique for studying inelastic collision processes in the halogens. By populating a single ro-vibronic state, extensive energy-transfer data on the excited electronic states can be obtained. An earlier version of this method is:

MEF (monochromatically excited fluorescence), in which an atomic lamp or even a filtered continuum is used to excite one or several energy levels. LIF and MEF have been distinguished in the tables.

ME (master-equation modeling) is employed to extract rate coefficients when the initial conditions are not specified with sufficient precision. Rate constants extracted from such kinetic modeling are frequently subject to large uncertainties.

OA (opto-acoustic, or spectrophone) techniques have occasionally been used to obtain data on ground-state thermal relaxation.

OPL (optically pumped laser) experiments, typically in conjunction with ME modeling, have been used to obtain kinetic data on several systems.

PB (pressure broadening) in either the microwave or optical regimes yields an overall linewidth, which represents a composite of several relaxation processes occurring in the molecule.

SSE (supersonic expansion) of a vapor through a nozzle or jet results in cooling the internal degrees of freedom in the gas. By measuring the vibrational and rotational distributions in the expanded gas, the relaxation cross section can be obtained[9,10] from the relationship

$$A = 2[(\gamma - 1)/\pi\gamma]^{1/2}(m_G/\mu_{G,X_2})^{1/2}(\sigma_{inel}P_0 d/kT_0) \times [1-(T/T_0)]^{-1/2}(T/T_0)^{(\gamma+1)/2(\gamma-1)}, \quad (3)$$

where A is the coefficient of cooling along the flow direction x, i.e.,

$$dE_{v,r}/dx = A(E_{v,r} - E_{v,r}^{eq});$$

γ is the specific heat ratio (C_p/C_v); m_G is the mass of the seed gas or diluent; μ_{G,X_2} is the reduced mass of the diluent–halogen pair; P_0 is the pressure in the source before expansion; d is the nozzle diameter; T_0 is the nozzle temperature; T is the local translational temperature at x; and σ_{inel} is the relaxation cross section for G–X_2 collisions.

ST (shock-tube) experiments measure relaxation among the lower vibrational levels of the ground electronic states. A principal advantage of this method is that a wide temperature range (up to 3000 K and higher) can be accessed.

UA/D (ultrasonic absorption and dispersion) experiments also measure relaxation among low v levels, but at room temperature or below. A complete treatment of this technique has been given.[11]

In addition to these principal experimental methods, several other miscellaneous techniques have been applied to the study of the halogens.

AA (atomic absorption) has been used to follow the concentrations of I* or Br* atoms.

CL (chemiluminescence) and DF (discharge-flow) measurements can be used to measure decay rates of excited halogens, albeit from a nonspecific initial distribution.

Hanle effect measurements yield radiative lifetimes and depolarization efficiencies.

IRA (infrared absorption) and IRF (infrared fluorescence) are alternative techniques for monitoring halogen atom concentrations.

Several pulsed-excitation methods, including PD (pulsed discharge), EB (pulsed electron-beam), and RAD (pulsed radiolysis) have been used to produce highly nonspecific initial distributions of halogen molecules.

A PS (phase-shift) technique has been used to measure fluorescence lifetimes, but has now been superseded by short-pulse LIF techniques.

SEP (stimulated-emission pumping) has been used to prepare selected vibration–rotation levels in the electronic ground state of I_2.

5. Discussion and Conclusions

The data presented in Tables 1.1–1.10 represent a substantial body of information on inelastic processes involving the ground and excited states of the diatomic halogens. Despite the enormous amount of work that is represented by these summaries, there still remain significant gaps in our knowledge concerning these systems, perhaps due in part to the wide diversity of processes that can take place. From the analysis of the state-to-state rate data using various scaling theories,[6] is appears that, at least for $I_2(B\,^3\Pi)$, rotationally inelastic energy-transfer rates can be well represented by angular-momentum based scaling laws such as the IOS and ECS (see Appendix C). Thus, extensive tabulation of individual rate coefficients for such processes is no longer required and several entries in Table 1.10 are presented in this condensed form. However, few data exist for systems other than this rather special one, or for collision partners other than rare-gas atoms or hydrogen. Therefore, the generality of these scaling laws cannot really be assessed at this time. Measurements on interhalogens are quite limited in extent; most have come from a single laboratory which is no longer in operation. Very few reliable measurements exist of the temperature dependence of these inelastic processes, although it can be argued that temperature dependence is a very insensitive probe of the collision dynamics. One class of experiments that is now feasible, although difficult, but does not seem to have been carried out to any great extent, is the measurement of state-to-state cross sections in a molecular beam, using laser-induced fluorescence for state-sensitive detection. Since thermal beams contain a broad distribution of initial $(v_i\, j_i)$ states, a vibrationally and rotationally cooled beam resulting from supersonic expansion would be required. Experiments with such sources[137,151] have explored very-low-energy (0–10 K) collisions; use of a target gas would be required to probe a higher range of collision energies. For bulk-gas experiments, the stimulated-emission-pumping technique[139] appears to be a promising method for measurement of inelastic collision rate, but its systematic application to the halogen systems has not yet taken place.

Table 1.1. Inelastic Collision Data for Bromine

Experimental Data for Bromine															
Electronic State															
Initial	Final	Process	Collision Partner	Temp (K)	Method	v_i	j_i	v_f	j_f	Quantity Reported	Data Entry	Units	Est. Error	Reference	Comment
X	?	E-E	Ar*	300	DF					k	6.5 (-10)	cm^3s^{-1}	?	12	
X	?	E-E	Xe*	300	DF					κ	6.0 (-10)	cm^3s^{-1}	?	12	
X	X	V-T	Br_2	18	SSE					P	2.9 (- 3)			9	
X	X	V-T	Br_2	331	UA					pτ	1.8 (- 6)	bar s		13	
X	X	V-T	Br_2	1000	ST					pτ	0.37 (- 6)	bar s		14	
X	X	V-T	Br_2	1500	ST					pτ	0.56 (- 6)	bar s		14	
X	X	V-T	Br_2	2000	ST					pτ	0.94 (- 6)	bar s		14	
X	X	V-T	Br_2	2500	ST					pτ	1.64 (- 6)	bar s		14	
X	X	V-T	Br_2	3000	ST					pτ	2.53 (- 6)	bar s		14	
X	X	V-T	Br_2	3260	ST					pτ	3.30 (- 6)	bar s		14	
X	X	V-T	Br_2	300	UA	1		0		P	1.85 (- 4)			15	
X	X	V-T	Br_2	373	UA	1		0		P	2.77 (- 4)			15	
X	X	V-T	Br_2	450	UA	1		0		P	4.55 (- 4)			15	
X	X	V-T	Br_2	529	UA	1		0		P	7.77 (- 4)			15	
X	X	V-T	He	4-25	SSE					σ	0.36	$10^{-16}cm^2$		9	
X	X	V-T	He	500	ST					pτ	0.064(- 6)	bar s	?	16	
X	X	V-T	He	1000	ST					pτ	0.15 (- 6)	bar s	?	16	
X	X	V-T	He	1500	ST					pτ	0.27 (- 6)	bar s	?	16	
X	X	V-T	He	2000	ST					pτ	0.39 (- 6)	bar s	?	16	
X	X	V-T	He	2100	ST					pτ	0.42 (- 6)	bar s	?	16	
X	X	V-T	Ne	4-25	SSE					σ	0.23	$10^{-16}cm^2$		9	
X	X	V-T	Ne	500	ST					pτ	0.12 (- 6)	bar s	?	16	
X	X	V-T	Ne	1000	ST					pτ	0.14 (- 6)	bar s	?	16	

Table 1.1. Inelastic Collision Data for Bromine (continued).

Electronic State Initial	Electronic State Final	Process	Collision Partner	Temp (K)	Method	v_i	j_i	v_f	j_f	Quantity Reported	Data Entry	Units	Est. Error	Reference	Comment
X	X	V-T	Ne	1500	ST					$p\tau$	0.21 (- 6)	bar s	?	16	
X	X	V-T	Ne	2000	ST					$p\tau$	0.34 (- 6)	bar s	?	16	
X	X	V-T	Ne	2140	ST					$p\tau$	0.40 (- 6)	bar s	?	16	
X	X	V-T	Ar	4-25	SSE					σ	0.18	$10^{-16}cm^2$		9	
X	X	V-T	Ar	500	ST					$p\tau$	0.27 (- 6)	bar s	?	16	
X	X	V-T	Ar	1000	ST					$p\tau$	0.18 (- 6)	bar s	?	16	
X	X	V-T	Ar	1500	ST					$p\tau$	0.24 (- 6)	bar s	?	16	
X	X	V-T	Ar	2000	ST					$p\tau$	0.46 (- 6)	bar s	?	16	
X	X	V-T	Ar	2250	ST					$p\tau$	0.66 (- 6)	bar s	?	16	
X	X	V-T	Xe	500	ST					$p\tau$	0.25 (- 6)	bar s	?	16	
X	X	V-T	Xe	1000	ST					$p\tau$	0.12 (- 6)	bar s	?	16	
X	X	V-T	Xe	1500	ST					$p\tau$	0.12 (- 6)	bar s	?	16	
X	X	V-T	Xe	2000	ST					$p\tau$	0.15 (- 6)	bar s	?	16	
X	X	V-T	Xe	2300	ST					$p\tau$	0.17 (- 6)	bar s	?	16	
X	X	V-T	K		BS						(a)			17	a
X	X	V-T	H_2	4-25	SSE					σ	0.75	$10^{-16}cm^2$		9	
X	X	V-T	D_2	4-25	SSE					σ	0.82	$10^{-16}cm^2$		9	
X	X	V-T	O_2	4-25	SSE					σ	0.29	$10^{-16}cm^2$		9	
X	X	V-T	N_2	4-25	SSE					σ	0.40	$10^{-16}cm^2$		9	
X	X	V-T	CO_2	4-25	SSE					σ	0.73	$10^{-16}cm^2$		9	
X	X	V-T	N_2O	4-25	SSE					σ	2.41	$10^{-16}cm^2$		9	
X	X	V-T	SF_6	4-25	SSE					σ	0.69	$10^{-16}cm^2$		9	
X	X	V-T	CH_4	4-25	SSE					σ	0.98	$10^{-16}cm^2$		9	
X	X	V-T	CF_4	4-25	SSE					σ	0.48	$10^{-16}cm^2$		9	
X	X	V-E	I*	300	LIF					k	5.2 (-11)	cm^3s^{-1}	10%	18,19	

Table 1.1. Inelastic Collision Data for Bromine (continued).

Electronic State Initial	Electronic State Final	Process	Collision Partner	Temp (K)	Method	v_i	j_i	v_f	j_f	Quantity Reported	Data Entry	Units	Est. Error	Reference	Comment
X	X	V-E	I*	295	FP					k	5.6 (-11)	cm^3s^{-1}	5%	20	
X	X	V-E	Br*	300	FP					k	4.7 (-13)	cm^3s^{-1}	10-30%	19,21	
X	X	V-V	$SiF_4^{\ddagger}$	1100	Misc					k	1.7 (-12)	cm^3s^{-1}	?	22	
X	X	V-V	$CHClF_2^{\ddagger}$	1100	Misc					k	1.7 (-12)	cm^3s^{-1}	?	22	
X	X	R-T	Br_2	18	SSE					P	1			9	
X	B	Linewidth	Br_2	300	PB/O			19,20	20-60	$\Delta\nu/p$	6.63	MHz/Torr	15%	23	
X	B	Linewidth	Ar	300	PB/O			19,20	20-60	$\Delta\nu/p$	6.87	MHz/Torr	15%	23	
A		Quench	$Br_2(X)$	293	LIF	Thermal				k	4.7 (-12)	cm^3s^{-1}	UL	24	
A	A	V-T	Br_2	293	LIF	11	23			k	2.4 (-10)	cm^3s^{-1}	?	24	
A	A	V-T	Ar	293	LIF	11	23			k	1.9 (-11)	cm^3s^{-1}	?	24	
A	B	E-E	$O_2^*(a^1\Delta)$	300	DF			0-27			(b)			25	b
B		Quench	Br_2	300	LIF	1-40					(c)			26	c
B		Quench	Br_2	300	LIF	2				k	5.8 (-11)	cm^3s^{-1}	5%	27	
B		Quench	Br_2	300	LIF	11	3-30			k	3-10 (-10)	cm^3s^{-1}	15-40%	28	d
B		Quench	Br_2	300	LIF	14	3-30			k	1.6-7 (-10)	cm^3s^{-1}	15-40%	28	d
B		Quench	Br_2	300	LIF	16	48			k	9.6 (-11)	cm^3s^{-1}	10-20%	29	
B		Quench	Br_2	600	LIF	17				k	3.67 (-10)	cm^3s^{-1}	10-20%	30	
B		Quench	Br_2	300	LIF	18	95			σ	72	$10^{-16}cm^2$	10%	31	
B		Quench	Br_2	300	MEF	19				k	4.2 (-10)	cm^3s^{-1}	10%	32	
B		Quench	Br_2	300	LIF	19	3-30			k	0.5-16.8(-10)	cm^3s^{-1}	15-40%	28	d
B		Quench	Br_2	300	LIF	19	40			k	3.4 (-10)	cm^3s^{-1}	10-20%	29	
B		Quench	Br_2	300	LIF	20	3-30			k	4.3-16.2(-10)	cm^3s^{-1}	15-40%	28	d
B		Quench	Br_2	300	LIF	20	118			σ	72	$10^{-16}cm^2$	10%	31	
B		Quench	Br_2	300	LIF	22	27			σ	138	$10^{-16}cm^2$	10%	31	

Table 1.1. Inelastic Collision Data for Bromine (continued).

Electronic State Initial	Final	Process	Collision Partner	Temp (K)	Method	v_i	j_i	v_f	j_f	Quantity Reported	Data Entry	Units	Est. Error	Reference	Comment
B		Quench	Br_2	300	LIF	23	3-30			k	3.8-17.0(-10)	cm^3s^{-1}	15-40%	28	d
B		Quench	Br_2	300	LIF	23	46			k	2.6 (-10)	cm^3s^{-1}	10-20%	29	
B		Quench	Br_2	300	LIF	23	106			σ	72	$10^{-16}cm^2$	10%	31	
B		Quench	Br_2	300	LIF	24	3-30			k	3.6-18.8(-10)	cm^3s^{-1}	15-40%	28	d
B		Quench	Br_2	300	LIF	32	32			σ	195	$10^{-16}cm^2$	10%	31	
B		Quench	Br_2	300	LIF	33	24			σ	179	$10^{-16}cm^2$	10%	31	
B		Quench	Br_2	300	LIF	33	29			σ	188	$10^{-16}cm^2$	10%	31	
B		Quench	Br_2	300	LIF	33	38			σ	169	$10^{-16}cm^2$	10%	31	
B		Quench	Br_2	300	LIF	35	48			σ	179	$10^{-16}cm^2$	10%	31	
B		Quench	Br_2	300	LIF	36	52			σ	374	$10^{-16}cm^2$	10%	31	
B		Quench	Br_2	300	LIF	36	54			σ	107	$10^{-16}cm^2$	10%	31	
B		Quench	Br_2	300	LIF	38	60			σ	374	$10^{-16}cm^2$	10%	31	
B		Quench	Br_2	300	LIF	40	15			σ	198	$10^{-16}cm^2$	10%	31	
B		Quench	Br_2	300	LIF	40	16			σ	220	$10^{-16}cm^2$	?	33	
B		Quench	Br_2	300	LIF	40	19			σ	251	$10^{-16}cm^2$	?	33	
B		Quench	Br_2	300	LIF	42	18			σ	229	$10^{-16}cm^2$	10%	31	
B		Quench	Br_2	300	LIF	42	32			σ	264	$10^{-16}cm^2$	?	33	
B		Quench	Br_2	300	LIF	42	33			σ	245	$10^{-16}cm^2$	10%	31	
B		Quench	Br_2	300	LIF	43	22			σ	229	$10^{-16}cm^2$	10%	31	
B		Quench	Br_2	300	LIF	44	29			σ	229	$10^{-16}cm^2$	10%	31	
B		Quench	Br_2	300	LIF	45	16			σ	226	$10^{-16}cm^2$	10%	31	
B		Quench	Br_2	300	LIF	45	38			σ	254	$10^{-16}cm^2$	10%	31	
B		Quench	Br_2	300	LIF	45	39			σ	273	$10^{-16}cm^2$	?	33	
B		Quench	Br_2	300	LIF	46-47	41-42			σ	276	$10^{-16}cm^2$	?	33	

Table 1.1. Inelastic Collision Data for Bromine (continued).

Electronic State Initial	Final	Process	Collision Partner	Temp (K)	Method	v_i	j_i	v_f	j_f	Quantity Reported	Data Entry	Units	Est. Error	Reference	Comment
B		Quench	He	600	LIF	17				k	3.24 (-10)	cm^3s^{-1}	10-20%	30	
B		Quench	He	300	MEF	19				k	2.9 (-10)	cm^3s^{-1}	10%	32	
B		Quench	Ne	600	LIF	17				k	2.54 (-10)	cm^3s^{-1}	10-20%	30	
B		Quench	Ne	300	MEF	19				k	3.0 (-10)	cm^3s^{-1}	10%	32	
B		Quench	Ar	300	LIF	2				k	1.7 (-11)	cm^3s^{-1}	15%	27	
B		Quench	Ar	600	LIF	17				k	4.44 (-10)	cm^3s^{-1}	10-20%	30	
B		Quench	Ar	300	MEF	19				k	4.3 (-10)	cm^3s^{-1}	10%	32	
B		Quench	Kr	600	LIF	17				k	2.80 (-10)	cm^3s^{-1}	10-20%	30	
B		Quench	Kr	300	MEF	19				k	4.0 (-10)	cm^3s^{-1}	10%	32	
B		Quench	O_2	300	MEF	19				k	4.2 (-10)	cm^3s^{-1}	10%	32	
B		Quench	N_2	300	LIF	2				k	1.0 (-11)	cm^3s^{-1}	UL	27	
B		Quench	N_2	300	MEF	19				k	5.6 (-10)	cm^3s^{-1}	10%	32	
B		Quench	CO_2	300	MEF	19				k	6.6 (-10)	cm^3s^{-1}	10%	32	
B		Quench+ V-T+R-T	Br_2	298	LIF	14	4			k	8.0 (-10)	cm^3s^{-1}	5-20%	34	
B		Quench+ V-T+R-T	Br_2	298	LIF	14	5			k	9.2 (-10)	cm^3s^{-1}	5-20%	34	
B		Quench+ V-T+R-T	Br_2	298	LIF	14	12			k	7.8 (-10)	cm^3s^{-1}	5-20%	34	
B		Quench+ V-T+R-T	Br_2	298	LIF	14	14			k	4.7 (-10)	cm^3s^{-1}	5-20%	34	
B		Quench+ V-T+R-T	Br_2	298	LIF	14	15			k	5.0 (-10)	cm^3s^{-1}	5-20%	34	
B		Quench+ V-T+R-T	Br_2	298	LIF	14	21			k	6.8 (-10)	cm^3s^{-1}	5-20%	34	
B		Quench+ V-T+R-T	Br_2	298	LIF	14	25			k	4.1 (-10)	cm^3s^{-1}	5-20%	34	

Table 1.1. Inelastic Collision Data for Bromine (continued).

Electronic State Initial	Electronic State Final	Process	Collision Partner	Temp (K)	Method	v_i	j_i	v_f	j_f	Quantity Reported	Data Entry	Units	Est. Error	Reference	Comment
B		Quench+ V-T+R-T	Br_2	298	LIF	14	30			k	4.2 (-10)	cm^3s^{-1}	5-20%	34	
B		Quench+ V-T+R-T	Cl_2	298	LIF	14	4			k	5.7 (-10)	cm^3s^{-1}	5-20%	34	
B		Quench+ V-T+R-T	Cl_2	298	LIF	14	12			k	6.0 (-10)	cm^3s^{-1}	5-20%	34	
B		Quench+ V-T+R-T	Cl_2	298	LIF	14	15			k	5.0 (-10)	cm^3s^{-1}	5-20%	34	
B		Quench+ V-T+R-T	Cl_2	298	LIF	14	25			k	3.9 (-10)	cm^3s^{-1}	5-20%	34	
B		Quench+ V-T+R-T	He	298	LIF	14	4			k	2.3 (-10)	cm^3s^{-1}	5-20%	34	
B		Quench+ V-T+R-T	He	298	LIF	14	12			k	2.3 (-10)	cm^3s^{-1}	5-20%	34	
B		Quench+ V-T+R-T	Ar	298	LIF	14	4			k	4.3 (-10)	cm^3s^{-1}	5-20%	34	
B		Quench+ V-T+R-T	Ar	298	LIF	14	5			k	4.2 (-10)	cm^3s^{-1}	5-20%	34	
B		Quench+ V-T+R-T	Ar	298	LIF	14	12			k	4.5 (-10)	cm^3s^{-1}	5-20%	34	
B		Quench+ V-T+R-T	Ar	298	LIF	14	14			k	3.2 (-10)	cm^3s^{-1}	5-20%	34	
B		Quench+ V-T+R-T	Ar	298	LIF	14	21			k	3.9 (-10)	cm^3s^{-1}	5-20%	34	
B		Quench+ V-T+R-T	Ar	298	LIF	14	25			k	1.7 (-10)	cm^3s^{-1}	5-20%	34	
B		Quench+ V-T+R-T	Ar	298	LIF	14	30			k	2.0 (-10)	cm^3s^{-1}	5-20%	34	

Table 1.1. Inelastic Collision Data for Bromine (continued).

Theoretical Treatments for Bromine

Electronic State Initial	Process	Collision Partners	Method, Comments	Reference
X	V-T	H	Semiclassical, collinear	35
X	V-T	H	Classical S-matrix	36
X	V-T	H,Ar	Quantum mechanical, collinear	37
X	V-T	He	Semiclassical, collinear, 200-3000 K	38
X	V-T	He,Ne,Ar	Calculation of kinetic coefficients	39
X	V-T	He,Ar,Xe	Classical trajectories, 1500 K	40
X	V-T	Ar	Classical trajectories, 3-D	41,42
X	V-T	Ar	Classical molecular dynamics, 160,295 K	43
X	V-T	Ar	Classical molecular dynamics; numerical simulation, 295 K	44,45
X	V-T	Ar	Classical molecular dynamics, 89-1500 K	46
X	V-T	Ar	Ergodic collision theory, 90,295,1500 K	47
X	V-T	Ar	Classical molecular dynamics, 1500 K	48
X	V-T	Ar	Classical trajectory, 2-D, 200-3300 K	49
X	V-T	Ar	Classical trajectory (Monte Carlo), 300-10000 K	50
X	V-T	Br_2	S-matrix calculation $v_i=1$, $v_f=0$; compare with SSH	51
X	V-T	Br_2	Semiclassical, 3-D, Morse oscillator, 300-900 K	52
X	V-T	H_2	Semiclassical, collinear	53
X	V-T	"H_2"	QM K-matrix, collinear	54
X	V-T	Br_2,HBr,N_2,H_2	Second order distorted-wave approximation	55
X	V-T+R-T	Ar	Numerical molecular dynamics	56
X	V-T+R-T	Ar	Effect of V-T and R-T on thermal dissociation	57
X	V-V	Br_2	Distorted-wave and close coupling calculations	58

Table 1.1. Inelastic Collision Data for Bromine (continued).

Radiative Lifetimes for Bromine

Electronic State Initial	Final	v_i	j_i	Method	Data (μs)	Est. Error	Comments	Reference
A	X			LIF	67	5%	Ar matrix, <30 K	59
A	X			LIF	170	5%	Kr matrix, <30 K ;	59
A	X	11	23	LIF	347	15%		24
A′	X			LIF	11(+3)	10-15%	Ar matrix, <30 K ; see note (e)	59
A′	X			LIF	6(+3)	10-15%	Kr matrix, <30 K ; see note (e)	59
A′	X			LIF	4(+3)	10-15%	Xe matrix, <30 K ; see note (e)	60
B	X			LIF	8.0	10%	Ar matrix, <30 K	59
B	X			LIF	5.3	10%	Kr matrix, <30 K	59
B	X			LIF	3.6	10%	Xe matrix, <30 K	60
B	X	0		LIF	7.3	?	Ar matrix, 4 K	59,61
B	X	0		LIF	8.6	?	Ne matrix, 4 K	59,61
B	X	0		LIF	6.4	?	Kr matrix, 4 K	59,61
B	X	1-40		LIF			Low-resolution measurement, $0.14 < \tau < 1.3$ μs	26
B	X	2	4-31	LIF	9.5-12.6	5%		27
B	X	11	3-30	LIF	(f)	15-40%	(f)	28
B	X	13		SSE+LIF	3.2	10-30%	In beam at 18 K	9
B	X	14		SSE+LIF	3.2	10-30%		9
B	X	14	3-30	LIF	(f)	15-40%	(f)	28
B	X	15		SSE+LIF	3.7	10-30%		9
B	X	16	48	LIF	0.11	10-20%		29
B	X	18	95	LIF	0.03	10%		31

Table 1.1. Inelastic Collision Data for Bromine (continued).

Radiative Lifetimes for Bromine

Electronic State Initial	Final	v_i	j_i	Method	Data (μs)	Est. Error	Comments	Reference
B	X	19		SSE+LIF	4.4	10-30%		9
B	X	19	3-30	LIF	(e)	15-40%	(e)	28
B	X	19	40	LIF	0.31	10-20%		29
B	X	20	3-30	LIF	(e)	15-40%	(e)	28
B	X	20	118	LIF	0.03	10%		31
B	X	21		SSE+LIF	5.8	10-30%		9
B	X	22	27	LIF	0.33	10%		31
B	X	23	3-30	LIF	(e)	15-40%	(e)	28
B	X	23	46	LIF	0.5	10-20%		29
B	X	23	106	LIF	0.03	10%		31
B	X	24	3-30	LIF	(e)	15-40%	(e)	28
B	X	25		SSE+LIF	5.7	10-30%		9
B	X	32	32	LIF	3.16	10%		31
B	X	33	24	LIF	0.49	10%		31
B	X	33	29	LIF	0.80	10%		31
B	X	33	38	LIF	0.41	10%		31
B	X	35	48	LIF	0.49	10%		31
B	X	36	52	LIF	0.40	10%		31
B	X	36	54	LIF	0.28	10%		31
B	X	38	60	LIF	0.40	10%		31
B	X	40	15	LIF	3.40	10%		31
B	X	40	16	LIF	3.57	?		33

Table 1.1. Inelastic Collision Data for Bromine (continued).

Radiative Lifetimes for Bromine

Electronic State Initial	Final	v_i	j_i	Method	Data (μs)	Est. Error	Comments	Reference
B	X	40	19	LIF	3.22	?		33
B	X	42	18	LIF	3.17	10%		31
B	X	42	32	LIF	1.96	?		33
B	X	42	33	LIF	1.31	10%		31
B	X	43	22	LIF	3.17	10%		31
B	X	44	29	LIF	3.17	10%		31
B	X	45	16	LIF	3.70	10%		31
B	X	45	38	LIF	1.46	10%		31
B	X	45	39	LIF	1.57	?		33
B	X	46-47	41-42	LIF	2.70	?		33

(a) Vibrationally inelastic scattering observed at small angles; collision energy 20-150 eV ($T_{eff} \sim 2.5 \times 10^5 - 1.8 \times 10^6$ K).

(b) Proposed mechanism $Br_2(A) + O_2^* \rightarrow Br_2(B,v_f) + O_2$; no kinetic data.

(c) Low-resolution measurements of quenching cross sections for $1 \lesssim v' \lesssim 40$; superseded by subsequent experimental work.

(d) Quenching rate varies with j_i; see reference for details.

(e) A' is tentatively identified as the lowest-lying $^3\Pi_{2u}$ state.

(f) Lifetimes given by $\tau_{rad}^{-1} = \tau_0^{-1}(v') + k_{v'}J'(J'+1)$, with the following parameter values (units of s^{-1}).

v'	$\tau_o^{-1}(v')$	$k_{v'}$
11	1.95(+5)	7.3(+3)
14	1.35(+5)	6.7(+3)
19	0.88(+5)	4.9(+3)
20	1.65(+5)	3.7(+3)
23	0.64(+5)	3.9(+3)
24	0.98(+5)	2.7(+3)

Table 1.2. Inelastic Collision Data for Bromine Chloride

Experimental Data for Bromire Chloride

Electronic State Initial	Final	Process	Collision Partner	Temp (K)	Method	v_i	j_i	v_f	j_f	Quantity Reported	Data Entry	Units	Est. Error	Reference	Comment
X	X	V-T	Cl_2	50	SSE					P	0.04		?	62	
X	X	V-E	I*	300	LIF					k	2.7 (-11)	cm^3s^{-1}	10%	18,19	
X	X	V-E	Br*	300	FP					k	2.9 (-14)	cm^3s^{-1}	10-30%	19,21	
X	X	R-T	Cl_2	50	SSE					P	1.0		?	62	
B		Quench	BrCl	300	LIF	0,1				k	1.02 (-12)	cm^3s^{-1}	20%	63	
B		Quench	BrCl	293	LIF	1				k	2.2 (-13)	cm^3s^{-1}	10%	64	
B		Quench	BrCl	293	LIF	4+5				k	3.9 (-13)	cm^3s^{-1}	10%	64	
B		Quench	Cl_2	300	LIF	0,1				k	1.23 (-13)	cm^3s^{-1}	20%	63	
B		Quench	Cl_2	293	LIF	1				k	2.7 (-12)	cm^3s^{-1}	10%	64	
B		Quench	Cl_2	300	LIF	4	4-45			k	6.2 (-11)	cm^3s^{-1}	20-30%	65	
B		Quench	Cl_2	300	LIF	5	6-55			k	9.6 (-11)	cm^3s^{-1}	20-30%	65	
B		Quench	Cl_2	300	LIF	6	10-41			k	2.1 (-10)	cm^3s^{-1}	20-30%	65	
B		Quench	He	300	LIF	0,1				k	1.23 (-13)	cm^3s^{-1}	20%	63	
B		Quench	Ar	293	LIF	1				k	1.3 (-12)	cm^3s^{-1}	10%	64	
B		Quench	O_2	293	LIF	1				k	5.8 (-12)	cm^3s^{-1}	10%	64	
B		Quench	Air	300	LIF	0,1				k	1.63 (-12)	cm^3s^{-1}	20%	63	
B	B	V-T	BrCl	293	LIF	1				k	3.0 (-12)	cm^3s^{-1}	10-20%	64	
B	B	V-T	BrCl	293	LIF	3				k	4.0 (-12)	cm^3s^{-1}	10-20%	64	
B	B	V-T	BrCl	293	LIF	4				k	6.2 (-11)	cm^3s^{-1}	10-20%	64	
B	B	V-T	BrCl	293	LIF	5				k	9.6 (-11)	cm^3s^{-1}	10-20%	64	
B	B	V-T	BrCl	293	LIF	6				k	2.1 (-10)	cm^3s^{-1}	10-20%	64	
B	B	V-T	Cl_2	300	LIF	3				k	1.0 (-11)	cm^3s^{-1}	30%	66	a

Table 1.2. Inelastic Collision Data for Bromine Chloride (continued).

