

Average Bond Lengths

bond	r_{bond} (pm)	bond	r_{bond} (pm)	bond	r_{bond} (pm)	bond	r_{bond} (pm)
C-H	109	N-H	101	O-H	96	H-H	74
C-C	154	N-N	145	O-O	148	H-F	92
C=C	134	N=N	125	O=O	121	H-Cl	127
C≡C	120.	N≡N	110.	O-F	133	H-Br	141
C-N	147	N-O	140.	O-Cl	142	H-I	161
C=N	129	N=O	121	O-Br	158		
C≡N	116	N-F	141	O-S	157	F-F	142
C-O	143	N-Cl	175	O=S	149	Cl-Cl	199
C=O	120.	N-Br	184	O-P	163	Br-Br	228
C≡O	113			O=P	151	I-I	267
C-F	135						
C-Cl	177						
C-Br	194						
C-I	214						
C-Si	185						
C-P	184						
C-S	182						
C=S	160.						

bond	r_{bond} (pm)
Si-H	148
Si-Si	233
Si-O	163
Si-F	160.
Si-Cl	202
Si-Br	215

bond	r_{bond} (pm)
P-H	144
P-P	221
P-F	151
P-Cl	201
P-Br	237

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)	bond	ΔH_{bond} (kJ/mol)	bond	ΔH_{bond} (kJ/mol)	bond	ΔH_{bond} (kJ/mol)
C-H	413	N-H	391	O-H	467	H-H	432
C-C	347	N-N	163	O-O	146	H-F	565
C=C	614	N=N	418	O=O	495	H-Cl	427
C≡C	839	N≡N	941	O-F	185	H-Br	363
C-N	305	N-O	201	O-Cl	203	H-I	295
C=N	613	N=O	607	O-Br	156		
C≡N	891	N-F	272	O-S	364	F-F	154
C-O	358	N-Cl	200.	O=S	522	Cl-Cl	239
C=O	743	N-Br	243	O-P	335	Br-Br	193
C≡O	1072			O=P	544	I-I	149
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)
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 x 10 ⁻¹⁵	0.99984	0.61129	4.2176
5°C	1.87 x 10 ⁻¹⁵	0.99997	0.87260	4.2049
10°C	2.96 x 10 ⁻¹⁵	0.99970	1.2281	4.1921
15°C	4.57 x 10 ⁻¹⁵	0.99910	1.7056	4.1870
20°C	6.87 x 10 ⁻¹⁵	0.99821	2.3388	4.1818
25°C	1.01 x 10 ⁻¹⁴	0.99705	3.1690	4.1801
30°C	1.46 x 10 ⁻¹⁴	0.99565	4.2455	4.1784
35°C	2.06 x 10 ⁻¹⁴	0.99404	5.6267	4.1785
40°C	2.87 x 10 ⁻¹⁴	0.99222	7.3814	4.1786
45°C	3.94 x 10 ⁻¹⁴	0.99013	9.5898	4.1796
50°C	5.31 x 10 ⁻¹⁴	0.98803	12.344	4.1806
55°C	7.05 x 10 ⁻¹⁴	0.98562	15.752	4.1825
60°C	9.25 x 10 ⁻¹⁴	0.98320	19.932	4.1843
65°C	1.20 x 10 ⁻¹³	0.98049	25.022	4.1869
70°C	1.53 x 10 ⁻¹³	0.97778	31.176	4.1895
75°C	1.94 x 10 ⁻¹³	0.97480	38.563	4.1929
80°C	2.44 x 10 ⁻¹³	0.97182	47.373	4.1963
85°C	3.02 x 10 ⁻¹³	0.96859	57.815	4.2007
90°C	3.73 x 10 ⁻¹³	0.96535	70.117	4.2050
95°C	4.52 x 10 ⁻¹³	0.96188	84.529	4.2105
100°C	5.43 x 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 x 10 ⁻⁴	2.2567	2.0784

