

Average Bond Lengths

bond	r_{bond} (pm)
H-H	74
H-F	92
H-Cl	127
H-Br	141
H-I	161
F-F	142
Cl-Cl	199
Br-Br	228
I-I	267

bond	r_{bond} (pm)
S-H	134
S-S	205
S=S	149
S-F	164
S-Cl	207
S-Br	232

Average Bond Enthalpies

bond	ΔH_{bond} (kJ/mol)
C–H	413
C–C	347
C=C	614
C $\equiv$ C	839
C–N	305
C=N	613
C $\equiv$ N	891
C–O	358
C=O	743
C $\equiv$ O	1072
C–F	485
C–Cl	339
C–Br	276
C–I	238
C–Si	318
C–P	264
C–S	259
C=S	573

bond	ΔH_{bond} (kJ/mol)
N–H	391
N–N	163
N=N	418
N $\equiv$ N	941
N–O	201
N=O	607
N–F	272
N–Cl	200.
N–Br	243

bond	ΔH_{bond} (kJ/mol)
O–H	467
O–O	146
O=O	495
O–F	185
O–Cl	203
O–Br	156
O–S	364
O=S	522
O–P	335
O=P	544

bond	ΔH_{bond} (kJ/mol)
H–H	432
H–F	565
H–Cl	427
H–Br	363
H–I	295
F–F	154
Cl–Cl	239
Br–Br	193
I–I	149

bond	ΔH_{bond} (kJ/mol)
Si–H	393
Si–Si	340.
Si–O	452
Si–F	565
Si–Cl	381
Si–Br	310.

bond	ΔH_{bond} (kJ/mol)
P–H	322
P–P	201
P–F	490.
P–Cl	326
P–Br	264

bond	ΔH_{bond} (kJ/mol)
S–H	347
S–S	266
S=S	425
S–F	327
S–Cl	253
S–Br	218

Properties of Water				
properties of water	K_w	ρ (g/cm ³)	P_{vap} (kPa)	C_p (J/g·K)
0°C	1.15×10^{-15}	0.99984	0.61129	4.2176
5°C	1.87×10^{-15}	0.99997	0.87260	4.2049
10°C	2.96×10^{-15}	0.99970	1.2281	4.1921
15°C	4.57×10^{-15}	0.99910	1.7056	4.1870
20°C	6.87×10^{-15}	0.99821	2.3388	4.1818
25°C	1.01×10^{-14}	0.99705	3.1690	4.1801
30°C	1.46×10^{-14}	0.99565	4.2455	4.1784
35°C	2.06×10^{-14}	0.99404	5.6267	4.1785
40°C	2.87×10^{-14}	0.99222	7.3814	4.1786
45°C	3.94×10^{-14}	0.99013	9.5898	4.1796
50°C	5.31×10^{-14}	0.98803	12.344	4.1806
55°C	7.05×10^{-14}	0.98562	15.752	4.1825
60°C	9.25×10^{-14}	0.98320	19.932	4.1843
65°C	1.20×10^{-13}	0.98049	25.022	4.1869
70°C	1.53×10^{-13}	0.97778	31.176	4.1895
75°C	1.94×10^{-13}	0.97480	38.563	4.1929
80°C	2.44×10^{-13}	0.97182	47.373	4.1963
85°C	3.02×10^{-13}	0.96859	57.815	4.2007
90°C	3.73×10^{-13}	0.96535	70.117	4.2050
95°C	4.52×10^{-13}	0.96188	84.529	4.2105
100°C	5.43×10^{-13}	0.95840	101.325	4.2159
properties of ice		ρ (g/cm ³)	ΔH_{fus} (J/g)	C_p (J/g·K)
0°C		0.9167	333.6	2.108
properties of steam		ρ (g/cm ³)	ΔH_{vap} (kJ/g)	C_p (J/g·K)
100°C		5.974×10^{-4}	2.2567	2.0784

Properties of Other Substances (condensed phase)					
substance (TSS)	ρ (g/cm ³)	C_p (J/g·K)	substance (TSS)	ρ (g/cm ³)	C_p (J/g·K)
Ag	10.48	0.235	Rb	1.53	0.364
Al	2.70	0.904	Re	20.81	0.137
As	5.75	0.328	Rh	12.42	0.243
Au	19.30	0.129	Ru	12.16	0.238
B	2.34	1.027	S	2.07	0.705
Ba	3.62	0.205	Sb	6.68	0.207
Be	1.85	1.820	Sc	2.99	0.567
Ca	1.54	0.646	Se	4.81	0.322
Cd	8.69	0.231	Si	2.33	0.712
Co	8.86	0.421	Sn	7.27	0.227
Cr	7.15	0.450	Sr	2.64	0.306
Cs	1.93	0.242	Ta	16.47	0.140
Cu	8.96	0.384	Te	6.24	0.201
Fe	7.87	0.449	Ti	4.51	0.522
Ga	5.91	0.374	U	19.08	0.116
Ge	5.32	0.321	V	6.07	0.489
Hg	13.5336	0.140	W	19.31	0.132
In	7.31	0.233	Zn	7.14	0.388
Ir	22.52	0.131	Zr	6.52	0.278
K	0.862	0.757			
Li	0.534	3.573			
Mg	1.74	1.024			
Mn	7.34	0.479			
Mo	10.18	0.251			
Na	0.971	1.227			
Nb	8.57	0.265			
Ni	8.90	0.445			
Os	22.59	0.130			
P	2.16	0.685			
Pb	11.30	0.127			
Pd	12.00	0.244			
Pt	21.43	0.133			

Properties of Other Substances (gas phase)

substance (TSS)	ρ (kg/m³)	C_p (J/g·K)	k_H (mol/L·atm)	% (v/v) of dry air
air	1.185	1.007		
N ₂	1.145	1.039	6.1×10^{-4}	78.0840
O ₂	1.308	0.919	1.3×10^{-3}	20.9476
Ar	1.632	0.521	1.4×10^{-3}	0.9340
CO ₂	1.805	0.843	3.6×10^{-2}	0.0314
Ne	0.8242	1.031	4.5×10^{-4}	0.001818
He	0.1637	5.196	3.8×10^{-4}	0.000524
CH ₄	0.6585	2.225	1.4×10^{-3}	0.000173
Kr	3.429	0.248	2.5×10^{-3}	0.000114
H ₂	0.08228	14.286	7.8×10^{-4}	0.000053
Xe	5.486	0.158	4.3×10^{-3}	0.0000087

B ₂ H ₆	1.131	2.049	
CF ₄	3.588	0.694	1.9×10^{-4}
CHF ₃	2.876	0.728	1.3×10^{-2}
CH ₂ F ₂	2.126	0.825	8.7×10^{-2}
CH ₃ Br	3.872	0.447	1.5×10^{-1}
CH ₃ Cl	2.070	0.808	9.4×10^{-2}
CH ₃ F	1.391	1.102	7.2×10^{-2}
CO	1.145	1.039	9.9×10^{-4}
C ₂ H ₂	1.070	1.690	3.9×10^{-2}
C ₂ H ₄	1.169	1.529	4.8×10^{-3}
C ₂ H ₆	1.234	1.746	1.9×10^{-3}
C ₃ H ₄	1.628	1.515	9.4×10^{-2}
C ₃ H ₆	1.710	1.528	4.8×10^{-3}
C ₃ H ₈	1.818	1.669	1.5×10^{-3}
Cl ₂	2.919	0.478	9.5×10^{-2}
F ₂	1.553	0.824	
H ₂ S	1.402	1.003	8.7×10^{-2}
NO	1.227	0.996	1.9×10^{-3}
NO ₂	1.896	0.809	1.2×10^{-2}
N ₂ O	1.805	0.877	2.5×10^{-2}
O ₃	1.946	0.817	9.4×10^{-3}
SO ₂	2.650	0.623	1.4×10^0

Acid Dissociation Constants				
name	formula	K_{a1}	K_{a2}	K_{a3}
2,3-dihydroxypropanoic acid	HC ₃ H ₅ O ₄	3.0×10^{-4}		
2,4,6-trihydroxybenzoic acid		2.1×10^{-2}		
2-acetoxybenzoic acid	HC ₉ H ₇ O ₄	3.3×10^{-4}		
2-chlorobenzoic acid		1.3×10^{-3}		
2-hydroxyethanoic acid	HC ₂ H ₃ O ₃	1.5×10^{-4}		
2-hydroxypropanoic acid	HC ₃ H ₅ O ₃	1.4×10^{-4}		
2-oxopropanoic acid	HC ₃ H ₃ O ₃	4.1×10^{-3}		
2-propenoic acid	HC ₃ H ₃ O ₂	5.6×10^{-5}		
3,4,5-trihydroxybenzoic acid		3.9×10^{-5}		
3-chlorobenzoic acid		1.4×10^{-4}		
4-chlorobenzoic acid		1.0×10^{-4}		
acetic acid	HCH ₃ CO ₂	1.7×10^{-5}		
acetic acid	HC ₂ H ₃ O ₂	1.7×10^{-5}		
acetylsalicylic acid	HC ₉ H ₇ O ₄	3.3×10^{-4}		
acrylic acid	HC ₃ H ₃ O ₂	5.6×10^{-5}		
adipic acid	H ₂ C ₆ H ₈ O ₄	3.9×10^{-5}	3.9×10^{-6}	
ammonia	NH ₃	5.6×10^{-10}		
aniline	C ₆ H ₅ NH ₂	1.3×10^{-5}		
arsenic acid	H ₃ AsO ₄	5.5×10^{-3}	1.7×10^{-7}	5.1×10^{-12}
arsenous acid	H ₃ AsO ₃	5.1×10^{-10}		
ascorbic acid	H ₂ C ₆ H ₆ O ₆	9.1×10^{-5}	2.0×10^{-12}	
barbituric acid	HC ₄ H ₃ N ₂ O ₃	9.8×10^{-5}		
benzoic acid	HC ₇ H ₅ O ₂	6.3×10^{-5}		
boric acid	H ₃ BO ₃	5.4×10^{-10}		
bromoacetic acid	HC ₂ H ₂ BrO ₂	1.3×10^{-3}		
butanedioic acid	H ₂ C ₄ H ₄ O ₄	6.2×10^{-5}	2.3×10^{-6}	
butanoic acid	HC ₄ H ₇ O ₂	1.5×10^{-5}		
butyric acid	HC ₄ H ₇ O ₂	1.5×10^{-5}		
caproic acid	HC ₆ H ₁₁ O ₂	1.4×10^{-5}		
carbonic acid	H ₂ CO ₃	4.5×10^{-7}	4.7×10^{-11}	
chloroacetic acid	HC ₂ H ₂ ClO ₂	1.3×10^{-3}		
chloroacetic acid	HC ₂ H ₂ O ₂ Cl	1.3×10^{-3}		
chromic acid	H ₂ CrO ₄	1.8×10^{-1}	3.2×10^{-7}	

