

PERIODIC TABLE OF THE ELEMENTS

1 H 1.008																	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 24.30											13 Al 26.98	14 Si 28.09	15 P 30.97	16 S 32.06	17 Cl 35.45	18 Ar 39.95
19 K 39.10	20 Ca 40.08	21 Sc 44.96	22 Ti 47.90	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 72.59	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 101.1	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 121.75	52 Te 127.60	53 I 126.91	54 Xe 131.29
55 Cs 132.91	56 Ba 137.33	* La 138.91	72 Hf 178.49	73 Ta 180.95	74 W 183.85	75 Re 186.21	76 Os 190.2	77 Ir 192.2	78 Pt 195.08	79 Au 196.97	80 Hg 200.59	81 Tl 204.38	82 Pb 207.2	83 Bi 208.98	84 Po (209)	85 At (210)	86 Rn (222)
87 Fr (223)	88 Ra 226.02	† Ac 227.03	104 Rf (261)	105 Db (262)	106 Sg (266)	107 Bh (264)	108 Hs (277)	109 Mt (268)	110 Ds (271)	111 Rg (272)							
*Lanthanide Series		58 Ce 140.12	59 Pr 140.91	60 Nd 144.24	61 Pm (145)	62 Sm 150.4	63 Eu 151.97	64 Gd 157.25	65 Tb 158.93	66 Dy 162.50	67 Ho 164.93	68 Er 167.26	69 Tm 168.93	70 Yb 173.04	71 Lu 174.97		
† Actinide Series		90 Th 232.04	91 Pa 231.04	92 U 238.03	93 Np (247)	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 (262)		

ATOMIC STRUCTURE

$E = h\nu$ $c = \lambda\nu$ $\nu = \text{frequency}$ $\lambda = \text{wavelength}$
 Planck's constant, $h = 6.626 \times 10^{-34} \text{ J s}$
 Speed of light, $c = 2.998 \times 10^8 \text{ ms}^{-1}$
 Avogadro's number $= 6.022 \times 10^{23} \text{ mol}^{-1}$
 Electron charge, $e = -1.602 \times 10^{-19} \text{ coulomb}$

EQUILIBRIUM

$K_a = \frac{[\text{H}^+][\text{A}^-]}{[\text{HA}]}$, $K_b = \frac{[\text{OH}^-][\text{HB}^+]}{[\text{HA}]}$
 $K_w = [\text{H}^+][\text{OH}^-] = 1.0 \times 10^{-14}$ at $25^\circ\text{C} = K_a \times K_b$
 $\text{pH} = -\log[\text{H}^+]$, $\text{pOH} = -\log[\text{OH}^-]$, $14 = \text{pH} + \text{pOH}$
 $\text{pH} = \text{p}K_a + \log \frac{[\text{A}^-]}{[\text{HA}]}$
 $\text{p}K_a = -\log K_a$, $\text{p}K_b = -\log K_b$

KINETICS

$\ln[A]_t - \ln[A]_0 = -kt$, $\frac{1}{[A]_t} - \frac{1}{[A]_0} = kt$, $t_{1/2} = \frac{0.693}{k}$

GASES, LIQUIDS, SOLUTIONS

$PV = nRT$, $P_A = P_{\text{total}} \times X_A$, $X_A = \frac{\text{mol } A}{\text{total mol}}$
 $n = m/M$ $m = \text{mass}$, $M = \text{molar mass}$
 $D = m/V$, $K = ^\circ\text{C} + 273$, $KE = \frac{1}{2}mv^2$
 $R = 8.314 \text{ J mol}^{-1}\text{K}^{-1} = 0.08206 \text{ L atm mol}^{-1}\text{K}^{-1}$
 $= 62.36 \text{ L torr mol}^{-1}\text{K}^{-1}$
 $1 \text{ atm} = 760 \text{ mmHg} = 760 \text{ torr}$
 $A = abc$ $A = \text{absorbance}$, $a = \text{molar absorptivity}$,
 $b = \text{path length}$, $c = \text{concentration}$

THERMOCHEMISTRY/ELECTROCHEMISTRY

$\Delta S^\circ, \Delta H^\circ, \Delta G^\circ = \sum \text{products} - \sum \text{reactants}$
 $q = mC\Delta T$ $q = \text{heat}$, $C = \text{specific heat}$
 $\Delta G^\circ = \Delta H^\circ - T\Delta S^\circ = -RT \ln K = -nFE^\circ$
 $F = \text{Faraday's constant} = 96,485 \text{ Coulombs/mol e}^-$
 $I = q/t$ $I = \text{current (amps)}$, $q = \text{charge(C)}$, $t = \text{sec}$
 $1 \text{ volt} = \frac{1 \text{ joule}}{1 \text{ coulomb}}$