



This is “Appendix E: Standard Reduction Potentials at 25°C”, appendix 5 from the book [Principles of General Chemistry \(index.html\)](#) (v. 1.0).

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## Chapter 29

### Appendix E: Standard Reduction Potentials at 25°C

Half-Reaction	E° (V)
$\text{Ac}^{3+} + 3\text{e}^{-} \rightarrow \text{Ac}$	-2.20
$\text{Ag}^{+} + \text{e}^{-} \rightarrow \text{Ag}$	0.7996
$\text{AgBr} + \text{e}^{-} \rightarrow \text{Ag} + \text{Br}^{-}$	0.07133
$\text{AgCl} + \text{e}^{-} \rightarrow \text{Ag} + \text{Cl}^{-}$	0.22233
$\text{Ag}_2\text{CrO}_4 + 2\text{e}^{-} \rightarrow 2\text{Ag} + \text{CrO}_4^{2-}$	0.4470
$\text{AgI} + \text{e}^{-} \rightarrow \text{Ag} + \text{I}^{-}$	-0.15224
$\text{Ag}_2\text{S} + 2\text{e}^{-} \rightarrow 2\text{Ag} + \text{S}^{2-}$	-0.691
$\text{Ag}_2\text{S} + 2\text{H}^{+} + 2\text{e}^{-} \rightarrow 2\text{Ag} + \text{H}_2\text{S}$	-0.0366
$\text{AgSCN} + \text{e}^{-} \rightarrow \text{Ag} + \text{SCN}^{-}$	0.08951
$\text{Al}^{3+} + 3\text{e}^{-} \rightarrow \text{Al}$	-1.662
$\text{Al}(\text{OH})_4^{-} + 3\text{e}^{-} \rightarrow \text{Al} + 4\text{OH}^{-}$	-2.328
$\text{Am}^{3+} + 3\text{e}^{-} \rightarrow \text{Am}$	-2.048
$\text{As} + 3\text{H}^{+} + 3\text{e}^{-} \rightarrow \text{AsH}_3$	-0.608
$\text{H}_3\text{AsO}_4 + 2\text{H}^{+} + 2\text{e}^{-} \rightarrow \text{HAsO}_2 + 2\text{H}_2\text{O}$	0.560
$\text{Au}^{+} + \text{e}^{-} \rightarrow \text{Au}$	1.692
$\text{Au}^{3+} + 3\text{e}^{-} \rightarrow \text{Au}$	1.498
$\text{H}_3\text{BO}_3 + 3\text{H}^{+} + 3\text{e}^{-} \rightarrow \text{B} + 3\text{H}_2\text{O}$	-0.8698
$\text{Ba}^{2+} + 2\text{e}^{-} \rightarrow \text{Ba}$	-2.912
$\text{Be}^{2+} + 2\text{e}^{-} \rightarrow \text{Be}$	-1.847
$\text{Bi}^{3+} + 3\text{e}^{-} \rightarrow \text{Bi}$	0.308
$\text{BiO}^{+} + 2\text{H}^{+} + 3\text{e}^{-} \rightarrow \text{Bi} + \text{H}_2\text{O}$	0.320
$\text{Br}_2(\text{aq}) + 2\text{e}^{-} \rightarrow 2\text{Br}^{-}$	1.0873
$\text{Br}_2(\text{l}) + 2\text{e}^{-} \rightarrow 2\text{Br}^{-}$	1.066
$\text{BrO}_3^{-} + 6\text{H}^{+} + 5\text{e}^{-} \rightarrow \frac{1}{2}\text{Br}_2 + 3\text{H}_2\text{O}$	1.482

