3610 Midterm Exam 3 Equations and Constants

Gas Constant Values

8.314	$\frac{J}{mole\ K}$	0.08314	$\frac{L\ bar}{mole\ K}$
0.08206	$\frac{L\ atm}{mole\ K}$	8.314	$\frac{m^3\ Pa}{mole\ K}$

Boltzmann Constant Values

1.381×10^{-23}	$\frac{J}{K}$	0.6950	$\frac{cm^{-1}}{K}$

Conversions

$1\ L\ atm$	$=$	$101.325\ J$
$1\ atm$	$=$	$1.01325\ bar$
$1\ atm$	$=$	$760\ torr$
$1\ atm$	$=$	$101,325\ Pa$

$$\Delta G_{mix} = nRT\left(\chi_A \ln \chi_A + \chi_B \ln \chi_B\right)$$

$$\Delta S_{mix} = -nR\left(\chi_A \ln \chi_A + \chi_B \ln \chi_B\right)$$

$$p_A = \chi_A p_A^\star$$

$$p_B = \chi_B K_B$$

$$\mu_A = \mu_A^\star + RT \ln \chi_A$$

$$K_b = \frac{RT_b^{\star 2}}{\Delta H_{vap}}$$

$$\Delta T_b = K_b \chi_B = K_b C_B$$

$$K_f = \frac{RT_f^{\star 2}}{\Delta H_{freeze}}$$

$$\Delta T_f = K_f \chi_B = K_f C_B$$

$$\frac{n_g}{n_{total}} = \left|\frac{x_B - z_B}{x_B - y_B}\right|$$

$$\frac{n_l}{n_{total}} = \left|\frac{z_B - y_B}{x_B - y_B}\right|$$

$$\ln \gamma_A = \xi \chi_B^2 \qquad \ln \gamma_B = \xi \chi_A^2$$

$$\mu_B = \mu_B^\ominus + RT \ln \gamma_B \chi_B$$

$$I = \frac{1}{2} \sum_{ions} z_i^2 \left(\frac{c_i}{c^\ominus}\right) \qquad c^\ominus = 1\ molal$$

$$\log \gamma_{\pm} = -\frac{A\left|z_+ z_-\right|\sqrt{I}}{1 + B\sqrt{I}} + CI$$

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

$$\Delta G = \Delta G^{\ominus} + RT\ln Q$$

$$E_{cell} = E_{cathode} - E_{anode}$$

$$\Delta G^{\ominus} = -RT\ln K_{eq}$$

$$\frac{\mathrm{d}E^{\ominus}_{cell}}{\mathrm{d}T} = \frac{\Delta S^{\ominus}}{\nu F}$$

$$K_p = K_C\left(RT\right)^{\Delta n}$$

$$\nu_C E^{\ominus}_C = \nu_A E^{\ominus}_A + \nu_B E^{\ominus}_B$$

$$E_{cell} = E^{\ominus}_{cell} - \frac{RT}{\nu F}\ln Q$$

$$\Delta H^{\ominus} = -\nu F\left(E^{\ominus}_{cell} - T\frac{\mathrm{d}E^{\ominus}_{cell}}{\mathrm{d}T}\right)$$

$$J_{matter} = -D\frac{\mathrm{d}\mathcal{N}}{\mathrm{d}z}$$

$$J_{energy} = -\kappa\frac{\mathrm{d}T}{\mathrm{d}z}$$

$$J_{x-momentum} = -\eta\frac{\mathrm{d}v_x}{\mathrm{d}z}$$

$$D = \frac{1}{3}\lambda v_{mean} = \frac{1}{3}\left(\frac{k_B T}{\sigma p}\right)\left(\frac{8RT}{\pi M}\right)^{1/2}$$

$$\eta = \frac{1}{3}\lambda v_{mean} m\mathcal{N} = \frac{pMD}{RT}$$

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

$$\kappa = \frac{1}{3}\lambda v_{mean}\nu\mathcal{N}k_B = \frac{\nu p D}{T}$$

$$\nu = \frac{1}{2}N_{D.o.F.}$$

$$G = \frac{1}{R} = \kappa\frac{A}{l}$$

$$\Lambda_m = \frac{\kappa}{c} = \left(z_+ u_+ \nu_+ + z_- u_- \nu_-\right)F$$

$$f = 6\pi\eta a$$

$$u = \frac{ze}{f}$$

$$s = uE = u\frac{\Delta V}{m}$$

$$c(x,t) = \frac{n_0}{A\sqrt{\pi D t}}e^{-x^2/4Dt}$$

$$x_{rms} = \sqrt{2Dt}$$

$$F = 96,485\frac{C}{mol}$$

$$e = 1.60217662\times 10^{-19}C$$