

SCH4U: Chemistry, Grade 12, University Preparation

Periodic Table

1 IA																	18 VIIIA
1 H 1.01	2 IIA											13 IIIA	14 IVA	15 VA	16 VIA	17 VIIA	2 He 4.00
3 Li 6.94	4 Be 9.01											5 B 10.81	6 C 12.01	7 N 14.01	8 O 16.00	9 F 19.00	10 Ne 20.18
11 Na 22.99	12 Mg 24.31	3 IIIB	4 IVB	5 VB	6 VIB	7 VIIB	8	9 VIIIB	10	11 IB	12 IIB	13 Al 26.98	14 Si 28.09	15 P 30.97	16 S 32.07	17 Cl 35.45	18 Ar 39.95
19 K 39.1	20 Ca 40.08	21 Sc 44.96	22 Ti 47.88	23 V 50.94	24 Cr 52.00	25 Mn 54.94	26 Fe 55.85	27 Co 58.93	28 Ni 58.69	29 Cu 63.55	30 Zn 65.39	31 Ga 69.72	32 Ge 72.61	33 As 74.92	34 Se 78.96	35 Br 79.90	36 Kr 83.80
37 Rb 85.47	38 Sr 87.62	39 Y 88.91	40 Zr 91.22	41 Nb 92.91	42 Mo 95.94	43 Tc (98)	44 Ru 101.07	45 Rh 102.91	46 Pd 106.42	47 Ag 107.87	48 Cd 112.41	49 In 114.82	50 Sn 118.71	51 Sb 121.76	52 Te 127.6	53 I 126.9	54 Xe 131.29
55 Cs 132.9	56 Ba 137.3	57 La* 138.9	58 Hf 178.5	59 Ta 180.9	60 W 183.9	61 Re 186.2	62 Os 190.2	63 Ir 192.2	64 Pt 195.1	65 Au 197.0	66 Hg 200.6	67 Tl 204.4	68 Pb 207.2	69 Bi 209	70 Po (209)	71 At (210)	72 Rn (222)
87 Fr (223)	88 Ra (226)	89 Ac^ (227)	104 Rf (261)	105 Db (262)	106 Sg (263)	107 Bh (264)	108 Hs (265)	109 Mt (268)	110 Ds (271)	111 Rg (272)							

* 58 Ce 140.1	59 Pr 140.9	60 Nd 144.2	61 Pm (145)	62 Sm 150.4	63 Eu 152.0	64 Gd 157.3	65 Tb 158.9	66 Dy 162.5	67 Ho 164.9	68 Er 167.3	69 Tm 168.9	70 Yb 173.0	71 Lu 175.0
^ 90 Th 232.0	91 Pa (231)	92 U 238.0	93 Np (237)	94 Pu (244)	95 Am (243)	96 Cm (247)	97 Bk (247)	98 Cf (251)	99 Es (252)	100 Fm (257)	101 Md (258)	102 No (259)	103 Lr (260)

Ions

Ion formula	Ion name	Ion formula	Ion name
NH_4^+	Ammonium		
CH_3CO_2^-	Acetate	PO_4^{3-}	Phosphate
CN^-	Cyanide	HPO_4^{2-}	Hydrogen phosphate
NO_2^-	Nitrite	H_2PO_4^-	Dihydrogen phosphate
NO_3^-	Nitrate	ClO^-	Hypochlorite
CO_3^{2-}	Carbonate	ClO_2^-	Chlorite
HCO_3^-	Hydrogen carbonate (or bicarbonate)	ClO_3^-	Chlorate
SO_3^{2-}	Sulfite	ClO_4^-	Perchlorate
SO_4^{2-}	Sulfate	CrO_4^{2-}	Chromate
HSO_4^-	Hydrogen sulfate (or bisulfate)	$\text{Cr}_2\text{O}_7^{2-}$	Dichromate
MnO_4^-	Permanganate	O_2^{2-}	Peroxide