Acid Dissociation Constants				
name	formula	K_{a1}	K_{a2}	K_{a3}
cinnamic acid	$\text{HC}_8\text{H}_7\text{O}_2$	3.6×10^{-5}		
citric acid	$\text{H}_3\text{C}_6\text{H}_5\text{O}_7$	7.4×10^{-4}	1.7×10^{-5}	4.0×10^{-7}
cyanoacetic acid	$\text{HC}_3\text{H}_2\text{NO}_2$	3.4×10^{-3}		
dichloroacetic acid	$\text{HC}_2\text{HCl}_2\text{O}_2$	4.5×10^{-2}		
ethanedioic acid	$\text{H}_2\text{C}_2\text{O}_4$	5.6×10^{-2}	1.5×10^{-4}	
ethanoic acid	$\text{HC}_2\text{H}_3\text{O}_2$	1.7×10^{-5}		
ethanol	$\text{HC}_2\text{H}_5\text{O}$	3.2×10^{-16}		
fluoroacetic acid	$\text{HC}_2\text{H}_2\text{FO}_2$	2.6×10^{-3}		
formic acid	HCHO_2	1.8×10^{-4}		
fumaric acid		9.5×10^{-4}	4.2×10^{-5}	
gallic acid		3.9×10^{-5}		
glutaric acid	$\text{H}_2\text{C}_5\text{H}_6\text{O}_4$	4.8×10^{-5}	3.8×10^{-6}	
glyceric acid	$\text{HC}_3\text{H}_5\text{O}_4$	3.0×10^{-4}		
glycolic acid	$\text{HC}_2\text{H}_3\text{O}_3$	1.5×10^{-4}		
hexanedioic acid	$\text{H}_2\text{C}_6\text{H}_8\text{O}_4$	3.9×10^{-5}	3.9×10^{-6}	
hexanoic acid	$\text{HC}_6\text{H}_{11}\text{O}_2$	1.4×10^{-5}		
hydrazine	N_2H_4	7.9×10^{-9}		
hydrazoic acid	HN_3	2.5×10^{-5}		
hydroazoic acid	HN_3	2.5×10^{-5}		
hydrocyanic acid	HCN	6.2×10^{-10}		
hydrofluoric acid	HF	6.3×10^{-4}		
hydrogen peroxide	H_2O_2	2.4×10^{-12}		
hydrogen selenide	H_2Se	1.3×10^{-4}	1.0×10^{-11}	
hydrogen sulfide	H_2S	8.9×10^{-8}	1.0×10^{-19}	
hydroxyacetic acid	$\text{HC}_2\text{H}_3\text{O}_3$	1.5×10^{-4}		
hydroxybutanedioic acid	$\text{H}_2\text{C}_4\text{H}_4\text{O}_5$	4.0×10^{-4}	7.8×10^{-6}	
hydroxylamine	HONH_2	1.1×10^{-6}		
iodoacetic acid	$\text{HC}_2\text{H}_2\text{IO}_2$	6.6×10^{-4}		
isophthalic acid		2.0×10^{-4}	2.5×10^{-5}	
lactic acid	$\text{HC}_3\text{H}_5\text{O}_3$	1.4×10^{-4}		
m-toluic acid		5.6×10^{-5}		
maleic acid		1.2×10^{-2}	5.9×10^{-7}	
malic acid	$\text{H}_2\text{C}_4\text{H}_4\text{O}_5$	4.0×10^{-4}	7.8×10^{-6}	

Acid Dissociation Constants				
name	formula	K_{a1}	K_{a2}	K_{a3}
malonic acid	$\text{H}_2\text{C}_3\text{H}_2\text{O}_4$	1.4×10^{-3}	2.0×10^{-6}	
mandelic acid	$\text{HC}_8\text{H}_7\text{O}_3$	4.3×10^{-4}		
methanoic acid	HCHO_2	1.8×10^{-4}		
methanol	HCH_3O	3.2×10^{-16}		
nitroacetic acid	$\text{HC}_2\text{H}_2\text{NO}_4$	3.3×10^{-2}		
o-toluic acid		1.2×10^{-4}		
oxalic acid	$\text{H}_2\text{C}_2\text{O}_4$	5.6×10^{-2}	1.5×10^{-4}	
oxaloacetic acid	$\text{H}_2\text{C}_4\text{H}_2\text{O}_5$	2.8×10^{-3}	4.3×10^{-5}	
oxobutanedioic acid	$\text{H}_2\text{C}_4\text{H}_2\text{O}_5$	2.8×10^{-3}	4.3×10^{-5}	
p-toluic acid		4.3×10^{-5}		
pentanedioic acid	$\text{H}_2\text{C}_5\text{H}_6\text{O}_4$	4.8×10^{-5}	3.8×10^{-6}	
pentanoic acid	$\text{HC}_5\text{H}_9\text{O}_2$	1.5×10^{-5}		
phenol	$\text{HC}_6\text{H}_5\text{O}$	1.0×10^{-10}		
phenylamine	$\text{C}_6\text{H}_5\text{NH}_2$	1.3×10^{-5}		
phloroglucinic acid		2.1×10^{-2}		
phosphoric acid	H_3PO_4	6.9×10^{-3}	6.2×10^{-8}	4.8×10^{-13}
phosphorous acid	H_3PO_3	5.0×10^{-2}	2.0×10^{-7}	
phthalic acid		1.1×10^{-3}	3.7×10^{-6}	
propanedioic acid	$\text{H}_2\text{C}_3\text{H}_2\text{O}_4$	1.4×10^{-3}	2.0×10^{-6}	
propanoic acid	$\text{HC}_3\text{H}_5\text{O}_2$	1.3×10^{-5}		
propionic acid	$\text{HC}_3\text{H}_5\text{O}_2$	1.3×10^{-5}		
pyruvic acid	$\text{HC}_3\text{H}_3\text{O}_3$	4.1×10^{-3}		
succinic acid	$\text{H}_2\text{C}_4\text{H}_4\text{O}_4$	6.2×10^{-5}	2.3×10^{-6}	
tartaric acid	$\text{H}_2\text{C}_4\text{H}_4\text{O}_6$	9.3×10^{-4}	4.3×10^{-5}	
terephthalic acid		2.9×10^{-4}	4.6×10^{-5}	
thioacetic acid	$\text{HC}_2\text{H}_3\text{OS}$	4.7×10^{-4}		
trichloroacetic acid	$\text{HC}_2\text{Cl}_3\text{O}_2$	2.2×10^{-1}		
trifluoroacetic acid	$\text{HC}_2\text{F}_3\text{O}_2$	3.0×10^{-1}		
uric acid	$\text{HC}_5\text{H}_3\text{N}_4\text{O}_3$	1.3×10^{-4}		
valeric acid	$\text{HC}_5\text{H}_9\text{O}_2$	1.5×10^{-5}		

Acid Dissociation Constants				
name	formula	K_{a1}	K_{a2}	K_{a3}
bromic acid	HBrO ₃	2.0×10^{-1}		
bromous acid	HBrO ₂	3.7×10^{-4}		
chloric acid	HClO ₃	$1.0 \times 10^{+1}$		
chlorous acid	HClO ₂	1.1×10^{-2}		
cyanic acid	HCNO	3.5×10^{-4}		
germanic acid	H ₂ GeO ₃	9.8×10^{-10}	5.0×10^{-13}	
hydriodic acid	HI	$2.0 \times 10^{+9}$		
hydrobromic acid	HBr	$5.0 \times 10^{+8}$		
hydrochloric acid	HCl	$1.3 \times 10^{+6}$		
hydroiodic acid	HI	$2.0 \times 10^{+9}$		
hypobromous acid	HBrO	2.8×10^{-9}		
hypochlorous acid	HClO	4.0×10^{-8}		
hypoiodous acid	HIO	3.2×10^{-11}		
iodic acid	HIO ₃	1.7×10^{-1}		
iodous acid	HIO ₂	3.2×10^{-5}		
methanesulfonic acid	HCH ₃ SO ₃	4.0×10^0		
nitric acid	HNO ₃	$2.4 \times 10^{+1}$		
nitrous acid	HNO ₂	5.6×10^{-4}		
p-toluenesulfonic acid	HCH ₃ C ₆ H ₄ SO ₃	$6.3 \times 10^{+2}$		
perchloric acid	HClO ₄	$4.0 \times 10^{+1}$		
selenic acid	H ₂ SeO ₄	$1.0 \times 10^{+2}$	2.0×10^{-2}	
selenous acid	H ₂ SeO ₃	2.4×10^{-3}	4.8×10^{-9}	
sulfuric acid	H ₂ SO ₄	$1.0 \times 10^{+3}$	1.0×10^{-2}	
sulfurous acid	H ₂ SO ₃	1.4×10^{-2}	6.3×10^{-8}	
thiocyanic acid	HSCN	$6.3 \times 10^{+1}$		
triflic acid	HCF ₃ SO ₃	$7.9 \times 10^{+14}$		
trifluoromethanesulfonic acid	HCF ₃ SO ₃	$7.9 \times 10^{+14}$		

Acid Dissociation Constants				
name	formula	K_{a1}	K_{a2}	K_{a3}
aluminum(III) ion	Al^{3+}	1.2×10^{-5}		
barium ion	Ba^{2+}	4.0×10^{-14}		
beryllium ion	Be^{2+}	3.0×10^{-7}		
calcium ion	Ca^{2+}	2.5×10^{-13}		
chromium(III) ion	Cr^{3+}	1.6×10^{-4}		
cobalt(II) ion	Co^{2+}	1.3×10^{-9}		
iron(II) ion	Fe^{2+}	3.2×10^{-10}		
iron(III) ion	Fe^{3+}	6.2×10^{-3}		
lithium ion	Li^{+}	1.6×10^{-14}		
magnesium ion	Mg^{2+}	4.0×10^{-12}		
nickel(II) ion	Ni^{2+}	2.5×10^{-11}		
potassium ion	K^{+}	7.9×10^{-16}		
sodium ion	Na^{+}	1.6×10^{-15}		
strontium ion	Sr^{2+}	6.3×10^{-14}		
zinc(II) ion	Zn^{2+}	2.5×10^{-10}		