Properties of Other Substances (condensed phase)

substance (TSS)	ρ (g/cm³)	C_p (J/g·K)
Ag	10.48	0.235
Al	2.70	0.904
As	5.75	0.328
Au	19.30	0.129
B	2.34	1.027
Ba	3.62	0.205
Be	1.85	1.820
Ca	1.54	0.646
Cd	8.69	0.231
Co	8.86	0.421
Cr	7.15	0.450
Cs	1.93	0.242
Cu	8.96	0.384
Fe	7.87	0.449
Ga	5.91	0.374
Ge	5.32	0.321
Hg	13.5336	0.140
In	7.31	0.233
Ir	22.52	0.131
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

substance (TSS)	ρ (g/cm³)	C_p (J/g·K)
Rb	1.53	0.364
Re	20.81	0.137
Rh	12.42	0.243
Ru	12.16	0.238
S	2.07	0.705
Sb	6.68	0.207
Sc	2.99	0.567
Se	4.81	0.322
Si	2.33	0.712
Sn	7.27	0.227
Sr	2.64	0.306
Ta	16.47	0.140
Te	6.24	0.201
Ti	4.51	0.522
U	19.08	0.116
V	6.07	0.489
W	19.31	0.132
Zn	7.14	0.388
Zr	6.52	0.278