Electronic State															
Initial	Final	Process	Collision Partner	Temp (K)	Method	v_i	j_i	v_f	j_f	Quantity Reported	Data Entry	Units	Est. Error	Reference	Comment
B	B	V-T	Cl_2	300	LIF	3-6		v_i+1		k	1.1 (-10)	cm^3s^{-1}	40%	65	
B	B	V-T	Cl_2	300	LIF	3-6		v_i+2		k	3.4 (-11)	cm^3s^{-1}	40%	65	
B	B	V-T	Cl_2	300	LIF	3-6		$v_i+3,4,5$		k	6.2 (-11)	cm^3s^{-1}	40%	65	
B	B	V-T	Cl_2	300	LIF	4				k	1.9 (-11)	cm^3s^{-1}	30%	66	a
B	B	V-T	Cl_2	300	LIF	5				k	4.8 (-11)	cm^3s^{-1}	30%	66	a
B	B	V-T	Cl_2	300	LIF	6				k	9.6 (-11)	cm^3s^{-1}	30%	66	a

Radiative Lifetimes for Bromine Chloride

Electronic State Initial	Final	v_i	j_i	Method	Data (μs)	Est. Error	Comments	Reference
B	X	0,1		LIF	13	60%	(a)	66
B	X	0,1		LIF	18.5	20%		63
B	X	1	25	LIF	41.5	1-2%		64
B	X	3		LIF	29	30%	(a)	66
B	X	3	15-35	LIF	42	5%		65
B	X	4		LIF	40	25%	(a)	66
B	X	4	4-45	LIF	40	5%		65
B	X	5	6	LIF	42.7	5%		65
B	X	5	10	LIF	39	5%		65
B	X	5	15	LIF	37.6	5%		65
B	X	5	20	LIF	37.7	5%		65
B	X	5	25	LIF	39.6	5%		65
B	X	5	30	LIF	38	5%		65
B	X	5	35	LIF	39	5%		65
B	X	5	40	LIF	39	5%		65

Table 1.2. Inelastic Collision Data for Bromine Chloride (continued).

Radiative Lifetimes for Bromine Chloride

Electronic State Initial	Final	v_i	j_i	Method	Data (μs)	Est. Error	Comments	Reference
B	X	5	45	LIF	41.3	5%		65
B	X	5	50	LIF	42.2	5%		65
B	X	5	55	LIF	42.6	5%		65
B	X	6	10–41	LIF	40	5%		65
B	X	7	7	LIF	.91		(a)	66
B	X	7	10	LIF	.78		(a)	66
B	X	7	13	LIF	.45		(a)	66
B	X	7	16	LIF	.35		(a)	66
B	X	7	19	LIF	.24		(a)	66

(a) Rates and lifetimes may be underestimated due to multiple-collision effects.[65]

Table 1.3. Inelastic Collision Data for Bromine Fluoride

Experimental Data for Bromine Fluoride

Electronic State Initial	Electronic State Final	Process	Collision Partner	Temp (K)	Method	v_i	j_i	v_f	j_f	Quantity Reported	Data Entry	Units	Est. Error	Reference	Comment
B		Quench	Br_2	300	LIF	6	17+20			k	1.5 (-10)	cm^3s^{-1}	15%	67	
B		Quench	BrF	300	LIF	6	17+20			k	2.6 (-10)	cm^3s^{-1}	15%	67	
B		Quench	Cl_2	298	LIF	3				k	<0.1 (-12)	cm^3s^{-1}	UL	68	
B		Quench	He	300	LIF	6	17+20			k	2.0 (-12)	cm^3s^{-1}	UL	67	
B		Quench	Ar	298	LIF	3				k	<0.1 (-12)	cm^3s^{-1}	UL	68	
B		Quench	HCl	298	LIF	3				k	12 (-12)	cm^3s^{-1}	30%	68	
B		Quench	O_2	298	LIF	Thermal				k	2.6 (-12)	cm^3s^{-1}	30%	68	
B		Quench	$CHFCl_2$	298	LIF	3				k	6 (-12)	cm^3s^{-1}	30%	68	
B	B	V-T	Cl_2	298	LIF	3				k	0.5 (-11)	cm^3s^{-1}	30%	68	
B	B	V-T	Ar	298	LIF	3				k	<0.25 (-11)	cm^3s^{-1}	UL	68	
B	B	V-T	HCl	298	LIF	3				k	5 (-11)	cm^3s^{-1}	30%	68	
B	B	V-T	O_2	298	LIF	3				(a)	0.50		30%	68	a
B	B	V-T	O_2	298	LIF	3				k	3.6 (-11)	cm^3s^{-1}	30%	68	
B	B	V-T	O_2	298	LIF	4				(a)	0.52		30%	68	a
B	B	V-T	O_2	298	LIF	4				k	2.2 (-11)	cm^3s^{-1}	30%	68	
B	B	V-T	O_2	298	LIF	5				(a)	0.60		30%	68	a
B	B	V-T	O_2	298	LIF	5				k	2.1 (-11)	cm^3s^{-1}	30%	68	
B	B	V-T	O_2	298	LIF	6				(a)	1.14		30%	68	a
B	B	V-T	O_2	298	LIF	6				k	3.4 (-11)	cm^3s^{-1}	30%	68	
B	B	V-T	O_2	298	LIF	7				(a)	5.2		30%	68	a
B	B	V-T	O_2	298	LIF	7				k	12.5 (-11)	cm^3s^{-1}	30%	68	
B	B	V-T	$CHFCl_2$	298	LIF	3				k	2 (-11)	cm^3s^{-1}	30%	68	
B	B	V-V	BrF(X)	300	LIF+ME	8	6			k	3.6 (-10)	cm^3s^{-1}	X2	69	
B	B	R-T	He	300	LIF+ME	7	15-23	7	$j_i \pm 10$	k	2.5 (-11)	cm^3s^{-1}	X2	69	

Table 1.3. Inelastic Collision Data for Bromine Fluoride (continued).

Radiative Lifetimes for Bromine Fluoride

Electronic State Initial	Final	v_i	j_i	Method	Data (μs)	Est. Error	Comments	Reference
B	X	0	16-26	LIF	43.0	1-2%		70
B	X	1	5-31	LIF	44.0	1-2%		70
B	X	2	7-39	LIF	46.0	1-2%		70
B	X	3	9-42	LIF	43.9	1-2%	(b)	70
B	X	3	21	LIF	55.5	<5%		68
B	X	4	3-45	LIF	44.7	1-2%	(b)	70
B	X	4	21	LIF	59.0	<5%		68
B	X	5	3-38	LIF	44.2	1-2%	(b)	70
B	X	5	21	LIF	58.9	<5%		68
B	X	6	3-44	LIF	46.3	1-2%	(b)	70
B	X	6	10	LIF	63.0	<5%		68
B	X	6	17+20	LIF	25	15%		67
B	X	6	21	LIF	62.6	<5%		68
B	X	6	45	LIF	62.1	<5%		68
B	X	6	46	LIF	58.8	<5%		68
B	X	6	47	LIF	50.3	<5%		68
B	X	6	48	LIF	10.4	<5%		68
B	X	7	3-27	LIF	48.1	1-2%	(b)	70
B	X	7	4-21	LIF	26-16	10%		69
B	X	7	11	LIF	63.2	<5%		68
B	X	7	20	LIF	65.2	<5%		68

Table 1.3. Inelastic Collision Data for Bromine Fluoride (continued).

Radiative Lifetime for Bromine Fluoride

Electronic State Initial	Final	v_i	j_i	Method	Data (μs)	Est. Error	Comments	Reference
B	X	7	22-26	LIF	>8	10%		69
B	X	7	27	LIF	>5	10%		69
B	X	7	27	LIF	60.1	<5%		68
B	X	7	28	LIF	59.4	<5%		68
B	X	7	29	LIF	1.6	10%		69
B	X	7	30	LIF	1.16	10%		69
B	X	7	31	LIF	0.74	10%		69
B	X	8	1-15	LIF	1.74-1.02			69
B	X	8	2-27	LIF	0.3-1.7	1-2%		70
B	X	8	16	LIF	0.95	10%		69
B	X	8	17	LIF	0.86	10%		69
B	X	8	18	LIF	0.90	10%		69
B	X	8	19	LIF	0.71	10%		69
B	X	8	20	LIF	0.57	10%		69
B	X	8	21	LIF	0.53	10%		69
B	X	8	23	LIF	0.48	10%		69
B	X	8	24	LIF	0.45	10%		69
B	X	8	25	LIF	0.40	10%		69
B	X	8	26	LIF	0.34	10%		69
B	X	8	27	LIF	0.38	10%		69
B	X	8	28	LIF	0.24	10%		69
B	X	8	29	LIF	0.14	10%		69
B	X	8	30	LIF	0.17	10%		69
B	X	8	31	LIF	0.11	10%		69

(a) Quantity reported[68] is the ratio $k(v \rightarrow v+1)/k(v \rightarrow v-1)$.

(b) Higher values of τ for $v = 3-7$ are reported.[68]

Table 1.4. Inelastic Collision Data for Bromine Iodide

Experimental Data for Bromine Iodide

Electronic State Initial	Final	Process	Collision Partner	Temp (K)	Method	v_i	j_i	v_f	j_f	Quantity Reported	Data Entry	Units	Est. Error	Reference	Comment
X	X	V-E	I*	293	LIF					k	6.6 (-11)	cm^3s^{-1}	10%	18,19	
X	X	V-E	Br*	300	FP					k	1.0 (-12)	cm^3s^{-1}	10-30%	19,21	

Theoretical Treatments for Bromine Iodide

Electronic State Initial	Process	Collision Partners	Method, Comments	Reference
X	E-E		Theory for curve crossing to $B'(0^+)$ state and predissociation	72

Radiative Lifetimes for Bromine Iodide

Electronic State Initial	Final	v_i	j_i	Method	Data (μs)	Est. Error	Comments	Reference
B	X	2		LIF	0.54	10%		73
B	X	3		LIF	0.55	10%		73
B	X	4		LIF	0.55	10%		73

Table 1.5. Inelastic Collision Data for Chlorine

Experimental Data for Chlorine

Electronic State Initial	Final	Process	Collision Partner	Temp (K)	Method	v_i	j_i	v_f	j_f	Quantity Reported	Data Entry	Units	Est. Error	Reference	Comment
X	?	E-E	Ar*	300	DF					k	7.1 (- 10)	cm^3s^{-1}	?	12	
X	?	E-E	Kr*	300	DF					k	7.3 (-10)	cm^3s^{-1}	?	12	
X	?	E-E	Xe*	300	DF					k	7.2 (-10)	cm^3s^{-1}	?	12	
X	X	V-T	Cl_2	298	UA					P	2.33 (- 5)			15	
X	X	V-T	Cl_2	376	UA					P	4.65 (- 5)			15	
X	X	V-T	Cl_2	387	UA					P	5.11 (- 5)			15	
X	X	V-T	Cl_2	440	UA					P	7.91 (- 5)			15	
X	X	V-T	Cl_2	477	UA					P	1.06 (- 4)			15	
X	X	V-T	Cl_2	528	UA					P	1.49 (- 4)			15	
X	X	V-T	Cl_2	290	UA					pτ	3.4 (- 6)	bar s	?	13	
X	X	V-T	Cl_2	273	UA					pτ	6.20 (- 6)	bar s		74	
X	X	V-T	Cl_2	293	UA					pτ	5.0 (- 6)	bar s		74	
X	X	V-T	Cl_2	303	UA					pτ	4.6 (- 6)	bar s		74	
X	X	V-T	Cl_2	313	UA					pτ	4.2 (- 6)	bar s		74	
X	X	V-T	Cl_2	323	UA					pτ	3.8 (- 6)	bar s		74	
X	X	V-T	Cl_2	241	UA					pτ	6.4 (- 6)	bar s		75	
X	X	V-T	Cl_2	291	UA					pτ	4.2 (- 6)	bar s		75	
X	X	V-T	Cl_2	347	UA					pτ	2.6 (- 6)	bar s		75	
X	X	V-T	Cl_2	415	UA					pτ	1.6 (- 6)	bar s		75	
X	X	V-T	Cl_2	400-1400	ST					pτ	(a)	bar s	20-30%	76	a
X	X	V-T	Cl_2	578	ST					pτ	0.69 (- 6)	bar s	20-50%	77	
X	X	V-T	Cl_2	658	ST					pτ	0.42 (- 6)	bar s	20-50%	77	
X	X	V-T	Cl_2	924	ST					pτ	0.14 (- 6)	bar s	20-50%	77	
X	X	V-T	Cl_2	1451	ST					pτ	0.08 (- 6)	bar s	20-50%	77	

Table 1.5. Inelastic Collision Data for Chlorine (continued).

Electronic State Initial	Final	Process	Collision Partner	Temp (K)	Method	v_i	j_i	v_f	j_f	Quantity Reported	Data Entry	Units	Est. Error	Reference	Comment
X	X	V-T	He	291	UA					P	1.0 (- 3)			75	
X	X	V-T	He	578	ST					pτ	0.014(- 6)	bar s	20-50%	77	
X	X	V-T	He	1370	ST					pτ	0.01 (- 6)	bar s	20-50%	77	
X	X	V-T	H_2	291	UA					P	1.16 (- 3)			75	
X	X	V-T	HCl	291	UA					P	7.4 (- 3)			75	
X	X	V-T	HCl	347	UA					P	.027			75	
X	X	V-T	HCl	400-1400	ST					pτ	(b)	bar s	20-30%	76	b
X	X	V-T	DCl	400-1400	ST					pτ	(c)	bar s	20-30%	76	c
X	X	V-T	N_2	291	UA					P	2.1 (- 5)			75	
X	X	V-T	CO	241	UA					P	2.1 (- 3)			75	
X	X	V-T	CO	291	UA					P	4.0 (- 3)			75	
X	X	V-T	CO	347	UA					P	7.3 (- 3)			75	
X	X	V-T	CO	415	UA					P	.012			75	
X	X	V-T	CO	400-1400	ST					pτ	(d)	bar s	20-30%	76	d
X	X	V-T	CH_4	291	UA					P	4.7 (- 3)			75	
X	X	V-E	I*	300	LIF					k	5.0 (-14)	cm^3s^{-1}	30%	18,19	e
X	X	V-E	I*	300	IRF					k	2.0 (-14)		10%	78	
X	X	V-E	Br*	300	FP					k	2.2 (-14)	cm^3s^{-1}	10-30%	19,21	
X	X	V-V	CO(v=1)	300	IRF	0	Thermal			k	7.4 (-17)	cm^3s^{-1}	20%	79	
X	B	Dephase	Ar	4	PB/O			10		T_2	1.1 (- 6)	μs		80,81	f
X	B	Dephase	Ar	4	PB/O			11		T_2	0.9 (- 6)	μs		80,81	f
X	B	Dephase	Ar	4	PB/O			12		T_2	0.4 (- 6)	μs		80,81	f
X	B	Dephase	Ar	4	PB/O			13		T_2	0.4 (- 6)	μs		80,81	f
X	B	Dephase	Ar	4	PB/O			14		T_2	0.3 (- 6)	μs		80,81	f
X	B	Linewidth	Cl_2	300	PB/O			17+19	2-30	Δν/p	8.13	MHz/Torr	5%	23	

Table 1.5. Inelastic Collision Data for Chlorine (continued).

Electronic State Initial	Final	Process	Collision Partner	Temp (K)	Method	v_i	j_i	v_f	j_f	Quantity Reported	Data Entry	Units	Est. Error	Reference	Comment
B		Quench	Cl_2	298	LIF	5				k	6.4 (-12)	cm^3s^{-1}	10%	82	
B		Quench	Cl_2	300	LIF	7-12	0-40			k	6 (-12)	cm^3s^{-1}	17%	83	
B		Quench	Cl_2	300	LIF	20				k	0.53 (-10)	cm^3s^{-1}	10%	84	
B		Quench	Ar	298	LIF	5				k	4.9 (-12)	cm^3s^{-1}	UL	82	
B		Quench	Ar	300	LIF	20				k	0.53 (-10)	cm^3s^{-1}	10%	84	
B		Quench	O_2	298	LIF	5				k	1.0 (-11)	cm^3s^{-1}	UL	82	
B		Quench	N_2	298	LIF	5				k	1.0 (-11)	cm^3s^{-1}	UL	82	
B		Quench+ V-T+R-T	Cl_2	298	LIF	13				k	1.8 (-10)	cm^3s^{-1}	5%	85	
B	B	V-T	Cl_2	298	LIF	5				k	1.7 (-11)	cm^3s^{-1}	50%	82	
B	B	V-T	Cl_2	300	LIF	10	0-40	13		k	5.6 (-11)	cm^3s^{-1}	17%	83	
B	B	V-T	Cl_2	300	LIF	11	0-40	13		k	1.2 (-10)	cm^3s^{-1}	17%	83	
B	B	V-T	Cl_2	300	LIF	12	0-40	13		k	1.5 (-10)	cm^3s^{-1}	17%	83	
D		Quench	Cl_2		MEF(g)					k	1.2 (- 9)	cm^3s^{-1}	10-20%	86	
D		Quench	Ar		MEF(g)					k	1.6 (-10)	cm^3s^{-1}	10-20%	86	
D		Quench	Kr		MEF(g)					k	1.6 (-10)	cm^3s^{-1}	10-20%	86	

Table 1.5. Inelastic Collision Data for Chlorine (continued).

Theoretical Treatments for Chlorine

Electronic State Initial	Process	Collision Partners	Method, Comments	Reference
X	V-T	Cl	Information theoretic analysis	87
X	V-T	Cl	Information theoretic synthesis, 1100 K	88
X	V-T	Cl	Monte Carlo quasiclassical trajectory, 500-1500 K v_i=0,1,3,7,14	89
X	V-T	Cl,M	Information theoretic analysis	90
X	V-T	Cl_2	SSH theory, compared potentials	91
X	V-T	Cl_2	Semiclassical non-Markovian master equation	92
X	V-T	Cl_2	S-matrix calculations; compared with SSH	51
X	V-T	Cl_2	Analytical classical mechanics, 250-1479 K Calculation of Z_{vib}	93
X	V-T	Cl_2	1 → 0 transition probability, 250-500 K	94
X	V-T	Cl_2	Semiclassical, 3-D; Morse oscillator, 300-900 K	52
X	V-T	Cl_2	WKB calculation of vibrational transition probability, 250-2000 K	95
X	V-T	"H_2"	Partial wave calculation	96
X	V-T	H_2,N_2	Second order distorted-wave approximation	55
X	V-T	HCl,DCl	Monte Carlo quasiclassical trajectory, 800-2100 K	97
X	V-T	Ar,Kr,Xe matrix	Quantum mechanical theory of vibrational relaxation in low temperature solids	98
X	V-T+V-V	Cl_2	Perturbed stationary state calculation, collinear collision	96
X	V-T+R-T	Ar	Effect of V-T and R-T on thermal dissociation	57
X	V-V	Cl_2	Distorted-wave and close coupling calculations	58
X	R-T	Cl_2	Exact classical calculation, 100-600 K	99
X	R-T	Rigid surface	Sudden and quasiclassical calculations	100

Table 1.5. Inelastic Collision Data for Chlorine (continued).

Radiative Lifetimes for Chlorine

Electronic State Initial	Electronic State Final	v_i	j_i	Method	Data (μs)	Est. Error	Comments	Reference
A′	X			LIF	76(+3)		Ar matrix, 4 K	101
A′	X			LIF	83(+3)		Ne matrix, 4 K	101
A′	X			LIF	55(+3)		Kr matrix, 4 K	101
B	X	5	16	LIF	305			82
B	X	7	4-31	LIF	78	5%	(h)	102
B	X	8	5-34	LIF	78	5%	(h)	102
B	X	9	10-40	LIF	87	5%	(h)	102
B	X	10	10-38	LIF	87	5%	(h)	102
B	X	11	6-36	LIF	72-114	5%	(h)	102
B	X	12	2-18	LIF	88	5%	(h)	102
B	X	>12		LIF	0.003	5%	(h)	102
B	X	13	J′	LIF	(i)	10-20%		103
B	X	13	J′	LIF	(j)			85
B	X	14	J′	LIF	(i)	10-20%		103
B	X	15	J′	LIF	(i)	10-20%		103
B	X	16	J′	LIF	(i)	10-20%		103
B	X	18	J′	LIF	(i)	10-20%		103
B	X	19	J′	LIF	(i)	10-20%		103
B	X	21	J′	LIF	(i)	10-20%		103
B	X	22	J′	LIF	(i)	10-20%		103
B	X	23	J′	LIF	(i)	10-20%		103

Table 1.5. Inelastic Collision Data for Chlorine (continued).

Radiative Lifetimes for Chlorine

Electronic State Initial	Electronic State Final	v_i	j_i	Method	Data (μs)	Est. Error	Comments	Reference
B	X	24	J′	LIF	(i)	10-20%		103
B	X	24	J′	LIF	(j)			85
B	X	25	J′	LIF	(i)	10-20%		103
B	X	25	J′	LIF	(j)			85
D				MEF(g)	0.003	10-20%		86

(a) Cl_2-Cl_2 vibrational relaxation time $p\tau$/bar·s = 4.81×10^{-10} $\exp[74\ T^{-1/3} - 537\ T^{-1}]$.

(b) Cl_2-HCl vibrational relaxation time $p\tau$/bar·s = 4.83×10^{-8} $\exp[-3.64\ T^{-1/3}]$.

(c) Cl_2-DCl vibrational relaxation time $p\tau$/bar·s = 7.99×10^{-9} $\exp[20.9\ T^{-1/3}]$.

(d) Cl_2-CO vibrational relaxation time $p\tau$/bar·s = 2.60×10^{-9} $\exp[40.6\ T^{-1/3}]$.

(e) Remeasurement of the I^*-Cl_2 quenching rate coefficient gives a value substantially different from that previously reported[18] (S. Leone, private communication).

(f) From line width measurements in Ar matrix at 4 K.

(g) Synchrotron radiation source.

(h) Lifetimes may be systematically too low; revised values have been reported.[82]

(i) Lifetimes given by $\tau_{rad}^{-1} = \tau_o^{-1}(v') + k_{v'}\ J'(J'+1)$, with the following parameter values (units of s^{-1}):

v′	$\tau_o^{-1}(v')$	$k_{v'}$
13	1.31(+6)	7.1(+5)
14	1.54(+6)	5.9(+5)
15	1.85(+6)	5.3(+5)
16	1.81(+6)	4.1(+5)
18	1.83(+6)	3.8(+5)
19	1.21(+6)	4.2(+5)
21	1.23(+6)	2.9(+5)
22	1.21(+6)	2.4(+5)
23	1.89(+6)	1.6(+5)
24	1.41(+6)	1.7(+5)
25	1.60(+6)	1.2(+5)

(j) Lifetimes given by $\tau_{rad}^{-1} = \tau_o^{-1} + k_{v'}\ J'(J'+1)$, with the following parameter values: τ_o = 3.5 μs, k_{13} = 8.2(+5) s^{-1}, k_{24} = 1.0(+5) s^{-1}, k_{25} = 1.1(+5) s^{-1}.

Table 1.6. Inelastic Collision Data for Chlorine Fluoride

Experimental Data for Chlorine Fluoride

Electronic State Initial	Final	Process	Collision Partner	Temp (K)	Method	v_i	j_i	v_f	j_f	Quantity Reported	Data Entry	Units	Est. Error	Reference	Comment
X	X	V-T	ClF	500-1000	ST					$p\tau$	(a)	bar s	30%	104	a
X	X	V-T	Ar	500-1000	ST					$p\tau$	(b)	bar s	30%	104	b
X	X	Linewidth	Ar	80-120	IRA						(c)			105	c
X	X	Linewidth	O_2	80-120	IRA						(c)			105	c
X	X	Linewidth	N_2	80-120	IRA						(c)			105	c

(a) CℓF-CℓF vibrational relaxation time $p\tau/\text{bar}\cdot\text{s} = 3.18 \times 10^{-9} \exp[50.57\ T^{-1/3}]$.

(b) CℓF-Ar vibrational relaxation time $p\tau/\text{bar}\cdot\text{s} = 1.214 \times 10^{-9} \exp[68.44\ T^{-1/3}]$.

(c) Line widths reported for $v = 1 \leftarrow 0$ transition in cryogenic solutions (liquid Ar, O_2, N_2).

Table 1.7. Inelastic Collision Data for Chlorine Iodide

Experimental Data for Chlorine Iodide

Electronic State Initial	Electronic State Final	Process	Collision Partner	Temp (K)	Method	v_i	j_i	v_f	j_f	Quantity Reported	Data Entry	Units	Est. Error	Reference	Comment
X	?	E-E	Ar*	300	DF					k	6.1 (-10)	cm^3s^{-1}	?	12	
X	?	E-E	Xe*	300	DF					k	5.0 (-10)	cm^3s^{-1}	?	12	
X	X	V-E	I*	293	IRF					k	2.3 (-11)	cm^3s^{-1}	10%	18,19	
X	X	V-E	I*	300	IRF					k	3.3 (-11)	cm^3s^{-1}	15%	78	
X	X	V-E	Br*	300	FP					k	9 (-13)	cm^3s^{-1}	10-30%	19,21	
X	X	V-V	$HCl^{\#}$	300	IRF					P	0.04-0.4		X10	106	
X	X	Linewidth	ClI	300	PB/M	0	0	0	1	Δν/p	6.6	MHz/Torr		107	a
X	X	Linewidth	ClI	300	PB/M	0	3	0	4	Δν/p	11	MHz/Torr	20%	108	b
X	B	Linewidth		300	PB/O			3	5-42		(c)			109	c
A		Quench	Cl_2	300	LIF					k	2.2 (-11)	cm^3s^{-1}	15%	110	
A		Quench	ClI	300	LIF					k	3.0 (-10)	cm^3s^{-1}	15%	110	
A		Quench	ClI	300	LIF						(d)			111	d
A		Quench	Ne	300	LIF					k	4.5 (-12)	cm^3s^{-1}	15%	110	
A		Quench	Ar	300	LIF					k	4.7 (-12)	cm^3s^{-1}	15%	110	
A		Quench	Xe	300	LIF					k	4.2 (-12)	cm^3s^{-1}	15%	110	
A		Quench	H_2	300	LIF					k	1.5 (-11)	cm^3s^{-1}	15%	110	
A		Quench	D_2	300	LIF					k	1.46 (-11)	cm^3s^{-1}	15%	110	
A		Quench	HCl	300	LIF					k	4.6 (-11)	cm^3s^{-1}	15%	110	
A		Quench	CO_2	300	LIF					k	3.0 (-11)	cm^3s^{-1}	15%	110	
A		Quench	SF_6	300	LIF					k	1.5 (-11)	cm^3s^{-1}	15%	110	
A		V-E	CO	300	LIF/IRA						(e)			112	e
B		Quench	ClI	298	LIF	1	17			k	2.2 (-10)	cm^3s^{-1}	20%	67	
B		Quench	ClI	298	LIF	1	44			k	2.7 (-10)	cm^3s^{-1}	20%	67	

Table 1.7. Inelastic Collision Data for Chlorine Iodide (continued).

Electronic State Initial	Final	Process	Collision Partner	Temp (K)	Method	v_i	j_i	v_f	j_f	Quantity Reported	Data Entry	Units	Est. Error	Reference	Comment
B		Quench	ClI	298	LIF	2	19			k	2.7 (-10)	cm^3s^{-1}	20%	67	
B		Quench	ClI	298	LIF	2	24			k	2.2 (-10)	cm^3s^{-1}	20%	67	
B		Quench	ClI	298	LIF	2	26			k	1.5 (-10)	cm^3s^{-1}	20%	67	
B		Quench	ClI	298	LIF	2	43			k	2.0 (-10)	cm^3s^{-1}	20%	67	
B		Quench	ClI	298	LIF	2	53			k	1.6 (-10)	cm^3s^{-1}	20%	67	
B		Quench	ClI	298	LIF	2	63			k	2.2 (-10)	cm^3s^{-1}	20%	67	

Radiative Lifetimes for Chlorine Iodide

Electronic State Initial	Final	v_i	j_i	Method	Data (μs)	Est. Error	Comments	Reference
A	X			LIF			superceded by 110	111
A	X			LIF	405	10%	λ_{exc} = 589 nm	110
A	X			LIF	410	10%	λ_{exc} = 604 nm	110
A	X			LIF	415	10%	λ_{exc} = 607 nm	110
A	X			LIF	460	10%	λ_{exc} = 661 nm	110
A	X			LIF	440	10%	λ_{exc} = 669 nm	110
A	X			LIF	260		Ar matrix <25 K	113
A	X			LIF	290		Ne matrix <25 K	113
A	X	3-5		LIF	300	30%		114
A	X	4-6		LIF	170	30%		114
A	X	6-8		LIF	110	30%		114
A	X	7-9		LIF	110	30%		114
A	X	8-10		LIF	300	30%		114

Table 1.7. Inelastic Collision Data for Chlorine Iodide (continued).

Radiative Lifetimes for Chlorine Iodide

Electronic State Initial	Final	v_i	j_i	Method	Data (μs)	Est. Error	Comments	Reference
A	X	9-12		LIF	200	30%		114
A	X	12-15		LIF	250	30%		114
A	X	13-16		LIF	275	30%		114
A	X	15-18		LIF	275	30%		114
A	X	17-21		LIF	200	30%		114
B	X	1	17	LIF	.60	20%		67
B	X	1	44	LIF	.57	20%		67
B	X	2	24	LIF	.42	20%		67
B	X	2	26	LIF	.45	20%		67
B	X	2	43	LIF	.23	20%		67
B	X	2	53	LIF	.56	20%		67
B	X	2	63	LIF	.22	20%		67
B	X			LIF	τ_1=1.25 τ_2=1.9	?	Xe matrix, 4.2 K	115
B	X			LIF	τ_1=1.57 τ_2=2.23	?	Kr matrix, 4.2 K	115
B	X			LIF	τ_1=1.9 τ_2=2.86	?	Ar matrix, 4.2 K	115
B	X			LIF	τ_1=2.28 τ_2=3.36	?	Ne matrix, 4.2 K	115

(a) $F_1 = 5/2 \rightarrow 7/2$.