Base Dissociation Constants

name	formula	K_b	name	formula	K_b
2,3-dimethylpyridine		3.8×10^{-8}	pyrazole		3.1×10^{-12}
2,4-dimethylpyridine		9.9×10^{-8}	pyridazine		1.8×10^{-12}
2,5-dimethylpyridine		2.5×10^{-8}	pyridine	C_5H_5N	1.7×10^{-9}
2,6-dimethylpyridine		4.5×10^{-8}	pyrimidine		1.7×10^{-13}
2-chloropyridine		3.1×10^{-14}	pyrrolidine	C_4H_8NH	2.1×10^{-3}
3,4-dimethylpyridine		2.9×10^{-8}	sec-butylamine		3.7×10^{-4}
3,5-dimethylpyridine		1.4×10^{-8}	strychnine	$C_{21}H_{22}N_2O_2$	1.8×10^{-6}
3-chloropyridine		6.5×10^{-12}	tert-butylamine		4.8×10^{-4}
4-chloropyridine		6.8×10^{-11}	triethylamine	$(C_2H_5)_3N$	5.7×10^{-4}
ammonia	NH_3	1.8×10^{-5}	trimethylamine	$(CH_3)_3N$	6.4×10^{-5}
aniline	$C_6H_5NH_2$	7.5×10^{-10}			
codeine	$C_{18}H_{21}NH_2$	1.6×10^{-6}	barium hydroxide	$Ba(OH)_2$	2.5×10^{-1}
decylamine	$(C_{10}H_{21})NH_2$	4.4×10^{-4}	calcium hydroxide	$Ca(OH)_2$	4.0×10^{-2}
diethylamine	$(C_2H_5)_2NH$	7.0×10^{-4}	lithium hydroxide	$LiOH$	6.4×10^{-1}
diisopropylamine	$(C_3H_7)_2NH$	1.1×10^{-3}	magnesium hydroxide	$Mg(OH)_2$	2.5×10^{-3}
dimethylamine	$(CH_3)_2NH$	5.4×10^{-4}	nickel(II) hydroxide	$Ni(OH)_2$	4.0×10^{-4}
ethanolamine	$HOC_2H_4NH_2$	3.2×10^{-5}	potassium hydroxide	KOH	$1.3 \times 10^{+1}$
ethylamine	$(C_2H_5)NH_2$	4.5×10^{-4}	sodium hydroxide	$NaOH$	6.4×10^0
heptylamine	$(C_7H_{15})NH_2$	4.7×10^{-4}	strontium hydroxide	$Sr(OH)_2$	1.6×10^{-1}
hexylamine	$(C_6H_{13})NH_2$	3.7×10^{-4}			
hydrazine	H_2NNH_2	1.3×10^{-6}			
hydroxylamine	$HONH_2$	8.8×10^{-9}			
imidazole		9.9×10^{-8}			
isopropylamine		4.3×10^{-4}			
methylamine	$(CH_3)NH_2$	4.6×10^{-4}			
morphine	$C_{17}H_{19}NO_3$	1.6×10^{-6}			
morpholine		3.2×10^{-6}			
n-butylamine	$(C_4H_9)NH_2$	4.0×10^{-4}			
nonylamine	$(C_9H_{19})NH_2$	4.4×10^{-4}			
octylamine	$(C_8H_{17})NH_2$	4.5×10^{-4}			
pentylamine	$(C_5H_{11})NH_2$	4.3×10^{-4}			
piperidine	$C_5H_{10}NH$	1.3×10^{-3}			
propylamine	$(C_3H_7)NH_2$	3.5×10^{-4}			

Solubility-Product Constants

name	formula	K_{sp}
aluminum hydroxide	$\text{Al}(\text{OH})_3$	1.9×10^{-33}
aluminum phosphate	AlPO_4	9.8×10^{-21}
barium carbonate	BaCO_3	2.6×10^{-9}
barium chromate	BaCrO_4	1.2×10^{-10}
barium fluoride	BaF_2	1.8×10^{-7}
barium hydroxide	$\text{Ba}(\text{OH})_2$	2.6×10^{-4}
barium sulfate	BaSO_4	1.1×10^{-10}
barium sulfite	BaSO_3	5.0×10^{-10}
beryllium hydroxide	$\text{Be}(\text{OH})_2$	6.9×10^{-22}
cadmium carbonate	CdCO_3	1.0×10^{-12}
cadmium hydroxide	$\text{Cd}(\text{OH})_2$	7.2×10^{-15}
cadmium phosphate	$\text{Cd}_3(\text{PO}_4)_2$	2.5×10^{-33}
cadmium sulfide	CdS	7.2×10^{-28}
calcium carbonate	CaCO_3	3.4×10^{-9}
calcium fluoride	CaF_2	3.5×10^{-11}
calcium hydroxide	$\text{Ca}(\text{OH})_2$	5.0×10^{-6}
calcium phosphate	$\text{Ca}_3(\text{PO}_4)_2$	2.1×10^{-33}
calcium sulfate	CaSO_4	4.9×10^{-5}
calcium sulfite	CaSO_3	3.1×10^{-7}
chromium(II) hydroxide	$\text{Cr}(\text{OH})_2$	2.0×10^{-16}
chromium(III) hydroxide	$\text{Cr}(\text{OH})_3$	6.3×10^{-31}
cobalt(II) carbonate	CoCO_3	1.4×10^{-13}
cobalt(II) hydroxide	$\text{Co}(\text{OH})_2$	5.9×10^{-15}
cobalt(II) phosphate	$\text{Co}_3(\text{PO}_4)_2$	2.1×10^{-35}
cobalt(II) sulfide	CoS	4.0×10^{-21}
cobalt(III) hydroxide	$\text{Co}(\text{OH})_3$	1.6×10^{-44}
copper(I) bromide	CuBr	6.3×10^{-9}
copper(I) chloride	CuCl	1.7×10^{-7}
copper(I) cyanide	CuCN	3.5×10^{-20}
copper(I) iodide	CuI	1.3×10^{-12}
copper(II) carbonate	CuCO_3	1.4×10^{-10}
copper(II) hydroxide	$\text{Cu}(\text{OH})_2$	2.2×10^{-20}
copper(II) phosphate	$\text{Cu}_3(\text{PO}_4)_2$	1.4×10^{-37}

name	formula	K_{sp}
copper(II) sulfide	CuS	5.4×10^{-37}
iron(II) carbonate	FeCO_3	3.1×10^{-11}
iron(II) hydroxide	$\text{Fe}(\text{OH})_2$	4.9×10^{-17}
iron(III) hydroxide	$\text{Fe}(\text{OH})_3$	2.8×10^{-39}
lead(II) bromide	PbBr_2	6.6×10^{-6}
lead(II) carbonate	PbCO_3	7.4×10^{-14}
lead(II) chloride	PbCl_2	1.7×10^{-5}
lead(II) chromate	PbCrO_4	2.8×10^{-13}
lead(II) fluoride	PbF_2	3.3×10^{-8}
lead(II) hydroxide	$\text{Pb}(\text{OH})_2$	1.4×10^{-20}
lead(II) iodide	PbI_2	9.8×10^{-9}
lead(II) sulfate	PbSO_4	2.5×10^{-8}
lead(II) sulfide	PbS	2.7×10^{-28}
magnesium carbonate	MgCO_3	6.8×10^{-6}
magnesium fluoride	MgF_2	5.2×10^{-11}
magnesium hydroxide	$\text{Mg}(\text{OH})_2$	5.6×10^{-12}
magnesium phosphate	$\text{Mg}_3(\text{PO}_4)_2$	1.0×10^{-24}
manganese(II) carbonate	MnCO_3	2.2×10^{-11}
manganese(II) hydroxide	$\text{Mn}(\text{OH})_2$	1.9×10^{-9}
manganese(II) sulfide	MnS	2.4×10^{-14}
mercury(I) bromide	Hg_2Br_2	6.4×10^{-23}
mercury(I) carbonate	Hg_2CO_3	3.6×10^{-17}
mercury(I) chloride	Hg_2Cl_2	1.4×10^{-18}
mercury(I) fluoride	Hg_2F_2	3.1×10^{-6}
mercury(I) iodide	Hg_2I_2	5.2×10^{-29}
mercury(II) sulfide	HgS	1.8×10^{-53}
nickel(II) carbonate	NiCO_3	1.4×10^{-7}
nickel(II) hydroxide	$\text{Ni}(\text{OH})_2$	5.5×10^{-16}
nickel(II) sulfide	NiS	3.0×10^{-19}
silver bromate	AgBrO_3	5.4×10^{-5}
silver bromide	AgBr	5.4×10^{-13}
silver carbonate	Ag_2CO_3	8.5×10^{-12}
silver chloride	AgCl	1.8×10^{-10}

Solubility-Product Constants		
name	formula	K_{sp}
silver chromate	Ag_2CrO_4	1.1×10^{-12}
silver cyanide	AgCN	6.0×10^{-17}
silver iodide	AgI	8.5×10^{-17}
silver phosphate	Ag_3PO_4	8.9×10^{-17}
silver sulfate	Ag_2SO_4	1.2×10^{-5}
silver sulfide	Ag_2S	5.4×10^{-51}
silver sulfite	Ag_2SO_3	1.5×10^{-14}
tin(II) hydroxide	$\text{Sn}(\text{OH})_2$	5.5×10^{-27}
tin(II) sulfide	SnS	9.0×10^{-27}
zinc carbonate	ZnCO_3	1.5×10^{-10}
zinc hydroxide	$\text{Zn}(\text{OH})_2$	3.0×10^{-17}
zinc sulfide	ZnS	1.8×10^{-25}

Ion Formation Constants		
name	formula	K_f
diamminesilver(I)	$\text{Ag}(\text{NH}_3)_2^+$	1.7×10^7
dicyanoargentate(I)	$\text{Ag}(\text{CN})_2^-$	5.6×10^{18}
dicyanocuprate(I)	$\text{Cu}(\text{CN})_2^-$	1.0×10^{16}
dithiosulfateargentate(I)	$\text{Ag}(\text{S}_2\text{O}_3)_2^{3-}$	2.9×10^{13}
hexaamminenickel(II)	$\text{Ni}(\text{NH}_3)_6^{2+}$	5.6×10^8
hexacyanoferrate(II)	$\text{Fe}(\text{CN})_6^{4-}$	7.7×10^{36}
hexacyanoferrate(III)	$\text{Fe}(\text{CN})_6^{3-}$	4.1×10^{42}
tetraamminecopper(II)	$\text{Cu}(\text{NH}_3)_4^{2+}$	5.6×10^{11}
tetraamminenickel(II)	$\text{Ni}(\text{NH}_3)_4^{2+}$	3.0×10^7
tetraamminezinc(II)	$\text{Zn}(\text{NH}_3)_4^{2+}$	5.1×10^8
tetracyanocuprate(I)	$\text{Cu}(\text{CN})_4^{3-}$	2.0×10^{30}
tetracyanocuprate(II)	$\text{Cu}(\text{CN})_4^{2-}$	1.0×10^{25}
tetracyanonickelate(II)	$\text{Ni}(\text{CN})_4^{2-}$	1.7×10^{30}
tetracyanozincate(II)	$\text{Zn}(\text{CN})_4^{2-}$	4.2×10^{19}
tetrahydroaluminate(III)	$\text{Al}(\text{OH})_4^-$	2.3×10^{33}
tetrahydroxyberyllate(II)	$\text{Be}(\text{OH})_4^{2-}$	4.0×10^{18}
tetrahydroxochromate(III)	$\text{Cr}(\text{OH})_4^-$	8.0×10^{29}
tetrahydroxocuprate(II)	$\text{Cu}(\text{OH})_4^{2-}$	4.0×10^{15}
tetrahydroxoferrate(II)	$\text{Fe}(\text{OH})_4^{2-}$	1.0×10^{10}
tetrahydroxoferrate(III)	$\text{Fe}(\text{OH})_4^-$	2.5×10^{34}
tetrahydroxogallate(III)	$\text{Ga}(\text{OH})_4^-$	2.5×10^{39}
tetrahydroxonickel(II)	$\text{Ni}(\text{OH})_4^{2-}$	2.0×10^{28}
tetrahydroxozincate(II)	$\text{Zn}(\text{OH})_4^{2-}$	3.2×10^{15}
trihydroxoplumbate(II)	$\text{Pb}(\text{OH})_3^-$	7.9×10^{13}
trihydroxostannate(II)	$\text{Sn}(\text{OH})_3^-$	2.5×10^{25}