## Chapter 29 Appendix E: Standard Reduction Potentials at 25°C

Half-Reaction	E° (V)
$\text{BrO}_3^- + 6\text{H}^+ + 6\text{e}^- \rightarrow \text{Br}^- + 3\text{H}_2\text{O}$	1.423
$\text{CO}_2 + 2\text{H}^+ + 2\text{e}^- \rightarrow \text{HCO}_2\text{H}$	-0.199
$\text{Ca}^{2+} + 2\text{e}^- \rightarrow \text{Ca}$	-2.868
$\text{Ca}(\text{OH})_2 + 2\text{e}^- \rightarrow \text{Ca} + 2\text{OH}^-$	-3.02
$\text{Cd}^{2+} + 2\text{e}^- \rightarrow \text{Cd}$	-0.4030
$\text{CdSO}_4 + 2\text{e}^- \rightarrow \text{Cd} + \text{SO}_4^{2-}$	-0.246
$\text{Cd}(\text{OH})_4^{2-} + 2\text{e}^- \rightarrow \text{Cd} + 4\text{OH}^-$	-0.658
$\text{Ce}^{3+} + 3\text{e}^- \rightarrow \text{Ce}$	-2.336
$\text{Ce}^{4+} + \text{e}^- \rightarrow \text{Ce}^{3+}$	1.72
$\text{Cl}_2(\text{g}) + 2\text{e}^- \rightarrow 2\text{Cl}^-$	1.35827
$\text{HClO} + \text{H}^+ + \text{e}^- \rightarrow \frac{1}{2}\text{Cl}_2 + \text{H}_2\text{O}$	1.611
$\text{HClO} + \text{H}^+ + 2\text{e}^- \rightarrow \text{Cl}^- + \text{H}_2\text{O}$	1.482
$\text{ClO}^- + \text{H}_2\text{O} + 2\text{e}^- \rightarrow \text{Cl}^- + 2\text{OH}^-$	0.81
$\text{ClO}_3^- + 6\text{H}^+ + 5\text{e}^- \rightarrow \frac{1}{2}\text{Cl}_2 + 3\text{H}_2\text{O}$	1.47
$\text{ClO}_3^- + 6\text{H}^+ + 6\text{e}^- \rightarrow \text{Cl}^- + 3\text{H}_2\text{O}$	1.451
$\text{ClO}_4^- + 8\text{H}^+ + 7\text{e}^- \rightarrow \frac{1}{2}\text{Cl}_2 + 4\text{H}_2\text{O}$	1.39
$\text{ClO}_4^- + 8\text{H}^+ + 8\text{e}^- \rightarrow \text{Cl}^- + 4\text{H}_2\text{O}$	1.389
$\text{Co}^{2+} + 2\text{e}^- \rightarrow \text{Co}$	-0.28
$\text{Co}^{3+} + \text{e}^- \rightarrow \text{Co}^{2+}$	1.92
$\text{Cr}^{2+} + 2\text{e}^- \rightarrow \text{Cr}$	-0.913
$\text{Cr}^{3+} + \text{e}^- \rightarrow \text{Cr}^{2+}$	-0.407
$\text{Cr}^{3+} + 3\text{e}^- \rightarrow \text{Cr}$	-0.744
$\text{Cr}_2\text{O}_7^{2-} + 14\text{H}^+ + 6\text{e}^- \rightarrow 2\text{Cr}^{3+} + 7\text{H}_2\text{O}$	1.232
$\text{CrO}_4^{2-} + 4\text{H}_2\text{O} + 3\text{e}^- \rightarrow \text{Cr}(\text{OH})_3 + 5\text{OH}^-$	-0.13
$\text{Cs}^+ + \text{e}^- \rightarrow \text{Cs}$	-3.026
$\text{Cu}^+ + \text{e}^- \rightarrow \text{Cu}$	0.521
$\text{Cu}^{2+} + \text{e}^- \rightarrow \text{Cu}^+$	0.153
$\text{Cu}^{2+} + 2\text{e}^- \rightarrow \text{Cu}$	0.3419

