

APPENDIX 19

Collision Integral and Lennard-Jones Force Constants[†]

Collision integral Ω_D

$\frac{kT}{\epsilon_{12}}$	Ω_D	$\frac{kT}{\epsilon_{12}}$	Ω_D	$\frac{kT}{\epsilon_{12}}$	Ω_D
0.30	2.662	1.65	1.153	4.0	0.8836
0.35	2.476	1.70	1.140	4.1	0.8788
0.40	2.318	1.75	1.128	4.2	0.8740
0.45	2.184	1.80	1.116	4.3	0.8694
0.50	2.066	1.85	1.105	4.4	0.8652
0.55	1.966	1.90	1.094	4.5	0.8610
0.60	1.877	1.95	1.084	4.6	0.8568
0.65	1.798	2.00	1.075	4.7	0.8530
0.70	1.729	2.1	1.057	4.8	0.8492
0.75	1.667	2.2	1.041	4.9	0.8456
0.80	1.612	2.3	1.026	5.0	0.8422
0.85	1.562	2.4	1.012	6	0.8124
0.90	1.517	2.5	0.9996	7	0.7896
0.95	1.476	2.6	0.9878	8	0.7712
1.00	1.439	2.7	0.9770	9	0.7556
1.05	1.406	2.8	0.9672	10	0.7424
1.10	1.375	2.9	0.9576	20	0.6640
1.15	1.346	3.0	0.9490	30	0.6232
1.20	1.320	3.1	0.9406	40	0.5960
1.25	1.296	3.2	0.9328	50	0.5756
1.30	1.273	3.3	0.9256	60	0.5596
1.35	1.253	3.4	0.9186	70	0.5464
1.40	1.233	3.5	0.9120	80	0.5352
1.45	1.215	3.6	0.9058	90	0.5256
1.50	1.198	3.7	0.8998	100	0.5130
1.55	1.182	3.8	0.8942	200	0.4644
1.60	1.167	3.9	0.8888	400	0.4170

Lennard-Jones force constants

Compound	ϵ/k (K)	σ (Å)
Acetone	560.2	4.600
Acetylene	231.8	4.033
Air	78.6	3.711
Ammonia	558.3	2.900
Argon	93.3	3.542
Benzene	412.3	5.349
Bromine	507.9	4.296
<i>n</i> -butane	310	5.339
<i>i</i> -butane	313	5.341
Carbon dioxide	195.2	3.941
Carbon disulfide	467	4.483
Carbon monoxide	91.7	3.690
Carbon tetrachloride	322.7	5.947
Carbonyl sulfide	336	4.130
Chlorine	316	4.217
Chloroform	340.2	5.389
Cyanogen	348.6	4.361
Cyclohexane	297.1	6.182
Cyclopropane	248.9	4.807
Ethane	215.7	4.443
Ethanol	362.6	4.530
Ethylene	224.7	4.163
Fluorine	112.6	3.357
Helium	10.22	2.551
<i>n</i> -Hexane	339.3	5.949
Hydrogen	59.7	2.827
Hydrogen cyanide	569.1	3.630
Hydrogen chloride	344.7	3.339
Hydrogen iodide	288.7	4.211
Hydrogen sulfide	301.1	3.623
Iodine	474.2	5.160
Krypton	178.9	3.655
Methane	148.6	3.758
Methanol	481.8	3.626
Methylene chloride	356.3	4.898
Methyl chloride	350	4.182
Mercury	750	2.969
Neon	32.8	2.820
Nitric oxide	116.7	3.492
Nitrogen	71.4	3.798
Nitrous oxide	232.4	3.828
Oxygen	106.7	3.467
<i>n</i> -Pentane	341.1	5.784
Propane	237.1	5.118
<i>n</i> -Propyl alcohol	576.7	4.549
Propylene	298.9	4.678
Sulfur dioxide	335.4	4.112
Water	809.1	2.641

[†]From J. O. Hirschfelder, C. F. Curtiss, and R. B. Bird, *Molecular Theory of Gases and Liquids*, New York: Wiley, 1954.