Standard Reduction Potentials

	E°_r (V)
$F_{2(g)} + 2e^- \rightleftharpoons 2F_{(aq)}^-$	+2.87
$PbO_{2(s)} + SO_{4(aq)}^{2-} + 4H_{(aq)}^+ + 2e^- \rightleftharpoons PbSO_{4(s)} + 2H_2O_{(l)}$	+1.69
$MnO_{4(aq)}^- + 8H_{(aq)}^+ + 5e^- \rightleftharpoons Mn_{(aq)}^{2+} + 4H_2O_{(l)}$	+1.51
$Au_{(aq)}^{3+} + 3e^- \rightleftharpoons Au_{(s)}$	+1.50
$ClO_{4(aq)}^- + 8H_{(aq)}^+ + 8e^- \rightleftharpoons Cl_{(aq)}^- + 4H_2O_{(l)}$	+1.39
$Cl_{2(g)} + 2e^- \rightleftharpoons 2Cl_{(aq)}^-$	+1.36
$2HNO_{2(aq)} + 4H_{(aq)}^+ + 4e^- \rightleftharpoons N_2O_{(g)} + 3H_2O_{(l)}$	+1.30
$Cr_2O_{7(aq)}^{2-} + 14H_{(aq)}^+ + 6e^- \rightleftharpoons 2Cr_{(aq)}^{3+} + 7H_2O_{(l)}$	+1.23
$O_{2(g)} + 4H_{(aq)}^+ + 4e^- \rightleftharpoons 2H_2O_{(l)}$	+1.23
$MnO_{2(s)} + 4H_{(aq)}^+ + 2e^- \rightleftharpoons Mn_{(aq)}^{2+} + 2H_2O_{(l)}$	+1.22
$2IO_{3(aq)}^- + 12H_{(aq)}^+ + 10e^- \rightleftharpoons I_{2(s)} + 6H_2O_{(l)}$	+1.20
$Br_{2(l)} + 2e^- \rightleftharpoons 2Br_{(aq)}^-$	+1.07
$Hg_{(aq)}^{2+} + 2e^- \rightleftharpoons Hg_{(l)}$	+0.85
$ClO_{(aq)}^- + H_2O_{(l)} + 2e^- \rightleftharpoons Cl_{(aq)}^- + 2OH_{(aq)}^-$	+0.84
$Ag_{(aq)}^+ + e^- \rightleftharpoons Ag_{(s)}$	+0.80
$NO_{3(aq)}^- + 2H_{(aq)}^+ + e^- \rightleftharpoons NO_{2(g)} + H_2O_{(l)}$	+0.80
$Fe_{(aq)}^{3+} + e^- \rightleftharpoons Fe_{(aq)}^{2+}$	+0.77
$O_{2(g)} + 2H_{(aq)}^+ + 2e^- \rightleftharpoons H_2O_{2(l)}$	+0.70
$MnO_{4(aq)}^- + 2H_2O_{(l)} + 3e^- \rightleftharpoons MnO_{2(s)} + 4OH_{(aq)}^-$	+0.60
$I_{2(s)} + 2e^- \rightleftharpoons 2I_{(aq)}^-$	+0.54
$Cu_{(aq)}^+ + e^- \rightleftharpoons Cu_{(s)}$	+0.52
$O_{2(g)} + 2H_2O_{(l)} + 4e^- \rightleftharpoons 4OH_{(aq)}^-$	+0.40
$Cu_{(aq)}^{2+} + 2e^- \rightleftharpoons Cu_{(s)}$	+0.34
$SO_{4(aq)}^{2-} + 4H_{(aq)}^+ + 2e^- \rightleftharpoons H_2SO_{3(aq)} + H_2O_{(l)}$	+0.17
$Sn_{(aq)}^{4+} + 2e^- \rightleftharpoons Sn_{(aq)}^{2+}$	+0.15
$Cu_{(aq)}^{2+} + e^- \rightleftharpoons Cu_{(aq)}^+$	+0.15
$S_{(s)} + 2H_{(aq)}^+ + 2e^- \rightleftharpoons H_2S_{(aq)}$	+0.14
$AgBr_{(s)} + e^- \rightleftharpoons Ag_{(s)} + Br_{(aq)}^-$	+0.07
$2H_{(aq)}^+ + 2e^- \rightleftharpoons H_{2(g)}$	0.00
$Pb_{(aq)}^{2+} + 2e^- \rightleftharpoons Pb_{(s)}$	-0.13
$Sn_{(aq)}^{2+} + 2e^- \rightleftharpoons Sn_{(s)}$	-0.14
$AgI_{(s)} + e^- \rightleftharpoons Ag_{(s)} + I_{(aq)}^-$	-0.15
$Ni_{(aq)}^{2+} + 2e^- \rightleftharpoons Ni_{(s)}$	-0.26
$Co_{(aq)}^{2+} + 2e^- \rightleftharpoons Co_{(s)}$	-0.28
$H_3PO_{4(aq)} + 2H_{(l)}^+ + 2e^- \rightleftharpoons H_3PO_{3(aq)} + H_2O_{(l)}$	-0.28
$PbSO_{4(s)} + 2e^- \rightleftharpoons Pb_{(s)} + SO_{4(aq)}^{2-}$	-0.36
$Se_{(s)} + 2H_{(aq)}^+ + 2e^- \rightleftharpoons H_2Se_{(aq)}$	-0.40
$Cd_{(aq)}^{2+} + 2e^- \rightleftharpoons Cd_{(s)}$	-0.40
$Cr_{(aq)}^{3+} + e^- \rightleftharpoons Cr_{(aq)}^{2+}$	-0.41
$Fe_{(aq)}^{2+} + 2e^- \rightleftharpoons Fe_{(s)}$	-0.44
$Ag_2S_{(s)} + 2e^- \rightleftharpoons 2Ag_{(s)} + S_{(aq)}^{2-}$	-0.69
$Zn_{(aq)}^{2+} + 2e^- \rightleftharpoons Zn_{(s)}$	-0.76
$Te_{(s)} + 2H_{(aq)}^+ + 2e^- \rightleftharpoons H_2Te_{(aq)}$	-0.79
$2H_2O_{(l)} + 2e^- \rightleftharpoons H_{2(g)} + 2OH_{(aq)}^-$	-0.83
$Cr_{(aq)}^{3+} + 2e^- \rightleftharpoons Cr_{(s)}$	-0.91
$SO_{4(aq)}^{2-} + H_2O_{(l)} + 2e^- \rightleftharpoons SO_{3(aq)}^{2-} + 2OH_{(aq)}^-$	-0.93
$Al_{(aq)}^{3+} + 3e^- \rightleftharpoons Al_{(s)}$	-1.66
$Mg_{(aq)}^{2+} + 2e^- \rightleftharpoons Mg_{(s)}$	-2.37
$Na_{(aq)}^+ + e^- \rightleftharpoons Na_{(s)}$	-2.71
$Ca_{(aq)}^{2+} + 2e^- \rightleftharpoons Ca_{(s)}$	-2.87
$Ba_{(aq)}^{2+} + 2e^- \rightleftharpoons Ba_{(s)}$	-2.91
$K_{(aq)}^+ + e^- \rightleftharpoons K_{(s)}$	-2.93
$Li_{(aq)}^+ + e^- \rightleftharpoons Li_{(s)}$	-3.04