## Chapter 29 Appendix E: Standard Reduction Potentials at 25°C

Half-Reaction	E° (V)
$\text{CuI}_2^- + \text{e}^- \rightarrow \text{Cu} + 2\text{I}^-$	0.00
$\text{Cu}_2\text{O} + \text{H}_2\text{O} + 2\text{e}^- \rightarrow 2\text{Cu} + 2\text{OH}^-$	-0.360
$\text{Dy}^{3+} + 3\text{e}^- \rightarrow \text{Dy}$	-2.295
$\text{Er}^{3+} + 3\text{e}^- \rightarrow \text{Er}$	-2.331
$\text{Es}^{3+} + 3\text{e}^- \rightarrow \text{Es}$	-1.91
$\text{Eu}^{2+} + 2\text{e}^- \rightarrow \text{Eu}$	-2.812
$\text{Eu}^{3+} + 3\text{e}^- \rightarrow \text{Eu}$	-1.991
$\text{F}_2 + 2\text{e}^- \rightarrow 2\text{F}^-$	2.866
$\text{Fe}^{2+} + 2\text{e}^- \rightarrow \text{Fe}$	-0.447
$\text{Fe}^{3+} + 3\text{e}^- \rightarrow \text{Fe}$	-0.037
$\text{Fe}^{3+} + \text{e}^- \rightarrow \text{Fe}^{2+}$	0.771
$[\text{Fe}(\text{CN})_6]^{3-} + \text{e}^- \rightarrow [\text{Fe}(\text{CN})_6]^{4-}$	0.358
$\text{Fe}(\text{OH})_3 + \text{e}^- \rightarrow \text{Fe}(\text{OH})_2 + \text{OH}^-$	-0.56
$\text{Fm}^{3+} + 3\text{e}^- \rightarrow \text{Fm}$	-1.89
$\text{Fm}^{2+} + 2\text{e}^- \rightarrow \text{Fm}$	-2.30
$\text{Ga}^{3+} + 3\text{e}^- \rightarrow \text{Ga}$	-0.549
$\text{Gd}^{3+} + 3\text{e}^- \rightarrow \text{Gd}$	-2.279
$\text{Ge}^{2+} + 2\text{e}^- \rightarrow \text{Ge}$	0.24
$\text{Ge}^{4+} + 4\text{e}^- \rightarrow \text{Ge}$	0.124
$2\text{H}^+ + 2\text{e}^- \rightarrow \text{H}_2$	0.00000
$\text{H}_2 + 2\text{e}^- \rightarrow 2\text{H}^-$	-2.23
$2\text{H}_2\text{O} + 2\text{e}^- \rightarrow \text{H}_2 + 2\text{OH}^-$	-0.8277
$\text{H}_2\text{O}_2 + 2\text{H}^+ + 2\text{e}^- \rightarrow 2\text{H}_2\text{O}$	1.776
$\text{Hf}^{4+} + 4\text{e}^- \rightarrow \text{Hf}$	-1.55
$\text{Hg}^{2+} + 2\text{e}^- \rightarrow \text{Hg}$	0.851
$2\text{Hg}^{2+} + 2\text{e}^- \rightarrow \text{Hg}_2^{2+}$	0.920
$\text{Hg}_2\text{Cl}_2 + 2\text{e}^- \rightarrow 2\text{Hg} + 2\text{Cl}^-$	0.26808
$\text{Ho}^{2+} + 2\text{e}^- \rightarrow \text{Ho}$	-2.1
$\text{Ho}^{3+} + 3\text{e}^- \rightarrow \text{Ho}$	-2.33

## Chapter 29 Appendix E: Standard Reduction Potentials at 25°C

Half-Reaction	E° (V)
$I_2 + 2e^- \rightarrow 2I^-$	0.5355
$I_3^- + 2e^- \rightarrow 3I^-$	0.536
$2IO_3^- + 12H^+ + 10e^- \rightarrow I_2 + 6H_2O$	1.195
$IO_3^- + 6H^+ + 6e^- \rightarrow I^- + 3H_2O$	1.085
$In^+ + e^- \rightarrow In$	-0.14
$In^{3+} + 2e^- \rightarrow In^+$	-0.443
$In^{3+} + 3e^- \rightarrow In$	-0.3382
$Ir^{3+} + 3e^- \rightarrow Ir$	1.156
$K^+ + e^- \rightarrow K$	-2.931
$La^{3+} + 3e^- \rightarrow La$	-2.379
$Li^+ + e^- \rightarrow Li$	-3.0401
$Lr^{3+} + 3e^- \rightarrow Lr$	-1.96
$Lu^{3+} + 3e^- \rightarrow Lu$	-2.28
$Md^{3+} + 3e^- \rightarrow Md$	-1.65
$Md^{2+} + 2e^- \rightarrow Md$	-2.40
$Mg^{2+} + 2e^- \rightarrow Mg$	-2.372
$Mn^{2+} + 2e^- \rightarrow Mn$	-1.185
$MnO_2 + 4H^+ + 2e^- \rightarrow Mn^{2+} + 2H_2O$	1.224
$MnO_4^- + 8H^+ + 5e^- \rightarrow Mn^{2+} + 4H_2O$	1.507
$MnO_4^- + 2H_2O + 3e^- \rightarrow MnO_2 + 4OH^-$	0.595
$Mo^{3+} + 3e^- \rightarrow Mo$	-0.200
$N_2 + 2H_2O + 6H^+ + 6e^- \rightarrow 2NH_4OH$	0.092
$HNO_2 + H^+ + e^- \rightarrow NO + H_2O$	0.983
$NO_3^- + 4H^+ + 3e^- \rightarrow NO + 2H_2O$	0.957
$Na^+ + e^- \rightarrow Na$	-2.71
$Nb^{3+} + 3e^- \rightarrow Nb$	-1.099
$Nd^{3+} + 3e^- \rightarrow Nd$	-2.323
$Ni^{2+} + 2e^- \rightarrow Ni$	-0.257
$No^{3+} + 3e^- \rightarrow No$	-1.20