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	$\text{HC}_3\text{H}_5\text{O}_4$	3.0×10^{-4}		
2,4,6-trihydroxybenzoic acid		2.1×10^{-2}		
2-acetoxybenzoic acid	$\text{HC}_9\text{H}_7\text{O}_4$	3.3×10^{-4}		
2-chlorobenzoic acid		1.3×10^{-3}		
2-hydroxyethanoic acid	$\text{HC}_2\text{H}_3\text{O}_3$	1.5×10^{-4}		
2-hydroxypropanoic acid	$\text{HC}_3\text{H}_5\text{O}_3$	1.4×10^{-4}		
2-oxopropanoic acid	$\text{HC}_3\text{H}_3\text{O}_3$	4.1×10^{-3}		
2-propenoic acid	$\text{HC}_3\text{H}_3\text{O}_2$	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_3CO_2	1.7×10^{-5}		
acetic acid	$\text{HC}_2\text{H}_3\text{O}_2$	1.7×10^{-5}		
acetylsalicylic acid	$\text{HC}_9\text{H}_7\text{O}_4$	3.3×10^{-4}		
acrylic acid	$\text{HC}_3\text{H}_3\text{O}_2$	5.6×10^{-5}		
adipic acid	$\text{H}_2\text{C}_6\text{H}_8\text{O}_4$	3.9×10^{-5}	3.9×10^{-6}	
ammonia	NH_3	5.6×10^{-10}		
aniline	$\text{C}_6\text{H}_5\text{NH}_2$	1.3×10^{-5}		
arsenic acid	H_3AsO_4	5.5×10^{-3}	1.7×10^{-7}	5.1×10^{-12}
arsenous acid	H_3AsO_3	5.1×10^{-10}		
ascorbic acid	$\text{H}_2\text{C}_6\text{H}_6\text{O}_6$	9.1×10^{-5}	2.0×10^{-12}	
barbituric acid	$\text{HC}_4\text{H}_3\text{N}_2\text{O}_3$	9.8×10^{-5}		
benzoic acid	$\text{HC}_7\text{H}_5\text{O}_2$	6.3×10^{-5}		
boric acid	H_3BO_3	5.4×10^{-10}		
bromoacetic acid	$\text{HC}_2\text{H}_2\text{BrO}_2$	1.3×10^{-3}		
butanedioic acid	$\text{H}_2\text{C}_4\text{H}_4\text{O}_4$	6.2×10^{-5}	2.3×10^{-6}	
butanoic acid	$\text{HC}_4\text{H}_7\text{O}_2$	1.5×10^{-5}		
butyric acid	$\text{HC}_4\text{H}_7\text{O}_2$	1.5×10^{-5}		
caproic acid	$\text{HC}_6\text{H}_{11}\text{O}_2$	1.4×10^{-5}		
carbonic acid	H_2CO_3	4.5×10^{-7}	4.7×10^{-11}	
chloroacetic acid	$\text{HC}_2\text{H}_2\text{ClO}_2$	1.3×10^{-3}		
chloroacetic acid	$\text{HC}_2\text{H}_2\text{O}_2\text{Cl}$	1.3×10^{-3}		
chromic acid	H_2CrO_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	$H_2C_3H_2O_4$	1.4×10^{-3}	2.0×10^{-6}	
mandelic acid	$HC_8H_7O_3$	4.3×10^{-4}		
methanoic acid	$HCHO_2$	1.8×10^{-4}		
methanol	HCH_3O	3.2×10^{-16}		
nitroacetic acid	$HC_2H_2NO_4$	3.3×10^{-2}		
o-toluic acid		1.2×10^{-4}		
oxalic acid	$H_2C_2O_4$	5.6×10^{-2}	1.5×10^{-4}	
oxaloacetic acid	$H_2C_4H_2O_5$	2.8×10^{-3}	4.3×10^{-5}	
oxobutanedioic acid	$H_2C_4H_2O_5$	2.8×10^{-3}	4.3×10^{-5}	
p-toluic acid		4.3×10^{-5}		
pentanedioic acid	$H_2C_5H_6O_4$	4.8×10^{-5}	3.8×10^{-6}	
pentanoic acid	$HC_5H_9O_2$	1.5×10^{-5}		
phenol	HC_6H_5O	1.0×10^{-10}		
phenylamine	$C_6H_5NH_2$	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	$H_2C_3H_2O_4$	1.4×10^{-3}	2.0×10^{-6}	
propanoic acid	$HC_3H_5O_2$	1.3×10^{-5}		
propionic acid	$HC_3H_5O_2$	1.3×10^{-5}		
