Data Sheet – CHEM 203

Periodic Table

1 1A												13 3A	14 4A	15 5A	16 6A	17 7A	18 8A
1 H 1.008	2 2A																2 He 4.003
3 Li 6.941	4 Be 9.012											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	4	5	6	7	8	9	10	11	12	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 39.10	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 65.38	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 102.9	46 Pd 106.4	47 Ag 107.9	48 Cd 112.4	49 In 114.8	50 Sn 118.7	51 Sb 121.8	52 Te 127.6	53 I 126.9	54 Xe 131.3
55 Cs 132.9	56 Ba 137.3	57* La 138.9	72 Hf 178.5	73 Ta 180.9	74 W 183.9	75 Re 186.2	76 Os 190.2	77 Ir 192.2	78 Pt 195.1	79 Au 197.0	80 Hg 200.6	81 Tl 204.4	82 Pb 207.2	83 Bi 209.0	84 Po (209)	85 At (210)	86 Rn (222)
87 Fr (223)	88 Ra 226.0	89** Ac (227)	104 Rf (261)	105 Ha (262)	106 Sg (263)	107 Ns (262)	108 Hs (265)	109 Mt (266)	110 Uun (269)	111 Uuu (272)							

Lanthanides *	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
Actinides **	90 Th 232.0	91 Pa 231.0	92 U 238.0	93 Np 237.0	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)

Strong Acids: HCl, HBr, HI, HNO_3, H_2SO_4, $HClO_4$
Strong Bases: Hydroxides of Group 1A (Li to Cs) and Group 2A (Ca, Sr, Ba)

Constants:

Gas constant, R = 0.08205 L atm mol^{-1} K^{-1}
= 8.314 J mol^{-1} K^{-1} = 8.314 L kPa mol^{-1} K^{-1}
Avogadro's number: N_A = 6.022 x 10^{23} mol^{-1}
Faraday: F = 96,485 C / mol electrons
STP conditions: 0 °C, 1 atm
Thermodynamic standard state: 1 bar, 1M, 25 °C

Conversion factors:

1 J = 1 kg m^2 s^{-2} 1 Pa = 1 kg m^{-1} s^{-2}
T K = T °C + 273.15
1 L = 10^{-3} m^3 1.00 L atm = 101.3 J
1atm = 760.0 torr = 101.3 kPa = 760.0 mm Hg = 1.013 bar
1 C = 1 J / V 1 A = 1 C s^{-1}

$$PV = nRT \qquad K_P = K_C(RT)^{\Delta n_{gas}}$$

$$\Delta E = q + w$$
$$w_{PV} = -P\Delta V = -\Delta nRT$$
$$q = m\,s\,\Delta T = C\,\Delta T$$

$$\Delta E = \Delta H - P\Delta V$$
$$\Delta H = \sum n\,\Delta H_{prod.} - \sum n\,\Delta H_{react.}$$

$$\Delta G = \Delta H - T\Delta S$$
$$\Delta G = \Delta G^o + RT\ln Q$$
$$\Delta G^o = -RT\ln K$$
$$\Delta G = \sum n\,\Delta G_{prod.} - \sum m\,\Delta G_{react.}$$
$$\Delta G^o = -n_e F E^o$$

$$\Delta S = \sum n\,S_{prod.} - \sum m\,S_{react.}$$

$$\ln\left(\frac{K_2}{K_1}\right) = \frac{\Delta H}{R}\left(\frac{1}{T_1} - \frac{1}{T_2}\right)$$

For $ax^2 + bx + c = 0$:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$[A]_t = -kt + [A]_0$$
$$\ln[A]_t = -kt + \ln[A]_0$$
$$\frac{1}{[A]_t} = kt + \frac{1}{[A]_0}$$
$$\ln\left(\frac{[A]_0}{[A]_t}\right) = kt$$
$$k = A\,e^{\frac{-E_a}{RT}}$$

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

$$K_w = K_a K_b$$
$$\text{pH} = -\log[H^+]$$
$$\text{pH} = pK_a + \log\left(\frac{[A^-]}{[HA]}\right)$$

$$E_{cell} = E_{cathode} - E_{anode}$$
$$E = E^o - \frac{RT}{n_e F}\ln Q$$
$$E = E^o - \frac{0.0592}{n_e}\log Q$$