## Chapter 29 Appendix E: Standard Reduction Potentials at 25°C

Half-Reaction	E° (V)
$\text{No}^{2+} + 2\text{e}^{-} \rightarrow \text{No}$	-2.50
$\text{Np}^{3+} + 3\text{e}^{-} \rightarrow \text{Np}$	-1.856
$\text{O}_2 + 2\text{H}^{+} + 2\text{e}^{-} \rightarrow \text{H}_2\text{O}_2$	0.695
$\text{O}_2 + 4\text{H}^{+} + 4\text{e}^{-} \rightarrow 2\text{H}_2\text{O}$	1.229
$\text{O}_2 + 2\text{H}_2\text{O} + 2\text{e}^{-} \rightarrow \text{H}_2\text{O}_2 + 2\text{OH}^{-}$	-0.146
$\text{O}_3 + 2\text{H}^{+} + 2\text{e}^{-} \rightarrow \text{O}_2 + \text{H}_2\text{O}$	2.076
$\text{OsO}_4 + 8\text{H}^{+} + 8\text{e}^{-} \rightarrow \text{Os} + 4\text{H}_2\text{O}$	0.838
$\text{P} + 3\text{H}_2\text{O} + 3\text{e}^{-} \rightarrow \text{PH}_3(\text{g}) + 3\text{OH}^{-}$	-0.87
$\text{PO}_4^{3-} + 2\text{H}_2\text{O} + 2\text{e}^{-} \rightarrow \text{HPO}_3^{2-} + 3\text{OH}^{-}$	-1.05
$\text{Pa}^{3+} + 3\text{e}^{-} \rightarrow \text{Pa}$	-1.34
$\text{Pa}^{4+} + 4\text{e}^{-} \rightarrow \text{Pa}$	-1.49
$\text{Pb}^{2+} + 2\text{e}^{-} \rightarrow \text{Pb}$	-0.1262
$\text{PbO} + \text{H}_2\text{O} + 2\text{e}^{-} \rightarrow \text{Pb} + 2\text{OH}^{-}$	-0.580
$\text{PbO}_2 + \text{SO}_4^{2-} + 4\text{H}^{+} + 2\text{e}^{-} \rightarrow \text{PbSO}_4 + 2\text{H}_2\text{O}$	1.6913
$\text{PbSO}_4 + 2\text{e}^{-} \rightarrow \text{Pb} + \text{SO}_4^{2-}$	-0.3588
$\text{Pd}^{2+} + 2\text{e}^{-} \rightarrow \text{Pd}$	0.951
$\text{Pm}^{3+} + 3\text{e}^{-} \rightarrow \text{Pm}$	-2.30
$\text{Po}^{4+} + 4\text{e}^{-} \rightarrow \text{Po}$	0.76
$\text{Pr}^{3+} + 3\text{e}^{-} \rightarrow \text{Pr}$	-2.353
$\text{Pt}^{2+} + 2\text{e}^{-} \rightarrow \text{Pt}$	1.18
$[\text{PtCl}_4]^{2-} + 2\text{e}^{-} \rightarrow \text{Pt} + 4\text{Cl}^{-}$	0.755
$\text{Pu}^{3+} + 3\text{e}^{-} \rightarrow \text{Pu}$	-2.031
$\text{Ra}^{2+} + 2\text{e}^{-} \rightarrow \text{Ra}$	-2.8
$\text{Rb}^{+} + \text{e}^{-} \rightarrow \text{Rb}$	-2.98
$\text{Re}^{3+} + 3\text{e}^{-} \rightarrow \text{Re}$	0.300
$\text{Rh}^{3+} + 3\text{e}^{-} \rightarrow \text{Rh}$	0.758
$\text{Ru}^{3+} + \text{e}^{-} \rightarrow \text{Ru}^{2+}$	0.2487
$\text{S} + 2\text{e}^{-} \rightarrow \text{S}^{2-}$	-0.47627
$\text{S} + 2\text{H}^{+} + 2\text{e}^{-} \rightarrow \text{H}_2\text{S}(\text{aq})$	0.142