(b) $F_1 = 11/2 \rightarrow 13/2$.

(c) Collision-free optical line widths of 0.04-0.08 cm^{-1} measured for j = 5-39, increasing to 0.17 cm^{-1} for j = 42. These are interpreted as a nonradiative decay rate of from 4 to 50×10^9 s^{-1}.

(d) Self-quenching rate measured as $(2.2-2.5) \times 10^{-10}$ cm^3 $molecule^{-1}$ s^{-1}, now superseded.[110]

(e) Very little vibrational excitation found in CO; no kinetic data given.

Table 1.8. Inelastic Collision Data for Fluorine

Experimental Data for Fluorine

Electronic State Initial	Final	Process	Collision Partner	Temp (K)	Method	v_i	j_i	v_f	j_f	Quantity Reported	Data Entry	Units	Est. Error	Reference	Comment
X	?	E-E	Ar*	300?	DF					k	7.5 (-10)	cm^3s^{-1}	?	12	
X	?	E-E	Kr*	300?	DF					k	7.2 (-10)	cm^3s^{-1}	?	12	
X	?	E-E	Xe*	300?	DF					k	7.5 (-10)	cm^3s^{-1}	?	12	
X	X	V-T	F_2	301	UA					pτ	20.9 (- 6)	bar-s		116	
X	X	V-T	F_2	375	UA					pτ	10.8 (- 6)	bar-s		116	
X	X	V-T	F_2	500-1300	ST					pτ	(a)	bar-s	30%	117	a
X	X	V-T	He	500-1050	ST					pτ	(b)	bar-s	20%	118	b
X	X	V-T	Ar	500-1300	ST					pτ	(c)	bar-s	30%	117	c
X	X	R-T	F_2		SSE					σ	14	$10^{-16}cm^2$	?	119	
D′		Quench	F_2	300	ME					k	3.5 (-10)	cm^3s^{-1}	10%	120	
D′		Quench	Xe	300	ME					k	1.55 (-10)	cm^3s^{-1}	10%	120	
D′		Quench	NF_3	300	ME					k	4.1 (-10)	cm^3s^{-1}	10%	120	

Theoretical Treatments for Fluorine

Electronic State Initial	Process	Collision Partners	Method, Comments	Reference
X	V-T	Ar,He	Calculated shock tube results, 450-1250 K (see refs. [117, 118])	121
X	V-T+R-T	F_2	Semiclassical calculation, 3-D, rotation included; T = 450-1250 K	122
X	V-T+R-T	Ar	Effect of V-T and R-T on thermal dissociation	57

Table 1.8. Inelastic Collision Data for Fluorine (continued).

Radiative Lifetimes for Fluorine

Electronic State Initial	Final	v_i	j_i	Method	Data (μs)	Est. Error	Comments	Reference
$^3\Pi_{2g}$	X			ME	0.041	10%?		120

(a) F_2-F_2 vibrational relaxation time $p\tau$/bar·s = 9.50×10^{-10} exp[65.2 $T^{-1/3}$].

(b) F_2-He vibrational relaxation time $p\tau$/bar·s = 6.71×10^{-10} exp[47.2 $T^{-1/3}$].

(c) F_2-Ar vibrational relaxation time $p\tau$/bar·s = 1.77×10^{-10} exp[96.97 $T^{-1/3}$].

Table 1.9. Inelastic Collision Data for Fluorine Iodide

Experimental Data for Fluorine Iodide

Electronic State Initial	Final	Process	Collision Partner	Temp (K)	Method	v_i	j_i	v_f	j_f	Quantity Reported	Data Entry	Units	Est. Error	Reference	Comment
X	B	E-E	$NF^*(b^1\Sigma^+)$	300?	CL	Thermal		$0<v_f<8$		k	5.6 (-11)	cm^3s^{-1}	LL	123	
B		Quench	He	300?	OPL,LIF	3				k	<1.0 (-14)	cm^3s^{-1}	UL	124,125	
B		Quench	Ne	300	LIF					k	<1.0 (-14)	cm^3s^{-1}	UL	125	
B		Quench	Ar	300	LIF					k	<1.0 (-14)	cm^3s^{-1}	UL	125	
B		Quench	Kr	300	LIF					k	<1.0 (-14)	cm^3s^{-1}	UL	125	
B		Quench	Xe	300	LIF					k	<1.0 (-14)	cm^3s^{-1}	UL	125	
B		Quench	F_2	300	LIF					k	3.5 (-12)	cm^3s^{-1}	20%	125	
B		Quench	O_2	300?	OPL	3				k	>4.0 (-13)	cm^3s^{-1}	LL	124	
B		Quench	N_2	300	LIF					k	<1.0 (-14)	cm^3s^{-1}	UL	125	
B		Quench	SF_6	300	LIF					k	<1.0 (-14)	cm^3s^{-1}	UL	125	
B	B	V-T	He	300?	OPL	3		2		k	1.2 (-11)	cm^3s^{-1}	?	124	
B	B	V-T	He	300	LIF	3	Thermal	2		k	5.8 (-12)	cm^3s^{-1}	40%	125	a
B	B	V-T	He	300	LIF	3	Thermal	4		k	1.0 (-12)	cm^3s^{-1}	40%	125	a
B	B	V-T	He	300	LIF	4	Thermal	3		k	8.3 (-12)	cm^3s^{-1}	40%	125	a
B	B	V-T	He	300	LIF	4	Thermal	5		k	1.7 (-12)	cm^3s^{-1}	40%	125	a
B	B	V-T	N_2	300	LIF	3	Thermal	2		k	2.8 (-12)	cm^3s^{-1}	40%	125	a
B	B	V-T	N_2	300	LIF	3	Thermal	4		k	4.9 (-13)	cm^3s^{-1}	40%	125	a
B	B	V-T	N_2	300	LIF	4	Thermal	3		k	4.2 (-12)	cm^3s^{-1}	40%	125	a
D′		Quench	Ar	?	EB+ME					k	2 (-13)	cm^3s^{-1}	?	126	b
D′		Quench	NF_3	?	EB+ME					k	5 (-11)	cm^3s^{-1}	?	126	b
D′		Quench	CF_3I	?	EB+ME					k	4 (-10)	cm^3s^{-1}	?	126	b

Table 1.9. Inelastic Collision Data for Fluorine Iodide (continued).

Radiative Lifetimes for Fluorine Iodide

Electronic State Initial	Final	v_i	j_i	Method	Data (μs)	Est. Error	Comments	Reference
B	X	0	5-45	LIF	7.0	5-10%	(c)	127
B	X	1	3-49	LIF	6.7	5-10%	(c)	127
B	X	2	3-48	LIF	7.1	5-10%	(c)	127
B	X	3	3-50	LIF	6.9	5-10%	(c)	127
B	X	4	3-59	LIF	7.4	5-10%	(c)	127
B	X	5	3-57	LIF	8.1	5-10%	(c)	127
B	X	6	3-57	LIF	8.2	5-10%	(c)	127
B	X	7	4-57	LIF	8.6	5-10%	(c)	127
B	X	8	5-52	LIF	8.6	5-10%	(c)	127
B	X	8	53	LIF	5.7	5-10%	(c)	127
B	X	8	54	LIF	2.4	5-10%	(c)	127
B	X	9		LIF	4	X2		67
B	X	9	0-6	LIF	8.8	5-10%	(c)	127
B	X	9	7-14	LIF	1.1	5-10%	(c)	127
B	X	10	0-21	LIF	0.3-0.7	5-10%	(c)	127
B	X			CL			Reports τ = 1 ms, which is incorrect	128
D′	A′			EB	0.015			126

(a) Preliminary rates, based on time-resolved measurements.

(b) Unpublished data.[126]

(c) Radiative lifetimes given for individual J states.[127]

Table 1.10. Inelastic Collision Data for Iodine

Experimental Data for Iodine

Electronic State Initial	Electronic State Final	Process	Collision Partner	Temp (K)	Method	v_i	j_i	v_f	j_f	Quantity Reported	Data Entry	Units	Est. Error	Reference	Comment
X		E-E	$O_2^*(b^1\Sigma)$	300	LIF					k	2.0 (-11)	cm^3s^{-1}	15%	129	
X	X	V-T	I_2	295	OA					pτ	1.70(- 7)	bar s		130	
X	X	V-T	I_2	385	UA					pτ	1.07(-7)	bar s	?	15	
X	X	V-T	I_2	453	UA					pτ	0.86(- 6)	bar s	?	13	
X	X	V-T	I_2	526	UA					pτ	1.03(- 7)	bar s	?	15	
X	X	V-T	I_2	300	LIF	40				k	5.6 (-11)	cm^3s^{-1}	20%	131	
X	X	V-T	He	1500	ST					pτ	0.20(- 6)	bar s	?	132	
X	X	V-T	He	2000	ST					pτ	0.31(- 6)	bar s	?	132	
X	X	V-T	He	2500	ST					pτ	0.45(- 6)	bar s	?	132	
X	X	V-T	He	3040	ST					pτ	0.63(- 6)	bar s	?	132	
X	X	V-T	He		ST						No Data			133,134	
X	X	V-T	He	500-4000	BS	0		1			(a)			135	a
X	X	V-T	He	300	LIF	40				k	3.1 (-11)	cm^3s^{-1}	20%	131	
X	X	V-T	Ar		ST						No Data			133,134	
X	X	V-T	Ar	1180	ST					pτ	0.20(- 6)	bar s	?	132	
X	X	V-T	Ar	1500	ST					pτ	0.31(- 6)	bar s	?	132	
X	X	V-T	Ar	2000	ST					pτ	0.63(- 6)	bar s	?	132	
X	X	V-T	Ar	2500	ST					pτ	1.32(- 6)	bar s	?	132	
X	X	V-T	Ar	300	LIF	40				k	2.2 (-11)	cm^3s^{-1}	20%	131	
X	X	V-T	Ar	300	ME	Activated				k	.01-4 (-12)	cm^3s^{-1}	X10-X20	136	
X	X	V-T	H_2	30	SSE			0		σ/σ(He)	3.3		30-40%	10	
X	X	V-T	H_2	Low	SSE	1		0		σ/σ(He)	7.1		10%	137	
X	X	V-T	D_2	30	SSE			0		σ/σ(He)	3.4		30-40%	10	

Table 1.10. Inelastic Collision Data for Iodine (continued).

Electronic State Initial	Electronic State Final	Process	Collision Partner	Temp (K)	Method	v_i	j_i	v_f	j_f	Quantity Reported	Data Entry	Units	Est. Error	Reference	Comment
X	X	V-T	D_2	Low	SSE	1		0		σ/σ(He)	7.6		10%	137	
X	X	V-T	O_2	300	ME	Activated				k	0.5-5 (-11)	cm^3s^{-1}	X10-X20	136	
X	X	V-T	$O_2(a^1\Delta)$	300	ME	Activated				k	0.3-3 (-10)	cm^3s^{-1}	X10	136	
X	X	V-T	$O_2(a^1\Delta)$	300	ME	Thermal	Thermal	Activated		k	7 (-15)	cm^3s^{-1}	X10	136	
X	X	V-T	N_2	30	SSE			0		σ/σ(He)	13		30-40%	10	
X	X	V-T	CO	30	SSE			0		σ/σ(He)	24		30-40%	10	
X	X	V-T	CO_2	30	SSE			0		σ/σ(He)	76		30-40%	10	
X	X	V-T	H_2O	300	ME	Activated				k	3 (-10)	cm^3s^{-1}	X10-X20	136	
X	X	V-T	CH_4	30	SSE			0		σ/σ(He)	78		30-40%	10	
X	X	V-T	CF_4	30	SSE			0		σ/σ(He)	<20		UL	10	
X	X	V-T	C_2H_6	30	SSE			0		σ/σ(He)	185		30-40%	10	
X	X	V-T	C_2F_6	30	SSE			0		σ/σ(He)	49		30-40%	10	
X	X	V-T	C_3F_8	30	SSE			0		σ/σ(He)	240		30-40%	10	
X	X	V-T	$i-C_4H_{10}$	30	SSE			0		σ/σ(He)	270		30-40%	10	
X	X	V-T	$n-C_4H_{10}$	30	SSE			0		σ/σ(He)	330		30-40%	10	
X	X	V-T+R-T	I_2	300	DP	0	13+15			σ	82	$10^{-16}cm^2$	?	138	b
X	X	V-T+R-T	I_2	300	SEP	11	36	11	34		(c)			139	c
X	X	V-T+R-T	I_2	300	OPL	42				k	2.1 (-10)	cm^3s^{-1}	?	140	
X	X	V-T+R-T	I_2	300	OPL	64				k	3.8 (-10)	cm^3s^{-1}	?	140	
X	X	V-T+R-T	I_2	300	OPL	90-100				k	10.3 (-10)	cm^3s^{-1}	?	140	
X	X	V-T+R-T	O_2	300	DP	1	52			σ	60	$10^{-16}cm^2$	10-20%	141	
X	X	V-T+R-T	O_2	300	DP	2	36			σ	60	$10^{-16}cm^2$	10-20%	141	
X	X	V-E	I*	300	AA					k	3.6 (-11)	cm^3s^{-1}	10%	142,143	
X	X	V-E	I*	300	FP					k	3.0 (-11)	cm^3s^{-1}	10%	144	

Table 1.10. Inelastic Collision Data for Iodine (continued).

Electronic State Initial	Final	Process	Collision Partner	Temp (K)	Method	v_i	j_i	v_f	j_f	Quantity Reported	Data Entry	Units	Est. Error	Reference	Comment
X	X	V-E	I*	300	AA					k	3.6 (-11)	cm^3s^{-1}	10%	145	
X	X	V-E	I*	300	IRF					k	3.0 (-11)	cm^3s^{-1}	3%	78	
X	X	V-E	I*	293-1000	FP					k	(d)	cm^3s^{-1}	?	146,147	d
X	X	V-E	I*	293	LIF					k	3.1 (-11)	cm^3s^{-1}	10%	18,19	
X	X	V-E	I*	293	ED					k	2.4 (-11)	cm^3s^{-1}	15%	148	
X	X	V-E	I*	297	FP					k	1.1 (-11)	cm^3s^{-1}		149	e
X	X	V-E	I*	339	FP					k	0.65(-11)	cm^3s^{-1}		149	e
X	X	V-E	I*	356	FP					k	0.27(-11)	cm^3s^{-1}		149	e
X	X	V-E	I*	380	FP					k	0.22(-11)	cm^3s^{-1}		149	e
X	X	V-E	I*	410	FP					k	0.31(-11)	cm^3s^{-1}		149	e
X	X	V-E	I*	300	LIF	Thermal	Thermal	40		k	8.6 (-13)	cm^3s^{-1}	50%	131	f
X	X	V-E	I*	300	LIF	Thermal	Thermal	All		k	4.6 (-12)	cm^3s^{-1}	100%	131	f
X	X	V-E	Br*	300	FP					k	1.86(-12)	cm^3s^{-1}	10-30%	19,21	
X	X	V-V	SO_2(100)	300	LIF-IR					pτ	3.0 (- 9)	bar s	12%	150	
X	X	R-T	He	0.5 cm-1	SSE					σ	67	$10^{-16}cm^2$		151	
X	X	R-T	He	0.7 cm-1	SSE					σ	49	$10^{-16}cm^2$		151	
X	X	R-T	He	1.0 cm-1	SSE					σ	36	$10^{-16}cm^2$		151	
X	X	R-T	He	1.6 cm-1	SSE					σ	26	$10^{-16}cm^2$		151	
X	X	R-T	He	2.0 cm-1	SSE					σ	23	$10^{-16}cm^2$		151	
X	X	R-T	He	2.7 cm-1	SSE					σ	21	$10^{-16}cm^2$		151	
X	X	R-T	Ne	0.5 cm-1	SSE					σ	106	$10^{-16}cm^2$		151	
X	X	R-T	Ne	1.0 cm-1	SSE					σ	56	$10^{-16}cm^2$		151	
X	X	R-T	Ne	2.0 cm-1	SSE					σ	33	$10^{-16}cm^2$		151	
X	X	R-T	Ne	3.0 cm-1	SSE					σ	27	$10^{-16}cm^2$		151	

Table 1.10. Inelastic Collision Data for Iodine (continued).

Electronic State Initial	Final	Process	Collision Partner	Temp (K)	Method	v_i	j_i	v_f	j_f	Quantity Reported	Data Entry	Units	Est. Error	Reference	Comment
X	X	R-T	Ne	3.7 cm-1	SSE					σ	25	$10^{-16}cm^2$		151	
X	X	R-T	Ar	0.8 cm-1	SSE					σ	87	$10^{-16}cm^2$		151	
X	X	R-T	Ar	1.0 cm-1	SSE					σ	70	$10^{-16}cm^2$		151	
X	X	R-T	Ar	1.5 cm-1	SSE					σ	51	$10^{-16}cm^2$		151	
X	X	R-T	Ar	2.0 cm-1	SSE					σ	45	$10^{-16}cm^2$		151	
X	X	R-T	Ar	2.5 cm-1	SSE					σ	43	$10^{-16}cm^2$		151	
X	B	E-E	$O_2*(b^1\Sigma_g^+)$		CL	Thermal		All			(g)			152	g
X	B	E-E	$C_4H_6O_2$	300	LIF	Thermal				k	2.38(-10)	cm^3s^{-1}	10%	153	h
X	B	Linewidth	I_2	300	PB/O			43	12	Δν/p	7.9	MHz/Torr	20%	23	
X	B	Linewidth	He	300	DP			43		Δν/p	0.24	MHz/Torr	?	154	
X	B	Linewidth	He	300	DP			62		Δν/p	4.14	MHz/Torr	?	154	
X	B	Linewidth	Ne	300	DP			43		Δν/p	0.43	MHz/Torr	?	154	
X	B	Linewidth	Ne	300	DP			62		Δν/p	2.11	MHz/Torr	?	154	
X	B	Linewidth	Ar	300	DP			43		Δν/p	0.31	MHz/Torr	?	154	
X	B	Linewidth	Ar	300	DP			62		Δν/p	2.96	MHz/Torr	?	154	
X	B	Linewidth	Kr	300	DP			43		Δν/p	0.33	MHz/Torr	?	154	
X	B	Linewidth	Kr	300	DP			62		Δν/p	2.64	MHz/Torr	?	154	
X	B	Linewidth	Xe	300	DP			43		Δν/p	0.41	MHz/Torr	?	154	
X	B	Linewidth	Xe	300	DP			62		Δν/p	2.92	MHz/Torr	?	154	
X	B	Linewidth	N_2	300	Raman			25	46	Δν/p	4.2	MHz/Torr		155	
X	D	E-E	$N_2*(A^3\Sigma^+)$	300	DF					k	6.9 (-12)	cm^3s^{-1}	30%	156	
B			I_2		LIF	62	27				(i)			157	i
B			Ar		LIF	62	27				(i)			157	i
B		Quench	Br_2	300	LIF	15,18				σ	130	$10^{-16}cm^2$	10-20%	158	

Table 1.10. Inelastic Collision Data for Iodine (continued).

Electronic State Initial	Final	Process	Collision Partner	Temp (K)	Method	v_i	j_i	v_f	j_f	Quantity Reported	Data Entry	Units	Est. Error	Reference	Comment
B		Quench	Br_2	300	LIF	19				σ	159	$10^{-16}cm^2$	10-20%	158	
B		Quench	Br_2	300	LIF	23				σ	151	$10^{-16}cm^2$	10-20%	158	
B		Quench	Br_2	300	LIF	26				σ	111	$10^{-16}cm^2$	10-20%	158	
B		Quench	I_2	300	LIF	0-25					(j)			159	j
B		Quench	I_2	300	LIF	6				k	3.91(-10)	cm^3s^{-1}	20%	30	
B		Quench	I_2	403	LIF	6				k	4.44(-10)	cm^3s^{-1}	20%	30	
B		Quench	I_2	481	LIF	6				k	4.76(-10)	cm^3s^{-1}	20%	30	
B		Quench	I_2	576	LIF	6				k	4.37(-10)	cm^3s^{-1}	20%	30	
B		Quench	I_2	618	LIF	6				k	4.91(-10)	cm^3s^{-1}	20%	30	
B		Quench	I_2	663	LIF	6				k	6.5 (-10)	cm^3s^{-1}	20%	30	
B		Quench	I_2	300	LIF	6	32			k	3.65(-10)	cm^3s^{-1}	10-20%	160	
B		Quench	I_2	300	LIF	6	32			σ	201	$10^{-16}cm^2$	5%	161	
B		Quench	I_2	300	LIF	6	32			k	5.22(-10)	cm^3s^{-1}	<10%	162	
B		Quench	I_2	300	LIF	6-70					(k)			158	k
B		Quench	I_2	300	MEF	6-8				σ	280	$10^{-16}cm^2$	?	163	
B		Quench	I_2	300	MEF	8-10				σ	170	$10^{-16}cm^2$	?	163	
B		Quench	I_2	300	LIF	9	33			σ	218	$10^{-16}cm^2$	5-10%	164,165	
B		Quench	I_2	300	LIF	9	39			σ	228	$10^{-16}cm^2$	5-10%	164,165	
B		Quench	I_2	300	LIF	9	61			σ	231	$10^{-16}cm^2$	5-10%	164,165	
B		Quench	I_2	300	LIF	9	84			σ	240	$10^{-16}cm^2$	5-10%	164,165	
B		Quench	I_2	300	LIF	10	20			σ	212	$10^{-16}cm^2$	5-10%	164,165	
B		Quench	I_2	300	LIF	10	70			σ	225	$10^{-16}cm^2$	5-10%	164,165	
B		Quench	I_2	300	LIF	10	89			σ	215	$10^{-16}cm^2$	5-10%	164,165	
B		Quench	I_2	300	MEF	10-14				σ	330	$10^{-16}cm^2$	?	163	

Table 1.10. Inelastic Collision Data for Iodine (continued).

Electronic State Initial	Electronic State Final	Process	Collision Partner	Temp (K)	Method	v_i	j_i	v_f	j_f	Quantity Reported	Data Entry	Units	Est. Error	Reference	Comment
B		Quench	I_2	300	PS	10-80					(1)			166	1
B		Quench	I_2	300	LIF	11	8			σ	223	$10^{-16}cm^2$	5-10%	164,165	
B		Quench	I_2	300	LIF	11	76			σ	226	$10^{-16}cm^2$	5-10%	164,165	
B		Quench	I_2	300	LIF	11	90			σ	225	$10^{-16}cm^2$	5-10%	164,165	
B		Quench	I_2	300	LIF	11	102			σ	231	$10^{-16}cm^2$	5-10%	164,165	
B		Quench	I_2	300	LIF	11	112			σ	228	$10^{-16}cm^2$	5-10%	164,165	
B		Quench	I_2	300	LIF	11	126			σ	214	$10^{-16}cm^2$	5-10%	164,165	
B		Quench	I_2	300	LIF	11	128			σ	204	$10^{-16}cm^2$	5%	161	
B		Quench	I_2	300	LIF	12	32			σ	210	$10^{-16}cm^2$	5-10%	164,165	
B		Quench	I_2	300	LIF	12	64			σ	213	$10^{-16}cm^2$	5-10%	164,165	
B		Quench	I_2	300	LIF	12	97			σ	220	$10^{-16}cm^2$	5-10%	164,165	
B		Quench	I_2	300	LIF	13	11			σ	205	$10^{-16}cm^2$	5-10%	164,165	
B		Quench	I_2	300	LIF	13	73			σ	208	$10^{-16}cm^2$	5-10%	164,165	
B		Quench	I_2	300	LIF	14	53			σ	201	$10^{-16}cm^2$	5-10%	164,165	
B		Quench	I_2	300	MEF	15	37+44			k	5.6 (-10)	cm^3s^{-1}	10%	167	
B		Quench	I_2	300	CT	15	60			σ	221	$10^{-16}cm^2$		168	
B		Quench	I_2	300	LIF	15	63			σ	201	$10^{-16}cm^2$	5-10%	164,165	
B		Quench	I_2	300	LIF	16	57			σ	195	$10^{-16}cm^2$	5-10%	164,165	
B		Quench	I_2	300	LIF	17	27			σ	207	$10^{-16}cm^2$	5-10%	164,165	
B		Quench	I_2	300	LIF	18	37			σ	221	$10^{-16}cm^2$	5-10%	164,165	
B		Quench	I_2	300	LIF	18	58			σ	217	$10^{-16}cm^2$	5-10%	164,165	
B		Quench	I_2	300	LIF	18	85			σ	214	$10^{-16}cm^2$	5-10%	164,165	
B		Quench	I_2	300	LIF	18	104			σ	217	$10^{-16}cm^2$	5-10%	164,165	
B		Quench	I_2	300	MEF	18-22				σ	446	$10^{-16}cm^2$	?	163	

Table 1.10. Inelastic Collision Data for Iodine (continued).

Electronic State Initial	Final	Process	Collision Partner	Temp (K)	Method	v_i	j_i	v_f	j_f	Quantity Reported	Data Entry	Units	Est. Error	Reference	Comment
B		Quench	I_2	300	LIF	19	96			σ	209	$10^{-16}cm^2$	5-10%	164,165	
B		Quench	I_2	300	LIF	20	40			σ	206	$10^{-16}cm^2$	5-10%	164,165	
B		Quench	I_2	300	LIF	21	116			σ	173	$10^{-16}cm^2$	10%	169	
B		Quench	I_2	370	MEF	25	34			k	7.6 (-10)	cm^3s^{-1}	10%	170	
B		Quench	I_2	300	MEF	25				k	8.45(-10)	cm^3s^{-1}	10%	171	
B		Quench	I_2	373	MEF	25				k	9.28(-10)	cm^3s^{-1}	10%	171	
B		Quench	I_2	400	MEF	25				k	9.30(-10)	cm^3s^{-1}	10%	171	
B		Quench	I_2	500	MEF	25				k	1.06(- 9)	cm^3s^{-1}	10%	171	
B		Quench	I_2	600	MEF	25				k	1.25(- 9)	cm^3s^{-1}	10%	171	
B		Quench	I_2		MEF	25	34				(m)			172	m
B		Quench	I_2	300	LIF	32	9+14			σ	204	$10^{-16}cm^2$	10%	169	
B		Quench	I_2	296	LIF	40				σ	126	$10^{-16}cm^2$	30%	173	
B		Quench	I_2	300	LIF	40	79			σ	198	$10^{-16}cm^2$	10%	169	
B		Quench	I_2	300	LIF	43	12+16			k	4.7 (-10)	cm^3s^{-1}	10%	174	
B		Quench	I_2	293.5	LIF	43	12+16			k	8 (-11)	cm^3s^{-1}	?	175	n
B		Quench	I_2	300	LIF	43	12+16			σ	201	$10^{-16}cm^2$	10%	169	
B		Quench	I_2	411	LIF	43	12+16			k	1.4 (-10)	cm^3s^{-1}	?	175	n
B		Quench	I_2	462	LIF	43	12+16			k	2.3 (-10)	cm^3s^{-1}	?	175	n
B		Quench	I_2	538.4	LIF	43	12+16			k	2.8 (-10)	cm^3s^{-1}	?	175	n
B		Quench	I_2	605.2	LIF	43	12+16			k	3.0 (-10)	cm^3s^{-1}	?	175	n
B		Quench	I_2	300	LIF	43	16			σ	201	$10^{-16}cm^2$	5-10%	176	
B		Quench	I_2	300	MEF	50	29			k	9.58(-10)	cm^3s^{-1}	20%	177	
B		Quench	I_2	300	MEF	50-60				σ	766	$10^{-16}cm^2$	?	163	
B		Quench	I_2	300	LIF	62				σ	235	$10^{-16}cm^2$	5-10%	176	

Table 1.10. Inelastic Collision Data for Iodine (continued).

Electronic State Initial	Final	Process	Collision Partner	Temp (K)	Method	v_i	j_i	v_f	j_f	Quantity Reported	Data Entry	Units	Est. Error	Reference	Comment
B		Quench	I_2	296	LIF	62				σ	236	$10^{-16}cm^2$	30%	173	
B		Quench	I_2	300	LIF	62	27			k	3.75(-10)	cm^3s^{-1}	20%	178	
B		Quench	I_2	300	LIF	62	27			σ	236	$10^{-16}cm^2$	10%	169	
B		Quench	I	880	MEF	25				k	1.72(-10)	cm^3s^{-1}	35%	179	
B		Quench	He	300	LIF	6	32			σ	0.82	$10^{-16}cm^2$	<10%	162	
B		Quench	He	293	LIF+ME	6	32			k	0.75(-12)	cm^3s^{-1}	?	180	
B		Quench	He	300	LIF	6-11				σ	1.38	$10^{-16}cm^2$	10-20%	158	
B		Quench	He	300	MEF	6-8				σ	<0.3	$10^{-16}cm^2$	?	163	
B		Quench	He	300	MEF	8-10				σ	1.57	$10^{-16}cm^2$	?	163	
B		Quench	He	300	MEF	10-14				σ	1.88	$10^{-16}cm^2$	?	163	
B		Quench	He	300	LIF	11,13				σ	0.44	$10^{-16}cm^2$	10-20%	158	
B		Quench	He	300	LIF	11-13				σ	1.10	$10^{-16}cm^2$	10-20%	158	
B		Quench	He	300	LIF	12,14				σ	1.07	$10^{-16}cm^2$	10-20%	158	
B		Quench	He	300	MEF	15	37+44			k	0.75(-11)	cm^3s^{-1}	10%	167	
B		Quench	He	300	MEF	18-22				σ	3.1	$10^{-16}cm^2$	?	163	
B		Quench	He	293	MEF	25	34				(m)			181	m
B		Quench	He	370	MEF	25	34			k	7.95(-11)	cm^3s^{-1}	10%	170	
B		Quench	He	293	MEF	25	34				(m)			182	m
B		Quench	He	300	LIF	43	12+16			k	5.3 (-11)	cm^3s^{-1}	10%	174	
B		Quench	He	300	LIF	43	12+16			k	9.9 (-12)	cm^3s^{-1}	?	183	
B		Quench	He	300	MEF	50	29			k	9.6 (-10)	cm^3s^{-1}	20%	177	
B		Quench	He	300	MEF	50-60				σ	7.5	$10^{-16}cm^2$	?	163	
B		Quench	^3He	370	MEF	25	34			k	6.31(-11)	cm^3s^{-1}	10%	170	
B		Quench	Ne	300	LIF	6	32			σ	7.2	$10^{-16}cm^2$	<10%	162	

Table 1.10. Inelastic Collision Data for Iodine (continued).

