Food For Thought

$$P = \sum_{i=1}^{n_s} P_i = \sum_{i=1}^{n_s} n_i RT/V = \frac{RT}{V}\sum_{i=1}^{n_s} n_i = \frac{n_{tot} RT}{V} \qquad X_i = \frac{n_i}{\sum_{j=1}^{n_s} n_j}$$

$$m = \frac{c\,(1L)}{\dfrac{1000mL\, d_{soln} - c\,(1L)\,\mathfrak{M}_B}{1000g/kg}} \qquad c = \frac{m\,(1kg)}{\dfrac{1000g + m\,(1kg)\,\mathfrak{M}_B}{d_{soln}\,1000mL/L}}$$

$$X_B = \frac{m_B\,(1kg)}{\left(\dfrac{1000g}{\mathfrak{M}_A}\right) + m_B\,(1kg)} \qquad X_B = \frac{c_B\,(1L)}{\left(\dfrac{1000mL\, d_{soln} - c_B\,(1L)\,\mathfrak{M}_B}{\mathfrak{M}_A}\right) + c_B\,(1L)}$$

$$P_{liq} = d\,g\,h \qquad d = \frac{\mathfrak{M}_{gas}\, n}{V} = \frac{\mathfrak{M}_{gas}\, P}{RT} \qquad \ln\frac{P}{P_o} = -\frac{\mathfrak{M}_{gas}\, g\, h}{RT} \qquad P = P_o\, e^{\left(\frac{-\mathfrak{M}_{gas}\, g\, h}{RT}\right)}$$

$$n = J_m A\,\Delta t \qquad J_m = -D\frac{dc}{dx} = -D\frac{(c' - c)}{\delta} \qquad dJ = -\beta\, c\, J(x)\, dx$$

$$J = J_o\, e^{-\beta \ell c} \qquad \ln\frac{J_o}{J} = \beta\,\ell\, c \qquad G = \frac{1}{R} \qquad \kappa = \frac{1}{R}\left(\frac{\ell}{A}\right) = \frac{G\,\ell}{A} \qquad \Lambda_m = \frac{\kappa}{c}$$

$$\Lambda_m = \Lambda_m^o - k\, c^{1/2} \qquad \Lambda_m^o = \nu_+\lambda_+ + \nu_-\lambda_- \qquad \kappa = \Lambda_m^o\, c - \mathcal{K}\, c^{3/2}$$

$$J_{el} = -\kappa\left(\frac{\Delta\phi}{\ell}\right) \qquad \mathcal{E}_x = -\frac{d\phi}{dx} = -\left(\frac{\Delta\phi}{\ell}\right) \qquad J_i = L_i X_i$$

$$A_1 = \varepsilon_{11}\,\ell\, c_1 + \varepsilon_{12}\,\ell\, c_2 \qquad \underset{\sim}{A} = \underset{\approx}{\varepsilon}\, \underset{\sim}{c} \qquad \underset{\approx}{\varepsilon}^{-1}\, \underset{\sim}{A} = \underset{\sim}{c}$$

$$A_2 = \varepsilon_{21}\,\ell\, c_1 + \varepsilon_{22}\,\ell\, c_2$$

$$\ln\left(\frac{[A]}{[A]_o}\right) = -k_1 t \qquad [A] = [A]_o\, e^{-k_1 t} \qquad [B] = [A]_o\,(1 - e^{-k_1 t}) \qquad I = I_o\, e^{-k_f t} = I_o\, e^{-t/\tau}$$

$$\frac{1}{[A]} - \frac{1}{[A]_o} = k_2 t \qquad [A] = \frac{1}{\dfrac{1}{[A]_o} + k_2 t} \qquad \frac{1}{[B]_o - [A]_o}\ln\left(\frac{[B]_o - \xi}{[A]_o - \xi}\right) = k_2 t + \frac{1}{[B]_o - [A]_o}\ln\left(\frac{[B]_o}{[A]_o}\right)$$

$$\ln\left(\frac{[A]_o - [A]_{eq}}{[A] - [A]_{eq}}\right) = (k_1 + k_{-1})\, t \qquad [A] = ([A]_o - [A]_{eq})\, e^{-(k_1 + k_{-1})t} + [A]_{eq}$$

$$\frac{[A]}{[A]_o} = \frac{[A]_o - \xi}{[A]_o} = \frac{A - A_\infty}{A_o - A_\infty} \qquad \frac{[A]_o - [A]}{[A]_o} = \frac{\xi}{[A]_o} = \frac{A_o - A}{A_o - A_\infty} \qquad [A] = [A]_o\, e^{-(k_1 + k_2)\, t}$$

$$[B] = \frac{k_1 [A]_o}{(k_1 + k_2)}\left(1 - e^{-(k_1 + k_2)\, t}\right) \qquad [C] = \frac{k_2 [A]_o}{(k_1 + k_2)}\left(1 - e^{-(k_1 + k_2)\, t}\right)$$