pyruvic acid	$HC_3H_3O_3$	4.1×10^{-3}		
succinic acid	$H_2C_4H_4O_4$	6.2×10^{-5}	2.3×10^{-6}	
tartaric acid	$H_2C_4H_4O_6$	9.3×10^{-4}	4.3×10^{-5}	
terephthalic acid		2.9×10^{-4}	4.6×10^{-5}	
thioacetic acid	HC_2H_3OS	4.7×10^{-4}		
trichloroacetic acid	$HC_2Cl_3O_2$	2.2×10^{-1}		
trifluoroacetic acid	$HC_2F_3O_2$	3.0×10^{-1}		
uric acid	$HC_5H_3N_4O_3$	1.3×10^{-4}		
valeric acid	$HC_5H_9O_2$	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 x 10 ⁻⁵		
barium ion	Ba ²⁺	4.0 x 10 ⁻¹⁴		
beryllium ion	Be ²⁺	3.0 x 10 ⁻⁷		
calcium ion	Ca ²⁺	2.5 x 10 ⁻¹³		
chromium(III) ion	Cr ³⁺	1.6 x 10 ⁻⁴		
cobalt(II) ion	Co ²⁺	1.3 x 10 ⁻⁹		
iron(II) ion	Fe ²⁺	3.2 x 10 ⁻¹⁰		
iron(III) ion	Fe ³⁺	6.2 x 10 ⁻³		
lithium ion	Li ⁺	1.6 x 10 ⁻¹⁴		
magnesium ion	Mg ²⁺	4.0 x 10 ⁻¹²		
nickel(II) ion	Ni ²⁺	2.5 x 10 ⁻¹¹		
potassium ion	K ⁺	7.9 x 10 ⁻¹⁶		
sodium ion	Na ⁺	1.6 x 10 ⁻¹⁵		
strontium ion	Sr ²⁺	6.3 x 10 ⁻¹⁴		
zinc(II) ion	Zn ²⁺	2.5 x 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}	barium hydroxide	$Ba(OH)_2$	2.5×10^{-1}
codeine	$C_{18}H_{21}NH_2$	1.6×10^{-6}	calcium hydroxide	$Ca(OH)_2$	4.0×10^{-2}
decylamine	$(C_{10}H_{21})NH_2$	4.4×10^{-4}	lithium hydroxide	$LiOH$	6.4×10^{-1}
diethylamine	$(C_2H_5)_2NH$	7.0×10^{-4}	magnesium hydroxide	$Mg(OH)_2$	2.5×10^{-3}
diisopropylamine	$(C_3H_7)_2NH$	1.1×10^{-3}	nickel(II) hydroxide	$Ni(OH)_2$	4.0×10^{-4}
dimethylamine	$(CH_3)_2NH$	5.4×10^{-4}	potassium hydroxide	KOH	$1.3 \times 10^{+1}$
ethanolamine	$HOC_2H_4NH_2$	3.2×10^{-5}	sodium hydroxide	$NaOH$	6.4×10^0
ethylamine	$(C_2H_5)NH_2$	4.5×10^{-4}	strontium hydroxide	$Sr(OH)_2$	1.6×10^{-1}
heptylamine	$(C_7H_{15})NH_2$	4.7×10^{-4}			
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	Al(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	Ba(OH) ₂	2.6×10^{-4}
barium sulfate	BaSO ₄	1.1×10^{-10}
barium sulfite	BaSO ₃	5.0×10^{-10}
beryllium hydroxide	Be(OH) ₂	6.9×10^{-22}
cadmium carbonate	CdCO ₃	1.0×10^{-12}
cadmium hydroxide	Cd(OH) ₂	7.2×10^{-15}
cadmium phosphate	Cd ₃ (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	Ca(OH) ₂	5.0×10^{-6}
calcium phosphate	Ca ₃ (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	Cr(OH) ₂	2.0×10^{-16}
chromium(III) hydroxide	Cr(OH) ₃	6.3×10^{-31}
cobalt(II) carbonate	CoCO ₃	1.4×10^{-13}
cobalt(II) hydroxide	Co(OH) ₂	5.9×10^{-15}
cobalt(II) phosphate	Co ₃ (PO ₄) ₂	2.1×10^{-35}
cobalt(II) sulfide	CoS	4.0×10^{-21}
cobalt(III) hydroxide	Co(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	Cu(OH) ₂	2.2×10^{-20}
copper(II) phosphate	Cu ₃ (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	Fe(OH) ₂	4.9×10^{-17}
iron(III) hydroxide	Fe(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	Pb(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	Mg(OH) ₂	5.6×10^{-12}