Electronic State Initial	Final	Process	Collision Partner	Temp (K)	Method	v_i	j_i	v_f	j_f	Quantity Reported	Data Entry	Units	Est. Error	Reference	Comment
B		Quench	Ne	300	LIF	6	32			k	7.1 (-11)	cm^3s^{-1}	10-20%	160	
B		Quench	Ne	300	LIF	6-11				σ	4.5	$10^{-16}cm^2$	10-20%	158	
B		Quench	Ne	300	LIF	11,13				σ	3.7	$10^{-16}cm^2$	10-20%	158	
B		Quench	Ne	300	LIF	11-13				σ	2.6	$10^{-16}cm^2$	10-20%	158	
B		Quench	Ne	300	LIF	12,14				σ	3.4	$10^{-16}cm^2$	10-20%	158	
B		Quench	Ne	300	MEF	15	37+44			k	1.08(-11)	cm^3s^{-1}	10%	167	
B		Quench	Ne	300	LIF	15,18				σ	1.5	$10^{-16}cm^2$	10-20%	158	
B		Quench	Ne	370	MEF	25	34			k	11.7 (-11)	cm^3s^{-1}	10%	170	
B		Quench	Ne	293	MEF	25	34				(m)			181	m
B		Quench	Ne	293	MEF	25	34				(m)			182	m
B		Quench	Ne	300	LIF	43	12+16			k	9.4 (-11)	cm^3s^{-1}	10%	174	
B		Quench	Ne	300	MEF	50	29			k	4.47(-10)	cm^3s^{-1}	20%	177	
B		Quench	Ar	293	LIF+ME	6	32			k	4.87(-12)	cm^3s^{-1}	?	180	
B		Quench	Ar	300	LIF	6	32			σ	5.36	$10^{-16}cm^2$	<10%	162	
B		Quench	Ar	300	LIF	6-11				σ	16.8	$10^{-16}cm^2$	10-20%	158	
B		Quench	Ar	300	LIF	11,13				σ	12.1	$10^{-16}cm^2$	10-20%	158	
B		Quench	Ar	300	LIF	11-13				σ	15.9	$10^{-16}cm^2$	10-20%	158	
B		Quench	Ar	300	MEF	15	37+44			k	3.3 (-11)	cm^3s^{-1}	10%	167	
B		Quench	Ar	300	LIF	23				σ	7.32	$10^{-16}cm^2$	10-20%	158	
B		Quench	Ar	370	MEF	25	34			k	14.8 (-11)	cm^3s^{-1}	10%	170	
B		Quench	Ar	293	MEF	25	34				(m)			181	m
B		Quench	Ar	293	MEF	25	34				(m)			182	m
B		Quench	Ar	300	LIF	26				σ	17.0	$10^{-16}cm^2$	10-20%	158	
B		Quench	Ar	300	LIF	32				σ	13.2	$10^{-16}cm^2$	10-20%	158	

Table 1.10. Inelastic Collision Data for Iodine (continued).

Electronic State Initial	Final	Process	Collision Partner	Temp (K)	Method	v_i	j_i	v_f	j_f	Quantity Reported	Data Entry	Units	Est. Error	Reference	Comment
B		Quench	Ar	300	LIF	38				σ	13.2	$10^{-16}cm^2$	10-20%	158	
B		Quench	Ar	300	LIF	43	12+16			k	6.8 (-11)	cm^3s^{-1}	10%	174	
B		Quench	Ar	293.5	LIF	43	12+16			k	1.0 (-10)	cm^3s^{-1}		175	n
B		Quench	Ar	300	LIF	43	12+16			k	3.6 (-11)	cm^3s^{-1}	?	183	
B		Quench	Ar	411	LIF	43	12+16			k	1.8 (-10)	cm^3s^{-1}		175	n
B		Quench	Ar	462	LIF	43	12+16			k	2.1 (-10)	cm^3s^{-1}		175	n
B		Quench	Ar	538.4	LIF	43	12+16			k	2.36(-10)	cm^3s^{-1}		175	n
B		Quench	Ar	605.2	LIF	43	12+16			k	3.0 (-10)	cm^3s^{-1}		175	n
B		Quench	Ar	300	LIF	45				σ	16.6	$10^{-16}cm^2$	10-20%	158	
B		Quench	Ar	300	MEF	50	29			k	6.4 (-10)	cm^3s^{-1}	20%	177	
B		Quench	Ar	300	LIF	54				σ	16.7	$10^{-16}cm^2$	10-20%	158	
B		Quench	Ar	300	LIF	59				σ	23.7	$10^{-16}cm^2$	10-20%	158	
B		Quench	Kr	300	LIF	6	32			σ	22.5	$10^{-16}cm^2$	<10%	162	
B		Quench	Kr	300	LIF	6-11				σ	35.8	$10^{-16}cm^2$	10-20%	158	
B		Quench	Kr	300	LIF	11,13				σ	25.1	$10^{-16}cm^2$	10-20%	158	
B		Quench	Kr	300	LIF	11-13				σ	30.5	$10^{-16}cm^2$	10-20%	158	
B		Quench	Kr	300	LIF	12,14				σ	19.5	$10^{-16}cm^2$	10-20%	158	
B		Quench	Kr	300	MEF	15	37+44			k	5.7 (-11)	cm^3s^{-1}	10%	167	
B		Quench	Kr	300	LIF	15,18				σ	19.5	$10^{-16}cm^2$	10-20%	158	
B		Quench	Kr	300	LIF	19				σ	13.8	$10^{-16}cm^2$	10-20%	158	
B		Quench	Kr	300	LIF	23				σ	11.3	$10^{-16}cm^2$	10-20%	158	
B		Quench	Kr	370	MEF	25	34			k	18.0 (-11)	cm^3s^{-1}	10%	170	
B		Quench	Kr	293	MEF	25	34				(m)			182	m
B		Quench	Kr	300	LIF	26				σ	11.9	$10^{-16}cm^2$	10-20%	158	

Table 1.10. Inelastic Collision Data for Iodine (continued).

Electronic State Initial	Electronic State Final	Process	Collision Partner	Temp (K)	Method	v_i	j_i	v_f	j_f	Quantity Reported	Data Entry	Units	Est. Error	Reference	Comment
B		Quench	Kr	300	LIF	38				σ	19.2	$10^{-16}cm^2$	10-20%	158	
B		Quench	Kr	300	LIF	43	12+16			k	7.3 (-11)	cm^3s^{-1}	10%	174	
B		Quench	Kr	300	LIF	45				σ	17.0	$10^{-16}cm^2$	10-20%	158	
B		Quench	Kr	300	MEF	50	29			k	5.8 (-10)	cm^3s^{-1}	20%	177	
B		Quench	Kr	300	LIF	54				σ	22.0	$10^{-16}cm^2$	10-20%	158	
B		Quench	Kr	300	LIF	59				σ	24.8	$10^{-16}cm^2$	10-20%	158	
B		Quench	Kr	300	LIF	63				σ	20.1	$10^{-16}cm^2$	10-20%	158	
B		Quench	Xe	300	LIF	6-11				σ	71.3	$10^{-16}cm^2$	10-20%	158	
B		Quench	Xe	300	MEF	8-10				σ	13.2	$10^{-16}cm^2$		163	
B		Quench	Xe	300	MEF	10-14				σ	50	$10^{-16}cm^2$		163	
B		Quench	Xe	300	LIF	11,13				σ	57.5	$10^{-16}cm^2$	10-20%	158	
B		Quench	Xe	300	LIF	11-13				σ	67.5	$10^{-16}cm^2$	10-20%	158	
B		Quench	Xe	300	LIF	12,14				σ	51.5	$10^{-16}cm^2$	10-20%	158	
B		Quench	Xe	300	MEF	15	37+44			k	11.7 (-11)	cm^3s^{-1}	10%	167	
B		Quench	Xe	300	LIF	15,18				σ	39.9	$10^{-16}cm^2$	10-20%	158	
B		Quench	Xe	300	MEF	18-22				σ	126	$10^{-16}cm^2$		163	
B		Quench	Xe	300	LIF	19				σ	39.9	$10^{-16}cm^2$	10-20%	158	
B		Quench	Xe	300	LIF	23				σ	35.5	$10^{-16}cm^2$	10-20%	158	
B		Quench	Xe	370	MEF	25	34			k	33.4 (-11)	cm^3s^{-1}	10%	170	
B		Quench	Xe	293	MEF	25	34				(m)			182	m
B		Quench	Xe	300	LIF	26				σ	30.8	$10^{-16}cm^2$	10-20%	158	
B		Quench	Xe	300	LIF	38				σ	30.8	$10^{-16}cm^2$	10-20%	158	
B		Quench	Xe	300	LIF	43	12+16			k	8.9 (-11)	cm^3s^{-1}	10%	174	
B		Quench	Xe	300	LIF	45				σ	36.7	$10^{-16}cm^2$	10-20%	158	

Table 1.10. Inelastic Collision Data for Iodine (continued).

Electronic State Initial	Final	Process	Collision Partner	Temp (K)	Method	v_i	j_i	v_f	j_f	Quantity Reported	Data Entry	Units	Est. Error	Reference	Comment
B		Quench	Xe	300	MEF	50	29			k	4.5 (-10)	cm^3s^{-1}	20%	177	
B		Quench	Xe	300	MEF	50-60				σ	173	$10^{-16}cm^2$		163	
B		Quench	Xe	300	LIF	54				σ	38	$10^{-16}cm^2$	10-20%	158	
B		Quench	Xe	300	LIF	59				σ	32	$10^{-16}cm^2$	10-20%	158	
B		Quench	Xe	300	LIF	63				σ	34.5	$10^{-16}cm^2$	10-20%	158	
B		Quench	H_2	300	LIF	6	32			σ	3.0	$10^{-16}cm^2$	<10%	162	
B		Quench	H_2	300	LIF	6-11				σ	3.42	$10^{-16}cm^2$	10-20%	158	
B		Quench	H_2	300	LIF	11,13				σ	2.26	$10^{-16}cm^2$	10-20%	158	
B		Quench	H_2	300	LIF	11-13				σ	2.70	$10^{-16}cm^2$	10-20%	158	
B		Quench	H_2	300	LIF	12,14				σ	1.60	$10^{-16}cm^2$	10-20%	158	
B		Quench	H_2	300	MEF	15	37+44			k	3.4 (-11)	cm^3s^{-1}	10%	167	
B		Quench	H_2	300	LIF	15,18				σ	1.10	$10^{-16}cm^2$	10-20%	158	
B		Quench	H_2	300	LIF	19				σ	0.50	$10^{-16}cm^2$	10-20%	158	
B		Quench	H_2	300	LIF	23				σ	0.82	$10^{-16}cm^2$	10-20%	158	
B		Quench	H_2	370	MEF	25	34			k	9.0 (-11)	cm^3s^{-1}	10%	170	
B		Quench	H_2		MEF	25	34				(m)			172	m
B		Quench	H_2	300	LIF	26				σ	0.57	$10^{-16}cm^2$	10-20%	158	
B		Quench	H_2	300	LIF	38				σ	0.72	$10^{-16}cm^2$	10-20%	158	
B		Quench	H_2	300	LIF	43	12+16			k	3.4 (-11)	cm^3s^{-1}	10%	174	
B		Quench	D_2	300	MEF	15	37+44			k	3.1 (-11)	cm^3s^{-1}	10%	167	
B		Quench	O_2	300	LIF	6	32			σ	11.0	$10^{-16}cm^2$	<10%	162	
B		Quench	O_2	300	LIF	6-11				σ	24.5	$10^{-16}cm^2$	10-20%	158	
B		Quench	O_2	300	LIF	11-13				σ	20.0	$10^{-16}cm^2$	10-20%	158	
B		Quench	O_2	300	LIF	12,14				σ	14.8	$10^{-16}cm^2$	10-20%	158	

Table 1.10. Inelastic Collision Data for Iodine (continued).

Electronic State Initial	Final	Process	Collision Partner	Temp (K)	Method	v_i	j_i	v_f	j_f	Quantity Reported	Data Entry	Units	Est. Error	Reference	Comment
B		Quench	O_2	300	MEF	15	37+44			k	5.0 (-11)	cm^3s^{-1}	10%	167	
B		Quench	O_2	300	LIF	15,18				σ	14.8	$10^{-16}cm^2$	10-20%	158	
B		Quench	O_2	300	LIF	19				σ	11.5	$10^{-16}cm^2$	10-20%	158	
B		Quench	O_2	300	LIF	23				σ	8.7	$10^{-16}cm^2$	10-20%	158	
B		Quench	O_2	370	MEF	25	34			k	17.8 (-11)	cm^3s^{-1}	10%	170	
B		Quench	O_2	293	MEF	25	34				(m)			181	m
B		Quench	O_2	300	LIF	26				σ	9.8	$10^{-16}cm^2$	10-20%	158	
B		Quench	O_2	300	LIF	38				σ	8.85	$10^{-16}cm^2$	10-20%	158	
B		Quench	O_2	300	LIF	43				σ	10.2	$10^{-16}cm^2$	10-20%	158	
B		Quench	O_2	300	LIF	45				σ	13.4	$10^{-16}cm^2$	10-20%	158	
B		Quench	O_2	300	LIF	54				σ	15.3	$10^{-16}cm^2$	10-20%	158	
B		Quench	O_2	300	LIF	59				σ	12.9	$10^{-16}cm^2$	10-20%	158	
B		Quench	O_2	300	LIF	63				σ	23.4	$10^{-16}cm^2$	10-20%	158	
B		Quench	N_2	300	LIF	6	32			σ	11.5	$10^{-16}cm^2$	<10%	162	
B		Quench	N_2	293	LIF+ME	6	32			k	6.36(-12)	cm^3s^{-1}	?	180	
B		Quench	N_2	300	LIF	6-11				σ	15.7	$10^{-16}cm^2$	10-20%	158	
B		Quench	N_2	300	LIF	11,13				σ	13.8	$10^{-16}cm^2$	10-20%	158	
B		Quench	N_2	300	LIF	11-13				σ	15.3	$10^{-16}cm^2$	10-20%	158	
B		Quench	N_2	300	LIF	12,14				σ	13.2	$10^{-16}cm^2$	10-20%	158	
B		Quench	N_2	300	MEF	15	37+44			k	4.6 (-11)	cm^3s^{-1}	10%	167	
B		Quench	N_2	300	LIF	15,18				σ	12.9	$10^{-16}cm^2$	10-20%	158	
B		Quench	N_2	300	LIF	19				σ	10.4	$10^{-16}cm^2$	10-20%	158	
B		Quench	N_2	300	LIF	23				σ	9.4	$10^{-16}cm^2$	10-20%	158	
B		Quench	N_2	300	LIF	26				σ	4.7	$10^{-16}cm^2$	10-20%	158	

Table 1.10. Inelastic Collision Data for Iodine (continued).

Electronic State Initial	Final	Process	Collision Partner	Temp (K)	Method	v_i	j_i	v_f	j_f	Quantity Reported	Data Entry	Units	Est. Error	Reference	Comment
B		Quench	N_2	300	LIF	38				σ	12.2	$10^{-16}cm^2$	10-20%	158	
B		Quench	N_2	296	LIF	40				σ	11.6	$10^{-16}cm^2$	30%	173	
B		Quench	N_2	300	LIF	45				σ	15.1	$10^{-16}cm^2$	10-20%	158	
B		Quench	N_2	300	LIF	54				σ	9.7	$10^{-16}cm^2$	10-20%	158	
B		Quench	N_2	296	LIF	62				σ	47	$10^{-16}cm^2$	30%	173	
B		Quench	Air	300	LIF	43	12+16			k	6.01(-11)	cm^3s^{-1}	?	183	
B		Quench	NO	300	LIF	11,13				σ	38.3	$10^{-16}cm^2$	10-20%	158	
B		Quench	NO	300	LIF	11-13				σ	43.3	$10^{-16}cm^2$	10-20%	158	
B		Quench	NO	300	LIF	12,14				σ	34.9	$10^{-16}cm^2$	10-20%	158	
B		Quench	NO	300	MEF	15	37+44			k	14 (-11)	cm^3s^{-1}	10%	167	
B		Quench	NO	300	LIF	15,18				σ	30.8	$10^{-16}cm^2$	10-20%	158	
B		Quench	NO	300	MEF	18-22				σ	91	$10^{-16}cm^2$	?	163	
B		Quench	NO	300	LIF	19				σ	29.8	$10^{-16}cm^2$	10-20%	158	
B		Quench	NO	300	LIF	23				σ	32.3	$10^{-16}cm^2$	10-20%	158	
B		Quench	NO	300	MEF	25				σ	69	$10^{-16}cm^2$	?	163	
B		Quench	NO	300	LIF	26				σ	32.3	$10^{-16}cm^2$	10-20%	158	
B		Quench	NO	300	LIF	38				σ	36.4	$10^{-16}cm^2$	10-20%	158	
B		Quench	NO	300	LIF	45				σ	44	$10^{-16}cm^2$	10-20%	158	
B		Quench	NO	300	MEF	50-60				σ	418	$10^{-16}cm^2$	?	163	
B		Quench	NO	300	LIF	59				σ	37.7	$10^{-16}cm^2$	10-20%	158	
B		Quench	CO	300	LIF	6	32			σ	23.0	$10^{-16}cm^2$	<10%	162	
B		Quench	CO_2	300	LIF	6	32			σ	28	$10^{-16}cm^2$	<10%	162	
B		Quench	CO_2	300	LIF	6-11				σ	69.4	$10^{-16}cm^2$	10-20%	158	
B		Quench	CO_2	300	LIF	11,13				σ	52.5	$10^{-16}cm^2$	10-20%	158	

Table 1.10. Inelastic Collision Data for Iodine (continued).

Electronic State Initial	Final	Process	Collision Partner	Temp (K)	Method	v_i	j_i	v_f	j_f	Quantity Reported	Data Entry	Units	Est. Error	Reference	Comment
B		Quench	CO_2	300	LIF	11-13				σ	56.5	$10^{-16}cm^2$	10-20%	158	
B		Quench	CO_2	300	LIF	12,14				σ	54	$10^{-16}cm^2$	10-20%	158	
B		Quench	CO_2	300	LIF	15,18				σ	39.6	$10^{-16}cm^2$	10-20%	158	
B		Quench	CO_2	300	MEF	18-22				σ	154	$10^{-16}cm^2$	?	163	
B		Quench	CO_2	300	LIF	19				σ	37.4	$10^{-16}cm^2$	10-20%	158	
B		Quench	CO_2	300	LIF	23				σ	30.8	$10^{-16}cm^2$	10-20%	158	
B		Quench	CO_2	370	MEF	25	34			k	64.5 (-11)	cm^3s^{-1}	10%	170	
B		Quench	CO_2	300	LIF	26				σ	30.8	$10^{-16}cm^2$	10-20%	158	
B		Quench	CO_2	300	LIF	38				σ	40.8	$10^{-16}cm^2$	10-20%	158	
B		Quench	CO_2	300	LIF	43	12+16			k	9.4 (-11)	cm^3s^{-1}	10%	174	
B		Quench	CO_2	300	LIF	45				σ	30.8	$10^{-16}cm^2$	10-20%	158	
B		Quench	CO_2	300	MEF	50-60				σ	176	$10^{-16}cm^2$	?	163	
B		Quench	CO_2	300	LIF	54				σ	29.8	$10^{-16}cm^2$	10-20%	158	
B		Quench	CO_2	300	LIF	59				σ	30	$10^{-16}cm^2$	10-20%	158	
B		Quench	NH_3	370	MEF	25	34			k	37. (-11)	cm^3s^{-1}	10%	170	
B		Quench	SO_2	370	MEF	25	34			k	32.8 (-11)	cm^3s^{-1}	10%	170	
B		Quench	SF_6	300	LIF	6-11				σ	59.7	$10^{-16}cm^2$	10-20%	158	
B		Quench	SF_6	300	LIF	11,13				σ	37.1	$10^{-16}cm^2$	10-20%	158	
B		Quench	SF_6	300	LIF	11-13				σ	52.8	$10^{-16}cm^2$	10-20%	158	
B		Quench	SF_6	300	LIF	12,14				σ	31.4	$10^{-16}cm^2$	10-20%	158	
B		Quench	SF_6	300	LIF	15,18				σ	29.2	$10^{-16}cm^2$	10-20%	158	
B		Quench	SF_6	300	LIF	19				σ	23.8	$10^{-16}cm^2$	10-20%	158	
B		Quench	SF_6	300	LIF	23				σ	22.0	$10^{-16}cm^2$	10-20%	158	
B		Quench	SF_6	300	LIF	26				σ	17.9	$10^{-16}cm^2$	10-20%	158	

Table 1.10. Inelastic Collision Data for Iodine (continued).

Electronic State Initial	Final	Process	Collision Partner	Temp (K)	Method	v_i	j_i	v_f	j_f	Quantity Reported	Data Entry	Units	Est. Error	Reference	Comment
B		Quench	SF_6	300	LIF	38				σ	23.9	$10^{-16}cm^2$	10-20%	158	
B		Quench	SF_6	300	LIF	45				σ	42.4	$10^{-16}cm^2$	10-20%	158	
B		Quench	SF_6	300	LIF	54				σ	51.5	$10^{-16}cm^2$	10-20%	158	
B		Quench	SF_6	300	LIF	59				σ	29.5	$10^{-16}cm^2$	10-20%	158	
B		Quench	SF_6	300	LIF	63				σ	28.3	$10^{-16}cm^2$	10-20%	158	
B		Quench	CH_3Cl	370	MEF	25	34			k	4.2 (-10)	cm^3s^{-1}	10%	170	
B		Quench	C_2H_4	300	MEF	15				σ	141	$10^{-16}cm^2$	?	163	
B		Quench	C_2H_4	300	MEF	18-22				σ	97	$10^{-16}cm^2$	?	163	
B		Quench	C_2H_4	300	MEF	25				σ	69	$10^{-16}cm^2$	?	163	
B		Quench	C_2H_4	300	MEF	50-60				σ	242	$10^{-16}cm^2$	?	163	
B		Quench	C_6H_6	300	MEF	18-22				σ	132	$10^{-16}cm^2$	?	163	
B		Quench	C_6H_6	300	MEF	25				σ	179	$10^{-16}cm^2$	?	163	
B		Quench	C_6H_6	300	MEF	50-60				σ	908	$10^{-16}cm^2$	?	163	
B		Quench	$C_4H_6O_2$	300	LIF	17				k	4.9 (-10)	cm^3s^{-1}	20%	153	
B		Quench	$C_4H_6O_2$	300	LIF	21				k	3.7 (-10)	cm^3s^{-1}	20%	153	
B		Quench	$C_4H_6O_2$	300	LIF	25				k	4.0 (-10)	cm^3s^{-1}	20%	153	
B		Quench	$C_4H_6O_2$	300	LIF	46				k	2.6 (-10)	cm^3s^{-1}	20%	153	
B		Quench	$C_4H_6O_2$	300	LIF	63				k	2.5 (-10)	cm^3s^{-1}	20%	153	
B		Quench+ V-T	I_2	300	LIF	43	16			σ	239	$10^{-16}cm^2$	5-10%	176	
B		Quench+ V-T	I_2	300	LIF	62				σ	261	$10^{-16}cm^2$	5-10%	176	
B		Quench+ V-T+R-T	I_2	300	LIF	15	33			k	6.5 (-10)	cm^3s^{-1}	10-20%	184	
B		Quench+ V-T+R-T	I_2	300	LIF	15	104			k	5.2 (-10)	cm^3s^{-1}	10-20%	184	
B		Quench+ V-T+R-T	I_2	300	LIF	43	16			σ	279	$10^{-16}cm^2$	5-10%	176	

Table 1.10. Inelastic Collision Data for Iodine (continued).

Electronic State Initial	Electronic State Final	Process	Collision Partner	Temp (K)	Method	v_i	j_i	v_f	j_f	Quantity Reported	Data Entry	Units	Est. Error	Reference	Comment
B		Quench+ V-T+R-T	He	300	LIF	15	12			k	7.0 (-10)	cm^3s^{-1}	10-20%	184	
B		Quench+ V-T+R-T	He	300	LIF	15	33			k	7.0 (-10)	cm^3s^{-1}	10-20%	184	
B		Quench+ V-T+R-T	He	300	LIF	15	59			k	7.0 (-10)	cm^3s^{-1}	10-20%	184	
B		Quench+ V-T+R-T	He	300	LIF	15	83			k	7.0 (-10)	cm^3s^{-1}	10-20%	184	
B		Quench+ V-T+R-T	He	300	LIF	15	104			k	7.0 (-10)	cm^3s^{-1}	10-20%	184	
B		Quench+ V-T+R-T	He	300	LIF	15	146			k	7.0 (-10)	cm^3s^{-1}	10-20%	184	
B		Quench+ V-T+R-	^3He	300	LIF	15	59			k	6.9 (-10)	cm^3s^{-1}	10-20%	185	
B		Quench+ V-T+R-T	Ne	300	LIF	15	33			k	5.7 (-10)	cm^3s^{-1}	10-20%	184	
B		Quench+ V-T+R-T	Ar	300	LIF	15	12			k	6.8 (-10)	cm^3s^{-1}	10-20%	184	
B		Quench+ V-T+R-T	Ar	300	LIF	15	33			k	6.8 (-10)	cm^3s^{-1}	10-20%	184	
B		Quench+ V-T+R-T	Ar	300	LIF	15	59			k	6.8 (-10)	cm^3s^{-1}	10-20%	184	
B		Quench+ V-T+R-T	Ar	300	LIF	15	83			k	6.8 (-10)	cm^3s^{-1}	10-20%	184	
B		Quench+ V-T+R-T	Ar	300	LIF	15	104			k	6.8 (-10)	cm^3s^{-1}	10-20%	184	
B		Quench+ V-T+R-T	Ar	300	LIF	15	146			k	6.8 (-10)	cm^3s^{-1}	10-20%	184	
B		Quench+ V-T+R-T	H_2	300	LIF	15	59			k	13.4 (-10)	cm^3s^{-1}	10%	185	
B		Quench+ V-T+R-T	D_2	300	LIF	15	59			k	11.0 (-10)	cm^3s^{-1}	10%	185	
B		Quench+ V-T+R-T	O_2	300	DP	15	51			σ	72	$10^{-16}cm^2$	20%	141	

Table 1.10. Inelastic Collision Data for Iodine (continued).

Electronic State Initial	Electronic State Final	Process	Collision Partner	Temp (K)	Method	v_i	j_i	v_f	j_f	Quantity Reported	Data Entry	Units	Est. Error	Reference	Comment
B		Quench+ V-T+R-T	O_2	300	DP	17	35			σ	63	$10^{-16}cm^2$	20%	141	
B		V-T+R-T	I_2	300	CT	15	60			σ	126	$10^{-16}cm^2$		168	
B		V-E	CO	300	LIF/IRA						(o)			112	o
B		V-E	CO_2	300	LIF	10-20				P(E-V)/P(Q)	0.04		50%	186	
B		Dephase		300	CT(THG)					T_2*	1.0 (- 3)	μs		187	
B		Dephase	I_2		CT						(p)			188	p
B		Dephase	I_2	300	CT	15	60			σ	455	$10^{-16}cm^2$		168	
B	B	V-T	I_2	300	LIF	15	33			k	0.2 (-10)	cm^3s^{-1}	10-20%	184	
B	B	V-T	I_2		MEF	25	34				(m)			172	m
B	B	V-T	I_2	300	LIF	43	12+16	35		σ	0.05	$10^{-16}cm^2$	20%	174	
								36			0.09			174	
								37			0.11			174	
								38			0.20			174	
								39			0.55			174	
								40			1.13			174	
								41			2.86			174	
								42			6.31			174	
								44			5.20			174	
								45			1.82			174	
								46			0.48			174	
								47			0.20			174	
								48			0.05			174	
B	B	V-T	I_2	300	LIF	43	12+16	All		σ	19.0	$10^{-16}cm^2$	20%	174	
B	B	V-T	He	300	LIF	6	32	5		σ	2.22	$10^{-16}cm^2$	10-30%	162	
B	B	V-T	He	293	LIF+ME	6	32	3,4,5,7		k	1.06(-12)	cm^3s^{-1}	?	180	q
B	B	V-T	He	0-15	SSE	14		13			(r)			189	r
B	B	V-T	He	1-100	SSE+LIF	14		13			(r)			190	r
B	B	V-T	He	300	LIF	15	12			k	2.2 (-10)	cm^3s^{-1}	10-20%	184	
B	B	V-T	He	300	LIF	15	33			k	2.2 (-10)	cm^3s^{-1}	10-20%	184	
B	B	V-T	He	300	LIF	15	59			k	2.2 (-10)	cm^3s^{-1}	10-20%	184	
B	B	V-T	He	300	LIF	15	83			k	2.2 (-10)	cm^3s^{-1}	10-20%	184	
B	B	V-T	He	300	LIF	15	104			k	2.2 (-10)	cm^3s^{-1}	10-20%	184	

Table 1.10. Inelastic Collision Data for Iodine (continued).