Phase Transition Thermodynamic Data

formula	T_m (°C)	ΔH_{fus} (kJ/mol)	E_f (K·kg/mol)	T_b (°C)	ΔH_{vap} (kJ/mol)	E_b (K·kg/mol)
(CH ₃) ₂ CO						1.80
(CH ₃) ₂ SO			3.85			3.22
(C ₂ H ₅)O						2.20
(C ₆ H ₅) ₂ CO			8.58			
(C ₆ H ₅ CH ₂) ₂ O			6.17			
Ag	961.78	11.28				
AgBr	432	9.12		1502	198	
AgCl	455	13.2		1547	199	
AgNO ₃	212	11.5				
Ag ₂ S	825	14.1				
Al	660.32	10.789		2519	294	
AlBr ₃	97.5	11.25		255	23.5	
AlCl ₃	192.6	35.4				
Al ₂ O ₃	2053	111.4				
Au	1064.18	12.72		2856	324	
B	2075	50.2		4000	480.	
BBr ₃				91	30.5	
BCl ₃	−107	2.10		12.65	23.77	
B ₂ H ₆				−92.4	14.28	
B ₂ O ₃	450	24.56				
Ba	727	7.12		1897	140.	
BaBr ₂	857	32.2				
BaCl ₂	962	15.85				
BaO	1972	46				
BaS	2229	63				
BaSO ₄	1580	40.				
Be	1287	7.895				
BeBr ₂	508	18				
BeCl ₂	415	8.66		482	105	
BeO	2577	86				
Br ₂	−7.2	10.57				
C	4489	117				
CBr ₄	92.3	3.76				

Phase Transition Thermodynamic Data

formula	T_m (°C)	ΔH_{fus} (kJ/mol)	E_f (K·kg/mol)	T_b (°C)	ΔH_{vap} (kJ/mol)	E_b (K·kg/mol)
CCl ₄	−22.62	2.56		76.8	29.82	
CHCl ₃	−63.41	9.5		61.17	29.24	
CH ₂ Cl ₂	−97.2	4.60		49.6	28.06	2.42
CH ₃ CN						1.44
CH ₃ COC ₆ H ₅			5.16			
CH ₃ CONH ₂			3.92			
CH ₃ CO ₂ C ₂ H ₅						2.82
CH ₃ Cl	−97.7	6.43		−24.09	21.40	
CH ₃ NO			4.25			
CH ₃ OH	−97.53	3.215		64.6	35.21	0.86
CH ₄	−182.47	0.94		−161.48	8.19	
CO	−205.02	0.833		−191.5	6.04	
CO ₂	−56.56	9.02				
C ₁₀ H ₁₆ O			37.8			
C ₁₀ H ₈			7.45			
C ₁₃ H ₁₀ O			8.58			
C ₁₄ H ₁₄ O			6.17			
C ₂ H ₄	−169.15	3.35		−103.77	13.53	
C ₂ H ₅ NO			3.92			
C ₂ H ₅ OH	−114.14	4.931		78.29	38.56	1.23
C ₂ H ₆	−182.79	2.72		−88.6	14.69	
C ₂ H ₆ O ₂			3.11			2.26
C ₂ H ₆ SO			3.85			3.22
C ₃ H ₆ O						1.80
C ₃ H ₈	−187.63	3.50		−42.1	19.04	
C ₃ H ₈ O ₃			3.56			
C ₄ H ₁₀	−138.3	4.66		−0.5	22.44	
C ₄ H ₁₀ O						2.17
C ₄ H ₈ O ₂			4.63			3.01
C ₄ H ₉ OH						2.17
C ₅ H ₁₂	−129.67	8.40		36.06	25.79	
C ₅ H ₅ N			4.26			2.83
C ₆ H ₁₁ OH			42.2			

Phase Transition Thermodynamic Data

formula	T_m (°C)	ΔH_{fus} (kJ/mol)	E_f (K·kg/mol)	T_b (°C)	ΔH_{vap} (kJ/mol)	E_b (K·kg/mol)
C ₆ H ₁₂			20.8			2.92
C ₆ H ₁₄	−95.35	13.08		68.73	28.85	2.90
C ₆ H ₄ (CH ₃) ₂			4.31			4.25
C ₆ H ₅ CH ₃			3.55			3.40
C ₆ H ₅ CN			5.35			
C ₆ H ₅ NH ₂			5.23			3.82
C ₆ H ₅ NO ₂			6.87			5.20
C ₆ H ₅ OH			6.84			3.54
C ₆ H ₆	5.49	9.87	5.07	80.09	30.72	2.64
C ₇ H ₈			3.55			3.40
C ₈ H ₁₀			4.31			4.25
C ₈ H ₁₇ OH						5.06
C ₈ H ₈ O			5.16			
Ca	842	8.54				
CaBr ₂	742	29.1				
CaCl ₂	775	28.05				
CaO	2898	80.				
CaSO ₄	1460	28				
Cl ₂	−101.5	6.40		−34.04	20.41	
Cr	1907	21.0				
CrCl ₂	814	32.2				
Cr ₂ O ₃	2329	130.				
Cs	28.5	2.09				
CsCl	645	15.9				
Cu	1084.62	12.93				
CuCl	430	10.2				
CuCl ₂	630	20.4				
CuO	1446	11.8				
F ₂	−219.66	0.51		−188.12	6.62	
Fe	1538	13.81				
FeBr ₂	691	50.2				
FeCl ₂	677	43.01				
FeCl ₃	304	43.1				

Phase Transition Thermodynamic Data

formula	T_m (°C)	ΔH_{fus} (kJ/mol)	E_f (K·kg/mol)	T_b (°C)	ΔH_{vap} (kJ/mol)	E_b (K·kg/mol)
FeO	1377	24				
FeS	1188	31.5				
Fe ₃ O ₄	1597	138				
HBr	-86.80	2.41		-66.38	12.69	
HCHO ₂			2.38			
HCONH ₂			4.25			
HC ₂ H ₃ O ₂	16.64	11.73	3.63	117.9	23.70	3.22
HCl	-114.17	2.00				
HF	-83.35	4.58				
HI	-50.76	2.87		-35.55	19.76	
HNO ₃				83	39.1	
H ₂	-259.34	0.12		-252.87	0.90	
H ₂ O	0	6.010	1.86	100	40.657	0.513
H ₂ O ₂				150.2	51.6	
H ₂ S				-59.55	18.67	
H ₂ Se				-41.25	19.7	
H ₃ PO ₃	74.4	12.8				
H ₃ PO ₄	42.4	13.4				
Hg	-38.83	2.29		356.73	59.11	
HgBr ₂	236	17.9				
HgCl ₂	276	19.41				
I ₂	113.7	15.52		184.4	41.57	
K	63.5	2.33				
KBr	734	25.5				
KCl	771	26.53				
KNO ₃	337	10.1				
Li	180.50	3.00				
LiBr	552	17.6				
LiCl	610	19.9				
Mg	650	8.48				
MgBr ₂	711	39.3				
MgCl ₂	714	43.1				
MgO	2825	77				

Phase Transition Thermodynamic Data

formula	T_m (°C)	ΔH_{fus} (kJ/mol)	E_f (K·kg/mol)	T_b (°C)	ΔH_{vap} (kJ/mol)	E_b (K·kg/mol)
MgSO ₄	1127	14.6				
Mn	1246	12.91				
MnCl ₂	650	30.7				
MnO	1839	54.4				
NH ₃	−77.73	5.66		−33.33	23.33	
NH ₄ NO ₃	210	6.40				
NO	−163.6	2.30		−151.74	13.83	
N ₂	−210.0	0.71		−195.79	5.57	
N ₂ H ₄	1.4	12.6		113.55	41.8	
N ₂ O	−90.8	6.54		−88.48	16.53	
N ₂ O ₄	−9.3	14.65		21.15	38.12	
Na	97.80	2.60				
NaBr	747	26.11				
NaCl	800.7	28.16				
NaClO ₃	248	22.1				
NaNO ₃	307	15				
NaOH	323	6.60		1388	175	
Na ₂ O	1132	48				
Na ₂ S	1172	19				
Na ₂ SO ₄	884	23.6				
Ni	1455	17.04				
NiCl ₂	1009	71.2				
O ₂	−218.79	0.44		−182.95	6.82	
P	44.15	0.66		280.5	12.4	
PCl ₃	−112	7.10				
PH ₃				−87.75	14.6	
P ₂ O ₅	562	27.2				
Pb	327.46	4.782		1749	179.5	
PbBr ₂	371	16.44				
PbCl ₂	501	21.75				
PbS	1113	49.4				
Rb	39.3	2.19				
S				444.60	45	

Phase Transition Thermodynamic Data

formula	T_m (°C)	ΔH_{fus} (kJ/mol)	E_f (K·kg/mol)	T_b (°C)	ΔH_{vap} (kJ/mol)	E_b (K·kg/mol)
SO ₂				−10.05	24.94	
SO ₃	16.8	8.60		45	40.69	
Se	220.5	6.69		685	95.48	
Si	1414	50.21				
SiCl ₄	−68.74	7.60				
SiO ₂	1722	9.6				
Sn	231.93	7.173				
SnCl ₄	−34.07	9.20				
Ti	1668	14.15				
TiCl ₄	−24.12	9.97				
Zn	419.53	7.068				
ZnBr ₂	394	16.7				
ZnO	1974	52.3				

Standard State Thermodynamic Data

formula	ΔH_f° (kJ/mol)	S° (J/mol·K)	ΔG_f° (kJ/mol)
Ag(g)	284.9	173.0	233.3
Ag(s)	0	42.6	-12.7
AgBr(s)	-100.4	107.1	-132.3
AgBrO ₃ (s)	-10.5	151.9	-55.8
AgCl(s)	-127.0	96.3	-155.7
AgClO ₃ (s)	-30.3	142.0	-72.6
AgI(s)	-61.8	115.5	-96.2
AgNO ₃ (s)	-124.4	140.9	-166.4
Ag ₂ O(s)	-31.1	121.3	-67.3
Ag ₂ S(s)	-32.6	144.0	-75.5
Al(g)	330.0	164.6	280.9
Al(s)	0	28.3	-8.4
AlBr ₃ (s)	-527.2	180.2	-580.9
AlCl ₃ (s)	-704.2	109.3	-736.8
AlH ₃ (s)	-46.0	30.0	-54.9
Al ₂ O ₃ (s)	-1675.7	50.9	-1690.9
Au(g)	366.1	180.5	312.3
Au(s)	0	47.4	-14.1
B(g)	565.0	153.4	519.3
B(s)	0	5.9	-1.8
BBr ₃ (l)	-239.7	229.7	-308.2
BCl ₃ (l)	-427.2	206.3	-488.7
BH ₃ (g)	89.2	188.2	33.1
BO ₂ (g)	-300.4	229.6	-368.9
B ₂ H ₆ (g)	36.4	232.1	-32.8
B ₂ O ₃ (s)	-1273.5	54.0	-1289.6
Ba(g)	180.0	170.2	129.3
Ba(s)	0	62.5	-18.6
BaBr ₂ (s)	-757.3	146.0	-800.8
BaCO ₃ (s)	-1213.0	112.1	-1246.4
BaCl ₂ (s)	-855.0	123.7	-891.9
BaO(s)	-548.0	72.1	-569.5
BaS(s)	-460.0	78.2	-483.3