magnesium phosphate	Mg ₃ (PO ₄) ₂	1.0×10^{-24}
manganese(II) carbonate	MnCO ₃	2.2×10^{-11}
manganese(II) hydroxide	Mn(OH) ₂	1.9×10^{-9}
manganese(II) sulfide	MnS	2.4×10^{-14}
mercury(I) bromide	Hg ₂ Br ₂	6.4×10^{-23}
mercury(I) carbonate	Hg ₂ CO ₃	3.6×10^{-17}
mercury(I) chloride	Hg ₂ Cl ₂	1.4×10^{-18}
mercury(I) fluoride	Hg ₂ F ₂	3.1×10^{-6}
mercury(I) iodide	Hg ₂ I 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	Ni(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 ₂ CO 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}
tetrahydroxoaluminate(III)	$\text{Al}(\text{OH})_4^-$	2.3×10^{33}
tetrahydroxoberyllate(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) ₂ 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)	formula	ΔH_f° (kJ/mol)	S° (J/mol·K)	ΔG_f° (kJ/mol)
Ag(g)	284.9	173.0	233.3	BaSO ₄ (s)	-1473.2	132.2	-1512.6
Ag(s)	0	42.6	-12.7	Be(OH) ₂ (s)	-902.5	45.5	-916.1
AgBr(s)	-100.4	107.1	-132.3	Be(g)	324.0	136.3	283.4
AgBrO ₃ (s)	-10.5	151.9	-55.8	Be(s)	0	9.5	-2.8
AgCl(s)	-127.0	96.3	-155.7	BeBr ₂ (s)	-353.5	108.0	-385.7
AgClO ₃ (s)	-30.3	142.0	-72.6	BeCl ₂ (s)	-490.4	75.8	-513.0
AgI(s)	-61.8	115.5	-96.2	BeO(s)	-609.4	13.8	-613.5
AgNO ₃ (s)	-124.4	140.9	-166.4	BeS(s)	-234.3	34.0	-244.4
Ag ₂ O(s)	-31.1	121.3	-67.3	Br(g)	111.9	175.0	59.7
Ag ₂ S(s)	-32.6	144.0	-75.5	BrF ₃ (g)	-255.6	292.5	-342.8
Al(g)	330.0	164.6	280.9	BrF ₃ (l)	-300.8	178.2	-353.9
Al(s)	0	28.3	-8.4	BrF ₅ (g)	-428.9	320.2	-524.4
AlBr ₃ (s)	-527.2	180.2	-580.9	BrF ₅ (l)	-458.6	225.1	-525.7
AlCl ₃ (s)	-704.2	109.3	-736.8	Br ₂ (g)	30.9	245.5	-42.3
AlH ₃ (s)	-46.0	30.0	-54.9	Br ₂ (l)	0	152.2	-45.4
Al ₂ O ₃ (s)	-1675.7	50.9	-1690.9	C(diamond)	1.9	2.4	1.2
Au(g)	366.1	180.5	312.3	C(g)	716.7	158.1	669.6
Au(s)	0	47.4	-14.1	C(graphite)	0	5.7	-1.7
B(g)	565.0	153.4	519.3	C(s)	0	5.7	-1.7
B(s)	0	5.9	-1.8	CBr ₄ (g)	83.9	358.1	-22.9
BBr ₃ (l)	-239.7	229.7	-308.2	CBr ₄ (s)	29.4	212.5	-34.0
BCl ₃ (l)	-427.2	206.3	-488.7	CCl ₄ (g)	-95.7	309.7	-188.0
BH ₃ (g)	89.2	188.2	33.1	CCl ₄ (l)	-128.2	214.4	-192.1
BO ₂ (g)	-300.4	229.6	-368.9	CHCl ₃ (g)	-102.7	295.7	-190.9
B ₂ H ₆ (g)	36.4	232.1	-32.8	CHCl ₃ (l)	-134.1	201.7	-194.2
B ₂ O ₃ (s)	-1273.5	54.0	-1289.6	CH ₂ Cl ₂ (g)	-95.4	270.2	-176.0
Ba(g)	180.0	170.2	129.3	CH ₂ Cl ₂ (l)	-124.2	177.8	-177.2
Ba(s)	0	62.5	-18.6	CH ₃ CH(CH ₃)OH(l)	-318.1	181.1	-372.1
BaBr ₂ (s)	-757.3	146.0	-800.8	CH ₃ CHO(g)	-166.2	263.8	-244.9
BaCO ₃ (s)	-1213.0	112.1	-1246.4	CH ₃ Cl(g)	-81.9	234.6	-151.8
BaCl ₂ (s)	-855.0	123.7	-891.9	CH ₃ OH(g)	-201.0	239.9	-272.5
BaO(s)	-548.0	72.1	-569.5	CH ₃ OH(g)	-201.0	239.9	-272.5
BaS(s)	-460.0	78.2	-483.3	CH ₃ OH(l)	-239.2	126.8	-277.0