Electronic State Initial	Final	Process	Collision Partner	Temp (K)	Method	v_i	j_i	v_f	j_f	Quantity Reported	Data Entry	Units	Est. Error	Reference	Comment
B	B	V-T	He	300	LIF	15	146			k	2.2 (-10)	cm^3s^{-1}	10-20%	184	
B	B	V-T	He	300	MEF	15	37+44	14		k	6.2 (-11)	cm^3s^{-1}	20%	167	s
B	B	V-T	He	300	MEF	15	37+44	16		k	9 (-11)	cm^3s^{-1}	20%	167	s
B	B	V-T	He	300	MEF	15	37+44	All		k	14.7 (-11)	cm^3s^{-1}	20%	167	
B	B	V-T	He	0-15	SSE	16		15			(r)			189	r
B	B	V-T	He	0.07	LIF+SSE	16-21		v_i-1		σ	24.8	$10^{-16}cm^2$		191	
B	B	V-T	He	0.11	LIF+SSE	16-21		v_i-1		σ	15.5	$10^{-16}cm^2$		191	
B	B	V-T	He	0.18	LIF+SSE	16-21		v_i-1		σ	8.9	$10^{-16}cm^2$		191	
B	B	V-T	He	293	MEF	25	34			k	1.76(-10)	cm^3s^{-1}		181	m
B	B	V-T	He	293	MEF	25	34				(m)			182	m
B	B	V-T	He	0.14	LIF+SSE	25		23		k	1.3-2.5(-11)	cm^3s^{-1}	?	192	t
B	B	V-T	He	370	MEF	25	34	23		k	0.23(-10)	cm^3s^{-1}	10%	170	
B	B	V-T	He	0.14	LIF+SSE	25		24		k	0.8-1.5(-10)	cm^3s^{-1}	?	192	t
B	B	V-T	He	370	MEF	25	34	24		k	1.22(-10)	cm^3s^{-1}	10%	170	
B	B	V-T	He	370	MEF	25	34	26		k	0.76(-10)	cm^3s^{-1}	10%	170	
B	B	V-T	He	370	MEF	25	34	27		k	0.19(-10)	cm^3s^{-1}	10%	170	
B	B	V-T	He	370	MEF	25	34	All		k	2.46(-10)	cm^3s^{-1}	10%	170	
B	B	V-T	He	0-15	SSE	28		27			(r)			189	r
B	B	V-T	He	300	LIF	43	12+16	35		σ	0.028	$10^{-16}cm^2$	20%	174	
								36			0.033			174	
								37			0.08			174	
								38			0.10			174	
								39			0.23			174	
								40			0.57			174	
								41			1.22			174	
								42			2.28			174	
								44			1.83			174	
								45			0.67			174	
								46			0.20			174	
								47			0.09			174	
								48			0.03			174	
B	B	V-T	He	300	LIF	43	12+16	All		σ	7.36	$10^{-16}cm^2$	20%	174	

Table 1.10. Inelastic Collision Data for Iodine (continued).

Electronic State Initial	Electronic State Final	Process	Collision Partner	Temp (K)	Method	v_i	j_i	v_f	j_f	Quantity Reported	Data Entry	Units	Est. Error	Reference	Comment
B	B	V-T	He	300	MEF	50	29	All		k	1.5 (-10)	cm^3s^{-1}	20%	177	
B	B	V-T	^3He	370	MEF	25	34	All		k	2.3 (-10)	cm^3s^{-1}	10%	170	
B	B	V-T	Ne	300	LIF	6	32	5		σ	3.18	$10^{-16}cm^2$	10-30%	162	
B	B	V-T	Ne	300	LIF	6	32	5+7		σ	4.1	$10^{-16}cm^2$	10-20%	160	
B	B	V-T	Ne	0-15	SSE	14		13			(r)			189	r
B	B	V-T	Ne	300	MEF	15	37+44	14		k	2.3 (-11)	cm^3s^{-1}	20%	167	s
B	B	V-T	Ne	300	MEF	15	37+44	16		k	2.8 (-11)	cm^3s^{-1}	20%	167	s
B	B	V-T	Ne	300	MEF	15	37+44	All		k	8.0 (-11)	cm^3s^{-1}	20%	167	
B	B	V-T	Ne	0-15	SSE	16		15			(r)			189	r
B	B	V-T	Ne	293	MEF	25	34				(m)			182	m
B	B	V-T	Ne	293	MEF	25	34			k	6.4 (-11)	cm^3s^{-1}		181	m
B	B	V-T	Ne	370	MEF	25	34	24		k	0.92(-10)	cm^3s^{-1}	10%	170	
B	B	V-T	Ne	370	MEF	25	34	All		k	1.75(-10)	cm^3s^{-1}	10%	170	
B	B	V-T	Ne	0-15	SSE	28		27			(r)			189	r
B	B	V-T	Ne	300	LIF	43	12+16	35		σ	0.06	$10^{-16}cm^2$	20%	174	
								36			0.11			174	
								37			0.16			174	
								38			0.26			174	
								39			0.63			174	
								40			1.16			174	
								41			2.64			174	
								42			5.07			174	
								44			4.33			174	
								45			1.58			174	
								46			0.64			174	
								46			0.53			174	
								47			0.21			174	
								48			0.07			174	
B	B	V-T	Ne	300	LIF	43	12+16	All		σ	16.8	$10^{-16}cm^2$	20%	174	
B	B	V-T	Ar	300	LIF	6	32	5		σ	36.6	$10^{-16}cm^2$	10-30%	162	
B	B	V-T	Ar	293	LIF+ME	6	32	3,4,5,7		k	1.5 (-12)	cm^3s^{-1}	?	180	q
B	B	V-T	Ar	0-15	SSE	14		13			(r)			189	r

Table 1.10. Inelastic Collision Data for Iodine (continued).

Electronic State Initial	Final	Process	Collision Partner	Temp (K)	Method	v_i	j_i	v_f	j_f	Quantity Reported	Data Entry	Units	Est. Error	Reference	Comment
B	B	V-T	Ar	300	LIF	15	12			k	2.0 (-10)	cm^3s^{-1}	10-20%	184	
B	B	V-T	Ar	300	LIF	15	33			k	2.0 (-10)	cm^3s^{-1}	10-20%	184	
B	B	V-T	Ar	300	LIF	15	59			k	2.0 (-10)	cm^3s^{-1}	10-20%	184	
B	B	V-T	Ar	300	LIF	15	83			k	2.0 (-10)	cm^3s^{-1}	10-20%	184	
B	B	V-T	Ar	300	LIF	15	104			k	2.0 (-10)	cm^3s^{-1}	10-20%	184	
B	B	V-T	Ar	300	LIF	15	146			k	2.0 (-10)	cm^3s^{-1}	10-20%	184	
B	B	V-T	Ar	300	MEF	15	37+44	14		k	2.5 (-11)	cm^3s^{-1}	20%	167	s
B	B	V-T	Ar	300	MEF	15	37+44	16		k	3.2 (-11)	cm^3s^{-1}	20%	167	s
B	B	V-T	Ar	300	MEF	15	37+44	All		k	7.3 (-11)	cm^3s^{-1}	20%	167	
B	B	V-T	Ar	0-15	SSE	16		15			(r)			189	r
B	B	V-T	Ar	293	MEF	25	34				(m)			182	m
B	B	V-T	Ar	370	MEF	25	34	All		k	2.5 (-10)	cm^3s^{-1}	10%	170	
B	B	V-T	Ar	293	MEF	25	34	All		k	3.9 (-11)	cm^3s^{-1}		181	m
B	B	V-T	Ar	0-15	SSE	28		27			(r)			189	r
B	B	V-T	Ar	300	LIF	43	12+16	35		σ	0.054	$10^{-16}cm^2$	20%	174	
B	B	V-T	Ar	300	LIF	43	12+16	36		σ	0.096	$10^{-16}cm^2$	20%	174	
B	B	V-T	Ar	300	LIF	43	12+16	37		σ	0.20	$10^{-16}cm^2$	20%	174	
B	B	V-T	Ar	300	LIF	43	12+16	38		σ	0.36	$10^{-16}cm^2$	20%	174	
B	B	V-T	Ar	300	LIF	43	12+16	39		σ	0.97	$10^{-16}cm^2$	20%	174	
B	B	V-T	Ar	300	LIF	43	12+16	40		σ	1.67	$10^{-16}cm^2$	20%	174	
B	B	V-T	Ar	300	LIF	43	12+16	41		σ	3.47	$10^{-16}cm^2$	20%	174	
B	B	V-T	Ar	293.5	LIF	43	12+16	41		k	4.4 (-11)	cm^3s^{-1}		175	n
B	B	V-T	Ar	411	LIF	43	12+16	41		k	5.2 (-11)	cm^3s^{-1}		175	n
B	B	V-T	Ar	462	LIF	43	12+16	41		k	6.4 (-11)	cm^3s^{-1}		175	n
B	B	V-T	Ar	538.4	LIF	43	12+16	41		k	1.16(-10)	cm^3s^{-1}		175	n

Table 1.10. Inelastic Collision Data for Iodine (continued).

Electronic State Initial	Electronic State Final	Process	Collision Partner	Temp (K)	Method	v_i	j_i	v_f	j_f	Quantity Reported	Data Entry	Units	Est. Error	Reference	Comment
B	B	V-T	Ar	605.2	LIF	43	12+16	41		κ	1.5 (-10)	cm^3s^{-1}		175	n
B	B	V-T	Ar	300	LIF	43	12+16	42		σ	7.07	$10^{-16}cm^2$	20%	174	
B	B	V-T	Ar	293.5	LIF	43	12+16	42		κ	6.8 (-11)	cm^3s^{-1}		175	n
B	B	V-T	Ar	411	LIF	43	12+16	42		κ	1.0 (-10)	cm^3s^{-1}		175	n
B	B	V-T	Ar	462	LIF	43	12+16	42		κ	1.16(-10)	cm^3s^{-1}		175	n
B	B	V-T	Ar	538.4	LIF	43	12+16	42		κ	1.9 (-10)	cm^3s^{-1}		175	n
B	B	V-T	Ar	605.2	LIF	43	12+16	42		κ	2.4 (-10)	cm^2s^{-1}		175	n
B	B	V-T	Ar	300	LIF	43	12+16	44		σ	5.89	$10^{-16}cm^2$	20%	174	
B	B	V-T	Ar	293.5	LIF	43	12+16	44		κ	3.4 (-11)	cm^3s^{-1}		175	n
B	B	V-T	Ar	411	LIF	43	12+16	44		κ	4.8 (-11)	cm^3s^{-1}		175	n
B	B	V-T	Ar	462	LIF	43	12+16	44		κ	5.2 (-11)	cm^3s^{-1}		175	n
B	B	V-T	Ar	538.4	LIF	43	12+16	44		κ	9.2 (-11)	cm^3s^{-1}		175	n
B	B	V-T	Ar	605.2	LIF	43	12+16	44		κ	9.6 (-11)	cm^3s^{-1}		175	n
B	B	V-T	Ar	300	LIF	43	12+16	45		σ	2.22	$10^{-16}cm^2$	20%	174	
B	B	V-T	Ar	300	LIF	43	12+16	46		σ	0.64	$10^{-16}cm^2$	20%	174	
B	B	V-T	Ar	300	LIF	43	12+16	47		σ	0.25	$10^{-16}cm^2$	20%	174	
B	B	V-T	Ar	300	LIF	43	12+16	48		σ	0.10	$10^{-16}cm^2$	20%	174	
B	B	V-T	Ar	293.5	LIF	43	12+16	All		κ	2.7 (-10)	cm^3s^{-1}		175	n
B	B	V-T	Ar	300	LIF	43	12+16	All		σ	23.0	$10^{-16}cm^2$	20%	174	
B	B	V-T	Ar	462	LIF	43	12+16	All		κ	3.6 (-10)	cm^3s^{-1}		175	n
B	B	V-T	Ar	538.4	LIF	43	12+16	All		κ	4.8 (-10)	cm^3s^{-1}		175	n
B	B	V-T	Kr	300	LIF	6	32	5		σ	14.8	$10^{-16}cm^2$	10-30%	162	
B	B	V-T	Kr	300	MEF	15	37+44	14		κ	1.2 (-11)	cm^3s^{-1}	20%	167	s
B	B	V-T	Kr	300	MEF	15	37+44	16		κ	1.4 (-11)	cm^3s^{-1}	20%	167	s
B	B	V-T	Kr	300	MEF	15	37+44	All		κ	3.3 (-11)	cm^3s^{-1}	20%	167	

Table 1.10. Inelastic Collision Data for Iodine (continued).

Electronic State Initial	Final	Process	Collision Partner	Temp (K)	Method	v_i	j_i	v_f	j_f	Quantity Reported	Data Entry	Units	Est. Error	Reference	Comment
B	B	V-T	Kr	293	MEF	25	34				(m)			182	m
B	B	V-T	Kr	370	MEF	25	34	24		k	0.67(-10)	cm^3s^{-1}	10%	170	
B	B	V-T	Kr	370	MEF	25	34	All		k	1.8 (-10)	cm^3s^{-1}	10%	170	
B	B	V-T	Kr	300	LIF	43	12+16	35		σ	0.09	$10^{-16}cm^2$	20%	174	
								36			0.15			174	
								37			0.34			174	
								38			0.49			174	
								39			1.23			174	
								40			2.09			174	
								41			4.56			174	
								42			9.12			174	
								44			7.61			174	
								45			2.81			174	
								46			0.80			174	
								47			0.32			174	
								48			0.13			174	
B	B	V-T	Kr	300	LIF	43	12+16	All		σ	29.8	$10^{-16}cm^2$	20%	174	
B	B	V-T	Xe	300	MEF	15	37+44	14		k	0.86(-11)	cm^3s^{-1}	20%	167	s
B	B	V-T	Xe	300	MEF	15	37+44	16		k	1.5 (-11)	cm^3s^{-1}	20%	167	s
B	B	V-T	Xe	300	MEF	15	37+44	All		k	3.1 (-11)	cm^3s^{-1}	20%	167	
B	B	V-T	Xe	293	MEF	25	34				(m)			182	m
B	B	V-T	Xe	370	MEF	25	34	24		k	0.46(-10)	cm^3s^{-1}	10%	170	
B	B	V-T	Xe	370	MEF	25	34	All		k	1.01(-10)	cm^3s^{-1}	10%	170	
B	B	V-T	Xe	300	LIF	43	12+16	35		σ	0.04	$10^{-16}cm^2$	20%	174	
								36			0.06			174	
								37			0.15			174	
								38			0.26			174	
								39			0.70			174	
								40			1.32			174	
								41			3.30			174	
								42			7.53			174	
								44			6.26			174	
								45			2.12			174	
								46			0.56			174	
								47			0.23			174	
								48			0.06			174	
B	B	V-T	Xe	300	LIF	43	12+16	All		σ	22.6	$10^{-16}cm^2$	20%	174	
B	B	V-T	H_2	300	LIF	6	32	5		σ	2.46	$10^{-16}cm^2$	10-30%	162	

Table 1.10. Inelastic Collision Data for Iodine (continued).

Electronic State Initial	Electronic State Final	Process	Collision Partner	Temp (K)	Method	v_i	j_i	v_f	j_f	Quantity Reported	Data Entry	Units	Est. Error	Reference	Comment
B	B	V-T	H_2	300	MEF	15	37+44	14		k	11.8 (-11)	cm^3s^{-1}	20%	167	s
B	B	V-T	H_2	300	MEF	15	37+44	16		k	16 (-11)	cm^3s^{-1}	20%	167	s
B	B	V-T	H_2	300	MEF	15	37+44	All		k	28 (-11)	cm^3s^{-1}	20%	167	
B	B	V-T	H_2		MEF	25	34				(m)			172	m
B	B	V-T	H_2	370	MEF	25	34	23		k	0.40(-10)	cm^3s^{-1}	10%	170	
B	B	V-T	H_2	370	MEF	25	34	24		k	1.5 (-10)	cm^3s^{-1}	10%	170	
B	B	V-T	H_2	370	MEF	25	34	26		k	1.15(-10)	cm^3s^{-1}	10%	170	
B	B	V-T	H_2	370	MEF	25	34	All		k	3.0 (-10)	cm^3s^{-1}	10%	170	
B	B	V-T	H_2	300	LIF	43	12+16	35		σ	0.013	$10^{-16}cm^2$	20%	174	
								36			0.02			174	
								37			0.03			174	
								38			0.05			174	
								39			0.14			174	
								40			0.29			174	
								41			0.73			174	
								42			1.59			174	
								44			1.32			174	
								45			0.46			174	
								46			0.12			174	
								47			0.05			174	
								48			0.015			174	
B	B	V-T	H_2	300	LIF	43	12+16	All		σ	4.81	$10^{-16}cm^2$	20%	174	
B	B	V-T	D_2	300	MEF	15	37+44	14		k	10.3 (-11)	cm^3s^{-1}	20%	167	s
B	B	V-T	D_2	300	MEF	15	37+44	16		k	13 (-11)	cm^3s^{-1}	20%	167	s
B	B	V-T	D_2	300	MEF	15	37+44	All		k	37 (-11)	cm^3s^{-1}	20%	167	
B	B	V-T	D_2		MEF	25	34				(m)			172	m
B	B	V-T	O_2	300	LIF	6	32	5		σ	25.0	$10^{-16}cm^2$	10-30%	162	
B	B	V-T	O_2	300	MEF	15	37+44	14		k	3.9 (-11)	cm^3s^{-1}	20%	167	s
B	B	V-T	O_2	300	MEF	15	37+44	16		k	5.0 (-11)	cm^3s^{-1}	20%	167	s
B	B	V-T	O_2	300	MEF	15	37+44	All		k	19 (-11)	cm^3s^{-1}	20%	167	
B	B	V-T	O_2	293	MEF	25	34	All		k	3.5 (-11)	cm^3s^{-1}		181	m

Table 1.10. Inelastic Collision Data for Iodine (continued).

Electronic State Initial	Final	Process	Collision Partner	Temp (K)	Method	v_i	j_i	v_f	j_f	Quantity Reported	Data Entry	Units	Est. Error	Reference	Comment
B	B	V-T	O_2	370	MEF	25	34	All		k	2.6 (-10)	cm^3s^{-1}	10%	170	
B	B	V-T	N_2	300	LIF	6	32	5		σ	28.2	$10^{-16}cm^2$	10-30%	162	
B	B	V-T	N_2	293	LIF+ME	6	32	3,4,5,7		k	2.26(-12)	cm^3s^{-1}	?	180	q
B	B	V-T	N_2	300	MEF	15	37+44	14		k	4.2 (-11)	cm^3s^{-1}	20%	170	s
B	B	V-T	N_2	300	MEF	15	37+44	16		k	5.3 (-11)	cm^3s^{-1}	20%	167	s
B	B	V-T	N_2	300	MEF	15	37+44	All		k	17 (-11)	cm^3s^{-1}	20%	167	
B	B	V-T	NO	300	MEF	15	37+44	14		k	3.5 (-11)	cm^3s^{-1}	20%	167	s
B	B	V-T	NO	300	MEF	15	37+44	16		k	4.5 (-11)	cm^3s^{-1}	20%	167	s
B	B	V-T	NO	300	MEF	15	37+44	All		k	18 (-11)	cm^3s^{-1}	20%	167	
B	B	V-T	CO	300	LIF	6	32	5		σ	18.8	$10^{-16}cm^2$	10-30%	162	
B	B	V-T	CO_2	300	LIF	6	32	5		σ	79.8	$10^{-16}cm^2$	10-30%	162	
B	B	V-T	CO_2	370	MEF	25	34	24		k	0.99(-10)	cm^3s^{-1}	10%	170	
B	B	V-T	CO_2	370	MEF	25	34	26		k	0.78(-10)	cm^3s^{-1}	10%	170	
B	B	V-T	CO_2	370	MEF	25	34	All		k	2.6 (-10)	cm^3s^{-1}	10%	170	
B	B	V-T	CO_2	300	LIF	43	12+16	35		σ	0.05	$10^{-16}cm^2$	20%	174	
								36			0.08			174	
								37			0.11			174	
								38			0.18			174	
								39			0.51			174	
								40			1.05			174	
								41			2.64			174	
								42			5.80			174	
								44			4.79			174	
								45			1.65			174	
								46			0.43			174	
								47			0.19			174	
								48			0.05			174	
B	B	V-T	CO_2	300	LIF	43	12+16	All		σ	17.5	$10^{-16}cm^2$	20%	174	
B	B	V-T	NH_3	370	MEF	25	34	All		k	2.19(-10)	cm^3s^{-1}	10%	170	
B	B	V-T	SO_2	370	MEF	25	34	24		k	1.8 (-10)	cm^3s^{-1}	10%	170	

Table 1.10. Inelastic Collision Data for Iodine (continued).

Electronic State Initial	Final	Process	Collision Partner	Temp (K)	Method	v_i	j_i	v_f	j_f	Quantity Reported	Data Entry	Units	Est. Error	Reference	Comment
B	B	V-T	SO_2	370	MEF	25	34	26		k	1.06(-10)	cm^3s^{-1}	10%	170	
B	B	V-T	SO_2	370	MEF	25	34	All		k	3.13(-10)	cm^3s^{-1}	10%	170	
B	B	V-T	CH_3Cl	370	MEF	25	34	24		k	1.34(-10)	cm^3s^{-1}	10%	170	
B	B	V-T	CH_3Cl	370	MEF	25	34	26		k	0.87(-10)	cm^3s^{-1}	10%	170	
B	B	V-T	CH_3Cl	370	MEF	25	34	All		k	3.0 (-10)	cm^3s^{-1}	10%	170	
B	B	V-T+R-T	I_2	300	LIF	43	12+16	39	2-6	σ	8.1 (- 2)	$10^{-16}cm^2$	10-20%	193	
									8		4.2 (- 2)			193	
									10		4.8 (- 2)			193	
									12		5.2 (- 2)			193	
									12+16		5.3 (- 2)			193	
									16		5.4 (- 2)			193	
									18		5.1 (- 2)			193	
									20		4.6 (- 2)			193	
									22		4.0 (- 2)			193	
									24		3.3 (- 2)			193	
									26		2.4 (- 2)			193	
									28		1.5 (- 2)			193	
									30		7.7 (- 3)			193	
									32		3.8 (- 3)			193	
									34		1.9 (- 3)			193	
									36		8 (- 4)			193	
									38		4 (- 4)			193	
									40		1.9 (- 4)			193	
									42		7 (- 5)			193	
									44		2 (- 5)			193	
									46		1 (- 5)			193	
									48		3 (- 6)			193	
B	B	V-T+R-T	I_2	300	LIF	43	12+16	39	All	σ	5.5 (- 1)	$10^{-16}cm^2$	10-20%	193	

Table 1.10. Inelastic Collision Data for Iodine (continued).

Electronic State															
Initial	Final	Process	Collision Partner	Temp (K)	Method	v_i	j_i	v_f	j_f	Quantity Reported	Data Entry	Units	Est. Error	Reference	Comment
B	B	V-T+R-T	I_2	300	LIF	43	12+16	40	2-6	σ	1.48(- 1)	$10^{-16}cm^2$	10-20%	193	
									8		8.3 (- 2)			193	
									10		1.02(- 1)			193	
									12		1.21(- 1)			193	
									12+16		1.40(- 1)			193	
									16		1.58(- 1)			193	
									18		1.74(- 1)			193	
									20		2.85(- 1)			193	
									22		2.0 (- 2)			193	
									24		9.3 (- 3)			193	
									26		5.2 (- 3)			193	
									28		3.0 (- 3)			193	
									30		1.8 (- 3)			193	
									32		1.0 (- 3)			193	
									34		5 (- 4)			193	
									36		1.6 (- 4)			193	
									38		6 (- 5)			193	
									40		2 (- 5)			193	
									42		1 (- 5)			193	
									44		4 (- 6)			193	
									46		2 (- 6)			193	
									48		1 (- 6)			193	
B	B	V-T+R-T	I_2	300	LIF	43	12+16	40	All	σ	1.15	$10^{-16}cm^2$	10-20%	193	
B	B	V-T+R-T	I_2	300	LIF	43	12+16	41	2-4	σ	2.1 (- 1)	$10^{-16}cm^2$	10-20%	193	
									6		1.5 (- 1)			193	
									8		2.03(- 1)			193	
									10		2.47(- 1)			193	
									12		2.88(- 1)			193	
									12+16		3.22(- 1)			193	
									16		3.49(- 1)			193	
									18		3.64(- 1)			193	
									20		3.62(- 1)			193	
									22		1.72(- 1)			193	
									24		9.7 (- 2)			193	
									26		6.3 (- 2)			193	
									28		3.7 (- 2)			193	
									30		5.3 (- 3)			193	
									32		2.7 (- 3)			193	
									34		1.4 (- 3)			193	
									36		6 (- 4)			193	
									38		3 (- 4)			193	
									40		1.3 (- 4)			193	
									42		5 (- 5)			193	
									44		1 (- 5)			193	
									46		5 (- 6)			193	
									48		2 (- 6)			193	
B	B	V-T+R-T	I_2	300	LIF	43	12+16	41	All	σ	2.89	$10^{-16}cm^2$	10-20%	193	

Table 1.10. Inelastic Collision Data for Iodine (continued).

Electronic State Initial	Final	Process	Collision Partner	Temp (K)	Method	v_i	j_i	v_f	j_f	Quantity Reported	Data Entry	Units	Est. Error	Reference	Comment
B	B	V-T+R-T	I_2	300	LIF	43	12+16	42	2-4	σ	3.9 (- 1)	$10^{-16}cm^2$	10-20%	193	
									6		3.0 (- 1)			193	
									8		3.92(- 1)			193	
									10		4.86(- 1)			193	
									12		5.77(- 1)			193	
									12+16		6.64(- 1)			193	
									16		7.4 (- 1)			193	
									18		8.02(- 1)			193	
									20		8.41(- 1)			193	
									22		6.59(- 1)			193	
									24		2.95(- 1)			193	
									26		8.5 (- 2)			193	
									28		3.5 (- 2)			193	
									30		8.9 (- 3)			193	
									32		5.3 (- 3)			193	
									34		3.0 (- 3)			193	
									36		1.4 (- 3)			193	
									38		5 (- 4)			193	
									40		1.7 (- 4)			193	
									42		6 (- 5)			193	
									44		2 (- 5)			193	
									46		1 (- 5)			193	
									48		4 (- 6)			193	
B	B	V-T+R-T	I_2	300	LIF	43	12+16	42	All	σ	6.28	$10^{-16}cm^2$	10-20%	193	

Table 1.10. Inelastic Collision Data for Iodine (continued).

Electronic State Initial	Final	Process	Collision Partner	Temp (K)	Method	v_i	j_i	v_f	j_f	Quantity Reported	Data Entry	Units	Est. Error	Reference	Comment
B	B	R-T	I_2	300	LIF	43	12+16	43	2-4	σ	6.8 (- 1)	$10^{-16}cm^2$	10-20%	193	
									6		8.3 (- 1)			193	
									8		1.27			193	
									10		2.45			193	
									12		4.88			193	
									16		11.86			193	
									18		4.25			193	
									20		1.80			193	
									22		1.19			193	
									24		9.2 (- 1)			193	
									26		7.3 (- 1)			193	
									28		4.4 (- 1)			193	
									30		2.7 (- 2)			193	
									32		1.1 (- 2)			193	
									34		5.1 (- 3)			193	
									36		2.8 (- 3)			193	
									38		1.5 (- 3)			193	
									40		7 (- 4)			193	
									42		2.5 (- 4)			193	
									44		3 (- 5)			193	
									46		1.3 (- 5)			193	
									48		6 (- 6)			193	
									50		3 (- 6)			193	
									52		1 (- 6)			193	
									54		3.5 (- 7)			193	
									56		7 (- 8)			193	
									58		2 (- 8)			193	
									60		1 (- 8)			193	
									62		3 (- 9)			193	
									64		1 (- 9)			193	
B	B	R-T	I_2	300	LIF	43	12+16	43	All	σ	36.3	$10^{-16}cm^2$	10-20%	193	

Table 1.10. Inelastic Collision Data for Iodine (continued).

Electronic State Initial	Electronic State Final	Process	Collision Partner	Temp (K)	Method	v_i	j_i	v_f	j_f	Quantity Reported	Data Entry	Units	Est. Error	Reference	Comment
B	B	V-T+R-T	I_2	300	LIF	43	12+16	44	2-6	σ	5.55(- 1)	$10^{-16}cm^2$	10-20%	193	
									8		3.10(- 1)			193	
									10		3.79(- 1)			193	
									12		4.44(- 1)			193	
									12+16		5.01(- 1)			193	
									16		5.47(- 1)			193	
									18		5.79(- 1)			193	
									20		5.91(- 1)			193	
									22		5.76(- 1)			193	
									24		4.07(- 1)			193	
									26		1.87(- 1)			193	
									28		8.9 (- 2)			193	
									30		1.07(- 2)			193	
									32		5.8 (- 3)			193	
									34		3.4 (- 3)			193	
									36		1.9 (- 3)			193	
									38		9 (- 4)			193	
									40		3.5 (- 4)			193	
									42		1.1 (- 4)			193	
									44		2.5 (- 5)			193	
									46		1.1 (- 5)			193	
									48		5 (- 6)			193	
									50		2 (- 6)			193	
									52		1 (- 6)			193	
B	B	V-T+R-T	I_2	300	LIF	43	12+16	44	All	σ	5.19	$10^{-16}cm^2$	10-20%	193	
B	B	V-T+R-T	I_2	300	LIF	43	12+16	45	2-6	σ	1.94(- 1)	$10^{-16}cm^2$	10-20%	193	
									8		1.08(- 1)			193	
									10		1.33(- 1)			193	
									12		1.56(- 1)			193	
									12+16		1.78(- 1)			193	
									16		1.97(- 1)			193	
									18		2.11(- 1)			193	
									20		2.20(- 1)			193	
									22		2.21(- 1)			193	
									24		1.12(- 1)			193	
									26		7.3 (- 2)			193	
									28		3.1 (- 2)			193	
									30		4.5 (- 3)			193	
									32		2.5 (- 3)			193	
									34		1.5 (- 3)			193	
									36		8 (- 4)			193	
									38		3.7 (- 4)			193	
									40		1.5 (- 4)			193	
									42		5 (- 5)			193	
									44		1.2 (- 5)			193	
									46		6 (- 6)			193	
									48		2 (- 6)			193	
									50		1 (- 6)			193	
									52		3 (- 7)			193	
B	B	V-T+R-T	I_2	300	LIF	43	12+16	45	All	σ	1.84	$10^{-16}cm^2$	10-20%	193	

Table 1.10. Inelastic Collision Data for Iodine (continued).

