Selected Thermodynamic Data p1

Substance & State	ΔH (kJ/mol)	ΔG (kJ/mol)	S (J/molK)
Aluminum			
Al(s)	0	0	28
Al^{3+}(aq)	-531	-485	-322
Al_2O_3(s)	-1676	-1582	51
$Al(OH)_3$(s)	-1277		
$AlCl_3$(s)	-704	-629	111
Barium			
Ba(s)	0	0	67
Ba^{+2}(aq)	-538	-561	10
$BaCO_3$(s)	-1219	-1139	112
BaO(s)	-582	-552	70
$Ba(OH)_2$(s)	-946		
$BaSO_4$(s)	-1465	-1353	132
$BaCl_2$	-859	-810	124
Beryllium			
Be(s)	0	0	10
BeO(s)	-599	-569	14
$Be(OH)_2$(s)	-904	-815	47
Bromine			
Br_2(l)	0	0	152
Br_2(g)	31	3	245
Br_2(aq)	-3	4	130
Br^-(aq)	-121	-104	82
HBr (g)	-36	-53	199
Cadmium			
Cd(s)	0	0	52
Cd^{+2}(aq)	-76	-78	-73
CdO(s)	-258	-228	55
$Cd(OH)_2$(s)	-561	-474	96
CdS(s)	-162	-156	65
$CdSO_4$(s)	-935	-823	123
$CdCl_2$(s)	-392	-344	115
Calcium			
Ca(s)	0	0	41
Ca^{+2}(aq)	-543	-554	-53
CaC_2(s)	-63	-68	70
$CaCO_3$(s)	-1207	-1129	93
CaO(s)	-635	-604	40
$Ca(OH)_2$(s)	-987	-899	83
$Ca_3(PO_4)_2$(s)	-4126	-3890	241
$CaSO_4$(s)	-1433	-1320	107

Substance & State	ΔH (kJ/mol)	ΔG (kJ/mol)	S (J/molK)
Calcium (cont)			
$CaSiO_3$(s)	-1630	-1550	84
$CaCl_2$(s)	-796	-748	105
Carbon			
C(s)(graphite)	0	0	6
C(s)(diamond)	2	3	2
CO(g)	-110.5	-137	198
CO_2(g)	-393.5	-394	214
CO_3^{-2}(aq)	-677	-528	57
CH_4(g)	-75	-51	186
CH_3OH(g)	-201	-163	240
CH_3OH(l)	-239	-166	127
H_2CO(g)	-116	-110	219
HCOOH(g)	-363	-351	249
HCN(g)	135.1	125	202
C_2H_2(g)	227	209	201
C_2H_4(g)	52	68	219
CH_3CHO(g)	-166	-129	250
C_2H_5OH(l)	-278	-175	161
C_2H_6(g)	-84.7	-32.9	229.5
C_3H_6(g)	20.9	62.7	266.9
C_3H_8(g)	-104	-24	270
C_2H_4O(g) ethylene oxide	-53	-13	242
CH_2=CHCN(g)	185	195.4	274
CH_3COOH(aq)	-484	-389	160
$C_6H_{12}O_6$(s)	-1275	-911	212
CCl_4(l)	-135	-65	216
$CHCl_3$(l)	-135	-65	202
Chlorine			
Cl_2(g)	0	0	223
Cl_2(aq)	-23	7	121
Cl^-(aq)	-167	-131	57
HCl(g)	-92	-95	187
ClO_3^-(aq)	-104	-8	162
ClO_4^-(aq)	-129	-8.5	182
Chromium			
Cr(s)	0	0	24
Cr_2O_3(s)	-1128	-1047	81
CrO_3(s)	-579	-502	72
CrO_4^-(aq)	-881	-728	50
$Cr_2O_7^{-2}$(aq)	-1490	-1301	262

