

APPENDIX A
STANDARD REDUCTION POTENTIALS AT 298.15 K

TABLE A.1 Standard Reduction Potentials at 298.15 K

Acidic Solution	Standard Reduction Potential, E° (volts)
$F_2(g) + 2e^- \rightarrow 2F^-(aq)$	2.87
$Co^{3+}(aq) + e^- \rightarrow Co^{2+}(aq)$	1.92
$Au^+(aq) + e^- \rightarrow Au(s)$	1.83
$H_2O_2(aq) + 2H_3O^+(aq) + 2e^- \rightarrow 4H_2O(l)$	1.763
$Ce^{4+}(aq) + e^- \rightarrow Ce^{3+}(aq)$	1.72
$Pb^{4+}(aq) + 2e^- \rightarrow Pb^{2+}(aq)$	1.69
$PbO_2(s) + SO_4^{2-}(aq) + 4H_3O^+(aq) + 2e^- \rightarrow$ $PbSO_4(s) + 6H_2O(l)$	1.690
$NiO_2(s) + 4H_3O^+(aq) + 2e^- \rightarrow Ni^{2+}(aq) + 6H_2O(l)$	1.68
$2HClO(aq) + 2H_3O^+(aq) + 2e^- \rightarrow Cl_2(g) + 4H_2O(l)$	1.63
$Au^{3+}(aq) + 3e^- \rightarrow Au(s)$	1.52
$MnO_4^-(aq) + 8H_3O^+(aq) + 5e^- \rightarrow Mn^{2+}(aq) +$ $12H_2O(l)$	1.51
$BrO_3^-(aq) + 6H_3O^+(aq) + 5e^- \rightarrow \frac{1}{2}Br_2(aq) +$ $9H_2O(l)$	1.478
$2ClO_3^-(aq) + 12H_3O^+(aq) + 10e^- \rightarrow Cl_2(g) +$ $18H_2O(l)$	1.47
$Cr_2O_7^{2-}(aq) + 14H_3O^+(aq) + 6e^- \rightarrow 2Cr^{3+}(aq) +$ $21H_2O(l)$	1.36
$Cl_2(g) + 2e^- \rightarrow 2Cl^-(aq)$	1.358
$N_2H_5^+(aq) + 3H_3O^+(aq) + 2e^- \rightarrow 2NH_4^+(aq) +$ $3H_2O(l)$	1.275
$MnO_2(s) + 4H_3O^+(aq) + 2e^- \rightarrow Mn^{2+}(aq) + 6H_2O(l)$	1.23
$O_2(g) + 4H_3O^+(aq) + 4e^- \rightarrow 6H_2O(l)$	1.229
$ClO_4^-(aq) + 2H_3O^+(aq) + 2e^- \rightarrow ClO_3^-(aq) +$ $3H_2O(l)$	1.201
$IO_3^-(aq) + 6H_3O^+(aq) + 5e^- \rightarrow \frac{1}{2}I_2(aq) + 9H_2O(l)$	1.195
$Pt^{2+}(aq) + 2e^- \rightarrow Pt(s)$	1.188
$Br_2(l) + 2e^- \rightarrow 2Br^-(aq)$	1.066
$AuCl_4^-(aq) + 3e^- \rightarrow Au(s) + 4Cl^-(aq)$	1.00
$NO_3^-(aq) + 4H_3O^+(aq) + 3e^- \rightarrow NO(g) + 6H_2O(l)$	0.96
$NO_3^-(aq) + 3H_3O^+(aq) + 2e^- \rightarrow HNO_2(aq) +$ $4H_2O(l)$	0.94
$Pd^{2+}(aq) + 2e^- \rightarrow Pd(s)$	0.915
$2Hg^{2+}(aq) + 2e^- \rightarrow Hg_2^{2+}(aq)$	0.9110
$Hg_2^{2+}(aq) + 2e^- \rightarrow Hg(l)$	0.8535
$SbCl_6^-(aq) + 2e^- \rightarrow SbCl_4^-(aq) + 2Cl^-(aq)$	0.84
$Ag^+(aq) + e^- \rightarrow Ag(s)$	0.7991
$Hg_2^{2+}(aq) + 2e^- \rightarrow 2Hg(l)$	0.7960
$Fe^{3+}(aq) + e^- \rightarrow Fe^{2+}(aq)$	0.771
$[PtCl_4]^{2-}(aq) + 2e^- \rightarrow Pt(s) + 4Cl^-(aq)$	0.758
$[PtCl_6]^{2-}(aq) + 2e^- \rightarrow [PtCl_4]^{2-}(aq) + 2Cl^-(aq)$	0.726
$TeO_2(s) + 4H_3O^+(aq) + 4e^- \rightarrow Te(s) + 6H_2O(l)$	0.604
$H_3AsO_4(aq) + 2H_3O^+(aq) + 2e^- \rightarrow HAsO_2(aq) +$ $4H_2O(l)$	0.560

TABLE A.1 Standard Reduction Potentials at 298.15 K (Continued)

