

## Equations and Conversions for CHEM152

Pressure conversions: 1 atm = 1.01325 x 10<sup>5</sup> Pa = 760 mm Hg = 760 torr

Ideal Gas Constant: R = 8.314 J K<sup>-1</sup> mol<sup>-1</sup> = 0.08206 L atm mol<sup>-1</sup> K<sup>-1</sup>

$$\Delta E = q + w \quad q = nC\Delta T \quad q = n\Delta H_{fus/vap} \quad w = Fd = -P_{ext}\Delta V$$

$$\Delta H = \Delta E + P\Delta V \quad \Delta H^\circ = \Delta H_f^\circ(pdt) - \Delta H_f^\circ(rct) \quad \Delta H = B.E._{rcts} - B.E._{pds}$$

$$\Delta S = \frac{q_{rev}}{T} \quad \Delta S^\circ = S^\circ(pdt) - S^\circ(rct) \quad \ln P_{vap} = \left( \frac{-\Delta H_{vap}}{R} \right) \frac{1}{T} + \text{const.}$$

$$\Delta G = \Delta H - T\Delta S \quad aA + bB \rightarrow cC + dD$$

$$\Delta G^\circ = -RT \ln K_{eq} \quad K_p = K_c (RT)^{\Delta n_{gas}} \quad \Delta G = \Delta G^\circ + RT \ln Q \quad ; \quad Q = \frac{[C]^c [D]^d}{[A]^a [B]^b} = \frac{P_C^c P_D^d}{P_A^a P_B^b}$$

$$\Delta G = -nFE_{cell} \quad E_{cell} = E_{cell}^\circ - \frac{RT}{nF} \ln Q = E_{cell}^\circ - \frac{0.0592V}{n} \log Q \quad F = 96,450 \text{ C mol}^{-1}$$

$$\text{Gases: } PV = nRT \quad \left( P + \frac{an^2}{V^2} \right) (V - nb) = nRT \quad v_{rms} = \sqrt{\frac{3RT}{MM}} \quad q = It \quad E_{kin} = \frac{3}{2} nRT$$

$$P_{tot} = P_A + P_B + P_C + \dots \quad P_A = \chi_A P_{tot} \quad n_A = \chi_A n_{tot}$$

$$\text{Solutions: } \text{Solubility} = k_H P \quad \Delta T_{bp} = k_{bp} m_i \quad \Delta T_{fp} = k_{fp} m_i \quad \Pi = MRT$$

$$\text{Rate} = -\frac{1}{a} \frac{d[A]}{dt} = -\frac{1}{b} \frac{d[B]}{dt} = \frac{1}{c} \frac{d[C]}{dt} = \frac{1}{d} \frac{d[D]}{dt} \quad aA + bB \rightarrow cC + dD$$

$$\text{Rate} = k[A]^m[B]^n \quad \text{Arrhenius equation: } k = A \exp\left(\frac{-E_a}{RT}\right)$$

$$[A] = -kt + [A]_o \quad t_{1/2} = \frac{[A]_o}{2k}$$

$$\text{Integrated Rate Laws: } \ln[A] = -kt + \ln[A]_o \quad t_{1/2} = \frac{\ln 2}{k}$$

$$\frac{1}{[A]} = kt + \frac{1}{[A]_o} \quad t_{1/2} = \frac{1}{[A]_o k}$$

$$pH = -\log[H_3O^+] \quad pK = -\log K$$

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

$$K_w = K_a K_b \quad K_w = 10^{-14}$$

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

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