Standard Reduction Potentials at 25oC\*

|  |  |
| --- | --- |
| **Half-Reaction** | **E0 (V)** |
| Li+(aq) + e-  Li(s) | -3.05 |
| K+(aq) + e-  K(s) | -2.93 |
| Ba2+(aq) + 2 e-  Ba(s) | -2.90 |
| Sr2+(aq) + 2 e-  Sr(s) | -2.89 |
| Ca2+(aq) + 2 e-  Ca(s) | -2.87 |
| Na+(aq) + e-  Na(s) | -2.71 |
| Mg2+(aq) + 2 e-  Mg(s) | -2.37 |
| Be2+(aq) + 2 e-  Be(s) | -1.85 |
| Al3+(aq) + 3 e-  Al(s) | -1.66 |
| Mn2+(aq) + 2 e-  Mn(s) | -1.18 |
| 2 H2O + 2 e-  H2(g) + 2 OH-(aq) | -0.83 |
| Zn2+(aq) + 2 e-  Zn(s) | -0.76 |
| Cr3+(aq) + 3 e-  Cr(s) | -0.74 |
| Fe2+(aq) + 2 e-  Fe(s) | -0.44 |
| Cd2+(aq) + 2 e-  Cd(s) | -0.40 |
| PbSO4(s) + 2 e-  Pb(s) + SO42-(aq) | -0.31 |
| Co2+(aq) + 2 e-  Co(s) | -0.28 |
| Ni2+(aq) + 2 e-  Ni(s) | -0.25 |
| Sn2+(aq) + 2 e-  Sn(s) | -0.14 |
| Pb2+(aq) + 2 e-  Pb(s) | -0.13 |
| 2 H+(aq) + 2 e-  H2(g) | 0.00 |
| Sn4+(aq) + 2 e-  Sn2+(aq) | +0.13 |
| Cu2+(aq) + e-  Cu+(aq)  S + 2 H+ 2 e−  H2S | +0.13  +0.14 |
| SO42-(aq) + 4 H+(aq) + 2 e-  SO2(g) + 2 H2O | +0.20 |
| AgCl(s) + e-  Ag(s) + Cl-(aq) | +0.22 |
| Cu2+(aq) + 2 e-  Cu(s) | +0.34 |
| O2(g) + 2 H2 + 4 e-  4 OH-(aq) | +0.40 |
| I2(s) + 2 e-  2 I-(aq) | +0.53 |
| MnO4-(aq) + 2 H2O + 3 e-  MnO2(s) + 4 OH-(aq) | +0.59 |
| O2(g) + 2 H+(aq) + 2 e-  H2O2(aq) | +0.68 |
| Fe3+(aq) + e-  Fe2+(aq) | +0.77 |
| Ag+(aq) + e-  Ag(s) | +0.80 |
| Hg22+(aq) + 2 e-  2 Hg(l) | +0.85 |
| 2 Hg2+(aq) + 2 e-  Hg22+(aq) | +0.92 |
| NO3-(aq) + 4 H+(aq) + 3 e-  NO(g) + 2 H2O | +0.96 |
| Br2(l) + 2 e- 2 Br-(aq) | +1.07 |
| O2(g) + 4 H+(aq) + 4 e- 2 H2O | +1.23 |
| MnO2(s) + 4 H+(aq) + 2 e-  Mn2+(aq) + 2 H2O | +1.2`3 |
| Cr2O72-(aq) + 14 H+(aq) + 6 e-  2 Cr3+(aq) + 7 H2O | +1.33 |
| Cl2(g) + 2 e-  2 Cl-(aq) | +1.36 |
| Au3+(aq) + 3 e-  Au(s) | +1.50 |
| MnO4-(aq) + 8 H+(aq) + 5 e-  Mn2+(aq) + 4 H2O | +1.51 |
| Ce4+(aq) + e-  Ce3+(aq) | +1.61 |
| PbO2(s) + 4 H+ + SO42-(aq) + 2 e- PbSO4(s) + 2 H2O | +1.70 |
| H2O2(aq) + 2 H+(aq) + 2 e-  2 H2O | +1.77 |
| Co3+(aq) + e-  Co2+(aq)  S2O82− + 2 e−  2 SO42− | +1.82  +2.01 |
| O3(g) + 2 H+(aq) + 2 e-  O2(g) + H2O | +2.07 |
| F2(g) + 2 e-  F-(aq) | +2.87 |

\*For all half-reactions the concentration is 1M for dissolved species and the pressure is 1 atm for gases. These are standard state values.

**Activity Series of Metals**

*A metal will displace any metal ion that appears below it in the series.*

|  |  |
| --- | --- |
| **The Activity Series**  These metals displace hydrogen in water | |
| Lithium | These metals displace hydrogen from water |
| Potassium |
| Barium |
| Calcium |
| Sodium |
| Magnesium | These metals displace hydrogen from acids. |
| Aluminium |
| Zinc  These metals displace hydrogen in acids |
| Chromium |
| Iron |
| Cadmium |
| Nickel |
| Tin |
| Lead |
| Hydrogen |  |
| Copper | These metals do not displace hydrogen from |
| Mercury |
| Silver |
| Gold |