Electronic State Initial	Final	Process	Collision Partner	Temp (K)	Method	v_i	j_i	v_f	j_f	Quantity Reported	Data Entry	Units	Est. Error	Reference	Comment
B	B	V-T+R-T	I_2	300	LIF	43	12+16	46	2-6	σ	5.7 (- 2)	$10^{-16}cm^2$	10-20%	193	
									8		3.1 (- 2)			193	
									10		3.8 (- 2)			193	
									12		4.5 (- 2)			193	
									12+16		5.2 (- 2)			193	
									16		5.8 (- 2)			193	
									18		6.4 (- 2)			193	
									20		6.7 (- 2)			193	
									22		2.5 (- 2)			193	
									24		1.8 (- 2)			193	
									26		1.2 (- 2)			193	
									28		7.3 (- 3)			193	
									30		1.3 (- 3)			193	
									32		8 (- 4)			193	
									34		4 (- 4)			193	
									36		2 (- 4)			193	
									38		1 (- 4)			193	
									40		5 (- 5)			193	
									42		2 (- 5)			193	
									44		4 (- 6)			193	
									46		2 (- 6)			193	
									48		1 (- 6)			193	
									50		3 (- 7)			193	
									52		1 (- 7)			193	
B	B	V-T+R-T	I_2	300	LIF	43	12+16	46	All	σ	4.8 (- 1)	$10^{-16}cm^2$	10-20%	193	
B	B	V-T+R-T	He	300	LIF	43	12+16	40	2-8	σ	1.02(- 1)	$10^{-16}cm^2$	10-20%	193	
									10		4.1 (- 2)			193	
									12		4.5 (- 2)			193	
									12+16		4.8 (- 2)			193	
									16		4.9 (- 2)			193	
									18		4.8 (- 2)			193	
									20		4.5 (- 2)			193	
									22		4.2 (- 2)			193	
									24		3.7 (- 2)			193	
									26		3.2 (- 2)			193	
									28		2.6 (- 2)			193	
									30		1.9 (- 2)			193	
									32		1.4 (- 2)			193	
									34		9.3 (- 3)			193	
									36		5.5 (- 3)			193	
									38		2.9 (- 3)			193	
									40		1.4 (- 3)			193	
									42		5.4 (- 4)			193	
									44		1.3 (- 4)			193	
									46		6 (- 5)			193	
									48		3 (- 5)			193	
									50		1 (- 5)			193	
B	B	V-T+R-T	He	300	LIF	43	12+16	40	All	σ	5.7 (- 1)	$10^{-16}cm^2$	10-20%	193	

Table 1.10. Inelastic Collision Data for Iodine (continued).

Electronic State Initial	Final	Process	Collision Partner	Temp (K)	Method	v_i	j_i	v_f	j_f	Quantity Reported	Data Entry	Units	Est. Error	Reference	Comment
B	B	V-T+R-T	He	300	LIF	43	12+16	41	2-6	σ	1.33(- 1)	$10^{-16}cm^2$	10-20%	193	
									8		7.3 (- 2)			193	
									10		8.9 (- 2)			193	
									12		1.05(- 1)			193	
									12+16		1.18(- 1)			193	
									16		1.29(- 1)			193	
									18		1.36(- 1)			193	
									20		1.39(- 1)			193	
									22		1.03(- 1)			193	
									24		7.8 (- 2)			193	
									26		5.9 (- 2)			193	
									28		5.0 (- 2)			193	
									30		2.9 (- 3)			193	
									32		1.6 (- 3)			193	
									34		9.5 (- 4)			193	
									36		5.8 (- 4)			193	
									38		3.1 (- 4)			193	
									40		1.4 (- 4)			193	
									42		4.0 (- 5)			193	
									44		8 (- 6)			193	
									46		4 (- 6)			193	
									48		2 (- 6)			193	
									50		1 (- 6)			193	
B	B	V-T+R-T	He	300	LIF	43	12+16	41	All	σ	1.22	$10^{-16}cm^2$	10-20%	193	
B	B	V-T+R-T	He	300	LIF	43	12+16	42	2-6	σ	2.6 (- 1)	$10^{-16}cm^2$	10-20%	193	
									8		1.42(- 1)			193	
									10		1.72(- 1)			193	
									12		2.0 (- 1)			193	
									12+16		2.2 (- 1)			193	
									16		2.4 (- 1)			193	
									18		2.5 (- 1)			193	
									20		2.5 (- 1)			193	
									22		2.26(- 1)			193	
									24		1.55(- 1)			193	
									26		9.1 (- 2)			193	
									28		5.0 (- 2)			193	
									30		4.3 (- 3)			193	
									32		2.5 (- 3)			193	
									34		1.5 (- 3)			193	
									36		8.4 (- 4)			193	
									38		4.0 (- 4)			193	
									40		1.6 (- 4)			193	
									42		4.8 (- 5)			193	
									44		1.1 (- 5)			193	
									46		5 (- 6)			193	
									48		2 (- 6)			193	
									50		1 (- 6)			193	
B	B	V-T+R-T	He	300	LIF	43	12+16	42	All	σ	2.27	$10^{-16}cm^2$	10-20%	193	

Table 1.10. Inelastic Collision Data for Iodine (continued).

Electronic State Initial	Electronic State Final	Process	Collision Partner	Temp (K)	Method	v_i	j_i	v_f	j_f	Quantity Reported	Data Entry	Units	Est. Error	Reference	Comment
B	B	R-T	He	300	LIF	43	12+16	43	2-4	σ	2.96(- 1)	$10^{-16}cm^2$	10-20%	193	
									6		3.06(- 1)			193	
									8		5.1 (- 1)			193	
									10		8.0 (- 1)			193	
									12		1.89			193	
									16		2.60			193	
									18		1.22			193	
									20		4.8 (- 1)			193	
									22		4.5 (- 1)			193	
									24		4.16(- 1)			193	
									26		2.74(- 1)			193	
									28		1.11(- 1)			193	
									30		6.6 (- 3)			193	
									32		3.2 (- 3)			193	
									34		1.8 (- 3)			193	
									36		1.1 (- 3)			193	
									38		5.2 (- 4)			193	
									40		1.9 (- 4)			193	
									42		5.0 (- 5)			193	
									44		1 (- 5)			193	
									46		5 (- 6)			193	
									48		2.2 (- 6)			193	
									50		9 (- 7)			193	
									52		3 (- 7)			193	
									54		7 (- 8)			193	
									56		1 (- 8)			193	
									58		3 (- 9)			193	
									60		1 (- 9)			193	
									62		1 (- 9)			193	
B	B	R-T	He	300	LIF	43	12+16	43	All	σ	9.42	$10^{-16}cm^2$	10-20%	193	

Table 1.10. Inelastic Collision Data for Iodine (continued).

Electronic State Initial	Final	Process	Collision Partner	Temp (K)	Method	v_i	j_i	v_f	j_f	Quantity Reported	Data Entry	Units	Est. Error	Reference	Comment
B	B	V-T+R-T	He	300	LIF	43	12+16	44	2-6	σ	2.5 (- 1)	$10^{-16}cm^2$	10-20%	193	
									8		1.37(- 1)			193	
									10		1.66(- 1)			193	
									12		1.9 (- 1)			193	
									12+16		2.1 (- 1)			193	
									16		2.2 (- 1)			193	
									18		2.16(- 1)			193	
									20		2.0 (- 1)			193	
									22		1.51(- 1)			193	
									24		6.3 (- 2)			193	
									26		1.9 (- 2)			193	
									28		6.9 (- 3)			193	
									30		2.4 (- 3)			193	
									32		1.4 (- 3)			193	
									34		7.9 (- 4)			193	
									36		3.7 (- 4)			193	
									38		1.4 (- 4)			193	
									40		5.0 (- 5)			193	
									42		1.7 (- 5)			193	
									44		6 (- 6)			193	
									46		3 (- 6)			193	
									48		1 (- 6)			193	
									50		4 (- 7)			193	
B	B	V-T+R-T	He	300	LIF	43	12+16	44	All	σ	1.83	$10^{-16}cm^2$	10-20%	193	
B	B	V-T+R-T	He	300	LIF	43	12+16	45	2-6	σ	8.1 (- 2)	$10^{-16}cm^2$	10-20%	193	
									8		4.4 (- 2)			193	
									10		5.3 (- 2)			193	
									12		6.1 (- 2)			193	
									12+16		6.8 (- 2)			193	
									16		7.4 (- 2)			193	
									18		7.8 (- 2)			193	
									20		7.9 (- 2)			193	
									22		6.6 (- 2)			193	
									24		3.7 (- 2)			193	
									26		1.9 (- 2)			193	
									28		6.1 (- 3)			193	
									30		1.2 (- 3)			193	
									32		7.4 (- 4)			193	
									34		4.3 (- 4)			193	
									36		2.2 (- 4)			193	
									38		1.0 (- 4)			193	
									40		3.6 (- 5)			193	
									42		1.0 (- 5)			193	
									44		3 (- 6)			193	
									46		2 (- 6)			193	
									48		1 (- 6)			193	
									50		3 (- 7)			193	
B	B	V-T+R-T	He	300	LIF	43	12+16	45	All	σ	6.7 (- 1)	$10^{-16}cm^2$	10-20%	193	

Table 1.10. Inelastic Collision Data for Iodine (continued).

Electronic State Initial	Electronic State Final	Process	Collision Partner	Temp (K)	Method	v_i	j_i	v_f	j_f	Quantity Reported	Data Entry	Units	Est. Error	Reference	Comment
B	B	V-T+R-T	Ne	300	LIF	43	12+16	40	2-8	σ	2.46(- 2)	$10^{-16}cm^2$	10-20%	193	
									10		9.3 (- 2)			193	
									12		1.01(- 1)			193	
									12+16		1.04(- 1)			193	
									16		1.03(- 1)			193	
									18		9.8 (- 2)			193	
									20		9.1 (- 2)			193	
									22		8.1 (- 2)			193	
									24		6.9 (- 2)			193	
									26		5.7 (- 2)			193	
									28		4.4 (- 2)			193	
									30		3.2 (- 2)			193	
									32		2.2 (- 2)			193	
									34		1.4 (- 2)			193	
									36		8.3 (- 3)			193	
									38		4.2 (- 3)			193	
									40		1.7 (- 3)			193	
									42		6.8 (- 4)			193	
									44		2.4 (- 4)			193	
									46		1.2 (- 4)			193	
									48		5 (- 5)			193	
									50		2 (- 5)			193	
									52		6 (- 6)			193	
B	B	V-T+R-T	Ne	300	LIF	43	12+16	40	All	σ	1.17	$10^{-16}cm^2$	10-20%	193	
B	B	V-T+R-T	Ne	300	LIF	43	12+16	41	2-8	σ	5.1 (- 1)	$10^{-16}cm^2$	10-20%	193	
									10		2.14(- 1)			193	
									12		2.45(- 1)			193	
									12+16		2.7 (- 1)			193	
									16		2.9 (- 1)			193	
									18		2.9 (- 1)			193	
									20		2.4 (- 1)			193	
									22		2.0 (- 1)			193	
									24		1.45(- 1)			193	
									26		1.27(- 1)			193	
									28		8.3 (- 2)			193	
									30		6.9 (- 3)			193	
									32		4.2 (- 3)			193	
									34		1.6 (- 3)			193	
									36		1.5 (- 3)			193	
									38		7.4 (- 4)			193	
									40		2.8 (- 4)			193	
									42		9 (- 5)			193	
									44		2.5 (- 5)			193	
									46		1.2 (- 4)			193	
									48		5 (- 6)			193	
									50		2 (- 6)			193	
									52		5 (- 6)			193	
B	B	V-T+R-T	Ne	300	LIF	43	12+16	41	All	σ	2.63	$10^{-16}cm^2$	10-20%	193	

Table 1.10. Inelastic Collision Data for Iodine (continued).

Electronic State Initial	Final	Process	Collision Partner	Temp (K)	Method	v_i	j_i	v_f	j_f	Quantity Reported	Data Entry	Units	Est. Error	Reference	Comment
B	B	V-T+R-T	Ne	300	LIF	43	12+16	42	2-8	σ	9.4 (- 1)	$10^{-16}cm^2$	10-20%	193	
									10		4.14(- 1)			193	
									12		4.76(- 1)			193	
									14		5.3 (- 1)			193	
									16		5.7 (- 1)			193	
									18		5.9 (- 1)			193	
									20		5.5 (- 1)			193	
									22		4.34(- 1)			193	
									24		3.51(- 1)			193	
									26		1.32(- 1)			193	
									28		6.5 (- 2)			193	
									30		1.1 (- 2)			193	
									32		6.7 (- 3)			193	
									34		3.9 (- 3)			193	
									36		1.9 (- 3)			193	
									38		8 (- 4)			193	
									40		2.8 (- 4)			193	
									42		1.0 (- 4)			193	
									44		3 (- 5)			193	
									46		1.5 (- 5)			193	
									48		6 (- 6)			193	
									50		2 (- 6)			193	
									52		1 (- 6)			193	
B	B	V-T+R-T	Ne	300	LIF	43	12+16	42	All	σ	5.07	$10^{-16}cm^2$	10-20%	193	

Table 1.10. Inelastic Collision Data for Iodine (continued).

Electronic State Initial	Final	Process	Collision Partner	Temp (K)	Method	v_i	j_i	v_f	j_f	Quantity Reported	Data Entry	Units	Est. Error	Reference	Comment
B	B	R-T	Ne	300	LIF	43	12+16	43	2-4	σ	7.1 (- 1)	$10^{-16}cm^2$	10-20%	193	
									6		8.0 (- 1)			193	
									8		1.3			193	
									10		2.21			193	
									12		5.98			193	
									16		5.27			193	
									18		2.93			193	
									20		2.34			193	
									22		1.81			193	
									24		1.49			193	
									26		6.7 (- 1)			193	
									28		2.56(- 1)			193	
									30		2.5 (- 2)			193	
									32		1.47(- 2)			193	
									34		8.4 (- 3)			193	
									36		4.1 (- 3)			193	
									38		1.7 (- 3)			193	
									40		5.6 (- 4)			193	
									42		1.6 (- 4)			193	
									44		5 (- 5)			193	
									46		2.2 (- 5)			193	
									48		9 (- 6)			193	
									50		3 (- 6)			193	
									52		1 (- 6)			193	
									54		2 (- 7)			193	
									56		2 (- 8)			193	
									58		1 (- 8)			193	
B	B	R-T	Ne	300	LIF	43	12+16	43	All	σ	25.84	$10^{-16}cm^2$	10-20%	193	

Table 1.10. Inelastic Collision Data for Iodine (continued).

Electronic State Initial	Electronic State Final	Process	Collision Partner	Temp (K)	Method	v_i	j_i	v_f	j_f	Quantity Reported	Data Entry	Units	Est. Error	Reference	Comment
B	B	V-T+R-T	Ne	300	LIF	43	12+16	44	2-8	σ	8.3 (- 1)	$10^{-16}cm^2$	10-20%	193	
									10		3.5 (- 1)			193	
									12		4.0 (- 1)			193	
									12+16		4.5 (- 1)			193	
									16		5.0 (- 1)			193	
									18		5.3 (- 1)			193	
									20		5.0 (- 1)			193	
									22		3.0 (- 1)			193	
									24		2.43(- 1)			193	
									26		1.29(- 1)			193	
									28		8.1 (- 2)			193	
									30		9.7 (- 3)			193	
									32		5.8 (- 3)			193	
									34		3.3 (- 3)			193	
									36		1.7 (- 3)			193	
									38		8.2 (- 4)			193	
									40		3.1 (- 4)			193	
									42		1.0 (- 4)			193	
									44		3 (- 5)			193	
									46		1.4 (- 5)			193	
									48		6 (- 6)			193	
									50		2 (- 6)			193	
									52		1 (- 6)			193	
B	B	V-T+R-T	Ne	300	LIF	43	12+16	44	All	σ	4.34	$10^{-16}cm^2$	10-20%	193	
B	B	V-T+R-T	Ne	300	LIF	43	12+16	45	2-8	σ	3.1 (- 1)	$10^{-16}cm^2$	10-20%	193	
									10		1.28(- 1)			193	
									12		1.46(- 1)			193	
									12+16		1.62(- 1)			193	
									16		1.74(- 1)			193	
									18		1.82(- 1)			193	
									20		1.63(- 1)			193	
									22		1.34(- 1)			193	
									24		9.8 (- 2)			193	
									26		5.5 (- 2)			193	
									28		3.1 (- 2)			193	
									30		4.1 (- 3)			193	
									32		2.5 (- 3)			193	
									34		1.5 (- 3)			193	
									36		7.8 (- 4)			193	
									38		3.7 (- 4)			193	
									40		1.4 (- 4)			193	
									42		5 (- 5)			193	
									44		1.5 (- 5)			193	
									46		7 (- 6)			193	
									48		3 (- 6)			193	
									50		1 (- 6)			193	
									52		3 (- 7)			193	
B	B	V-T+R-T	Ne	300	LIF	43	12+16	45	All	σ	1.59	$10^{-16}cm^2$	10-20%	193	

Table 1.10. Inelastic Collision Data for Iodine (continued).

Electronic State Initial	Final	Process	Collision Partner	Temp (K)	Method	v_i	j_i	v_f	j_f	Quantity Reported	Data Entry	Units	Est. Error	Reference	Comment
B	B	V-T+R-T	H_2	300	LIF	43	12+16	40	2-6	σ	3.9 (- 2)	$10^{-16}cm^2$	10-20%	193	
									8		2.0 (- 2)			193	
									10		2.3 (- 2)			193	
									12		2.5 (- 2)			193	
									12+16		2.6 (- 2)			193	
									16		2.6 (- 2)			193	
									18		2.5 (- 2)			193	
									20		2.4 (- 2)			193	
									22		2.1 (- 2)			193	
									24		1.8 (- 2)			193	
									26		1.45(- 2)			193	
									28		1.07(- 2)			193	
									30		6.9 (- 3)			193	
									32		2.1 (- 3)			193	
									34		1.0 (- 3)			193	
									36		4.3 (- 4)			193	
									38		1.8 (- 4)			193	
									40		8 (- 5)			193	
									42		3 (- 5)			193	
									44		1 (- 5)			193	
									46		5 (- 6)			193	
									48		2 (- 6)			193	
B	B	V-T+R-T	H_2	300	LIF	43	12+16	40	All	σ	2.9 (- 1)	$10^{-16}cm^2$	10-20%	193	
B	B	V-T+R-T	H_2	300	LIF	43	12+16	41	2-8	σ	1.40(- 1)	$10^{-16}cm^2$	10-20%	193	
									10		6.0 (- 2)			193	
									12		6.9 (- 2)			193	
									12+16		7.8 (- 2)			193	
									16		8.5 (- 2)			193	
									18		9.0 (- 2)			193	
									20		9.3 (- 2)			193	
									22		5.7 (- 2)			193	
									24		2.5 (- 2)			193	
									26		1.5 (- 2)			193	
									28		7.2 (- 3)			193	
									30		1.6 (- 3)			193	
									32		5 (- 4)			193	
									34		2.4 (- 4)			193	
									36		1 (- 5)			193	
									38		4 (- 5)			193	
									40		1.4 (- 5)			193	
									42		4 (- 6)			193	
									44		2 (- 6)			193	
									46		1 (- 6)			193	
									48		3 (- 7)			193	
B	B	V-T+R-T	H_2	300	LIF	43	12+16	41	All	σ	7.2 (- 1)	$10^{-16}cm^2$	10-20%	193	

Table 1.10. Inelastic Collision Data for Iodine (continued).

Electronic State Initial	Final	Process	Collision Partner	Temp (K)	Method	v_i	j_i	v_f	j_f	Quantity Reported	Data Entry	Units	Est. Error	Reference	Comment
B	B	V-T+R-T	H_2	300	LIF	43	12+16	42	2-6	σ	1.81(- 1)	$10^{-16}cm^2$	10-20%	193	
									8		1.01(- 1)			193	
									10		1.24(- 1)			193	
									12		1.45(- 1)			193	
									12+16		1.63(- 1)			193	
									16		1.77(- 1)			193	
									18		1.85(- 1)			193	
									20		1.87(- 1)			193	
									22		1.78(- 1)			193	
									24		9.2 (- 2)			193	
									26		3.7 (- 2)			193	
									28		1.5 (- 2)			193	
									30		3.4 (- 3)			193	
									32		1.2 (- 3)			193	
									34		5.5 (- 4)			193	
									36		2.2 (- 4)			193	
									38		8 (- 5)			193	
									40		3 (- 5)			193	
									42		1 (- 5)			193	
									44		4 (- 6)			193	
									46		2 (- 6)			193	
									48		1 (- 6)			193	
B	B	V-T+R-T	H_2	300	LIF	43	12+16	42	All	σ	1.59	$10^{-16}cm^2$	10-20%	193	

Table 1.10. Inelastic Collision Data for Iodine (continued).

Electronic State Initial	Final	Process	Collision Partner	Temp (K)	Method	v_i	j_i	v_f	j_f	Quantity Reported	Data Entry	Units	Est. Error	Reference	Comment
B	B	R-T	H_2	300	LIF	43	12+16	43	2-4	σ	2.7 (- 1)	$10^{-16}cm^2$	10-20%	193	
									6		2.8 (- 1)			193	
									8		4.3 (- 1)			193	
									10		6.6 (- 1)			193	
									12		1.25			193	
									16		1.83			193	
									18		7.2 (- 1)			193	
									20		6.5 (- 1)			193	
									22		5.9 (- 1)			193	
									24		5.1 (- 1)			193	
									26		1.92(- 1)			193	
									28		1.12(- 1)			193	
									30		8.2 (- 3)			193	
									32		2.8 (- 3)			193	
									34		1.4 (- 3)			193	
									36		6.6 (- 4)			193	
									38		2.1 (- 4)			193	
									40		7.5 (- 5)			193	
									42		1.8 (- 5)			193	
									44		8 (- 6)			193	
									46		4 (- 6)			193	
									48		1 (- 6)			193	
									50		4 (- 7)			193	
									52		1 (- 7)			193	
									54		1 (- 8)			193	
									56		6 (- 9)			193	
									58		2 (- 9)			193	
									60		1 (- 9)			193	
B	B	R-T	H_2	300	LIF	43	12+16	43	All	σ	7.60	$10^{-16}cm^2$	10-20%	193	

Table 1.10. Inelastic Collision Data for Iodine (continued).

Electronic State Initial	Final	Process	Collision Partner	Temp (K)	Method	v_i	j_i	v_f	j_f	Quantity Reported	Data Entry	Units	Est. Error	Reference	Comment
B	B	V-T+R-T	H_2	300	LIF	43	12+16	44	2-6	σ	1.45(- 1)	$10^{-16}cm^2$	10-20%	193	
									8		8.3 (- 2)			193	
									10		1.01(- 1)			193	
									12		1.19(- 1)			193	
									12+16		1.34(- 1)			193	
									16		1.46(- 1)			193	
									18		1.52(- 1)			193	
									20		1.52(- 1)			193	
									22		1.36(- 1)			193	
									24		6.9 (- 2)			193	
									26		4.5 (- 2)			193	
									28		2.8 (- 2)			193	
									30		3.0 (- 3)			193	
									32		1.1 (- 3)			193	
									34		5.6 (- 4)			193	
									36		2.6 (- 4)			193	
									38		9 (- 5)			193	
									40		4 (- 5)			193	
									42		1 (- 5)			193	
									44		4 (- 6)			193	
									46		2 (- 6)			193	
									48		1 (- 6)			193	
B	B	V-T+R-T	H_2	300	LIF	43	12+16	44	All	σ	1.32	$10^{-16}cm^2$	10-20%	193	
B	B	V-T+R-T	H_2	300	LIF	43	12+16	45	2-6	σ	5.6 (- 2)	$10^{-16}cm^2$	10-20%	193	
									8		3.2 (- 2)			193	
									10		3.9 (- 2)			193	
									12		4.6 (- 2)			193	
									14		5.3 (- 2)			193	
									16		5.9 (- 2)			193	
									18		6.4 (- 2)			193	
									20		5.9 (- 2)			193	
									22		2.9 (- 2)			193	
									24		1.1 (- 2)			193	
									26		4.9 (- 3)			193	
									28		2.1 (- 3)			193	
									30		1.0 (- 3)			193	
									32		1.3 (- 4)			193	
									34		5 (- 5)			193	
									36		2 (- 5)			193	
									38		1 (- 5)			193	
									40		3 (- 6)			193	
									42		1 (- 6)			193	
									44		6 (- 7)			193	
									46		2 (- 7)			193	
									48		1 (- 7)			193	
B	B	V-T+R-T	H_2	300	LIF	43	12+16	45	All	σ	4.6 (- 1)	$10^{-16}cm^2$	10-20%	193	

Table 1.10. Inelastic Collision Data for Iodine (continued).

Electronic State															
Initial	Final	Process	Collision Partner	Temp (K)	Method	v_i	j_i	v_f	j_f	Quantity Reported	Data Entry	Units	Est. Error	Reference	Comment
B	B	R-T	I_2	300	LIF	15	33			κ	2.0 (-10)	cm^3s^{-1}	10-20%	184	
B	B	R-T	I_2	300	LIF	15	104			κ	1.2 (-10)	cm^3s^{-1}	10-20%	184	
B	B	R-T	I_2	300	LIF	15	22	15			(u)			184	u
B	B	R-T	I_2	300	LIF	15	59	15			(u)			184	u
B	B	R-T	I_2	300	LIF	15	124	15			(u)			184	u
B	B	R-T	I_2		DP	16				No Kinetic Data				194	
B	B	R-T	I_2	292	LIF-DP	16	19				(v)			195	v

Table 1.10. Inelastic Collision Data for Iodine (continued).

Electronic State Initial	Final	Process	Collision Partner	Temp (K)	Method	v_i	j_i	v_f	j_f	Quantity Reported	Data Entry	Units	Est. Error	Reference	Comment
B	B	R-T	I_2	370	MEF	25	34	25	0	σ	4.03(- 1)	$10^{-16}cm^2$		170	
									2		4.93(- 1)			170	
									4		5.82(- 1)			170	
									6		7.17(- 1)			170	
									8		7.83(- 1)			170	
									10		8.6 (- 1)			170	
									12		9.32(- 1)			170	
									14		1.0			170	
									16		1.15			170	
									18		9.32(- 1)?			170	
									20		1.72			170	
									22		2.53			170	
									24		3.53			170	
									26		5.02			170	
									28		7.89			170	
									30		10.0			170	
									32		11.7			170	
									36		12.8			170	
									38		11.7			170	
									40		10.0			170	
									42		7.89			170	
									44		3.53			170	
									46		2.6			170	
									48		1.7			170	
									50		1.29			170	
									52		1.15			170	
									54		1.0			170	
									56		8.6 (- 1)			170	
									58		7.89(- 1)			170	
									60		6.45(- 1)			170	
									62		5.02(- 1)			170	
									64		4.3 (- 1)			170	
									66		3.58(- 1)			170	
									68		3.58(- 1)			170	
									70		2.69(- 1)			170	
									72		2.69(- 1)			170	
									74		2.15(- 1)			170	
									76		2.15(- 1)			170	
									78		1.79(- 1)			170	
									80		1.43(- 1)			170	
									82		1.34(- 1)			170	
									84		7.19(- 2)			170	
									86		4.5 (- 2)			170	
									88		2.69(- 2)			170	
									90	σ	8.95(- 3)	$10^{-16}cm^2$		170	
B	B	R-T	I_2	370	MEF	25	34	25	All ≠ 34	k	3.0 (-10)	cm^3s^{-1}	10%	170	

Table 1.10. Inelastic Collision Data for Iodine (continued).

Electronic State Initial	Final	Process	Collision Partner	Temp (K)	Method	v_i	j_i	v_f	j_f	Quantity Reported	Data Entry	Units	Est. Error	Reference	Comment
B	B	R-T	I_2	300	LIF	43	12+16	43		k	3.7 (-11)	cm^3s^{-1}	10%	174	
B	B	R-T	I_2	300	LIF	43	12+16	43	20	$\sigma(j_f-4)/\sigma(j_f)$	3.1		10%	138	
B	B	R-T	I_2	300	LIF	43	12+16	43	22	$\sigma(j_f-4)/\sigma(j_f)$	2.1		10%	138	
B	B	R-T	I_2	300	LIF	43	12+16	43	24	$\sigma(j_f-4)/\sigma(j_f)$	2.4		10%	138	
B	B	R-T	I_2	300	LIF	43	12+16	43	26	$\sigma(j_f-4)/\sigma(j_f)$	2.25		10%	138	
B	B	R-T	He	300	LIF	13	41	13	35	k	3.49(-11)	cm^3s^{-1}	<10%	196	
									37		4.71(-11)			196	
									39		8.14(-11)			196	
									43		8.31(-11)			196	
									45		4.42(-11)			196	
									47		3.37(-11)			196	
									49		2.53(-11)			196	
									51		1.85(-11)			196	
									53		1.46(-11)			196	
									55		1.16(-11)			196	
									57		9.0 (-12)			196	
									59		6.6 (-12)			196	
									61		5.2 (-12)			196	
									63		4.1 (-12)			196	
									65		3.2 (-12)			196	
									67		2.3 (-12)			196	
									69		1.7 (-12)			196	
									71		1.2 (-12)			196	
									73		9 (-13)			196	
									75		6 (-13)			196	
									77		5 (-13)			196	
									79		4 (-13)			196	
B	B	R-T	He	300	LIF	13	41	13	81	k	2 (-13)	cm^3s^{-1}	<10%	196	

Table 1.10. Inelastic Collision Data for Iodine (continued).

Electronic State Initial	Final	Process	Collision Partner	Temp (K)	Method	v_i	j_i	v_f	j_f	Quantity Reported	Data Entry	Units	Est. Error	Reference	Comment
B	B	R-T	He	300	LIF	13	91	13	61	k	1.8 (-12)	cm^3s^{-1}	<10%	196	
									63		2.3 (-12)			196	
									65		2.9 (-12)			196	
									67		5.0 (-12)			196	
									69		5.1 (-12)			196	
									71		5.8 (-12)			196	
									73		7.0 (-12)			196	
									75		9.2 (-12)			196	
									77		1.25(-11)			196	
									79		1.52(-11)			196	
									81		1.99(-11)			196	
									83		2.44(-11)			196	
									85		3.24(-11)			196	
									87		4.59(-11)			196	
									89		8.69(-11)			196	
									93		8.66(-11)			196	
									95		4.31(-11)			196	
									97		3.09(-11)			196	
									99		2.28(-11)			196	
									101		1.73(-11)			196	
									103		1.30(-11)			196	
									105		1.03(-11)			196	
									107		7.8 (-12)			196	
									109		6.1 (-12)			196	
									111		4.3 (-12)			196	
B	B	R-T	He	300	LIF	13	91	13	113	k	4.7 (-12)	cm^3s^{-1}	<10%	196	
B	B	R-T	He	300	LIF	15	12			k	5.8 (-10)	cm^3s^{-1}	10-20%	184	
B	B	R-T	He	300	LIF	15	33			k	5.8 (-10)	cm^3s^{-1}	10-20%	184	
B	B	R-T	He	300	LIF	15	59			k	5.46(-10)	cm^3s^{-1}	10-20%	184,185	
B	B	R-T	He	300	LIF	15	83			k	5.8 (-10)	cm^3s^{-1}	10-20%	184	
B	B	R-T	He	300	LIF	15	104			k	5.8 (-10)	cm^3s^{-1}	10-20%	184	
B	B	R-T	He	300	LIF	15	146			k	5.8 (-10)	cm^3s^{-1}	10-20%	184	
B	B	R-T	He	300	LIF	15	12	15			(w)			184	w
B	B	R-T	He	300	LIF	15	33	15			(w)			184	w
B	B	R-T	He	300	MEF	15	37+44	15		σ	15.4	$10^{-16}cm^2$	10-20%	167	
B	B	R-T	He	300	LIF	15	59	15			(w)			184	w
B	B	R-T	He	300	LIF	15	83	15			(w)			184	w

Table 1.10. Inelastic Collision Data for Iodine (continued).