Selected Thermodynamic Data p2

Substance & State	ΔH (kJ/mol)	ΔG (kJ/mol)	S (J/molK)
Copper			
Cu(s)	0	0	33
Cu^{+}(aq)	72	50	41
Cu^{+2}(aq)	65	65.5	-100
$CuCO_3$(s)	-595	-518	88
Cu_2O(s)	-170	-148	93
CuO(s)	-156	-128	43
$Cu(OH)_2$(s)	-450	-372	108
CuS(s)	-49	-49	67
$CuSO_4$(s)	-771	-662	108
Fluorine			
F_2(g)	0	0	203
F^{-}(aq)	-333	-279	-14
HF(g)	-271	-273	174
Hydrogen			
H_2(g)	0	0	131
H(g)	217	203	115
H^{+}(aq)	0	0	0
OH^{-}(aq)	-230	-157	-11
H_2O(l)	-286	-237	70
H_2O(g)	-242	-229	189
HCO_3^{-}(aq)	-692	-587	91
H_2O_2(l)	-188	-1130	90
Iodine			
I_2(s)	0	0	116
I_2(g)	62	19	261
I_2(aq)	23	16	137
I^{-}(aq)	-55	-52	106
HI(g)	26.5	1.7	206.5
Iron			
Fe(s)	0	0	27
Fe^{+2}(aq)	-89	-79	-138
Fe^{+3}(aq)	-48.5	-5	-316
$Fe(OH)_3$(s)	-823	-697	107
Fe_3C(s)	21	15	108
$Fe_{0.95}O$(s)(wustite)	-264	-240	59
FeO(s)	-272	-255	61
Fe_3O_4(s) (magnetic)	-1117	-1013	146
Fe_2O_3(s) (hematite)	-826	-740	90
FeS(s)	-95	-97	67
FeS_2(s)	-178	-166	53
$FeSO_4$(s)	-929	-825	121

Substance & State	ΔH (kJ/mol)	ΔG (kJ/mol)	S (J/molK)
Lead			
Pb(s)	0	0	65
Pb^{+2}(aq)	-1.7	-24	10.5
PbO_2(s)	-277	-217	69
PbS(s)	-100	-99	91
$PbSO_4$(s)	-920	-813	149
$PbBr_2$(s)	-279	-262	161.5
$PbCl_2$(s)	-359	-314	136
Magnesium			
Mg(s)	0	0	33
Mg^{2+}(aq)	-467	-455	-138
$MgCO_3$(s)	-1113	-1029	66
MgO(s)	-602	-569	27
$Mg(OH)_2$(s)	-925	-834	64
$MgCl_2$(s)	-641	-592	90
$MgSO_4$(s)	-1285	-1171	92
Manganese			
Mn(s)	0	0	32
MnO(s)	-385	-363	60
Mn_3O_4(s)	-1387	-1280	149
Mn_2O_3(s)	-971	-893	110
MnO_2(s)	-521	-466	53
MnO_4^{-}(aq)	-543	-449	190
Mn^{2+}(aq)	-221	-228	-74
Mercury			
Hg(l)	0	0	76
Hg_2Cl_2(s)	-265	-211	196
$HgCl_2$(s)	-230	-184	144
HgO(s)	-90	-59	70
HgS(s)	-58	-49	78
Hg^{2+}(aq)	171	164	-32
Nickel			
Ni(s)	0	0	30
$NiCl_2$(s)	-316	-272	107
NiO(s)	-241	-213	38
$Ni(OH)_2$(s)	-538	-453	79
NiS(s)	-93	-90	53
Ni^{2+}(aq)	-54	-46	-129

Selected Thermodynamic Data p3

Substance & State	ΔH (kJ/mol)	ΔG (kJ/mol)	S (J/molK)
Nitrogen			
$N_2(g)$	0	0	192
$NH_3(g)$	-46	-17	193
$NH_3(aq)$	-80	-27	111
$NH^{4+}(aq)$	-132	-79	113
NO(g)	90	87	211
$NO_2(g)$	34	52	240
$N_2O(g)$	82	104	220
$N_2O_4(g)$	10	98	304
$N_2O_4(l)$	-20	97	209
$N_2O_5(s)$	-42	134	178
$N_2H_4(l)$	51	149	121
$N_2H_3CH_3(l)$	54	180	166
$HNO_3(aq)$	-207	-111	146
$HNO_3(l)$	-174	-81	156
$NH_4ClO_4(s)$	-295	-89	186
$NH_4Cl(s)$	-314	-203	96
$NH_4NO_3(s)$	-366	-184	151
$NO^{2-}(aq)$	-105	-32	123
$NO^{3-}(aq)$	-205	-109	146
Oxygen			
$O_2(g)$	0	0	205
O(g)	249	232	161
$O_3(g)$	143	163	239
$OH^-(aq)$	-230	-157	-11
Phosphorus			
P(s) (white)	0	0	41
P(s) (red)	-18	-12	23
P(s) (black)	-39	-33	23
$P_4(g)$	59	24	280
$PF_5(g)$	-1578	-1509	296
$PH_3(g)$	5	13	210
$H_3PO_4(s)$	-1279	-1119	110
$H_3PO_4(l)$	-1267		
$H_3PO_4(aq)$	-1288	-1143	158
$P_4O_{10}(s)$	-2984	-2698	229
$H_2PO_4^-(aq)$	-1296	-1130	90
$HPO_4^{-2}(aq)$	-1292	-1089	-33.5
$PCl_3(g)$	-287	-268	312
$PCl_5(g)$	-375	-305	365
$PO_4^{-3}(aq)$	-1277	-1019	-222