formula	ΔH_f° (kJ/mol)	S° (J/mol·K)	ΔG_f° (kJ/mol)
BaSO ₄ (s)	-1473.2	132.2	-1512.6
Be(OH) ₂ (s)	-902.5	45.5	-916.1
Be(g)	324.0	136.3	283.4
Be(s)	0	9.5	-2.8
BeBr ₂ (s)	-353.5	108.0	-385.7
BeCl ₂ (s)	-490.4	75.8	-513.0
BeO(s)	-609.4	13.8	-613.5
BeS(s)	-234.3	34.0	-244.4
Br(g)	111.9	175.0	59.7
BrF ₃ (g)	-255.6	292.5	-342.8
BrF ₃ (l)	-300.8	178.2	-353.9
BrF ₅ (g)	-428.9	320.2	-524.4
BrF ₅ (l)	-458.6	225.1	-525.7
Br ₂ (g)	30.9	245.5	-42.3
Br ₂ (l)	0	152.2	-45.4
C(diamond)	1.9	2.4	1.2
C(g)	716.7	158.1	669.6
C(graphite)	0	5.7	-1.7
C(s)	0	5.7	-1.7
CBr ₄ (g)	83.9	358.1	-22.9
CBr ₄ (s)	29.4	212.5	-34.0
CCl ₄ (g)	-95.7	309.7	-188.0
CCl ₄ (l)	-128.2	214.4	-192.1
CHCl ₃ (g)	-102.7	295.7	-190.9
CHCl ₃ (l)	-134.1	201.7	-194.2
CH ₂ Cl ₂ (g)	-95.4	270.2	-176.0
CH ₂ Cl ₂ (l)	-124.2	177.8	-177.2
CH ₂ O(g)	-108.6	218.8	-173.8
CH ₂ O ₂ (l)	-425.0	129.0	-463.5
CH ₃ CH(CH ₃)OH(l)	-318.1	181.1	-372.1
CH ₃ CHO(g)	-166.2	263.8	-244.9
CH ₃ Cl(g)	-81.9	234.6	-151.8
CH ₃ OH(g)	-201.0	239.9	-272.5

Standard State Thermodynamic Data

formula	ΔH_f° (kJ/mol)	S° (J/mol·K)	ΔG_f° (kJ/mol)
CH ₃ OH(g)	-201.0	239.9	-272.5
CH ₃ OH(l)	-239.2	126.8	-277.0
CH ₃ OH(l)	-239.2	126.8	-277.0
CH ₄ (g)	-74.6	186.3	-130.1
CO(g)	-110.5	197.7	-169.4
COBr ₂ (g)	-96.2	309.1	-188.4
COCl ₂ (g)	-219.1	283.5	-303.6
CO ₂ (g)	-393.5	213.8	-457.2
CS ₂ (g)	116.7	237.8	45.8
CS ₂ (l)	89.0	151.3	43.9
C ₂ H ₂ (g)	227.4	200.9	167.5
C ₂ H ₄ (g)	52.4	219.3	-13.0
C ₂ H ₄ O(g)	-52.6	242.5	-124.9
C ₂ H ₅ OH(g)	-234.8	281.6	-318.8
C ₂ H ₅ OH(l)	-277.6	160.7	-325.5
C ₂ H ₆ (g)	-84.0	229.2	-152.3
C ₃ H ₇ OH(l)	-302.6	193.6	-360.3
C ₃ H ₈ (g)	-103.8	270.3	-184.4
C ₄ H ₁₀ (g)	-125.7	310.0	-218.1
C ₄ H ₁₀ (l)	-147.3	226.8	-214.9
C ₅ H ₁₂ (l)	-173.5	263.5	-252.1
C ₅ H ₅ N(l)	100.2	177.9	47.2
C ₆ H ₁₂ O ₆ (s)	-1273.3	209.2	-1335.7
C ₆ H ₁₄ (l)	-198.7	296.1	-287.0
C ₆ H ₅ Br(l)	60.9	219.2	-4.5
C ₆ H ₅ CH(CH ₃) ₂ (l)	-41.1	277.6	-123.9
C ₆ H ₅ CHO(l)	-87.0	221.2	-153.0
C ₆ H ₅ CH ₃ (l)	12.4	220.1	-53.2
C ₆ H ₅ C ₂ H ₃ (l)	103.8	240.5	32.1
C ₆ H ₅ C ₂ H ₅ (l)	-12.3	255.0	-88.3
C ₆ H ₅ C ₃ H ₇ (l)	-38.3	287.8	-124.1
C ₆ H ₅ Cl(l)	11.1	197.5	-47.8
C ₆ H ₅ F(l)	-150.6	205.9	-212.0

formula	ΔH_f° (kJ/mol)	S° (J/mol·K)	ΔG_f° (kJ/mol)
C ₆ H ₅ I(l)	117.2	205.4	56.0
C ₆ H ₅ NH ₂ (l)	31.6	191.3	-25.4
C ₆ H ₅ NO ₂ (l)	12.5	224.3	-54.4
C ₆ H ₅ OH(s)	-165.1	144.0	-208.0
C ₆ H ₆ (g)	82.9	269.2	2.6
C ₆ H ₆ (l)	49.1	173.4	-2.6
C ₇ H ₁₆ (l)	-224.2	328.6	-322.2
C ₇ H ₈ (l)	12.4	220.1	-53.2
C ₈ H ₁₈ (l)	-250.1	361.2	-357.8
Ca(NO ₃) ₂ (s)	-938.2	193.2	-995.8
Ca(OH) ₂ (s)	-985.2	83.4	-1010.1
Ca(g)	177.8	154.9	131.6
Ca(s)	0	41.6	-12.4
CaBr ₂ (s)	-682.8	130.0	-721.6
CaCO ₃ (s)	-1207.6	91.7	-1234.9
CaCl ₂ (s)	-795.4	108.4	-827.7
CaF ₂ (s)	-1228.0	68.5	-1248.4
CaI ₂ (s)	-533.5	142.0	-575.8
CaO(s)	-634.9	38.1	-646.3
CaSO ₄ (s)	-1434.5	106.5	-1466.3
Cl(g)	121.3	165.2	72.0
ClNO(g)	51.7	261.7	-26.3
ClNO ₂ (g)	12.6	272.2	-68.6
Cl ₂ (g)	0	223.1	-66.5
Cr(g)	396.6	174.5	344.6
Cr(s)	0	23.8	-7.1
CrCl ₂ (s)	-395.4	115.3	-429.8
CrCl ₃ (s)	-556.5	123.0	-593.2
Cr ₂ O ₃ (s)	-1139.7	81.2	-1163.9
Cs(g)	76.5	175.6	24.1
Cs(s)	0	85.2	-25.4
CsBr(s)	-405.8	113.1	-439.5
CsCl(s)	-443.0	101.2	-473.2

Standard State Thermodynamic Data

formula	ΔH_f° (kJ/mol)	S° (J/mol·K)	ΔG_f° (kJ/mol)
CsF(s)	-553.3	92.8	-581.0
CsI(s)	-346.6	123.1	-383.3
Cs ₂ O(s)	-345.8	146.9	-389.6
Cu(g)	337.4	166.4	287.8
Cu(s)	0	33.2	-9.9
CuBr(s)	-104.6	96.1	-133.3
CuCl(s)	-137.2	86.2	-162.9
CuCl ₂ (s)	-220.1	108.1	-252.3
CuO(s)	-157.3	42.6	-170.0
Cu ₂ O(s)	-168.6	93.1	-196.4
F(g)	79.4	158.8	32.1
F ₂ (g)	0	202.8	-60.5
Fe(g)	416.3	180.5	362.5
Fe(s)	0	27.3	-8.1
FeBr ₂ (s)	-249.8	140.6	-291.7
FeCl ₂ (s)	-341.8	118.0	-377.0
FeCl ₃ (s)	-399.5	142.3	-441.9
FeS(s)	-100.0	60.3	-118.0
FeS ₂ (s)	-178.2	52.9	-194.0
Fe ₂ O ₃ (s)	-824.2	87.4	-850.3
Fe ₃ O ₄ (s)	-1118.4	146.4	-1162.0
H(g)	218.0	114.7	183.8
HBr(g)	-36.3	198.7	-95.5
HCN(g)	135.1	201.8	74.9
HC ₂ H ₃ O ₂ (g)	-432.2	283.5	-516.7
HC ₂ H ₃ O ₂ (l)	-484.3	159.8	-531.9
HCl(g)	-92.3	186.9	-148.0
HF(g)	-273.3	173.8	-325.1
HI(g)	26.5	206.6	-35.1
HNO ₃ (g)	-133.9	266.9	-213.5
HNO ₃ (l)	-174.1	155.6	-220.5
H ₂ (g)	0	130.7	-39.0
H ₂ O(g)	-241.8	188.8	-298.1

formula	ΔH_f° (kJ/mol)	S° (J/mol·K)	ΔG_f° (kJ/mol)
H ₂ O(l)	-285.8	70.0	-306.7
H ₂ O ₂ (g)	-136.3	232.7	-205.7
H ₂ O ₂ (l)	-187.8	109.6	-220.5
H ₂ S(g)	-20.6	205.8	-82.0
H ₂ SO ₄ (l)	-814.0	156.9	-860.8
H ₂ Se(g)	29.7	219.0	-35.6
H ₃ PO ₃ (s)	-964.4		
H ₃ PO ₄ (l)	-1271.7	150.8	-1316.7
Hg(g)	61.4	175.0	9.2
Hg(l)	0	75.9	-22.6
HgBr ₂ (s)	-170.7	172.0	-222.0
HgCl ₂ (s)	-224.3	146.0	-267.8
HgO(s)	-90.8	70.3	-111.8
Hg ₂ (g)	108.8	288.1	22.9
Hg ₂ Br ₂ (s)	-206.9	218.0	-271.9
Hg ₂ Cl ₂ (s)	-265.4	191.6	-322.5
I(g)	106.8	180.8	52.9
I ₂ (g)	62.4	260.7	-15.3
I ₂ (s)	0	116.1	-34.6
K(g)	89.0	160.3	41.2
K(s)	0	64.7	-19.3
KBr(s)	-393.8	95.9	-422.4
KBrO ₃ (s)	-360.2	149.2	-404.7
KCl(s)	-436.5	82.6	-461.1
KClO ₃ (s)	-397.7	143.1	-440.4
KClO ₄ (s)	-432.8	151.0	-477.8
KF(s)	-567.3	66.6	-587.2
KI(s)	-327.9	106.3	-359.6
KMnO ₄ (s)	-837.2	171.7	-888.4
KNO ₂ (s)	-369.8	152.1	-415.1
KNO ₃ (s)	-494.6	133.1	-534.3
KOH(s)	-424.6	81.2	-448.8
KO ₂ (s)	-284.9	116.7	-319.7

