

Periodic Table of the Elements

	1A																8A	
1	1 H 1.00794																2 He 4.002602	
2	3 Li 6.941	2A											3A	4A	5A	6A	7A	
	4 Be 9.012182											5 B 10.811	6 C 12.0107	7 N 14.0067	8 O 15.9994	9 F 18.998403	10 Ne 20.1797	
3	11 Na 22.989770	12 Mg 24.3050	3B	4B	5B	6B	7B	8B	8B	8B	1B	2B	13 Al 26.981538	14 Si 28.0855	15 P 30.973761	16 S 32.065	17 Cl 35.453	18 Ar 39.948
4	19 K 39.0983	20 Ca 40.078	21 Sc 44.955910	22 Ti 47.867	23 V 50.9415	24 Cr 51.9961	25 Mn 54.938049	26 Fe 55.845	27 Co 58.933200	28 Ni 58.6934	29 Cu 63.546	30 Zn 65.38	31 Ga 69.723	32 Ge 72.64	33 As 74.92160	34 Se 78.96	35 Br 79.904	36 Kr 83.798
5	37 Rb 85.4678	38 Sr 87.62	39 Y 88.90585	40 Zr 91.224	41 Nb 92.90638	42 Mo 95.96	43 Tc (98)	44 Ru 101.07	45 Rh 102.90550	46 Pd 106.42	47 Ag 107.8682	48 Cd 112.411	49 In 114.818	50 Sn 118.710	51 Sb 121.760	52 Te 127.60	53 I 126.90447	54 Xe 131.293
6	55 Cs 132.90545	56 Ba 137.327	71 Lu 174.9668	72 Hf 178.49	73 Ta 180.9479	74 W 183.84	75 Re 186.207	76 Os 190.23	77 Ir 192.217	78 Pt 195.078	79 Au 196.96655	80 Hg 200.59	81 Tl 204.3833	82 Pb 207.2	83 Bi 208.98038	84 Po (209)	85 At (210)	86 Rn (222)
7	87 Fr (223)	88 Ra (226)	103 Lr (262)	104 Rf (267)	105 Db (268)	106 Sg (271)	107 Bh (272)	108 Hs (270)	109 Mt (276)	110 Ds (281)	111 Rg (280)	112 Cp (285)	113 Uut (284)	114 Fl (289)	115 Uup (288)	116 Lv (293)	117 Uus (294)	118 Uuo (294)

57 La 138.9055	58 Ce 140.116	59 Pr 140.90765	60 Nd 144.24	61 Pm (145)	62 Sm 150.36	63 Eu 151.964	64 Gd 157.25	65 Tb 158.92534	66 Dy 162.500	67 Ho 164.93032	68 Er 167.259	69 Tm 168.93421	70 Yb 173.054
89 Ac (227)	90 Th 232.0381	91 Pa 231.03588	92 U 238.02891	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)

EQUATIONS

$$\Delta E = -R_H \left(\frac{1}{n_f^2} - \frac{1}{n_i^2} \right)$$

$$\ln \frac{P_2}{P_1} = \frac{-\Delta H}{R} \left(\frac{1}{T_2} - \frac{1}{T_1} \right)$$

$$[A]_t = -kt + [A]_0$$

$$\ln([A]_t) = -kt + \ln [A]_0$$

$$\frac{1}{[A]_t} = kt + \frac{1}{[A]_0}$$

$$k = Ae^{-E_a/RT}$$

$$\ln \frac{k_2}{k_1} = -\frac{E_a}{R} \left(\frac{1}{T_2} - \frac{1}{T_1} \right)$$

$$K_p = K_c(RT)^{\Delta n}$$

$$\Delta G = \Delta G^\circ + RT \ln Q$$

$$\Delta G = -nFE$$

CONSTANTS

$$1 \text{ J} = 1 \text{ kg} \cdot \text{m}^2 \cdot \text{s}^{-2}$$

$$h = 6.626 \times 10^{-34} \text{ J} \cdot \text{s}$$

$$c = 2.998 \times 10^8 \text{ m} \cdot \text{s}^{-1}$$

$$R_H = 2.179 \times 10^{-18} \text{ J}$$

$$1 \text{ L} \cdot \text{atm} = 101.3 \text{ J}$$

$$C_{\text{water}} = 4.184 \text{ J} \cdot \text{g}^{-1} \cdot \text{°C}^{-1}$$

$$1 \text{ atm} = 760 \text{ mm Hg} = 760 \text{ torr} = 101.3 \text{ kPa} = 1.013 \text{ bar}$$

$$R = 0.08206 \text{ L} \cdot \text{atm} \cdot \text{mol}^{-1} \cdot \text{K}^{-1}$$

$$R = 8.314 \text{ J} \cdot \text{mol}^{-1} \cdot \text{K}^{-1}$$

$$K_w = 1.00 \times 10^{-14} \text{ at } 25 \text{ °C}$$

$$1 \text{ F} = 96,500 \text{ C} \cdot \text{mol}^{-1} = 96,500 \text{ J} \cdot \text{V}^{-1} \cdot \text{mol}^{-1}$$

$$1 \text{ A} = 1 \text{ C} \cdot \text{s}^{-1}$$

SOLUBILITY RULES

Compounds containing the following ions are *generally* **SOLUBLE**:

1. lithium, sodium, potassium, and ammonium ions (ALWAYS! No exceptions.)
2. acetate, nitrate, chlorate, and perchlorate ions
3. halide (X) ions: chloride, bromide, and iodide
EXCEPT AgX, Hg₂X₂, HgX₂, and PbX₂ are insoluble
4. sulfate ion
EXCEPT sulfates of calcium, strontium, barium, silver, and lead are insoluble

Compounds containing the following ions are *generally* **INSOLUBLE**:

1. carbonate ion
2. chromate ion
3. phosphate ion
4. sulfide ion
EXCEPT sulfides of calcium, strontium, and barium are soluble
5. hydroxide ion
EXCEPT hydroxides of calcium, strontium, and barium are soluble

ACTIVITY SERIES (active metals are underlined)

Li > K > Ba > Sr > Ca > Na > Mg > Al > Mn > Zn > Cr > Fe > Cd > Co > Ni > Sn > Pb > H₂ > Cu > Ag > Hg > Pt > Au