Acidic Solution	Standard Reduction Potential, E° (volts)
$I_2(s) + 2e^- \rightarrow 2I^-(aq)$	0.535
$[RhCl_6]^{3-}(aq) + 3e^- \rightarrow Rh(s) + 6Cl^-(aq)$	0.5
$Cu^{2+}(aq) + 2e^- \rightarrow Cu(s)$	0.340
$Hg_2Cl_2(s) + 2e^- \rightarrow 2Hg(l) + 2Cl^-(aq)$	0.27
$AgCl(s) + e^- \rightarrow Ag(s) + Cl^-(aq)$	0.222
$Cu^{2+}(aq) + e^- \rightarrow Cu^+(aq)$	0.159
$SO_4^{2-}(aq) + 4H_3O^+(aq) + 2e^- \rightarrow H_2SO_3(aq) + 5H_2O(l)$	0.158
$Sn^{4+}(aq) + 2e^- \rightarrow Sn^{2+}(aq)$	0.15
$S(s) + 2H_3O^+(aq) + 2e^- \rightarrow H_2S(aq) + 2H_2O(l)$	0.144
$AgBr(s) + e^- \rightarrow Ag(s) + Br^-(aq)$	0.0713
$2H_3O^+(aq) + 2e^- \rightarrow 2H_2(g) + 2H_2O(l)$ (reference electrode)	0.0000
$N_2O(g) + 6H_3O^+(aq) + 4e^- \rightarrow 2NH_3OH^+(aq) + 5H_2O(l)$	-0.05
$HgS(s, \text{black}) + 2H_3O^+(aq) + 2e^- \rightarrow Hg(l) + H_2S(g) + 2H_2O(l)$	-0.085
$Se(s) + 2H_3O^+(aq) + 2e^- \rightarrow H_2Se(aq) + 2H_2O(l)$	-0.115
$Pb^{2+}(aq) + 2e^- \rightarrow Pb(s)$	-0.125
$Sn^{2+}(aq) + 2e^- \rightarrow Sn(s)$	-0.1375
$AgI(s) + e^- \rightarrow Ag(s) + I^-(aq)$	-0.1522
$[SnF_6]^{2-}(aq) + 4e^- \rightarrow Sn(s) + 6F^-(aq)$	-0.200
$Ni^{2+}(aq) + 2e^- \rightarrow Ni(s)$	-0.25
$Co^{2+}(aq) + 2e^- \rightarrow Co(s)$	-0.277
$Tl^+(aq) + e^- \rightarrow Tl(s)$	-0.3363
$PbSO_4(s) + 2e^- \rightarrow Pb(s) + SO_4^{2-}(aq)$	-0.3505
$Cd^{2+}(aq) + 2e^- \rightarrow Cd(s)$	-0.403
$Cr^{3+}(aq) + e^- \rightarrow Cr^{2+}(aq)$	-0.424
$Fe^{2+}(aq) + 2e^- \rightarrow Fe(s)$	-0.44
$2CO_2(g) + 2H_3O^+(aq) + 2e^- \rightarrow (COOH)_2(aq) + 2H_2O(l)$	-0.481
$Ga^{3+}(aq) + 3e^- \rightarrow Ga(s)$	-0.53
$Cr^{3+}(aq) + 3e^- \rightarrow Cr(s)$	-0.74
$Zn^{2+}(aq) + 2e^- \rightarrow Zn(s)$	-0.763
$Cr^{2+}(aq) + 2e^- \rightarrow Cr(s)$	-0.90
$V^{2+}(aq) + 2e^- \rightarrow V(s)$	-1.13
$Mn^{2+}(aq) + 2e^- \rightarrow Mn(s)$	-1.18
$Zr^{4+}(aq) + 4e^- \rightarrow Zr(s)$	-1.55
$Al^{3+}(aq) + 3e^- \rightarrow Al(s)$	-1.676
$H_2(g) + 2e^- \rightarrow 2H^-(aq)$	-2.25
$Mg^{2+}(aq) + 2e^- \rightarrow Mg(s)$	-2.356
$Na^+(aq) + e^- \rightarrow Na(s)$	-2.714
$Ca^{2+}(aq) + 2e^- \rightarrow Ca(s)$	-2.84
$Sr^{2+}(aq) + 2e^- \rightarrow Sr(s)$	-2.89
$Ba^{2+}(aq) + 2e^- \rightarrow Ba(s)$	-2.92

TABLE A.1 Standard Reduction Potentials at 298.15 K (Continued)

Acidic Solution	Standard Reduction Potential, E° (volts)
$\text{Rb}^+(\text{aq}) + \text{e}^- \rightarrow \text{Rb}(\text{s})$	- 2.925
$\text{K}^+(\text{aq}) + \text{e}^- \rightarrow \text{K}(\text{s})$	- 2.925
$\text{Li}^+(\text{aq}) + \text{e}^- \rightarrow \text{Li}(\text{s})$	- 3.045