Standard State Thermodynamic Data

formula	ΔH_f° (kJ/mol)	S° (J/mol·K)	ΔG_f° (kJ/mol)
K ₂ CO ₃ (s)	-1150.2	155.4	-1196.5
K ₂ O ₂ (s)	-494.1	102.1	-524.5
Li(g)	159.3	138.8	117.9
Li(s)	0	29.1	-8.7
LiBr(s)	-351.2	74.3	-373.4
LiCl(s)	-408.6	59.3	-426.3
LiF(s)	-616.0	35.7	-626.6
LiI(s)	-270.4	86.8	-296.3
Li ₂ O(s)	-597.9	37.6	-609.1
Mg(g)	147.1	148.6	102.8
Mg(s)	0	32.7	-9.7
MgBr ₂ (s)	-524.3	117.2	-559.2
MgCO ₃ (s)	-1095.8	65.7	-1115.4
MgCl ₂ (s)	-641.3	89.6	-668.0
MgO(s)	-601.6	27.0	-609.7
Mn(g)	280.7	173.7	228.9
Mn(s)	0	32.0	-9.5
MnCl ₂ (s)	-481.3	118.2	-516.5
MnO(s)	-385.2	59.7	-403.0
MnO ₂ (s)	-520.0	53.1	-535.8
N(g)	472.7	153.3	427.0
NH ₂ CH ₂ CO ₂ H(s)	-527.5	103.5	-558.4
NH ₃ (g)	-45.9	192.8	-103.4
NH ₄ Cl(s)	-314.4	94.6	-342.6
NH ₄ NO ₃ (s)	-365.6	151.1	-410.7
NO(g)	91.3	210.8	28.4
NOCl(g)	51.7	261.7	-26.3
NO ₂ (g)	33.2	240.1	-38.4
N ₂ (g)	0	191.6	-57.1
N ₂ H ₄ (g)	95.4	238.5	24.3
N ₂ H ₄ (l)	50.6	121.2	14.5
N ₂ O(g)	81.6	220.0	16.0

formula	ΔH_f° (kJ/mol)	S° (J/mol·K)	ΔG_f° (kJ/mol)
N ₂ O ₃ (g)	86.6	314.7	-7.2
N ₂ O ₄ (g)	11.1	304.4	-79.7
Na(g)	107.5	153.7	61.7
Na(s)	0	51.3	-15.3
NaBr(s)	-361.1	86.8	-387.0
NaCl(s)	-411.2	72.1	-432.7
NaClO ₃ (s)	-365.8	123.4	-402.6
NaClO ₄ (s)	-383.3	142.3	-425.7
NaF(s)	-576.6	51.1	-591.8
NaHCO ₃ (s)	-950.8	101.7	-981.1
NaI(s)	-287.8	98.5	-317.2
NaNO ₂ (s)	-358.7	103.8	-389.6
NaNO ₃ (s)	-467.9	116.5	-502.6
NaOH(s)	-425.8	64.4	-445.0
NaO ₂ (s)	-260.2	115.9	-294.8
Na ₂ CO ₃ (s)	-1130.7	135.0	-1171.0
Na ₂ O(s)	-414.2	75.1	-436.6
Na ₂ O ₂ (s)	-510.9	95.0	-539.2
Na ₂ S(s)	-364.8	83.7	-389.8
Na ₂ SO ₃ (s)	-1100.8	145.9	-1144.3
Na ₂ SO ₄ (s)	-1387.1	149.6	-1431.7
Ni(g)	429.7	182.2	375.4
Ni(s)	0	29.9	-8.9
NiCl ₂ (s)	-305.3	97.7	-334.4
O(g)	249.2	161.1	201.2
O ₂ (g)	0	205.2	-61.2
O ₃ (g)	142.7	238.9	71.5
P(g)	316.5	163.2	267.8
P(red)	-17.6	22.8	-24.4
P(s)	0	41.1	-12.3
P(white)	0	41.1	-12.3
PBr ₃ (g)	-139.3	348.1	-243.1
PBr ₃ (l)	-184.5	240.2	-256.1

Standard State Thermodynamic Data

formula	ΔH_f° (kJ/mol)	S° (J/mol·K)	ΔG_f° (kJ/mol)
PCl ₃ (g)	-287.2	311.8	-380.2
PCl ₃ (l)	-319.7	217.1	-384.4
PCl ₅ (g)	-374.9	364.6	-483.6
PH ₃ (g)	5.4	210.2	-57.3
POCl ₃ (g)	-558.5	325.5	-655.5
POCl ₃ (l)	-597.1	222.5	-663.4
P ₄ (g)	58.9	280.0	-24.6
P ₄ O ₁₀ (s)	-3009.9	228.8	-3078.1
Pb(g)	195.2	175.4	142.9
Pb(s)	0	64.8	-19.3
PbBr ₂ (s)	-278.7	161.5	-326.9
PbCO ₃ (s)	-699.1	131.0	-738.2
PbCl ₂ (s)	-359.4	136.0	-399.9
PbO(s)	-217.3	68.7	-237.8
Rb(g)	80.9	170.1	30.2
Rb(s)	0	76.8	-22.9
RbBr(s)	-394.6	110.0	-427.4
RbCl(s)	-435.4	95.9	-464.0
S(g)	277.2	167.8	227.2
S(monoclinic)	0.3	33.2	-9.6
S(rhombic)	0	32.1	-9.6
S(s)	0	32.1	-9.6
SO(g)	6.3	222.0	-59.9
SOCl ₂ (g)	-212.5	309.8	-304.9
SO ₂ (g)	-296.8	248.2	-370.8
SO ₂ Cl ₂ (g)	-364.0	311.9	-457.0
SO ₃ (g)	-395.7	256.8	-472.3
Se(g)	227.1	176.7	174.4
Se(s)	0	42.4	-12.6
Si(g)	450.0	168.0	399.9
Si(s)	0	18.8	-5.6
SiBr ₄ (l)	-457.3	277.8	-540.1
SiC(s)	-65.3	16.6	-70.2

formula	ΔH_f° (kJ/mol)	S° (J/mol·K)	ΔG_f° (kJ/mol)
SiCl ₄ (g)	-657.0	330.7	-755.6
SiCl ₄ (l)	-687.0	239.7	-758.5
SiO ₂ (s)	-910.7	41.5	-923.1
Sn(g)	301.2	168.5	251.0
Sn(s)	0	51.2	-15.3
SnCl ₄ (l)	-511.3	258.6	-588.4
Ti(g)	473.0	180.3	419.2
Ti(s)	0	30.7	-9.2
TiCl ₂ (s)	-513.8	87.4	-539.9
TiCl ₃ (s)	-720.9	139.7	-762.6
TiCl ₄ (g)	-763.2	353.2	-868.5
TiCl ₄ (l)	-804.2	252.3	-879.4
TiO ₂ (s)	-944.0	50.6	-959.1
Zn(g)	130.4	161.0	82.4
Zn(s)	0	41.6	-12.4
ZnBr ₂ (s)	-328.7	138.5	-370.0
ZnCO ₃ (s)	-812.8	82.4	-837.4
ZnCl ₂ (s)	-415.1	111.5	-448.3
ZnO(s)	-350.5	43.7	-363.5

Standard Aqueous Thermodynamic Data

formula	ΔH_f^0 (kJ/mol)	ΔS^0 (J/mol·K)	ΔG_f^0 (kJ/mol)
Ca(NO ₃) ₂ (aq)	-957.6	239.7	-1029.1
CaCl ₂ (aq)	-877.1	59.8	-894.9
CaSO ₄ (aq)	-1452.1	-33.1	-1442.2
HBr(aq)	-121.6	82.4	-146.2
HCN(aq)	150.6	94.1	122.5
HC ₂ H ₃ O ₂ (aq)	-486.0	86.6	-511.8
HCl(aq)	-167.2	56.5	-184.0
HF(aq)	-332.6	-13.8	-328.5
HI(aq)	-55.2	111.3	-88.4
HNO ₃ (aq)	-207.4	146.4	-251.0
H ₂ SO ₄ (aq)	-909.3	20.1	-915.3
H ₃ PO ₃ (aq)	-964.8		
H ₃ PO ₄ (aq)	-1277.4	220.5	-1343.1
KOH(aq)	-482.4	91.7	-509.7
NH ₃ (aq)	-80.3	111.3	-113.5
NaCl(aq)	-407.3	115.5	-441.7
NaOH(aq)	-470.1	48.2	-484.5

Enthalpies of Solution

formula	ΔH_{sol} (kJ/mol)	formula	ΔH_{sol} (kJ/mol)	formula	ΔH_{sol} (kJ/mol)
AgClO ₄	+7.36	KMnO ₄	+43.56	NaNO ₃	+20.50
AgNO ₂	+36.94	KNO ₂	+13.35	NaOH	−44.51
AgNO ₃	+22.59	KNO ₃	+34.89	RbBr	+21.88
Ca(NO ₃) ₂	−19.40	KOH	−57.61	RbCl	+17.28
Ca(OH) ₂	−17.60	LiBr	−48.83	RbClO ₃	+47.74
CaCl ₂	−81.80	LiCl	−37.03	RbClO ₄	+56.74
CaF ₂	+20.00	LiClO ₄	−26.55	RbF	−26.11
CaSO ₄	−17.60	LiF	+4.73	RbI	+25.10
CsBr	+25.98	LiI	−63.30	RbNO ₃	+36.48
CsCl	+17.78	LiNO ₂	−11.00	RbOH	−62.34
CsClO ₄	+55.44	LiNO ₃	−2.51		
CsF	−36.86	LiOH	−23.56		
CsI	+33.35	NH ₃	−30.50		
CsNO ₃	+40.00	NH ₄ Br	+16.78		
CsOH	−71.55	NH ₄ CN	+17.57		
HBr	−85.14	NH ₄ C ₂ H ₃ O ₂	−2.38		
HCO ₂ H	−0.86	NH ₄ Cl	+14.78		
HC ₂ H ₃ O ₂	−1.51	NH ₄ ClO ₄	+33.47		
HCl	−74.84	NH ₄ I	+13.72		
HClO ₄	−88.76	NH ₄ IO ₃	+31.80		
HF	−61.50	NH ₄ NO ₂	+19.25		
HI	−81.67	NH ₄ NO ₃	+25.69		
HIO ₃	+8.79	NaBr	−0.60		
HNO ₃	−33.28	NaCN	+1.21		
KBr	+19.87	NaC ₂ H ₃ O ₂	−17.32		
KCN	+11.72	NaCl	+3.88		
KC ₂ H ₃ O ₂	−15.33	NaClO ₂	+0.33		
KCl	+17.22	NaClO ₃	+21.72		
KClO ₃	+41.38	NaClO ₄	+13.88		
KClO ₄	+51.04	NaF	+0.91		
KF	−17.73	NaI	−7.53		
KI	+20.33	NaIO ₃	+20.29		
KIO ₃	+27.74	NaNO ₂	+13.89		