Standard State Thermodynamic Data

formula	ΔH_f° (kJ/mol)	S° (J/mol·K)	ΔG_f° (kJ/mol)
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
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

formula	ΔH_f° (kJ/mol)	S° (J/mol·K)	ΔG_f° (kJ/mol)
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
CsF(s)	-553.3	92.8	-581.0
CsI(s)	-346.6	123.1	-383.3

Standard State Thermodynamic Data

formula	ΔH_f° (kJ/mol)	S° (J/mol·K)	ΔG_f° (kJ/mol)	formula	ΔH_f° (kJ/mol)	S° (J/mol·K)	ΔG_f° (kJ/mol)
Cs ₂ O(s)	-345.8	146.9	-389.6	H ₂ O ₂ (l)	-187.8	109.6	-220.5
Cu(g)	337.4	166.4	287.8	H ₂ S(g)	-20.6	205.8	-82.0
Cu(s)	0	33.2	-9.9	H ₂ SO ₄ (l)	-814.0	156.9	-860.8
CuBr(s)	-104.6	96.1	-133.3	H ₂ Se(g)	29.7	219.0	-35.6
CuCl(s)	-137.2	86.2	-162.9	H ₃ PO ₃ (s)	-964.4		
CuCl ₂ (s)	-220.1	108.1	-252.3	H ₃ PO ₄ (l)	-1271.7	150.8	-1316.7
CuO(s)	-157.3	42.6	-170.0	Hg(g)	61.4	175.0	9.2
Cu ₂ O(s)	-168.6	93.1	-196.4	Hg(l)	0	75.9	-22.6
F(g)	79.4	158.8	32.1	HgBr ₂ (s)	-170.7	172.0	-222.0
F ₂ (g)	0	202.8	-60.5	HgCl ₂ (s)	-224.3	146.0	-267.8
Fe(g)	416.3	180.5	362.5	HgO(s)	-90.8	70.3	-111.8
Fe(s)	0	27.3	-8.1	Hg ₂ (g)	108.8	288.1	22.9
FeBr ₂ (s)	-249.8	140.6	-291.7	Hg ₂ Br ₂ (s)	-206.9	218.0	-271.9
FeCl ₂ (s)	-341.8	118.0	-377.0	Hg ₂ Cl ₂ (s)	-265.4	191.6	-322.5
FeCl ₃ (s)	-399.5	142.3	-441.9	I(g)	106.8	180.8	52.9
FeS(s)	-100.0	60.3	-118.0	I ₂ (g)	62.4	260.7	-15.3
FeS ₂ (s)	-178.2	52.9	-194.0	I ₂ (s)	0	116.1	-34.6
Fe ₂ O ₃ (s)	-824.2	87.4	-850.3	K(g)	89.0	160.3	41.2
Fe ₃ O ₄ (s)	-1118.4	146.4	-1162.0	K(s)	0	64.7	-19.3
H(g)	218.0	114.7	183.8	KBr(s)	-393.8	95.9	-422.4
HBr(g)	-36.3	198.7	-95.5	KBrO ₃ (s)	-360.2	149.2	-404.7
HCN(g)	135.1	201.8	74.9	KCl(s)	-436.5	82.6	-461.1
HC ₂ H ₃ O ₂ (g)	-432.2	283.5	-516.7	KClO ₃ (s)	-397.7	143.1	-440.4
HC ₂ H ₃ O ₂ (l)	-484.3	159.8	-531.9	KClO ₄ (s)	-432.8	151.0	-477.8
HCl(g)	-92.3	186.9	-148.0	KF(s)	-567.3	66.6	-587.2
HF(g)	-273.3	173.8	-325.1	KI(s)	-327.9	106.3	-359.6
HI(g)	26.5	206.6	-35.1	KMnO ₄ (s)	-837.2	171.7	-888.4
HNO ₃ (g)	-133.9	266.9	-213.5	KNO ₂ (s)	-369.8	152.1	-415.1
HNO ₃ (l)	-174.1	155.6	-220.5	KNO ₃ (s)	-494.6	133.1	-534.3
H ₂ (g)	0	130.7	-39.0	KOH(s)	-424.6	81.2	-448.8
H ₂ O(g)	-241.8	188.8	-298.1	KO ₂ (s)	-284.9	116.7	-319.7
H ₂ O(l)	-285.8	70.0	-306.7	K ₂ CO ₃ (s)	-1150.2	155.4	-1196.5
H ₂ O ₂ (g)	-136.3	232.7	-205.7	K ₂ O ₂ (s)	-494.1	102.1	-524.5

Standard State Thermodynamic Data

formula	ΔH_f° (kJ/mol)	S° (J/mol·K)	ΔG_f° (kJ/mol)
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
N ₂ O ₃ (g)	86.6	314.7	-7.2
N ₂ O ₄ (g)	11.1	304.4	-79.7

formula	ΔH_f° (kJ/mol)	S° (J/mol·K)	ΔG_f° (kJ/mol)
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
PCl ₃ (g)	-287.2	311.8	-380.2
PCl ₃ (l)	-319.7	217.1	-384.4

