CP203 Chemical Principles – Equation Sheet

$$V = -\frac{\mu_A \mu_B}{4\pi\varepsilon r^3}\left[-2\cos\theta_A \cos\theta_B + \sin\theta_A \sin\theta_B \cos(\phi_B - \phi_A)\right]$$

$$F_{electrostatic} = -k\frac{q_1 \cdot q_2}{r^2}$$

$$E_{electrostatic} = k\frac{q_1 \cdot q_2}{r}$$

$$\varepsilon_r = \frac{\varepsilon}{\varepsilon_o}$$

$$k = \frac{1}{4\pi\varepsilon_o}$$

$$K.E. = ½mv^2$$

$$\langle v^2 \rangle^{\frac{1}{2}} = \left(\frac{3RT}{M}\right)^{\frac{1}{2}}$$

$$\frac{\left({}^{3RT}/_{M_A}\right)^{\frac{1}{2}}}{\left({}^{3RT}/_{M_B}\right)^{\frac{1}{2}}} = \left(\frac{M_B}{M_A}\right)^{\frac{1}{2}}$$

$$d^2 = 2Dt$$

$$D = \frac{\lambda^2}{2\tau}$$

$$D = D_0 e^{-\frac{E_a}{RT}}$$

$$D = \frac{k_B T}{6\pi\eta a}$$

$$\eta = \eta_0 e^{\frac{E_a}{RT}}$$

$$V = -\frac{\mu Q\cos\theta}{4\pi\varepsilon r^2}$$

$$V = -\frac{\alpha Q^2 e^2}{32\pi^2\varepsilon^2 r^4}$$

$$V = -\frac{\alpha_B \mu_A^2 (3\cos^2\theta_A + 1)}{32\pi^2\varepsilon^2 r^6}$$

$$V = -\frac{3h(\nu_A \nu_B)\alpha_A \alpha_B}{512(\nu_A + \nu_B)\pi^4\varepsilon^4 r^6}$$

$$p = p^* e^{\frac{V_m \Delta P}{RT}}$$

$$p = p^* e^{\frac{2\gamma V_m}{rRT}}$$

$$p_{in} = p_{out} + \frac{2\gamma}{r}$$

$$p_{in} = p_{out} + \frac{4\gamma}{r}$$

$$\gamma = \frac{F}{L}$$

$$\frac{2\gamma}{r} = \rho g h$$

$$\gamma = \frac{rh\rho g}{2\cos\theta}$$

$$ratio = \frac{V}{A \cdot L}$$

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$$PV = nRT$$

$$\Delta G = -RTlnK$$

$$\left(p + \frac{n^2 a}{V^2}\right)(V - nb) = nRT$$

$$\frac{p}{n(p^o - p)} = \frac{1}{n_m c} + \frac{(c-1)}{n_m c} \cdot \frac{p}{p^o}$$

$$\Gamma = \frac{-1}{RT}\left(\frac{d\gamma}{dlnc}\right)_{p,T}$$

$$c = exp\left(\frac{|\Delta H_A| - |\Delta H_L|}{RT}\right)$$

$$\Gamma = \frac{-1}{2.303RT}\left(\frac{d\gamma}{dlogc}\right)_{p,T}$$

$$\theta = c_1 ln(c_2 p)$$

$$\theta = c_1 p^{\frac{1}{c_2}}$$

$$A = \frac{1}{N_A \Gamma}$$

$$\theta_A = \frac{K_A P_A}{1 + \sum_i K_i P_i}$$

$$\Delta G = \Delta H - T\Delta S$$

$$Z = \frac{P}{(2\pi m k_B T)^{\frac{1}{2}}}$$

$$V_{ads} = \frac{(K \cdot p)^{\frac{1}{2}} \cdot V_m}{\left[1 + (K \cdot p)^{\frac{1}{2}}\right]}$$

$$T = \frac{Number\ of\ sites}{Collision\ rate}$$

$$logw = logw_o - Dlog_{10}^2\left(\frac{p^o}{p}\right)$$

$$\frac{P}{n_{ads}} = \frac{1}{Kn_m} + \frac{P}{n_m}$$

$$D = B\left(\frac{T}{\beta}\right)^2$$

$$s = n_m A_m L$$

$$\frac{M_t}{M_e} = 1 - e^{-kt}$$

$$\frac{dlnK}{dT} = \frac{\Delta_f H^\circ}{RT^2}$$

$$k = Ae^{-\frac{E_a}{RT}}$$

$$\left(\frac{\partial lnp}{\partial({}^1/_T)}\right)_\theta = \frac{\Delta_{ad} H^\circ}{R}$$

$$\frac{M_t}{M_e} = A_1\left[1 - e^{-(k_1 t)^{\beta_1}}\right] + A_2\left[1 - e^{-(k_2 t)^{\beta_2}}\right]$$