Lattice Enthalpies

formula	ΔH_{latt} (kJ/mol)	formula	ΔH_{latt} (kJ/mol)	formula	ΔH_{latt} (kJ/mol)
(NH ₄) ₂ SO ₄	1777	FeCl ₃	5436	NH ₄ CN	691
AgBr	905	KBr	691	NH ₄ HCO ₃	577
AgCl	918	KCN	686	NaBr	754
AgNO ₃	832	KC ₂ H ₃ O ₂	726	NaCN	759
Al(OH) ₃	5627	KCl	720.	NaC ₂ H ₃ O ₂	807
AlBr ₃	5360.	KF	829	NaCl	790.
AlCl ₃	5513	KH	713	NaF	930.
AlF ₃	6252	KHCO ₃	573	NaH	807
AlH ₃	5969	KI	650.	NaHCO ₃	656
AlI ₃	5227	KNO ₂	687	NaI	705
AuBr	1059	KNO ₃	694	NaNO ₂	772
AuCl	1066	KN ₃	697	NaNO ₃	763
Ca(NO ₃) ₂	2247	KOH	796	NaN ₃	784
Ca(OH) ₂	2637	K ₂ CO ₃	1846	NaOH	892
CaBr ₂	2132	K ₂ SO ₄	1796	Na ₂ CO ₃	2016
CaCO ₃	2811	LiBr	820.	Na ₂ SO ₄	1938
CaCl ₂	2271	LiCN	874	Ni(NO ₃) ₂	2729
CaF ₂	2651	LiC ₂ H ₃ O ₂	843	Ni(OH) ₂	3186
CaH ₂	2406	LiCl	864	NiBr ₂	2721
CaI ₂	2087	LiF	1049	NiCl ₂	2786
CaSO ₄	2480.	LiH	918	Pb(NO ₃) ₂	2208
Cr(OH) ₃	6299	LiI	764	PbBr ₂	2230.
CrBr ₃	5355	LiNO ₃	854	PbCO ₃	2750.
CrCl ₃	5529	LiN ₃	875	PbCl ₂	2282
Cu(NO ₃) ₂	2739	LiOH	1028	SnCl ₂	2310.
CuBr	978	Li ₂ SO ₄	2142	SnCl ₄	8930.
CuBr ₂	2774	Mg(NO ₃) ₂	2521	TiBr ₄	9288
CuCO ₃	3494	Mg(OH) ₂	2998	TiCl ₄	9431
CuCl	996	MgBr ₂	2451	Zn(NO ₃) ₂	2649
CuCl ₂	2824	MgCO ₃	3122	Zn(OH) ₂	3151
Fe(OH) ₂	3044	MgCl ₂	2540.	ZnBr ₂	2689
FeBr ₂	2577	MgF ₂	2978	ZnCO ₃	3273
FeBr ₃	5347	MgH ₂	2718	ZnCl ₂	2748
FeCO ₃	3169	MgI ₂	2340.		
FeCl ₂	2641	MnCO ₃	3095		

Standard Electrode Potentials

half-reaction	E^0 (V)	half-reaction	E^0 (V)
$\text{F}_2(\text{g}) + 2 \text{e}^- \rightarrow 2 \text{F}^-(\text{aq})$	+2.866	$\text{Hg}_2^{2+}(\text{aq}) + 2 \text{e}^- \rightarrow 2 \text{Hg}(\text{l})$	+0.797
$\text{O}_3(\text{g}) + 2 \text{H}^+(\text{aq}) + 2 \text{e}^- \rightarrow \text{O}_2(\text{g}) + \text{H}_2\text{O}(\text{l})$	+2.076	$\text{Fe}^{3+}(\text{aq}) + \text{e}^- \rightarrow \text{Fe}^{2+}(\text{aq})$	+0.771
$\text{Co}^{3+}(\text{aq}) + \text{e}^- \rightarrow \text{Co}^{2+}(\text{aq})$	+1.920	$2 \text{NO}(\text{g}) + \text{H}_2\text{O}(\text{l}) + 2 \text{e}^- \rightarrow \text{N}_2\text{O}(\text{g}) + 2 \text{OH}^-(\text{aq})$	+0.760
$\text{H}_2\text{O}_2(\text{aq}) + 2 \text{H}^+(\text{aq}) + 2 \text{e}^- \rightarrow 2 \text{H}_2\text{O}(\text{l})$	+1.776	$\text{O}_2(\text{g}) + 2 \text{H}^+(\text{aq}) + 2 \text{e}^- \rightarrow \text{H}_2\text{O}_2(\text{aq})$	+0.695
$\text{PbO}_2(\text{s}) + \text{SO}_4^{2-}(\text{aq}) + 4 \text{H}^+(\text{aq}) + 2 \text{e}^- \rightarrow \text{PbSO}_4(\text{s}) + 2 \text{H}_2\text{O}(\text{l})$	+1.691	$\text{ClO}_3^-(\text{aq}) + 3 \text{H}_2\text{O}(\text{l}) + 6 \text{e}^- \rightarrow \text{Cl}^-(\text{aq}) + 6 \text{OH}^-(\text{aq})$	+0.620
$\text{MnO}_4^-(\text{aq}) + 4 \text{H}^+(\text{aq}) + 3 \text{e}^- \rightarrow \text{MnO}_2(\text{s}) + 2 \text{H}_2\text{O}(\text{l})$	+1.679	$\text{MnO}_4^-(\text{aq}) + 2 \text{H}_2\text{O}(\text{l}) + 3 \text{e}^- \rightarrow \text{MnO}_2(\text{s}) + 4 \text{OH}^-(\text{aq})$	+0.595
$2 \text{HClO}(\text{aq}) + 2 \text{H}^+(\text{aq}) + 2 \text{e}^- \rightarrow \text{Cl}_2(\text{g}) + 2 \text{H}_2\text{O}(\text{l})$	+1.611	$\text{S}_2\text{O}_6^{2-}(\text{aq}) + 4 \text{H}^+(\text{aq}) + 2 \text{e}^- \rightarrow 2 \text{H}_2\text{SO}_3(\text{aq})$	+0.564
$2 \text{NO}(\text{g}) + 2 \text{H}^+(\text{aq}) + 2 \text{e}^- \rightarrow \text{N}_2\text{O}(\text{g}) + \text{H}_2\text{O}(\text{l})$	+1.591	$\text{I}_3^-(\text{aq}) + 2 \text{e}^- \rightarrow 3 \text{I}^-(\text{aq})$	+0.536
$\text{MnO}_4^-(\text{aq}) + 8 \text{H}^+(\text{aq}) + 5 \text{e}^- \rightarrow \text{Mn}^{2+}(\text{aq}) + 4 \text{H}_2\text{O}(\text{l})$	+1.507	$\text{I}_2(\text{s}) + 2 \text{e}^- \rightarrow 2 \text{I}^-(\text{aq})$	+0.535
$\text{Au}^{3+}(\text{aq}) + 3 \text{e}^- \rightarrow \text{Au}(\text{s})$	+1.498	$\text{Cu}^+(\text{aq}) + \text{e}^- \rightarrow \text{Cu}(\text{s})$	+0.521
$\text{HClO}(\text{aq}) + \text{H}^+(\text{aq}) + 2 \text{e}^- \rightarrow \text{Cl}^-(\text{aq}) + \text{H}_2\text{O}(\text{l})$	+1.482	$\text{O}_2(\text{g}) + 2 \text{H}_2\text{O}(\text{l}) + 4 \text{e}^- \rightarrow 4 \text{OH}^-(\text{aq})$	+0.401
$2 \text{ClO}_3^-(\text{aq}) + 12 \text{H}^+(\text{aq}) + 10 \text{e}^- \rightarrow \text{Cl}_2(\text{g}) + 6 \text{H}_2\text{O}(\text{l})$	+1.470	$\text{ClO}_4^-(\text{aq}) + \text{H}_2\text{O}(\text{l}) + 2 \text{e}^- \rightarrow \text{ClO}_3^-(\text{aq}) + 2 \text{OH}^-(\text{aq})$	+0.360
$\text{PbO}_2(\text{s}) + 4 \text{H}^+(\text{aq}) + 2 \text{e}^- \rightarrow \text{Pb}^{2+}(\text{aq}) + 2 \text{H}_2\text{O}(\text{l})$	+1.455	$\text{Cu}^{2+}(\text{aq}) + 2 \text{e}^- \rightarrow \text{Cu}(\text{s})$	+0.342
$\text{Cl}_2(\text{g}) + 2 \text{e}^- \rightarrow 2 \text{Cl}^-(\text{aq})$	+1.358	$\text{PbO}_2(\text{s}) + \text{H}_2\text{O}(\text{l}) + 2 \text{e}^- \rightarrow \text{PbO}(\text{s}) + 2 \text{OH}^-(\text{aq})$	+0.247
$\text{HCrO}_4^-(\text{aq}) + 7 \text{H}^+(\text{aq}) + 3 \text{e}^- \rightarrow \text{Cr}^{3+}(\text{aq}) + 4 \text{H}_2\text{O}(\text{l})$	+1.350	$\text{AgCl}(\text{s}) + \text{e}^- \rightarrow \text{Ag}(\text{s}) + \text{Cl}^-(\text{aq})$	+0.222
$2 \text{HNO}_2(\text{aq}) + 4 \text{H}^+(\text{aq}) + 4 \text{e}^- \rightarrow \text{N}_2\text{O}(\text{g}) + 3 \text{H}_2\text{O}(\text{l})$	+1.297	$\text{SO}_4^{2-}(\text{aq}) + 4 \text{H}^+(\text{aq}) + 2 \text{e}^- \rightarrow \text{H}_2\text{SO}_3(\text{aq}) + \text{H}_2\text{O}(\text{l})$	+0.172
$\text{Cr}_2\text{O}_7^{2-}(\text{aq}) + 14 \text{H}^+(\text{aq}) + 6 \text{e}^- \rightarrow 2 \text{Cr}^{3+}(\text{aq}) + 7 \text{H}_2\text{O}(\text{l})$	+1.232	$\text{Cu}^{2+}(\text{aq}) + \text{e}^- \rightarrow \text{Cu}^+(\text{aq})$	+0.153
$\text{O}_2(\text{g}) + 4 \text{H}^+(\text{aq}) + 4 \text{e}^- \rightarrow 2 \text{H}_2\text{O}(\text{l})$	+1.229	$\text{Sn}^{4+}(\text{aq}) + 2 \text{e}^- \rightarrow \text{Sn}^{2+}(\text{aq})$	+0.151
$\text{MnO}_2(\text{s}) + 4 \text{H}^+(\text{aq}) + 2 \text{e}^- \rightarrow \text{Mn}^{2+}(\text{aq}) + 2 \text{H}_2\text{O}(\text{l})$	+1.224	$2 \text{NO}_2^-(\text{aq}) + 3 \text{H}_2\text{O}(\text{l}) + 4 \text{e}^- \rightarrow \text{N}_2\text{O}(\text{g}) + 6 \text{OH}^-(\text{aq})$	+0.150
$\text{ClO}_3^-(\text{aq}) + 3 \text{H}^+(\text{aq}) + 2 \text{e}^- \rightarrow \text{HClO}_2(\text{aq}) + \text{H}_2\text{O}(\text{l})$	+1.214	$\text{S}_4\text{O}_6^{2-}(\text{aq}) + 2 \text{e}^- \rightarrow 2 \text{S}_2\text{O}_3^{2-}(\text{aq})$	+0.080
$\text{ClO}_4^-(\text{aq}) + 2 \text{H}^+(\text{aq}) + 2 \text{e}^- \rightarrow \text{ClO}_3^-(\text{aq}) + \text{H}_2\text{O}(\text{l})$	+1.189	$\text{NO}_3^-(\text{aq}) + \text{H}_2\text{O}(\text{l}) + 2 \text{e}^- \rightarrow \text{NO}_2^-(\text{aq}) + 2 \text{OH}^-(\text{aq})$	+0.010
$\text{ClO}_3^-(\text{aq}) + 2 \text{H}^+(\text{aq}) + \text{e}^- \rightarrow \text{ClO}_2(\text{g}) + \text{H}_2\text{O}(\text{l})$	+1.152	$2 \text{H}^+(\text{aq}) + 2 \text{e}^- \rightarrow \text{H}_2(\text{g})$	0.000
$\text{Br}_2(\text{aq}) + 2 \text{e}^- \rightarrow 2 \text{Br}^-(\text{aq})$	+1.087		
$\text{Br}_2(\text{l}) + 2 \text{e}^- \rightarrow 2 \text{Br}^-(\text{aq})$	+1.066		
$\text{N}_2\text{O}_4(\text{g}) + 2 \text{H}^+(\text{aq}) + 2 \text{e}^- \rightarrow 2 \text{HNO}_2(\text{aq})$	+1.065		
$\text{N}_2\text{O}_4(\text{g}) + 4 \text{H}^+(\text{aq}) + 4 \text{e}^- \rightarrow 2 \text{NO}(\text{g}) + 2 \text{H}_2\text{O}(\text{l})$	+1.035		
$\text{HNO}_2(\text{aq}) + \text{H}^+(\text{aq}) + \text{e}^- \rightarrow \text{NO}(\text{g}) + \text{H}_2\text{O}(\text{l})$	+0.983		
$\text{NO}_3^-(\text{aq}) + 4 \text{H}^+(\text{aq}) + 3 \text{e}^- \rightarrow \text{NO}(\text{g}) + 2 \text{H}_2\text{O}(\text{l})$	+0.957		
$2 \text{Hg}^{2+}(\text{aq}) + 2 \text{e}^- \rightarrow \text{Hg}_2^{2+}(\text{aq})$	+0.920		
$\text{N}_2\text{O}_4(\text{g}) + 2 \text{e}^- \rightarrow 2 \text{NO}_2^-(\text{aq})$	+0.867		
$\text{Hg}^{2+}(\text{aq}) + 2 \text{e}^- \rightarrow \text{Hg}(\text{l})$	+0.851		
$\text{ClO}^-(\text{aq}) + \text{H}_2\text{O}(\text{l}) + 2 \text{e}^- \rightarrow \text{Cl}^-(\text{aq}) + 2 \text{OH}^-(\text{aq})$	+0.841		
$\text{Ag}^+(\text{aq}) + \text{e}^- \rightarrow \text{Ag}(\text{s})$	+0.800		

