R = 0.0821 L atm/(mol K) = 8.314 J/(mol K) = 8.314×10^{-3} kJ/(mol K)
1 atmosphere = 760 mm Hg

$$\ln(P) = -\left(\frac{\Delta H^0_{vap}}{RT}\right) + C$$

$$\ln\left(\frac{P_2}{P_1}\right) = \left(\frac{\Delta H^0_{vap}}{R}\right)\left[\frac{1}{T_1} - \frac{1}{T_2}\right]$$

<u>Zero Order</u>

$$[R] = [R]_0 - kt$$

<u>First Order</u>

$$[R] = [R]_0 e^{-kt}$$

$$\ln[R] = \ln[R]_0 - kt$$

$$t_{1/2} = \frac{0.693}{k}$$

<u>Second Order</u>

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

$$k = Ae^{-\frac{E_a}{RT}} \qquad \ln(k) = \ln(A) - \frac{E_a}{RT}$$

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

$$\Delta S^0 = \sum S^0(\text{products}) - \sum S^0(\text{reactants})$$
$$\Delta H^0_{rxn} = \sum H^0_f(\text{products}) - \sum H^0_f(\text{reactants})$$
$$\Delta G^0_{rxn} = \sum G^0_f(\text{products}) - \sum G^0_f(\text{reactants})$$

$$\Delta S = \frac{q_{rev}}{T} \qquad \Delta S_{surroundings} = -\frac{\Delta H_{rxn}}{T} \qquad K_p = K_c(RT)^{\Delta n}$$

$$\Delta G = \Delta H - T\Delta S \qquad \Delta G^0_{rxn} = -RT\ \ln(K) \qquad K = e^{-\frac{\Delta G^0_{rxn}}{RT}}$$

$$pH = -\log[H_3O^+] \qquad pOH = -\log[OH^-]$$

K_a is the equilibrium constant for the reaction $HA_{(aq)} + H_2O_{(l)} \rightleftharpoons A^-_{(aq)} + H_3O^+_{(aq)}$
K_b is the equilibrium constant for the reaction $B^-_{(aq)} + H_2O_{(l)} \rightleftharpoons HB_{(aq)} + OH^-_{(aq)}$

$$pK_a = -\log(K_a) \qquad pK_b = -\log(K_b)$$

$K_aK_b = K_w = [H_3O^+][OH^-] = 10^{-14}$ $\qquad pH + pOH = 14 \qquad pK_a + pK_b = 14$

$$pH = pK_a + \log\frac{[\text{conjugate base}]}{[\text{acid}]}$$

$$S_g = k_H P_g \qquad P_{solvent} = X_{solvent}P^0_{solvent}$$

$$\Delta T_{bp} = K_{bp}m_{solute}i \qquad \Delta T_{fp} = K_{fp}m_{solute}i \qquad \Pi = c\ R\ T\ i$$

$$E = E^0 - \frac{0.0257}{n}\ \ln(Q) \qquad \Delta G^0 = -nFE^0 \qquad \ln(K) = \frac{nE^0}{0.0257}$$

charge = current x time 1 Coulomb = 1 Amp x 1 second
F = Faraday constant = 9.6485×10^4 Coulomb/mole of electrons