## Chapter 29 Appendix E: Standard Reduction Potentials at 25°C

Half-Reaction	E° (V)
$2S + 2e^- \rightarrow S_2^{2-}$	-0.42836
$H_2SO_3 + 4H^+ + 4e^- \rightarrow S + 3H_2O$	0.449
$SO_4^{2-} + H_2O + 2e^- \rightarrow SO_3^{2-} + 2OH^-$	-0.93
$Sb + 3H^+ + 3e^- \rightarrow SbH_3$	-0.510
$Sc^{3+} + 3e^- \rightarrow Sc$	-2.077
$Se + 2e^- \rightarrow Se^{2-}$	-0.924
$Se + 2H^+ + 2e^- \rightarrow H_2Se$	-0.082
$SiF_6^{2-} + 4e^- \rightarrow Si + 6F^-$	-1.24
$Sm^{3+} + 3e^- \rightarrow Sm$	-2.304
$Sn^{2+} + 2e^- \rightarrow Sn$	-0.1375
$Sn^{4+} + 2e^- \rightarrow Sn^{2+}$	0.151
$Sr^{2+} + 2e^- \rightarrow Sr$	-2.899
$Ta^{3+} + 3e^- \rightarrow Ta$	-0.6
$TcO_4^- + 4H^+ + 3e^- \rightarrow TcO_2 + 2H_2O$	0.782
$TcO_4^- + 8H^+ + 7e^- \rightarrow Tc + 4H_2O$	0.472
$Tb^{3+} + 3e^- \rightarrow Tb$	-2.28
$Te + 2e^- \rightarrow Te^{2-}$	-1.143
$Te^{4+} + 4e^- \rightarrow Te$	0.568
$Th^{4+} + 4e^- \rightarrow Th$	-1.899
$Ti^{2+} + 2e^- \rightarrow Ti$	-1.630
$Tl^+ + e^- \rightarrow Tl$	-0.336
$Tl^{3+} + 2e^- \rightarrow Tl^+$	1.252
$Tl^{3+} + 3e^- \rightarrow Tl$	0.741
$Tm^{3+} + 3e^- \rightarrow Tm$	-2.319
$U^{3+} + 3e^- \rightarrow U$	-1.798
$VO_2^+ + 2H^+ + e^- \rightarrow VO^{2+} + H_2O$	0.991
$V_2O_5 + 6H^+ + 2e^- \rightarrow 2VO^{2+} + 3H_2O$	0.957
$W_2O_5 + 2H^+ + 2e^- \rightarrow 2WO_2 + H_2O$	-0.031
$XeO_3 + 6H^+ + 6e^- \rightarrow Xe + 3H_2O$	2.10

## Chapter 29 Appendix E: Standard Reduction Potentials at 25°C

Half-Reaction	E° (V)
$\text{Y}^{3+} + 3\text{e}^{-} \rightarrow \text{Y}$	-2.372
$\text{Yb}^{3+} + 3\text{e}^{-} \rightarrow \text{Yb}$	-2.19
$\text{Zn}^{2+} + 2\text{e}^{-} \rightarrow \text{Zn}$	-0.7618
$\text{Zn}(\text{OH})_4^{2-} + 2\text{e}^{-} \rightarrow \text{Zn} + 4\text{OH}^{-}$	-1.199
$\text{Zn}(\text{OH})_2 + 2\text{e}^{-} \rightarrow \text{Zn} + 2\text{OH}^{-}$	-1.249
$\text{ZrO}_2 + 4\text{H}^{+} + 4\text{e}^{-} \rightarrow \text{Zr} + 2\text{H}_2\text{O}$	-1.553
$\text{Zr}^{4+} + 4\text{e}^{-} \rightarrow \text{Zr}$	-1.45

Source of data: CRC Handbook of Chemistry and Physics, 84th Edition (2004).