Electronic State Initial	Final	Process	Collision Partner	Temp (K)	Method	v_i	j_i	v_f	j_f	Quantity Reported	Data Entry	Units	Est. Error	Reference	Comment
B	B	R-T	He	300	LIF	15	104	15			(w)			184	w
B	B	R-T	He	300	LIF	15	146	15			(w)			184	w
B	B	V-T+R-T	He	370	MEF	25	34	24	0	σ	1.08(- 2)	$10^{-16}cm^2$		170	
									2		1.62(- 2)			170	
									4		3.25(- 2)			170	
									6		4.33(- 2)			170	
									8		5.41(- 2)			170	
									10		7.03(- 2)			170	
									12		8.66(- 2)			170	
									14		1.19(- 1)			170	
									16		1.62(- 1)			170	
									18		2.11(- 1)			170	
									20		2.76(- 1)			170	
									22		3.25(- 1)			170	
									24		3.68(- 1)			170	
									26		4.54(- 1)			170	
									28		5.63(- 1)			170	
									30		6.11(- 1)			170	
									32		6.28(- 1)			170	
									34		6.71(- 1)			170	
									36		6.28(- 1)			170	
									38		5.63(- 1)			170	
									40		4.87(- 1)			170	
									42		4.17(- 1)			170	
									44		3.30(- 1)			170	
									46		2.6 (- 1)			170	
									48		2.06(- 1)			170	
									50		1.73(- 1)			170	
									52		1.3 (- 1)			170	
									54		1.03(- 1)			170	
									56		8.66(- 2)			170	
									58		7.03(- 2)			170	
									60		5.41(- 2)			170	
									62		4.33(- 2)			170	
									64		3.79(- 2)			170	
									66		3.25(- 2)			170	
									68		2.71(- 2)			170	
									70		2.16(- 2)			170	
									72		1.62(- 2)			170	
									76		1.62(- 2)			170	
									76		1.08(- 2)			170	
									78		1.08(- 2)			170	
									80		1.08(- 2)			170	
									82		5.41(- 3)			170	
									84		5.41(- 3)			170	
									86		5.41(- 3)			170	
									88		5.41(- 3)			170	
B	B	V-T+R-T	He	370	MEF	25	34	24	90	σ	5.41(- 3)	$10^{-16}cm^2$		170	

Table 1.10. Inelastic Collision Data for Iodine (continued).

Electronic State Initial	Final	Process	Collision Partner	Temp (K)	Method	v_i	j_i	v_f	j_f	Quantity Reported	Data Entry	Units	Est. Error	Reference	Comment
B	B	R-T	He	370	MEF	25	34	25	0	σ	3.79(- 2)	$10^{-16}cm^2$		170	
									2		4.33(- 2)			170	
									4		6.49(- 2)			170	
									6		8.12(- 2)			170	
									8		1.08(- 1)			170	
									10		1.41(- 1)			170	
									12		2.16(- 1)			170	
									14		2.76(- 1)			170	
									16		3.79(- 1)			170	
									18		5.14(- 1)			170	
									20		7.14(- 1)			170	
									22		1.05			170	
									24		1.41			170	
									26		2.16			170	
									28		2.98			170	
									30		4.22			170	
									32		6.22			170	
									36		6.22			170	
									38		4.38			170	
									40		3.08			170	
									42		2.16			170	
									44		1.62			170	
									46		1.19			170	
									48		8.66(- 1)			170	
									50		5.95(- 1)			170	
									52		4.33(- 1)			170	
									54		3.25(- 1)			170	
									56		2.33(- 1)			170	
									58		1.79(- 1)			170	
									60		1.41(- 1)			170	
									62		1.14(- 1)			170	
									64		7.57(- 2)			170	
									66		5.95(- 2)			170	
									68		4.87(- 2)			170	
									70		4.33(- 2)			170	
									72		3.79(- 2)			170	
									74		3.25(- 2)			170	
									76		2.71(- 2)			170	
									78		2.16(- 2)			170	
									80		2.16(- 2)			170	
									82		1.62(- 2)			170	
									84		1.62(- 2)			170	
									86		1.08(- 2)			170	
									88		1.08(- 2)			170	
									90		5.41(- 3)			170	
									92		5.41(- 3)			170	
									94		5.41(- 3)			170	
									96	σ	5.41(- 3)	$10^{-16}cm^2$		170	
B	B	R-T	He	370	MEF	25	34	25	All ≠ 34	k	6.45(-10)	cm^3s^{-1}	10%	170	

Table 1.10. Inelastic Collision Data for Iodine (continued).

Electronic State Initial	Electronic State Final	Process	Collision Partner	Temp (K)	Method	v_i	j_i	v_f	j_f	Quantity Reported	Data Entry	Units	Est. Error	Reference	Comment
B	B	V-T+R-T	He	370	MEF	25	34	26	0	σ	1.08(- 2)	$10^{-16}cm^2$		170	
									2		1.62(- 2)			170	
									4		2.71(- 2)			170	
									6		4.33(- 2)			170	
									8		5.95(- 2)			170	
									10		7.57(- 2)			170	
									12		9.2 (- 2)			170	
									14		1.14(- 1)			170	
									16		1.46(- 1)			170	
									18		1.68(- 1)			170	
									20		1.89(- 1)			170	
									22		2.22(- 1)			170	
									24		2.71(- 1)			170	
									26		2.98(- 1)			170	
									28		3.35(- 1)			170	
									30		3.68(- 1)			170	
									32		3.9 (- 1)			170	
									34		3.95(- 1)			170	
									36		3.68(- 1)			170	
									38		3.46(- 1)			170	
									40		2.54(- 1)			170	
									42		2.27(- 1)			170	
									44		2.06(- 1)			170	
									46		1.73(- 1)			170	
									48		1.46(- 1)			170	
									50		1.14(- 1)			170	
									52		9.2 (- 2)			170	
									54		7.03(- 2)			170	
									56		5.41(- 2)			170	
									58		4.87(- 2)			170	
									60		3.25(- 2)			170	
									62		2.71(- 2)			170	
									64		2.16(- 2)			170	
									66		1.62(- 2)			170	
									68		1.62(- 2)			170	
									70		1.08(- 2)			170	
									72		5.41(- 3)			170	
									74		5.41(- 3)			170	
									76		5.41(- 3)			170	
B	B	V-T+R-T	He	370	MEF	25	34	26	78	σ	5.41(- 3)	$10^{-16}cm^2$		170	
B	B	R-T	He	300	LIF	43	12+16	43		k	6.4 (-11)	cm^3s^{-1}	10%	174	

Table 1.10. Inelastic Collision Data for Iodine (continued).

Electronic State Initial	Final	Process	Collision Partner	Temp (K)	Method	v_i	j_i	v_f	j_f	Quantity Reported	Data Entry	Units	Est. Error	Reference	Comment
B	B	R-T	^3He	300	LIF	15	59	15		k	5.8 (-10)	cm^3s^{-1}	20%	185	x
B	B	V-T+R-T	^3He	370	MEF	25	34	23	8	σ	5.41(- 3)	$10^{-16}cm^2$		170	
									10		5.41(- 3)			170	
									12		5.41(- 3)			170	
									14		1.08(- 2)			170	
									16		1.62(- 2)			170	
									18		2.16(- 2)			170	
									20		2.71(- 2)			170	
									22		4.33(- 2)			170	
									24		6.49(- 2)			170	
									26		8.12(- 2)			170	
									28		9.2 (- 2)			170	
									30		1.03(- 1)			170	
									32		1.14(- 1)			170	
									34		1.19(- 1)			170	
									36		1.08(- 1)			170	
									38		1.03(- 1)			170	
									40		9.2 (- 2)			170	
									42		7.57(- 2)			170	
									44		6.49(- 2)			170	
									46		5.95(- 2)			170	
									48		4.87(- 2)			170	
									50		3.79(- 2)			170	
									52		3.25(- 2)			170	
									54		2.16(- 2)			170	
									56		1.62(- 2)			170	
									58		1.08(- 2)			170	
									60		5.41(- 3)			170	
									62		5.41(- 3)			170	
									64		5.41(- 3)			170	
									66		5.41(- 3)			170	
B	B	V-T+R-T	^3He	370	MEF	25	34	23	68	σ	5.41(- 3)	$10^{-16}cm^2$		170	

Table 1.10. Inelastic Collision Data for Iodine (continued).

Electronic State Initial	Electronic State Final	Process	Collision Partner	Temp (K)	Method	v_i	j_i	v_f	j_f	Quantity Reported	Data Entry	Units	Est. Error	Reference	Comment
B	B	V-T+R-T	^3He	370	MEF	25	34	24	0	σ	2.16(- 2)	$10^{-16}cm^2$		170	
									2		2.71(- 2)			170	
									4		3.25(- 2)			170	
									6		4.33(- 2)			170	
									8		5.41(- 2)			170	
									10		6.49(- 2)			170	
									12		9.2 (- 2)			170	
									14		1.14(- 1)			170	
									16		1.62(- 1)			170	
									18		2.0 (- 1)			170	
									20		2.81(- 1)			170	
									22		3.08(- 1)			170	
									24		3.7 (- 1)			170	
									26		4.6 (- 1)			170	
									28		5.73(- 1)			170	
									30		6.22(- 1)			170	
									32		6.33(- 1)			170	
									34		6.76(- 1)			170	
									36		6.17(- 1)			170	
									38		5.3 (- 1)			170	
									40		4.17(- 1)			170	
									42		3.3 (- 1)			170	
									44		2.87(- 1)			170	
									46		2.22(- 1)			170	
									48		2.06(- 1)			170	
									50		1.73(- 1)			170	
									52		1.41(- 1)			170	
									54		1.19(- 1)			170	
									56		9.2 (- 2)			170	
									58		7.03(- 2)			170	
									60		6.49(- 2)			170	
									62		4.33(- 2)			170	
									64		3.79(- 2)			170	
									66		3.25(- 2)			170	
									68		2.71(- 2)			170	
									70		2.16(- 2)			170	
									72		1.62(- 2)			170	
									74		1.08(- 2)			170	
									76		1.08(- 2)			170	
									78		5.41(- 3)			170	
									80		5.41(- 3)			170	
									82		5.41(- 3)			170	
									84		5.41(- 3)			170	
B	B	V-T+R-T	^3He	370	MEF	25	34	24	86	σ	5.41(- 3)	$10^{-16}cm^2$		170	

Table 1.10. Inelastic Collision Data for Iodine (continued).

Electronic State Initial	Electronic State Final	Process	Collision Partner	Temp (K)	Method	v_i	j_i	v_f	j_f	Quantity Reported	Data Entry	Units	Est. Error	Reference	Comment
B	B	R-T	^3He	370	MEF	25	34	25	0	σ	2.16(- 2)	$10^{-16}cm^2$		170	
									2		4.87(- 2)			170	
									4		6.49(- 2)			170	
									6		8.12(- 2)			170	
									8		1.19(- 1)			170	
									10		1.51(- 1)			170	
									12		2.22(- 1)			170	
									14		2.87(- 1)			170	
									16		3.84(- 1)			170	
									18		5.57(- 1)			170	
									20		8.6 (- 1)			170	
									22		1.24(- 1)			170	
									24		1.73			170	
									26		2.19			170	
									28		2.81			170	
									30		3.57			170	
									32		4.06			170	
									36		4.06			170	
									38		3.76			170	
									40		2.98			170	
									42		2.49			170	
									44		1.73			170	
									46		1.38			170	
									48		9.58(- 1)			170	
									50		6.38(- 1)			170	
									52		4.17(- 1)			170	
									54		3.52(- 1)			170	
									56		2.71(- 1)			170	
									58		1.73(- 1)			170	
									60		1.35(- 1)			170	
									62		9.74(- 2)			170	
									64		6.49(- 2)			170	
									66		4.87(- 2)			170	
									68		4.33(- 2)			170	
									70		3.25(- 2)			170	
									72		2.16(- 2)			170	
									74		1.62(- 2)			170	
									76		1.08(- 2)			170	
									78		1.08(- 2)			170	
									80		5.41(- 3)			170	
									82		5.41(- 3)			170	
									84		5.41(- 3)			170	
									86	σ	5.41(- 3)			170	
B	B	R-T	^3He	370	MEF	25	34	25	All ≠ 34	k	5.5 (-10)	cm^3s^{-1}	10%	170	

Table 1.10. Inelastic Collision Data for Iodine (continued).

Electronic State Initial	Final	Process	Collision Partner	Temp (K)	Method	v_i	j_i	v_f	j_f	Quantity Reported	Data Entry	Units	Est. Error	Reference	Comment
B	B	V-T+R-T	^3He	370	MEF	25	34	26	0	σ	3.25(- 2)	$10^{-16}cm^2$		170	
									2		3.79(- 2)			170	
									4		4.33(- 2)			170	
									6		5.41(- 2)			170	
									8		6.49(- 2)			170	
									10		7.57(- 2)			170	
									12		9.74(- 2)			170	
									14		1.08(- 1)			170	
									16		1.24(- 1)			170	
									18		1.41(- 1)			170	
									20		1.46(- 1)			170	
									22		1.73(- 1)			170	
									24		2.06(- 1)			170	
									26		2.54(- 1)			170	
									28		2.87(- 1)			170	
									30		3.08(- 1)			170	
									32		3.25(- 1)			170	
									34		3.52(- 1)			170	
									36		3.25(- 1)			170	
									38		3.03(- 1)			170	
									40		2.54(- 1)			170	
									42		1.95(- 1)			170	
									44		1.84(- 1)			170	
									46		1.51(- 1)			170	
									48		1.3 (- 1)			170	
									50		9.74(- 2)			170	
									52		8.12(- 2)			170	
									54		4.87(- 2)			170	
									56		3.79(- 2)			170	
									58		3.79(- 2)			170	
									60		3.25(- 2)			170	
									62		2.71(- 2)			170	
									64		2.16(- 2)			170	
									66		1.62(- 2)			170	
									68		1.08(- 2)			170	
									70		1.08(- 2)			170	
									72		1.08(- 2)			170	
									74		5.41(- 3)			170	
									76		5.41(- 3)			170	
									78		5.41(- 3)			170	
B	B	V-T+R-T	^3He	370	MEF	25	34	26	80	σ	5.41(- 3)	$10^{-16}cm^2$		170	

Table 1.10. Inelastic Collision Data for Iodine (continued).

Electronic State Initial	Final	Process	Collision Partner	Temp (K)	Method	v_i	j_i	v_f	j_f	Quantity Reported	Data Entry	Units	Est. Error	Reference	Comment
B	B	V-T+R-T	^3He	370	MEF	25	34	27	0	σ	5.41(- 3)	$10^{-16}cm^2$		170	
									2		1.08(- 2)			170	
									4		1.08(- 2)			170	
									6		1.08(- 2)			170	
									8		1.62(- 2)			170	
									10		2.16(- 2)			170	
									12		2.16(- 2)			170	
									14		2.71(- 2)			170	
									16		2.71(- 2)			170	
									18		3.25(- 2)			170	
									20		3.25(- 2)			170	
									22		3.25(- 2)			170	
									24		3.79(- 2)			170	
									26		3.79(- 2)			170	
									28		4.33(- 2)			170	
									30		4.33(- 2)			170	
									32		4.87(- 2)			170	
									34		5.41(- 2)			170	
									36		4.87(- 2)			170	
									38		4.33(- 2)			170	
									40		4.33(- 2)			170	
									42		3.79(- 2)			170	
									44		3.79(- 2)			170	
									46		3.79(- 2)			170	
									48		3.25(- 2)			170	
									50		3.25(- 2)			170	
									52		3.25(- 2)			170	
									54		2.71(- 2)			170	
									56		2.71(- 2)			170	
									58		2.71(- 2)			170	
									60		2.71(- 2)			170	
									62		2.71(- 2)			170	
									64		2.71(- 2)			170	
									66		2.16(- 2)			170	
									68		2.16(- 2)			170	
									70		2.16(- 2)			170	
									72		2.16(- 2)			170	
									74		1.62(- 2)			170	
									76		1.08(- 2)			170	
									78		1.08(- 2)			170	
									80		5.41(- 3)			170	
									82		5.41(- 3)			170	
									84		5.41(- 3)			170	
B	B	V-T+R-T	^3He	370	MEF	25	34	27	86	σ	5.41(- 3)	$10^{-16}cm^2$		170	

Table 1.10. Inelastic Collision Data for Iodine (continued).

Electronic State Initial	Final	Process	Collision Partner	Temp (K)	Method	v_i	j_i	v_f	j_f	Quantity Reported	Data Entry	Units	Est. Error	Reference	Comment
B	B	R-T	Ne	300	LIF	15	33			k	4.0 (-10)	cm^3s^{-1}	10-20%	184	
B	B	R-T	Ne	300	MEF	15	37+44			σ	42.1	$10^{-16}cm^2$	10-20%	167	
B	B	R-T	Ne	300	LIF	15	33	15			(y)			184	y
B	B	R-T	Ne	370	MEF	25	34	25	All ≠ 34	k	2.95(-10)	cm^3s^{-1}	10%	170	
B	B	R-T	Ne	300	LIF	43	12+16	43		k	4.8 (-11)	cm^3s^{-1}	10%	174	
B	B	R-T	Ar	300	LIF	15	12			k	5.3 (-10)	cm^3s^{-1}	10-20%	184	
B	B	R-T	Ar	300	LIF	15	33			k	5.3 (-10)	cm^3s^{-1}	10-20%	184	
B	B	R-T	Ar	300	MEF	15	37+44			σ	53.4	$10^{-16}cm^2$	10-20%	167	
B	B	R-T	Ar	300	LIF	15	59			k	5.3 (-10)	cm^3s^{-1}	10-20%	184	
B	B	R-T	Ar	300	LIF	15	83			k	5.3 (-10)	cm^3s^{-1}	10-20%	184	
B	B	R-T	Ar	300	LIF	15	104			k	5.3 (-10)	cm^3s^{-1}	10-20%	184	
B	B	R-T	Ar	300	LIF	15	146			k	5.3 (-10)	cm^3s^{-1}	10-20%	184	
B	B	R-T	Ar	300	LIF	15	12	15			(z)			184	z
B	B	R-T	Ar	300	LIF	15	33	15			(z)			184	z
B	B	R-T	Ar	300	LIF	15	59	15			(z)			184	z
B	B	R-T	Ar	300	LIF	15	83	15			(z)			184	z
B	B	R-T	Ar	300	LIF	15	104	15			(z)			184	z
B	B	R-T	Ar	300	LIF	15	146	15			(z)			184	z
B	B	R-T	Ar	370	MEF	25	34	25	All ≠ 34	k	3.2 (-10)	cm^3s^{-1}	10%	170	
B	B	R-T	Ar	300	LIF	43	12+16	43		k	6.9 (-11)	cm^3s^{-1}	10%	174	
B	B	R-T	Kr	300	MEF	15	37+44			σ	62.8	$10^{-16}cm^2$	10-20%	167	

Table 1.10. Inelastic Collision Data for Iodine (continued).

Electronic State Initial	Electronic State Final	Process	Collision Partner	Temp (K)	Method	v_i	j_i	v_f	j_f	Quantity Reported	Data Entry	Units	Est. Error	Reference	Comment
B	B	R-T	Kr	370	MEF	25	34	25	0	σ	1.36(- 1)	$10^{-16} cm^2$		170	
									2		2.04(- 1)			170	
									4		2.72(- 1)			170	
									6		3.4 (- 1)			170	
									8		4.75(- 1)			170	
									10		5.43(- 1)			170	
									12		7.47(- 1)			170	
									14		8.83(- 1)			170	
									16		1.09			170	
									18		1.49			170	
									20		1.97			170	
									22		2.58			170	
									24		3.33			170	
									26		4.21			170	
									28		5.5			170	
									30		7.88			170	
									32		14.7			170	
									36		14.7			170	
									38		8.28			170	
									40		5.64			170	
									42		4.48			170	
									44		3.25			170	
									46		2.65			170	
									48		2.04			170	
									50		1.55			170	
									52		1.22			170	
									54		1.02			170	
									56		8.15(- 1)			170	
									58		6.45(- 1)			170	
									60		5.03(- 1)			170	
									62		4.07(- 1)			170	
									64		2.99(- 1)			170	
									66		2.33(- 1)			170	
									68		2.04(- 1)			170	
									70		1.77(- 1)			170	
									72		1.36(- 1)			170	
									74		1.09(- 1)			170	
									76		8.83(- 2)			170	
									78		8.15(- 2)			170	
									80		6.11(- 2)			170	
									82		5.43(- 2)			170	
									84		4.07(- 2)			170	
									86		3.4 (- 2)			170	
									88		2.72(- 2)			170	
									90		2.04(- 2)			170	
									92		1.36(- 2)			170	
									94	σ	6.79(- 3)	$10^{-16} cm^2$		170	
B	B	R-T	Kr	370	MEF	25	34	25	All ≠ 34	k	3.3 (-10)	$cm^3 s^{-1}$	10%	170	

Table 1.10. Inelastic Collision Data for Iodine (continued).

Electronic State Initial	Final	Process	Collision Partner	Temp (K)	Method	v_i	j_i	v_f	j_f	Quantity Reported	Data Entry	Units	Est. Error	Reference	Comment
E	B	R-T	Kr	300	LIF	43	12+16	43		k	6.8 (-11)	cm^3s^{-1}	10%	174	
E	B	R-T	Xe	300	LIF	13	41	13	33	k	1.38(-11)	cm^3s^{-1}	<10%	196	
									35		1.72(-11)			196	
									37		2.45(-11)			196	
									39		5.37(-11)			196	
									43		5.52(-11)			196	
									45		2.53(-11)			196	
									47		1.50(-11)			196	
									49		1.34(-11)			196	
									51		1.06(-11)			196	
									53		9.0 (-12)			196	
									55		8.1 (-12)			196	
									57		6.8 (-12)			196	
									59		6.1 (-12)			196	
									61		5.4 (-12)			196	
									63		5.0 (-12)			196	
									65		4.3 (-12)			196	
									67		4.3 (-12)			196	
									69		3.7 (-12)			196	
									71		3.4 (-12)			196	
									73		3.1 (-12)			196	
									75		2.8 (-12)			196	
									77		2.7 (-12)			196	
									79		2.3 (-12)			196	
E	B	R-T	Xe	300	LIF	13	41	13	81	k	2.5 (-12)	cm^3s^{-1}	<10%	196	

Table 1.10. Inelastic Collision Data for Iodine (continued).

Electronic State Initial	Final	Process	Collision Partner	Temp (K)	Method	v_i	j_i	v_f	j_f	Quantity Reported	Data Entry	Units	Est. Error	Reference	Comment
B	B	R-T	Xe	300	LIF	13	81	13	51	k	4.0 (-12)	cm^3s^{-1}	<10%	196	
									53		4.1 (-12)			196	
									55		4.7 (-12)			196	
									57		4.8 (-12)			196	
									59		5.0 (-12)			196	
									61		5.2 (-12)			196	
									63		6.0 (-12)			196	
									65		6.4 (-12)			196	
									67		7.5 (-12)			196	
									69		8.2 (-12)			196	
									71		9.6 (-12)			196	
									73		1.10(-11)			196	
									75		1.46(-11)			196	
									77		1.86(-11)			196	
									79		3.86(-11)			196	
									83		3.66(-11)			196	
									85		1.70(-11)			196	
									87		1.17(-11)			196	
									89		9.4 (-12)			196	
									91		7.7 (-12)			196	
									93		6.6 (-12)			196	
									95		5.2 (-12)			196	
									97		4.8 (-12)			196	
									99		4.1 (-12)			196	
									101		4.1 (-12)			196	
									103		3.1 (-12)			196	
									105		2.9 (-12)			196	
									107		2.3 (-12)			196	
									109		2.4 (-12)			196	
B	B	k-T	Xe	300	LIF	13	81	13	111	k	2.0 (-12)	cm^3s^{-1}	<10%	196	

Table 1.10. Inelastic Collision Data for Iodine (continued).

Electronic State Initial	Electronic State Final	Process	Collision Partner	Temp (K)	Method	v_i	j_i	v_f	j_f	Quantity Reported	Data Entry	Units	Est. Error	Reference	Comment
B	B	R-T	Xe	300	LIF	13	91	13	61	k	4.3 (-12)	cm^3s^{-1}	<10%	196	
									63		4.2 (-12)			196	
									65		4.8 (-12)			196	
									67		5.5 (-12)			196	
									69		5.3 (-12)			196	
									71		5.6 (-12)			196	
									73		6.1 (-12)			196	
									75		6.9 (-12)			196	
									77		7.3 (-12)			196	
									79		8.1 (-12)			196	
									81		9.5 (-12)			196	
									83		1.06(-11)			196	
									85		1.33(-11)			196	
									87		1.79(-11)			196	
									89		3.55(-11)			196	
									93		3.48(-11)			196	
									95		1.67(-11)			196	
									97		1.16(-11)			196	
									99		9.0 (-12)			196	
									101		7.9 (-12)			196	
									103		6.7 (-12)			196	
									105		5.3 (-12)			196	
									107		4.6 (-12)			196	
									109		3.8 (-12)			196	
									111		3.7 (-12)			196	
B	B	R-T	Xe	300	LIF	13	91	13	113	k	4.2 (-12)	cm^3s^{-1}	<10%	196	
B	B	R-T	Xe	300	LIF	13	113	13	87	k	4.1 (-12)	cm^3s^{-1}	<10%	196	
									89		5.4 (-12)			196	
									91		5.0 (-12)			196	
									93		5.5 (-12)			196	
									95		5.6 (-12)			196	
									97		6.0 (-12)			196	
									99		7.8 (-12)			196	
									101		7.8 (-12)			196	
									103		8.6 (-12)			196	
									105		1.00(-11)			196	
									107		1.18(-11)			196	
									109		1.74(-11)			196	
									111		3.11(-11)			196	
									115		2.63(-11)			196	
									117		1.42(-11)			196	
									119		1.16(-11)			196	
									121		8.0 (-12)			196	
									123		6.8 (-12)			196	
									125		5.9 (-12)			196	
B	B	R-T	Xe	300	LIF	13	113	13	127	k	4.5 (-12)	cm^3s^{-1}	<10%	196	

Table 1.10. Inelastic Collision Data for Iodine (continued).

Electronic State Initial	Final	Process	Collision Partner	Temp (K)	Method	v_i	j_i	v_f	j_f	Quantity Reported	Data Entry	Units	Est. Error	Reference	Comment
B	B	R-T	Xe	300	MEF	15	37+44			σ	61.3	$10^{-16}cm^2$	10-20%	167	
B	B	R-T	Xe	370	MEF	25	34	25	All ≠ 34	k	3.7 (-10)	cm^3s^{-1}	10%	170	
B	B	R-T	Xe	300	LIF	43	12+16	43		k	5.6 (-11)	cm^3s^{-1}	10%	174	
B	B	R-T	H_2	300	MEF	15	37+44			σ	11.3	$10^{-16}cm^2$	10-20%	167	
B	B	R-T	H_2	300	LIF	15	59	15		k	8.65(-10)	cm^3s^{-1}	10%	184,185	aa
B	B	R-T	H_2	370	MEF	25	34	25	All ≠ 34	k	8.0 (-10)	cm^3s^{-1}	10%	170	
B	B	R-T	H_2	300	LIF	43	12+16	43		k	6.5 (-11)	cm^3s^{-1}	10%	174	
B	B	R-T	D_2	300	MEF	15	37+44			σ	22.9	$10^{-16}cm^2$	10-20%	167	
B	B	R-T	D_2	300	LIF	15	59	15		k	1.07(- 9)	cm^3s^{-1}	18%	184,185	bb
B	B	R-T	O_2	300	MEF	15	37+44			σ	59.7	$10^{-16}cm^2$	10-20%	167	
B	B	R-T	O_2	370	MEF	25	34	25	All ≠ 34	k	3.8 (-10)	cm^3s^{-1}	10%	170	
B	B	R-T	N_2	300	MEF	15	37+44			σ	55.3	$10^{-16}cm^2$	10-20%	167	
B	B	R-T	NO	300	MEF	15	37+44			σ	34.5	$10^{-16}cm^2$	10-20%	167	
B	B	R-T	CO_2	370	MEF	25	34	25	All ≠ 34	k	9.9 (-10)	cm^3s^{-1}	10%	170	
B	B	R-T	CO_2	300	LIF	43	12+16	43		k	11.8 (-11)	cm^3s^{-1}	10%	174	
B	B	R-T	CO_2	300	LIF	13	44	13			(cc)			197	cc
B	B	R-T	NH_3	370	MEF	25	34	25	All ≠ 34	k	3.2 (-10)	cm^3s^{-1}	10%	170	
B	B	R-T	SO_2	370	MEF	25	34	25	All ≠ 34	k	5.1 (-10)	cm^3s^{-1}	10%	170	
B	B	R-T	CH_3F	300	LIF	13	44	13			(dd)			197	dd
B	B	R-T	CH_3Cl	370	MEF	25	34	25	All ≠ 34	k	7.4 (-10)	cm^3s^{-1}	10%	170	
B	B	Dephase	I_2	300	CT	15	60			T_2	0.50	μs	10-15%	198	
B	B	Dephase	I_2	300	CT	15	60			T_2	0.44	μs	10-15%	199	
B	B	Depol	I_2	292	LIF-DP	16	19				(v)			195	v
B	B	Depol	I_2	300	LIF-DP	16	34				(ee)			200	ee
B	B	Depol	I_2	300	LIF-DP	16	19	16			(ee)			201	ee

Table 1.10. Inelastic Collision Data for Iodine (continued).