Standard State Thermodynamic Data

formula	ΔH_f° (kJ/mol)	S° (J/mol·K)	ΔG_f° (kJ/mol)
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
SiCl ₄ (g)	-657.0	330.7	-755.6
SiCl ₄ (l)	-687.0	239.7	-758.5

formula	ΔH_f° (kJ/mol)	S° (J/mol·K)	ΔG_f° (kJ/mol)
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° (kJ/mol)	ΔS° (J/mol·K)	ΔG_f° (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° (V)	half-reaction	E° (V)
$F_2(g) + 2 e^- \rightarrow 2 F^-(aq)$	+2.866	$Hg_2^{2+}(aq) + 2 e^- \rightarrow 2 Hg(l)$	+0.797
$O_3(g) + 2 H^+(aq) + 2 e^- \rightarrow O_2(g) + H_2O(l)$	+2.076	$Fe^{3+}(aq) + e^- \rightarrow Fe^{2+}(aq)$	+0.771
$Co^{3+}(aq) + e^- \rightarrow Co^{2+}(aq)$	+1.920	$2 NO(g) + H_2O(l) + 2 e^- \rightarrow N_2O(g) + 2 OH^-(aq)$	+0.760
$H_2O_2(aq) + 2 H^+(aq) + 2 e^- \rightarrow 2 H_2O(l)$	+1.776	$O_2(g) + 2 H^+(aq) + 2 e^- \rightarrow H_2O_2(aq)$	+0.695
$PbO_2(s) + SO_4^{2-}(aq) + 4 H^+(aq) + 2 e^- \rightarrow PbSO_4(s) + 2 H_2O(l)$	+1.691	$ClO_3^-(aq) + 3 H_2O(l) + 6 e^- \rightarrow Cl^-(aq) + 6 OH^-(aq)$	+0.620
$MnO_4^-(aq) + 4 H^+(aq) + 3 e^- \rightarrow MnO_2(s) + 2 H_2O(l)$	+1.679	$MnO_4^-(aq) + 2 H_2O(l) + 3 e^- \rightarrow MnO_2(s) + 4 OH^-(aq)$	+0.595
$2 HClO(aq) + 2 H^+(aq) + 2 e^- \rightarrow Cl_2(g) + 2 H_2O(l)$	+1.611	$S_2O_6^{2-}(aq) + 4 H^+(aq) + 2 e^- \rightarrow 2 H_2SO_3(aq)$	+0.564
$2 NO(g) + 2 H^+(aq) + 2 e^- \rightarrow N_2O(g) + H_2O(l)$	+1.591	$I_3^-(aq) + 2 e^- \rightarrow 3 I^-(aq)$	+0.536
$MnO_4^-(aq) + 8 H^+(aq) + 5 e^- \rightarrow Mn^{2+}(aq) + 4 H_2O(l)$	+1.507	$I_2(s) + 2 e^- \rightarrow 2 I^-(aq)$	+0.535
$Au^{3+}(aq) + 3 e^- \rightarrow Au(s)$	+1.498	$Cu^+(aq) + e^- \rightarrow Cu(s)$	+0.521
$HClO(aq) + H^+(aq) + 2 e^- \rightarrow Cl^-(aq) + H_2O(l)$	+1.482	$O_2(g) + 2 H_2O(l) + 4 e^- \rightarrow 4 OH^-(aq)$	+0.401
$2 ClO_3^-(aq) + 12 H^+(aq) + 10 e^- \rightarrow Cl_2(g) + 6 H_2O(l)$	+1.470	$ClO_4^-(aq) + H_2O(l) + 2 e^- \rightarrow ClO_3^-(aq) + 2 OH^-(aq)$	+0.360
$PbO_2(s) + 4 H^+(aq) + 2 e^- \rightarrow Pb^{2+}(aq) + 2 H_2O(l)$	+1.455	$Cu^{2+}(aq) + 2 e^- \rightarrow Cu(s)$	+0.342