Substance & State	ΔH (kJ/mol)	ΔG (kJ/mol)	S (J/molK)
Potassium			
K(s)	0	0	64
$K^+(aq)$	-252	-283	102.5
KBr(s)	-394	-381	96
KCl(s)	-436	-408	83
$KClO_3(s)$	-391	-290	143
$KClO_4(s)$	-433	-304	151
$KNO_3(s)$	-370	-395	133
$K_2O(s)$	-361	-322	98
$K_2O_2(s)$	-496	-430	113
$KO_2(s)$	-283	-238	117
KOH(s)	-425	-379	79
KOH(aq)	-481	-440	9.2
Silicon			
Si(s)	0	0	19
$SiO_2(s)$ (quartz)	-911	-856	42
$SiCl_4(l)$	-687	-620	240
Silver			
Ag(s)	0	0	43
$Ag^+(aq)$	105	77	73
AgBr(s)	-100	-97	107
AgCN(s)	146	164	84
AgCl(s)	-127	-110	96
$Ag_2CrO_4(s)$	-712	-622	217
AgI(s)	-62	-66	115
$Ag_2O(s)$	-31	-11	122
$Ag_2S(s)$	-32	-40	146
$AgNO_3(s)$	-124	-33	141
Sodium			
Na(s)	0	0	51
$Na^+(aq)$	-240	-262	59
NaBr(s)	-360	-347	84
$Na_2CO_3(s)$	-1131	-1048	136
$NaHCO_3(s)$	-948	-852	102
NaCl(s)	-411	-384	72
NaF	-574	-544	51.5
NaH(s)	-56	-33	40
NaI(s)	-288	-282	91
$NaNO_2(s)$	-359		
$NaNO_3(s)$	-467	-366	116
$Na_2O(s)$	-416	-377	73
$Na_2O_2(s)$	-515	-451	95
NaOH(s)	-427	-381	64

Selected Thermodynamic Data p4

Substance & State	ΔH (kJ/mol)	ΔG (kJ/mol)	S (J/molK)
Sodium (cont)			
NaOH(aq)	-470	-419	50
Sulfur			
S(s) (rhombic)	0	0	32
S(s) (monoclinic)	0.3	0.1	33
S^{-2}(aq)	33	86	-15
S_8(g)	102	50	431
SF_6(g)	-1209	-1105	292
H_2S(g)	-21	-34	206
SO_2(g)	-297	-300	248
SO_3(g)	-396	-371	257
SO_4^{-2}(aq)	-909	-745	20
HSO_4^-(aq)	-887	-756	132
H_2SO_4(l)	-814	-690	157
H_2SO_4(aq)	-909	-745	20
Tin			
Sn(s) (white)	0	0	52
Sn(s) (gray)	-2	0.1	44
Sn^{2+} (aq)	-9	-27	-17
SnO(s)	-285	-257	56
SnO_2(s)	-581	-520	52
$Sn(OH)_2$(s)	-561	-492	155
Titanium			
$TiCl_4$(g)	-763	-727	355
TiO_2(s)	-945	-890	50
Uranium			
U(s)	0	0	50
UF_6(s)	-2137	-2008	228
UF_6(g)	-2113	-2029	380
UO_2(s)	-1084	-1029	78
U_3O_8(s)	-3575	-3393	282
UO_3(s)	-1230	-1150	99
Xenon			
Xe(g)	0	0	170
XeF_2(g)	-108	-48	254
XeF_4(s)	-251	-121	146
XeF_6(g)	-294		
XeO_3(s)	402		

Substance & State	ΔH (kJ/mol)	ΔG (kJ/mol)	S (J/molK)
Zinc			
Zn(s)	0	0	42
Zn^{2+}(aq)	-154	-147	-112
ZnO(s)	-348	-318	44
$Zn(OH)_2$(s)	-642		
ZnI_2(s)	-208	-209	161
ZnS(s) (wurtzite)	-193		
ZnS(s) (zinc blende)	-206	-201	58
$ZnSO_4$(s)	-983	-874	120