$$[B] = [A]_o\left(\frac{k_1}{k_1' - k_1}\right)\left(e^{-k_1 t} - e^{-k_1' t}\right) \qquad [C] = [A]_o\left(1 + \left(\frac{1}{k_1 - k_1'}\right)\left(k_1'\, e^{-k_1 t} - k_1\, e^{-k_1' t}\right)\right)$$

$$\frac{d[P]}{dt} = \frac{k_2\, k_1\, [RX]\, [Nuc:^-]}{k_{-1}\, [X^-]} \qquad \frac{d[P]}{dt} = \frac{k_1\, [E]_o [S]}{(k_M + [S])} \qquad k_M = \frac{(k_1 + k_{-1})}{k_2}$$

$$\frac{d[B]}{dt} = \frac{k_1 k_2 [A]^2}{k_{-2}[A] + k_1} \qquad \tau = \frac{1}{k_{-1} + k_1([A]_{eq} + [B]_{eq})} \qquad x = x_o\, e^{-t/\tau} \qquad \tau = \frac{1}{k_1 + k_{-1}}$$

$$\xi - \xi_{eq} = (\xi_o - \xi_{eq})\, e^{-t/\tau} \qquad k = A\, e^{-E_a/RT} \qquad \ln \frac{k_{T2}}{k_{T1}} = -\frac{E_a}{R}\left(\frac{1}{T_2} - \frac{1}{T_1}\right) \qquad \frac{d \ln k}{dT} = \frac{E_a}{RT^2}$$

$$k_{T2} = k_{T1}\, e^{\frac{-E_a}{R}\left(\frac{1}{T_2} - \frac{1}{T_1}\right)} \qquad \ln \frac{k_{T2}}{k_{T1}} = -\frac{E_a}{R}\left(\frac{1}{T_2} - \frac{1}{T_1}\right) \approx \frac{E_a}{RT_1^2}\Delta T \qquad K_{eq} = \frac{k_1\, k_2\, k_3 \ldots.}{k_{-1}\, k_{-2}\, k_{-3} \ldots.}$$

$$\lambda = \frac{hc}{E/N_A} \qquad J_a = J_o(1 - e^{-2.303\, \varepsilon \ell [A]}) \qquad J_o = J_o' \left(\frac{A}{V}\right) = \frac{J_o}{N_A\, h\nu}\left(\frac{A}{V}\right) \qquad J_a = J_o\,(1 - e^{-2.303\, \varepsilon \ell [A]})$$

$$\Phi_f = J_f/J_a \qquad \frac{d[A^*]}{dt} = J_a = J_o\,(1 - e^{-2.303\, \varepsilon \ell [A]}) \qquad J_a = 2.303\, J_o\, \varepsilon \ell [A]$$

$$\frac{d[A^*]}{dt} = 2.303\, J_o\, \varepsilon \ell [A] \qquad \Phi_B = \frac{d[B]/dt}{J_a} \qquad \frac{d[B]}{dt} = \Phi_B\, J_o\,(1 - e^{-2.303\, \varepsilon \ell [A]})$$

$$\frac{d[B]}{dt} = \Phi_B\, J_a = \Phi_B\, J_o \qquad \frac{d[A^*]}{dt} = J_a = j_{A^*}\,[A] \qquad j_{A^*} = 2.303\, J_o\, \varepsilon \ell$$

$$\frac{d[B]}{dt} = \Phi_B\, J_a = 2.303\, J_o \Phi_B\, \varepsilon \ell\, [A] \qquad \frac{d[B]}{dt} = j_B\,[A] \qquad j_B = \Phi_B\, j_{A^*} = 2.303\, J_o \Phi_B\, \varepsilon \ell$$

$$E_{str} = 1/2\, k_{s,ij}\,(r_{ij} - r_o)^2 \qquad E_{bend} = 1/2\, k_{b,ij}\,(\theta_{ij} - \theta_o)^2 \qquad E_{str\text{-}bend} = 1/2\, k_{sb,ijk}\,(r_{ij} - r_o)(\theta_{ik} - \theta_o)$$

$$E_{tor} = 1/2\, k_{tor,1}\,(1 - \cos\phi) + 1/2\, k_{tor,2}\,(1 - \cos 2\phi) + 1/2\, k_{tor,3}\,(1 - \cos 3\phi) \qquad E_{VdW} = -\frac{A}{r_{ij}^{6}} + \frac{B}{r_{ij}^{12}}$$

$$E_{qq} = \frac{kQ_iQ_j}{4\pi\varepsilon\, r_{ij}}$$

$$f \approx f(x_o) + \left(\frac{df}{dx}\right)_{x=x_o}(x - x_o) + \left(\frac{d^2f}{dx^2}\right)_{x=x_o}\frac{(x - x_o)^2}{2} + \left(\frac{d^3f}{dx^3}\right)_{x=x_o}\frac{(x - x_o)^3}{3!} + \ldots$$

$N_A = 6.022\text{x}10^{23}$ mol^{-1} $h = 6.626\text{x}10^{-34}$ J s $c = 2.998\text{x}10^{8}$ m s^{-1}

$\ln 10 = 2.303$ $\ln 2 = 0.693$