$Cl_2(g) + 2 e^- \rightarrow 2 Cl^-(aq)$	+1.358	$PbO_2(s) + H_2O(l) + 2 e^- \rightarrow PbO(s) + 2 OH^-(aq)$	+0.247
$HCrO_4^-(aq) + 7 H^+(aq) + 3 e^- \rightarrow Cr^{3+}(aq) + 4 H_2O(l)$	+1.350	$AgCl(s) + e^- \rightarrow Ag(s) + Cl^-(aq)$	+0.222
$2 HNO_2(aq) + 4 H^+(aq) + 4 e^- \rightarrow N_2O(g) + 3 H_2O(l)$	+1.297	$SO_4^{2-}(aq) + 4 H^+(aq) + 2 e^- \rightarrow H_2SO_3(aq) + H_2O(l)$	+0.172
$Cr_2O_7^{2-}(aq) + 14 H^+(aq) + 6 e^- \rightarrow 2 Cr^{3+}(aq) + 7 H_2O(l)$	+1.232	$Cu^{2+}(aq) + e^- \rightarrow Cu^+(aq)$	+0.153
$O_2(g) + 4 H^+(aq) + 4 e^- \rightarrow 2 H_2O(l)$	+1.229	$Sn^{4+}(aq) + 2 e^- \rightarrow Sn^{2+}(aq)$	+0.151
$MnO_2(s) + 4 H^+(aq) + 2 e^- \rightarrow Mn^{2+}(aq) + 2 H_2O(l)$	+1.224	$2 NO_2^-(aq) + 3 H_2O(l) + 4 e^- \rightarrow N_2O(g) + 6 OH^-(aq)$	+0.150
$ClO_3^-(aq) + 3 H^+(aq) + 2 e^- \rightarrow HClO_2(aq) + H_2O(l)$	+1.214	$S_4O_6^{2-}(aq) + 2 e^- \rightarrow 2 S_2O_3^{2-}(aq)$	+0.080
$ClO_4^-(aq) + 2 H^+(aq) + 2 e^- \rightarrow ClO_3^-(aq) + H_2O(l)$	+1.189	$NO_3^-(aq) + H_2O(l) + 2 e^- \rightarrow NO_2^-(aq) + 2 OH^-(aq)$	+0.010
$ClO_3^-(aq) + 2 H^+(aq) + e^- \rightarrow ClO_2(g) + H_2O(l)$	+1.152	$2 H^+(aq) + 2 e^- \rightarrow H_2(g)$	0.000
$Br_2(aq) + 2 e^- \rightarrow 2 Br^-(aq)$	+1.087		
$Br_2(l) + 2 e^- \rightarrow 2 Br^-(aq)$	+1.066		
$N_2O_4(g) + 2 H^+(aq) + 2 e^- \rightarrow 2 HNO_2(aq)$	+1.065		
$N_2O_4(g) + 4 H^+(aq) + 4 e^- \rightarrow 2 NO(g) + 2 H_2O(l)$	+1.035		
$HNO_2(aq) + H^+(aq) + e^- \rightarrow NO(g) + H_2O(l)$	+0.983		
$NO_3^-(aq) + 4 H^+(aq) + 3 e^- \rightarrow NO(g) + 2 H_2O(l)$	+0.957		
$2 Hg^{2+}(aq) + 2 e^- \rightarrow Hg_2^{2+}(aq)$	+0.920		
$N_2O_4(g) + 2 e^- \rightarrow 2 NO_2^-(aq)$	+0.867		
$Hg^{2+}(aq) + 2 e^- \rightarrow Hg(l)$	+0.851		
$ClO^-(aq) + H_2O(l) + 2 e^- \rightarrow Cl^-(aq) + 2 OH^-(aq)$	+0.841		
$Ag^+(aq) + e^- \rightarrow Ag(s)$	+0.800		

Standard Electrode Potentials

half-reaction	E° (V)	half-reaction	E° (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	$> 0.10 M$
Moderately Soluble	$0.01 - 0.10 M$
Insoluble or Slightly Soluble	$< 0.01 M$