Electronic State Initial	Final	Process	Collision Partner	Temp (K)	Method	v_i	j_i	v_f	j_f	Quantity Reported	Data Entry	Units	Est. Error	Reference	Comment
B	B	Depol	I_2	300	Hanle	17	35			σ	62	$10^{-16}cm^2$	10–20%	202	
B	B	Depol	I_2	300	Hanle	18	95			σ	64	$10^{-16}cm^2$	10–20%	202	
B	B	Depol	I_2	300	Hanle	21	116+122			σ	90	$10^{-16}cm^2$	10–20%	202	
B	B	Depol	I_2	300	Hanle	32	9+14			σ	93	$10^{-16}cm^2$	10–20%	202	
B	B	Depol	I_2	300	Hanle	40	77			σ	89	$10^{-16}cm^2$	10–20%	202	
B	B	Depol	I_2	300	Hanle	43	12+16			σ	70	$10^{-16}cm^2$	10–20%	202	
B	B	Depol	I_2	300	Hanle	62	27			σ	91	$10^{-16}cm^2$	10–20%	202	
B	B	Depol	He	300	LIF	43	12+16			$\langle \sin\theta \rangle$	0.74		?	203	
B	B	Depol	He	300	LIF	43	12+16	42	All	σ	9.4	$10^{-16}cm^2$	?	203	
B	B	Depol	He	300	LIF	43	12+16	43	All	σ	3.7	$10^{-16}cm^2$	?	203	
B	B	Depol	He	300	LIF	43	12+16	43	$\Delta j \neq 0$	σ	7.0	$10^{-16}cm^2$	?	203	
B	B	Depol	He	300	LIF	43	12+16	44	All	σ	12.9	$10^{-16}cm^2$	?	203	
B	B	Depol	Ne	300	LIF	43	12+16			$\langle \sin\theta \rangle$	0.88		?	203	
B	B	Depol	Ne	300	LIF	43	12+16	43	All	σ	22.7	$10^{-16}cm^2$	?	203	
B	B	Depol	Ne	300	LIF	43	12+16	43	$\Delta j \neq 0$	σ	22.8	$10^{-16}cm^2$	?	203	
B	B	Depol	H_2	300	LIF	43	12+16			$\langle \sin\theta \rangle$	0.70		?	203	
B	B	Depol	H_2	300	LIF	43	12+16	43	All	σ	2.9	$10^{-16}cm^2$	?	203	
B	B	Depol	H_2	300	LIF	43	12+16	43	$\Delta j \neq 0$	σ	5.3	$10^{-16}cm^2$	?	203	
D			Ar		LIF						No Data			204	
D			N_2		LIF						No Data			204	
D			SF_6		LIF						No Data			204	
D		Quench	Ne	300?	ED					k	1.88(−12)	cm^3s^{-1}	10%	205,206	
D		Quench	Ar	300?	ED					k	8.1 (−12)	cm^3s^{-1}	10%	205,206	
D		Quench	O_2	300	FP					k	1.0 (−10)	cm^3s^{-1}	15%	206,207	
D		Quench	O_2	300?	ED					k	0.96(−10)	cm^3s^{-1}	10%	205,206	

Table 1.10. Inelastic Collision Data for Iodine (continued).

Electronic State Initial	Final	Process	Collision Partner	Temp (K)	Method	v_i	j_i	v_f	j_f	Quantity Reported	Data Entry	Units	Est. Error	Reference	Comment
D		Quench	CO_2	300	FP					k	1.0 (-10)	cm^3s^{-1}	15%	206,207	
D		Quench	CO_2	300?	ED					k	0.96(-10)	cm^3s^{-1}	10%	205,206	
D		Quench	CF_4	300?	ED					k	1.6 (-11)	cm^3s^{-1}	10%	205,206	
D		Quench	C_3H_8	300	FP					k	5 (-10)	cm^3s^{-1}	15%	206,207	
D(?)		Quench+ Radiate	Ar	298-353	RAD					τ	1 (- 2)	μs	?	208	
D	D′	Quench	He	323	MEF					k	1.0 (-12)	cm^3s^{-1}	10-50%	209	
D	D′	Quench	Ne	300	FP					k	1.88(-12)	cm^3s^{-1}	15%	206,207	
D	D′	Quench	Ar	323	MEF					k	2.4 (-12)	cm^3s^{-1}	10-50%	209	
D	D′	Quench	Ar	300	FP					k	8.2 (-12)	cm^3s^{-1}	15%	206,207	
D	D′	Quench	Kr	323	MEF					k	1.2 (-12)	cm^3s^{-1}	10-50%	209	
D	D′	Quench	Xe	323	MEF					k	6 (-12)	cm^3s^{-1}	10-50%	209	
D	D′	Quench	Xe	300	MEF					k	4 (-12)	cm^3s^{-1}	?	210	
D	D′	Quench	N_2	300	MEF					k	6 (-12)	cm^3s^{-1}	?	210	
D	D′	Quench	N_2	323	MEF					k	1.9 (-12)	cm^3s^{-1}	10-50%	209	
D	D′	Quench	SF_6	323	MEF					k	6.2 (-12)	cm^3s^{-1}	10-50%	209	
D	D′	Quench	CH_4	300	LIF	140				k	7.9 (-10)	cm^3s^{-1}	5-10%	211	
D	D′	Quench	CF_4	300	MEF					k	8.2 (-12)	cm^3s^{-1}	?	210	
D	D′	Quench	CF_4	300	FP					k	1.6 (-11)	cm^3s^{-1}	15%	206,207	
D	D′	Quench	CF_4	300	LIF	140				k	6.0 (-10)	cm^3s^{-1}	5-10%	211	
D	D′	Quench	CH_3Cl	300	LIF	140				k	2.1 (-9)	cm^3s^{-1}	5%	212	ff
D	D′	Quench	CH_3Cl	300	LIF	140				k	2.1 (- 9)	cm^3s^{-1}	5-10%	211	
D	D′	Quench	CF_3Cl	300	LIF	140				k	7.1 (-10)	cm^3s^{-1}	5-10%	211	
D	D′	Quench	C_3F_8	300	MEF					k	2.2 (-11)	cm^3s^{-1}	?	210	
D	D′	Quench	C_5F_{12}	300	MEF					k	3.5 (-11)	cm^3s^{-1}	?	210	

Table 1.10. Inelastic Collision Data for Iodine (continued).

Electronic State Initial	Electronic State Final	Process	Collision Partner	Temp (K)	Method	v_i	j_i	v_f	j_f	Quantity Reported	Data Entry	Units	Est. Error	Reference	Comment
D′		Quench	I_2	293-373	MEF					k	1.5 (-11)	cm^3s^{-1}	?	209	
D′		Quench	Xe	300	MEF					k	>3 (-10)	cm^3s^{-1}	LL	210	
D′		Quench	O_2	300	FP					k	1.65(-10)	cm^3s^{-1}	15%	207	
D′		Quench	N_2	300	MEF					k	1.0 (-11)	cm^3s^{-1}	?	210	
D′		Quench	CO_2	300	FP					k	4.2 (-10)	cm^3s^{-1}	15%	207	
D′		Quench	CF_4	300	MEF					k	<1.5 (-13)	cm^3s^{-1}	UL	210	
D′		Quench	C_3H_8	300	FP					k	9 (-10)	cm^3s^{-1}	15%	207	
D′		Quench	C_3F_8	300	MEF					k	1.2 (-12)	cm^3s^{-1}	?	210	
D′		Quench	C_5F_{12}	300	MEF					k	1.2 (-11)	cm^3s^{-1}	?	210	

Table 1.10. Inelastic Collision Data for Iodine (continued).

Theoretical Treatments for Iodine

Electronic State Initial	Process	Collision Partners	Method, Comments	Reference
	V-T	He	Semiclassical and information theoretical calculations; $0.5 < T/\theta) < 5.0$	213
X	V-T	He,Ar,Xe	Classical trajectory calculations; T = 300 K; Power-law scaling law (See also ref. 215)	214
X	V-T	He,Ne,Ar, Kr,Xe	Quasiclassical trajectory calculations; Power-law scaling law	215
X	V-T	Ar	Exact classical calculation	216
X	V-T	I_2	Calculated interference between 0-1 and 0-2 channels	217
X	V-T	I_2	Semiclassical, 3-D; Morse oscillator	52
X	V-T	I_2	Quasiclassical trajectory calculation, 700-1500 K; v_i = 0,1,7,10,12,14	89
X	V-T	I	Information-theoretic analysis	90
X	V-T	Si	Quantum mechanical sudden, collinear	37
X	V-T+R-T	Ar	Effect of V-T and R-T on thermal dissociation	57
X	V-V	I_2	Quantum mechanical calculation, 100-3000 K	218
B	Quench	Various	Model for quenching (scaling law)	219
B	Quench	Various	General scaling law for quenching	220
B	Quench+ V-T	He,Ne,Ar, Kr,Xe	First-order distorted wave and optical models	221
B	V-T		Matrix elements for (Δv=1) vs. (Δv=2)	222
B	V-T	He	Quantum mechanical close coupling calculation; v_i = 1,25 Low temperature ($E_{translational} < 1.0\ cm^{-1}$)	223
B	V-T+R-T	He	Quantal sudden approximation	224
B	V-T+R-T	He	Semiclassical calculations, 3-D	225
B	V-T+R-T	He	Quantum calculation, compares breathing-sphere and angularly asymmetric potentials; T=85 K	226
B	V-T+R-T	He	Quantum mechanical close-coupled calculation; low temperature (~1 K)	227

Table 1.10. Inelastic Collision Data for Iodine (continued).

Electronic State Initial	Process	Collision Partners	Method, Comments	Reference
B	V-T+R-T	He,Ne,Ar, Kr,Xe	Information theoretic analysis, 300-350 K	228
B	V-T+R-T	He,Ne,Ar, Kr,Xe	Comparison of simple V-T theories	229
B	V-T+R-T	He,Ne,Ar, Kr,Xe	Classical trajectory calculations, 3-D; also semiclassical model; v_i = 15,25,43,50	230
B	R-T	He	Sudden approximation, j_f dependence	231
B	R-T	He	Classical trajectory, sudden approximation	232
B	R-T	He	Sudden approximation and quasiclassical trajectory (j_i = 12)	233

Radiative Lifetimes for Iodine

Electronic State Initial	Electronic State Final	v_i	j_i	Method	Data (μs)	Est. Error	Comments	Reference
A	X			LIF	260	10%	Ar,Kr,Xe matrix at 12-30 K	234
A′	X			LIF	6.3(+3)	17%	Xe matrix, 12-30 K	234
B	X			CT	1.24	2%		235
B	X	0-25		LIF			Superceded by 158	159
B	X	6	32	LIF	0.31	5%		161
B	X	6-69		LIF			Values reported 0.4 ≤ τ ≤ 7.9 μs	158
B	X	7	J′	LIF	(gg)	10-20%		236
B	X	9	33	LIF	0.60	5-10%		164, 165
B	X	9	39	LIF	0.57	5-10%		164, 165
B	X	9	61	LIF	0.48	5-10%		164, 165
B	X	9	84	LIF	0.38	5-10%		164, 165

Table 1.10. Inelastic Collision Data for Iodine (continued).

Radiative Lifetimes for Iodine

Electronic State Initial	Final	v_i	j_i	Method	Data (μs)	Est. Error	Comments	Reference
B	X	10	20	LIF	0.69	5-10%		164, 165
B	X	10	70	LIF	0.53	5-10%		164, 165
B	X	10	89	LIF	0.46	5-10%		164, 165
B	X	10-80		PS			Superceded by Ref. 158	166
B	X	11	8	LIF	0.92	5-10%		164, 165
B	X	11	76	LIF	0.70	5-10%		164, 165
B	X	11	90	LIF	0.61	5-10%		164, 165
B	X	11	102	LIF	0.57	5-10%		164, 165
B	X	11	112	LIF	0.48	5-10%		164, 165
B	X	11	126	LIF	0.39	5-10%		164, 165
B	X	11	128	LIF	0.41	5%		161
B	X	11	128	LIF	0.38	5%		237
B	X	12	32	LIF	1.09	5-10%		164, 165
B	X	12	64	LIF	1.00	5-10%		164, 165
B	X	12	97	LIF	0.80	5-10%		164, 165
B	X	13	11	LIF	1.26	5-10%		164, 165
B	X	13	73	LIF	1.15	5-10%		164, 165
B	X	14	53	LIF	1.31	5-10%		164, 165
B	X	15	60	CT	1.25	?		238
B	X	15	63	LIF	1.36	5-10%		164, 165
B	X	16	57	LIF	1.23	5-10%		164, 165
B	X	17	27	LIF	1.15	5-10%		164, 165
B	X	17	35	Hanle	1.0	10-30%		202

Table 1.10. Inelastic Collision Data for Iodine (continued).

Radiative Lifetimes for Iodine

Electronic State Initial	Electronic State Final	v_i	j_i	Method	Data (μs)	Est. Error	Comments	Reference
B	X	18	37	LIF	0.97	5-10%		164, 165
B	X	18	58	LIF	0.96	5-10%		164, 165
B	X	18	85	LIF	0.97	5-10%		164, 165
B	X	18	95	Hanle	0.95	10-30%		202
B	X	18	104	LIF	0.98	5-10%		164, 165
B	X	19	96	LIF	0.92	5-10%		164, 165
B	X	20	40	LIF	0.89	5-10%		164, 165
B	X	21	116	LIF	0.7	10%		169
B	X	21	116+122	Hanle	0.55	10-30%		202
B	X	32	9+14	LIF	1.1	10%		169
B	X	32	9+14	Hanle	0.92	10-30%		202
B	X	40	77	Hanle	1.6	10-30%		202
B	X	40	79	LIF	1.4	10%		169
B	X	43	12+16	LIF	2.3	10%		169
B	X	43	12+16	Hanle	2.3	10-30%		202
B	X	43	16	LIF	2.2			176
B	X	62		LIF	8			176
B	X	62	27	LIF	8.8	10%		169
B	X	62	27	Hanle	14	10-30%		202
B	X	62	27	LIF	14	20%		178
D				ED	0.015	10%		205
E	B	46		LIF (2 photon)	0.027	10%		239

Comments for Table 1.10

(a) Vibrational excitation ($0 \rightarrow 1$) cross section in arbitrary units given as a function of collision energy 40-330 meV, corresponding to $T_{transl} \sim$ 500-4000 K.

(b) Also reports a total elastic cross section of 680×10^{-16} cm^2 for these levels.

(c) State-to-state transfer observed but no quantitative rate data given.

(d) Gives $k(T) = 8 \times 10^{-11} \exp[-4.4 \times 10^{-3} T]$ cm^3 molecule^{-1} s^{-1}; evaluated at T = 298 K, gives $k(298) = 2.16 \times 10^{-11}$, which is $\approx 50\%$ too low.

(e) Measured rates are a factor of 3 too low but temperature dependence may be reliable.

(f) Vibrational states $26 \lesssim v_f \lesssim 43$ populated, with peak at $v_f \approx 35$; the sum of the measured $E \rightarrow V$ rates accounts for about 20% of the total I^* quenching rate [P. L. Houston, private communication].

(g) A broad distribution of v' states in $B(^3\Pi)$ is populated. An excitation mechanism $B \leftarrow A \leftarrow X$ is suggested, but no rate data are given.

(h) Estimated 8% of biacetyl quenching excites I_2 B←X; remainder is $I_2(X) + BA^* \rightarrow 2I + BA$.

(i) Transfer bands observed, but no rate data given.

(j) Low-resolution data, superseded.[158]

(k) Quenching cross sections ($I_2^*(v_i) - I_2$) reported for $6 \leq v_i \leq 70$; values from 150-270 $\times 10^{-16}$ cm^2 with 10-20% precision.

(ℓ) Low-resolution phase-shift measurements for $10 \lesssim v_i \lesssim 80$, superseded.[158]

(m) Quenching and vibrational relaxation of Hg(546.1 nm)-excited I_2 observed, but reported rate inaccurate due to photographic measurement and use of incorrect radiative lifetime.

(n) The reported data have been corrected for a radiative lifetime $\tau(43, 12 \leftarrow 16) = 2.5$ μs (1.0 μs was used in the analysis). However, the values still appear to be in poor agreement with other experimental measurements.

(o) Very little vibrational excitation observed in CO; no rate data given.

(p) Summary of experimental results.

(q) Value reported is $k_{1\rightarrow 0}$ assuming $k_{v\rightarrow v+1} = v k_{1\rightarrow 0}$.

(r) Vibrational relaxation observed in beam; no kinetic data given.

(s) Corrected for radiative lifetime using published values.[167] Ratio of $k(15\rightarrow 16)/k(15\rightarrow 14)$ does not satisfy detailed balancing, probably due to error in $\Delta v = +1$ rate measurement resulting from band overlapping.

(t) The lower range of published values[192] is probably reliable (C. Cerjan, private communication).

(u) Individual rotational energy transfer rate coefficients are presented in terms of an ECS scaling law (see Appendix C) with the following parameters: $a = 13.8 \times 10^{-11}$ cm^3 molecule^{-1} s^{-1}, $\gamma = 1.17$, $\ell_c = 3.5 \times 10^{-8}$ cm.

(v) Circular polarization measurements give $\Delta M_j = 0$ for $0 \lesssim \Delta j \lesssim 30$.

(w) Individual rotational energy transfer rate coefficients are presented in terms of an ECS scaling law (see Appendix C) with the following parameters. $a = 9.5 \times 10^{-11}$ cm^3 molecule^{-1} s^{-1}, $\gamma = 0.75$, $\ell^*(j_i)$ = 22.9(12), 26.0(33), 25.0(59), 30.5(83), 29.5(104), and 31.9(146).

(x) As in (w), with:
$\gamma = 0.72 \pm 0.06$, $\ell_c = 0$, $\ell^* = 22.6$.

(y) As in (w), with:
$a = 1.9 \times 10^{-10}$ cm^3 molecule^{-1} s^{-1}, $\gamma = 1.08$, $\ell_c = 0$.

(z) As in (w), with:
$a = 1.38 \times 10^{-10}$ cm^3 molecule^{-1} s^{-1}, $\gamma = 1.015$, $\ell_c = 4 \times 10^{-8}$ cm.

(aa) As in (w), with:
$\gamma = 0.86 \pm 0.05$, $\ell_c = 0$, $\ell^* = 22.0$.

(bb) As in (w), with:
$\gamma = 0.98 \pm 0.04$, $\ell_c = 0$, $\ell^* = 41$.

(cc) As in (w), with:
$a = 1.02 \times 10^{-12}$ cm^3 molecule^{-1} s^{-1}, $\gamma = 0.9$, $\ell_c = 0$.

(dd) As in (w), with:
$a = 1.14 \times 10^{-12}$ cm^3 molecule^{-1} s^{-1}, $\gamma = 0.94$, $\ell_c = 0$.

(ee) Conclude $\Delta M_j = 0$ for $\Delta v = 0$ and any Δj, but no kinetic data given.

(ff) Also statement (unpublished reference) that P(quench) ≈ 1.0 for He, ..., Xe.

(gg) Lifetime given by $\Gamma_{vJ'} = \tau_{rad}^{-1}(v, J') = \Gamma_v^{(0)}$

$$+ \frac{|a_v|^2}{3}\left\{I^2 + \frac{3(\underset{\sim}{I}\cdot\underset{\sim}{J}')^2 + \frac{3}{2}\underset{\sim}{I}\cdot\underset{\sim}{J}' - I^2J^2}{(2J'-1)(2J'+3)}\right\}$$

$$- \sqrt{2}\, a_v k_v^{1/2}\, \underset{\sim}{I}\cdot\underset{\sim}{J}' + k_v J'(J'+1)$$

with $\Gamma_{v=7}^{(0)} = 1.1(+6)$ s^{-1}, $|a_7|^2 = 2.8(+5)$ s^{-1}, $k_7 = 1.65(+2)$ s^{-1}, and $\underset{\sim}{I}$ = nuclear spin .

Table 2.

Vibration-Rotation Constants for the Diatomic Halogens (all values in cm^{-1})

Electronic State		G_v			B_v			D_v
		ω_e	$\omega_e x_e$	$\omega_e y_e$	β_e	α_e	γ_e	
Br_2	$X^1\Sigma_g^+$	325.321	1.0774	-0.002298	-0.082107	0.0003187	-1.04(-6)	2.092(-8)
	$A^3\Pi_{1u}$	153	2.7		0.0588	0.0008		
	$B^3\Pi_{0u^+}$	167.607	1.6361	-0.009369	0.059589	0.0004891	-6.637(-6)	3.013(-8)
BrCl	$X^1\Sigma^+$	444.27	1.843	-0.0040	0.152469	0.000769	-2.6(-6)	0.7183(-7)
	$B^3\Pi_0^+$	222.68	2.884	-0.0673	0.107704			1.0(-7)
BrF	$X^1\Sigma^+$	670.75	4.054		0.35584	0.00261		0.40(-6)
	$B^3\Pi_0^+$	372.2	3.49	-0.22	0.264[a]	0.00498[a]		1.0(-6)[a]
BrI	$X^1\Sigma^+$	268.64	0.814	-0.0017	0.0568325	0.0001969	-4.7(-7)	1.02(-8)
	$B^3\Pi_0^+$	142.	2.57	-0.11	0.0432	0.0005		2.5(-8)
Cl_2	$X^1\Sigma_g^+$	559.751	2.69427	-3.32527(-3)	0.244153	0.0015163	-3.908(-6)	1.86(-7)
		$\omega_e z_e$ = -2.27337(-4)				δ_e=+7.08(-8)		
		$\omega_e t_e$ = +3.92041(-6)						
	$B^3\Pi_{0u^+}$	259.57	4.75	-0.067	0.1625	0.0021	-9.0(-5)	[2.356 + 0.225 (v+1/2)] × 10(-7)
		$\omega_e z_e$ = +0.00212						
ClF	$X^1\Sigma^+$	786.15	6.16		0.516478	0.004357		8.7(-7)
	$B^3\Pi_0^+$	363.1	8.6	-0.12	0.3319	0.0047	-0.00047	1.0(-6)
ClI	$X^1\Sigma^+$	348.29	1.501		0.1141587	0.0005354		4.0(-8)
	$A^3\Pi_1$	212.3	2.39	-0.012	0.084832			5.4(-8)
	$B^3\Pi_0^+$	221.1	9.62		0.0872	0.0017		1.0(-7)
F_2	$X^1\Sigma_g^+$	916.64	11.236	-0.113	0.89019	0.013847	+0.0001179	3.3(-6)
FI	$X^1\Sigma^+$	610.24	3.123	-0.00347	0.279710	0.001873	-2.7(-6)	2.37(-7)
	$B^3\Pi_0^+$	411.34	2.825	-0.0744	0.2272	0.00139	-0.00008	2(-7)
I_2	$X^1\Sigma_g^+$		(b)			(b)		(b)
	$B^3\Pi_{0u^+}$	125.69	0.764	-0.00178	0.02903	0.00158	-3.3(-7)	[5.4 + 0.9(v+1/2)] × 10(-9)
		$\omega_e z_e$ = -0.0000738				δ_e=-4.7(-8)		
		$\omega_e t_e$ = +1.03(-6)						

(a) Rotational constants for $3 \leq v' \leq 8$ fitted to data in Ref. A4.

(b) For $I_2[X^1\Sigma_g^+]$, take

$$G_v = 214.5481(v+1/2) - 0.616259(v+1/2)^2 + 7.507(-5)(v+1/2)^3$$
$$- 1.263643(-4)(v+1/2)^4 + 6.198129(-6)(v+1/2)^5 - 2.0255975(-7)(v+1/2)^6$$
$$+ 3.9662824(-9)(v+1/2)^7 - 4.6346554(-11)(v+1/2)^8$$
$$+ 2.9330755(-13)(v+1/2)^9$$

$$B_v = 3.7395(-2) - 1.2435(-4)(v+1/2) + 4.498(-7)(v+1/2)^2$$
$$- 1.482(-8)(v+1/2)^3 - 3.64(-11)(v+1/2)^4$$

$$D_v = 4.54(-9) + 1.7(-11)(v+1/2) + 7.0(-12)(v+1/2)^2$$

Table 3.

Mean Thermal Relative Velocities for Halogens and Selected Collision Partners (300 K), Units of cm $s^{-1} \times 10^4$.

$\bar{v}$	Self	He	Ne	Ar	Kr	Xe
Br_2	2.82	12.76	5.95	4.46	3.40	2.97
BrCℓ	3.32	12.86	6.08	4.63	3.62	3.22
BrF	3.58	12.86	6.15	4.72	3.74	3.35
BrI	2.48	12.73	5.88	4.35	3.26	2.81
$Cℓ_2$	4.23	12.94	6.36	4.98	4.06	3.71
CℓF	4.83	13.05	6.57	5.25	4.39	4.06
CℓI	2.80	12.76	5.95	4.45	3.39	2.96
F_2	5.78	13.24	6.94	5.71	4.93	4.64
FI	2.95	12.77	5.98	4.50	3.45	3.03
I_2	2.24	12.69	5.83	4.29	3.17	2.71

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Appendix A. Vibrational and Rotational Energy Levels for the Diatomic Halogens

For applying the scaling laws (Appendix C) for vibrational and rotational energy transfer, and various other purposes, it is necessary to know the amount of energy transferred in an inelastic collision, and thus the vib-rotational term values for the halogen molecule. They are given by a standard Dunham polynomial expansion,

$$\begin{aligned} E_{v,J} &= G(v+1/2) + B_v J(J+1) - D_v [J(J+1)]^2 \\ &= \omega_e(v+1/2) - \omega_e x_e (v+1/2)^2 + \omega_e y_e (v+1/2)^3 + \cdots \\ &\quad + [\, B_e - \alpha_e(v+1/2) + \gamma_e(v+1/2)^2 + \cdots] J(J+1) \\ &\quad - D_v [J(J+1)]^2. \end{aligned} \tag{A.1}$$

The constants appearing in Eq. (A.1), taken from the most recent compilation by Huber and Herzberg,[A1] are listed in Table 2. Constants for the very accurately known $X\,^1\Sigma_g{}^+$ state of I_2 are taken from Ref. A2. A highly precise (15-term) series expansion for the $B\,^3\Pi_{0u}{}^+$ state of I_2 is available,[A3] but is not required for these purposes. Note the sign convention that only the first anharmonic term in each series ($\omega_e x_e, \alpha_e$) appears with a minus sign; the signs of all other terms in the expansion are positive.

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Appendix B. Interconversion of Units

Rate coefficient data appear in the literature with a sometimes bewildering array of units. We have attempted, wherever possible in this review, to present data in standard units of cm^3 $molecule^{-1}$ s^{-1}. Other units which are frequently employed include relaxation times, cross sections, and collision probabilities. In this appendix, we give conversion factors between each of these and standard rate coefficient units.

Relaxation Time

Generally given as a pressure-time product $(p\tau)$ or $(p\tau)^{-1}$ in a multitude of units. We convert $(p\tau)^{-1}$ to units of bar^{-1} s^{-1} at 273 K (1 bar = 100 000 Pa; 1 atm = 101 325 Pa). To obtain k in cm^3 $molecule^{-1}$ s^{-1} at temperature T, multiply by $1.345\times10^{22}\,T$ cm^3 $molecule^{-1}$ bar^{-1}. This cannot be simply used to convert shock-tube data, since the ideal-gas law is not necessarily valid at the high pressure and temperatures encountered in these experiments. Therefore, we have left shock-tube data in the $(p\tau)$ form.

Cross Section

A rate coefficient can be expressed as an effective cross section by the relationship

$$k=\bar{v}\sigma, \qquad \text{(B.1)}$$

where $\bar{v}$ is the mean thermal relative velocity $(8kT/\pi\mu)^{1/2}$ for the collision pair ($cm\ s^{-1}$) and σ has units (cm^2 $molecule^{-1}$). A table of $\bar{v}$ values for halogens and selected collision partners (at 300 K) is given in Table 3. An unfortunate ambiguity which has appeared in the literature is that σ is sometimes taken to be the cross section appearing in Eq. (B.1) and sometimes to be a collision distance, so that the actual cross section is $\pi\sigma^2$. The cross section values reported in this survey include the factor of π, insofar as this is clear from the original citation.

Collision Probability

Inelastic collision efficiencies are sometimes given as a probability per collision (P) or reciprocal of a collision number ($1/Z$). To convert to rate coefficient results, this value must be multiplied by a gas-kinetic collision rate; to do so, a gas-kinetic cross section or collision diameter must be assumed, making this quantity somewhat arbitrary.

Appendix C. Scaling Laws for Rotational Energy Transfer in I_2

The most recent R-T measurements in the B state of I_2 report data, not as individual rates or cross sections, but in terms of a $(j_i\rightarrow j_f)$ scaling law.[184,185,197] In order to allow reconstruction of individual rates, we give that relationship here. The energy-corrected sudden (ECS) scaling law rate for a transition from initial rotational state j_i to final state j_f is given by

$$k_{if}(j_i\rightarrow j_f)=(2j_f+1)\exp[(E_{j_i}-E_{j_>})/kT]$$
$$\times\left[\sum_l\begin{pmatrix} j_i & l & j_f\\ 0 & 0 & 0\end{pmatrix}^2(2l+1)[A_l^{j_>}]^2k(l\rightarrow0)\right],$$

where the symbols have the following meanings: $j_>$ = larger (j_i, j_f); $E_{j_i}, E_{j_>}$ to be calculated from energy level expressions in Appendix A; T = ambient translational temperature; $\begin{pmatrix} \cdot & \cdot & \cdot\\ \cdot & \cdot & \cdot\end{pmatrix}=3-j$ symbol;

$$A_l^{j_>}=\frac{1+\tau_l^2/6}{1+\tau_{j_>}^2/6};$$

$$\tau_j=4\pi l_c cB(j+1/2)/\bar{v},$$

where $\bar{v}$ = mean thermal relative velocity (see Appendix B); B = rotational constant in cm^{-1} (see Appendix A);

$$k(l\rightarrow0)=a[l(l+1)]^{-\gamma}.$$

The parameters a, γ, and l_c are given in the footnotes to Table I; the sum over l can be taken over

$$|j_i-j_f|<l<|j_i+j_f|$$

with sufficient accuracy. If l_c is set equal to zero, the infinite-order sudden (IOS) scaling law is obtained.

For I_2^*-He collisions, a modified expression has been used for $k(l\rightarrow0)$, introducing an additional parameter l^*, viz.,

$$k^{He}(l\rightarrow0)=a[l(l+1)]^{-\gamma}\exp[-l(l+1)/l^*(l^*+1)].$$

These scaling and fitting laws are discussed in greater detail in Ref. 6.