Standard Electrode Potentials

half-reaction	E^0 (V)	half-reaction	E^0 (V)
$\text{Fe}^{3+}(\text{aq}) + 3 \text{e}^- \rightarrow \text{Fe}(\text{s})$	-0.037	$\text{Mn}^{2+}(\text{aq}) + 2 \text{e}^- \rightarrow \text{Mn}(\text{s})$	-1.185
$\text{Se}(\text{s}) + 2 \text{H}^+(\text{aq}) + 2 \text{e}^- \rightarrow \text{H}_2\text{Se}(\text{g})$	-0.082	$\text{Ti}^{3+}(\text{aq}) + 3 \text{e}^- \rightarrow \text{Ti}(\text{s})$	-1.370
$\text{SnO}_2(\text{s}) + 4 \text{H}^+(\text{aq}) + 2 \text{e}^- \rightarrow \text{Sn}^{2+}(\text{aq}) + 2 \text{H}_2\text{O}(\text{l})$	-0.094	$\text{Zr}^{4+}(\text{aq}) + 4 \text{e}^- \rightarrow \text{Zr}(\text{s})$	-1.450
$\text{SnO}_2(\text{s}) + 4 \text{H}^+(\text{aq}) + 4 \text{e}^- \rightarrow \text{Sn}(\text{s}) + 2 \text{H}_2\text{O}(\text{l})$	-0.117	$\text{Al}^{3+}(\text{aq}) + 3 \text{e}^- \rightarrow \text{Al}(\text{s})$	-1.662
$\text{Pb}^{2+}(\text{aq}) + 2 \text{e}^- \rightarrow \text{Pb}(\text{s})$	-0.126	$\text{Be}^{2+}(\text{aq}) + 2 \text{e}^- \rightarrow \text{Be}(\text{s})$	-1.847
$\text{Sn}^{2+}(\text{aq}) + 2 \text{e}^- \rightarrow \text{Sn}(\text{s})$	-0.138	$\text{Sc}^{3+}(\text{aq}) + 3 \text{e}^- \rightarrow \text{Sc}(\text{s})$	-2.077
$\text{O}_2(\text{g}) + 2 \text{H}_2\text{O}(\text{l}) + 2 \text{e}^- \rightarrow \text{H}_2\text{O}_2(\text{aq}) + 2 \text{OH}^-(\text{aq})$	-0.146	$\text{Mg}^{2+}(\text{aq}) + 2 \text{e}^- \rightarrow \text{Mg}(\text{s})$	-2.372
$\text{MoO}_2(\text{s}) + 4 \text{H}^+(\text{aq}) + 4 \text{e}^- \rightarrow \text{Mo}(\text{s}) + 2 \text{H}_2\text{O}(\text{l})$	-0.152	$\text{Na}^+(\text{aq}) + \text{e}^- \rightarrow \text{Na}(\text{s})$	-2.710
$\text{CO}_2(\text{g}) + 2 \text{H}^+(\text{aq}) + 2 \text{e}^- \rightarrow \text{HCHO}_2(\text{aq})$	-0.199	$\text{Ca}^{2+}(\text{aq}) + 2 \text{e}^- \rightarrow \text{Ca}(\text{s})$	-2.868
$\text{Ni}^{2+}(\text{aq}) + 2 \text{e}^- \rightarrow \text{Ni}(\text{s})$	-0.257	$\text{Sr}^{2+}(\text{aq}) + 2 \text{e}^- \rightarrow \text{Sr}(\text{s})$	-2.889
$\text{Co}^{2+}(\text{aq}) + 2 \text{e}^- \rightarrow \text{Co}(\text{s})$	-0.280	$\text{Ba}^{2+}(\text{aq}) + 2 \text{e}^- \rightarrow \text{Ba}(\text{s})$	-2.912
$\text{In}^{3+}(\text{aq}) + 3 \text{e}^- \rightarrow \text{In}(\text{s})$	-0.338	$\text{K}^+(\text{aq}) + \text{e}^- \rightarrow \text{K}(\text{s})$	-2.931
$\text{PbSO}_4(\text{s}) + 2 \text{e}^- \rightarrow \text{Pb}(\text{s}) + \text{SO}_4^{2-}(\text{aq})$	-0.359	$\text{Li}^+(\text{aq}) + \text{e}^- \rightarrow \text{Li}(\text{s})$	-3.040
$\text{Cd}^{2+}(\text{aq}) + 2 \text{e}^- \rightarrow \text{Cd}(\text{s})$	-0.403		
$\text{Fe}^{2+}(\text{aq}) + 2 \text{e}^- \rightarrow \text{Fe}(\text{s})$	-0.447		
$\text{NO}_2^-(\text{aq}) + \text{H}_2\text{O}(\text{l}) + \text{e}^- \rightarrow \text{NO}(\text{g}) + 2 \text{OH}^-(\text{aq})$	-0.460		
$\text{S}(\text{s}) + 2 \text{e}^- \rightarrow \text{S}^{2-}(\text{aq})$	-0.476		
$2 \text{SO}_3^{2-}(\text{aq}) + 3 \text{H}_2\text{O}(\text{l}) + 4 \text{e}^- \rightarrow \text{S}_2\text{O}_3^{2-}(\text{aq}) + 6 \text{OH}^-(\text{aq})$	-0.571		
$\text{Cr}^{3+}(\text{aq}) + 3 \text{e}^- \rightarrow \text{Cr}(\text{s})$	-0.744		
$\text{Zn}^{2+}(\text{aq}) + 2 \text{e}^- \rightarrow \text{Zn}(\text{s})$	-0.762		
$2 \text{H}_2\text{O}(\text{l}) + 2 \text{e}^- \rightarrow \text{H}_2(\text{g}) + 2 \text{OH}^-(\text{aq})$	-0.828		
$\text{Se}(\text{s}) + 2 \text{e}^- \rightarrow \text{Se}^{2-}(\text{aq})$	-0.924		
$\text{SO}_4^{2-}(\text{aq}) + \text{H}_2\text{O}(\text{l}) + 2 \text{e}^- \rightarrow \text{SO}_3^{2-}(\text{aq}) + 2 \text{OH}^-(\text{aq})$	-0.930		

Aqueous Solubility Rules

<i>Category</i>	<i>Ions</i>	<i>Except In Combination With</i>
Soluble Cations	$\text{Li}^+, \text{Na}^+, \text{K}^+, \text{Rb}^+, \text{Cs}^+$	none
	NH_4^+	none
Soluble Anions	$\text{NO}_3^-, \text{NO}_2^-$	none
	$\text{C}_2\text{H}_3\text{O}_2^-$ or CH_3CO_2^-	none
	$\text{ClO}_4^-, \text{ClO}_3^-$	none
	HCO_3^-	none
Usually Soluble Anions	$\text{Cl}^-, \text{Br}^-, \text{I}^-, \text{CN}^-$	$\text{Ag}^+, \text{Hg}_2^{2+}, \text{Pb}^{2+}$
	$\text{SO}_4^{2-}, \text{SO}_3^{2-}$	$\text{Ag}^+, \text{Hg}_2^{2+}, \text{Pb}^{2+}, \text{Ca}^{2+}, \text{Sr}^{2+}, \text{Ba}^{2+}$
Usually Insoluble Anions	$\text{PO}_4^{3-}, \text{PO}_3^{3-}$	$\text{Li}^+, \text{Na}^+, \text{K}^+, \text{Rb}^+, \text{Cs}^+, \text{NH}_4^+$
	$\text{CO}_3^{2-}, \text{S}^{2-}$	$\text{Li}^+, \text{Na}^+, \text{K}^+, \text{Rb}^+, \text{Cs}^+, \text{NH}_4^+$
	F^-	$\text{Li}^+, \text{Na}^+, \text{K}^+, \text{Rb}^+, \text{Cs}^+, \text{NH}_4^+$
	OH^-	$\text{Li}^+, \text{Na}^+, \text{K}^+, \text{Rb}^+, \text{Cs}^+, \text{Ca}^{2+}, \text{Sr}^{2+}, \text{Ba}^{2+}$
	$\text{CrO}_4^{2-}, \text{Cr}_2\text{O}_7^{2-}$	$\text{Li}^+, \text{Na}^+, \text{K}^+, \text{Rb}^+, \text{Cs}^+, \text{NH}_4^+$

Semi-Quantitative Categorization

Soluble	$> 0.10\text{ M}$
Moderately Soluble	$0.01 - 0.10\text{ M}$
Insoluble or Slightly Soluble	$< 0.01\text{ M}$