MECH 221 (W2016)
Equation Sheet

$F_{Net} = F_A + F_R$ $\quad E = \int F dr$ $\quad E_{Net} = E_A + E_R$ $\quad \rho = \dfrac{nA}{V_c N_A}$ $\quad n\lambda = 2d_{hkl}\sin\theta$

$\%\,ionicity = \left\{1 - \exp\left(-0.25\left[X_A - X_B\right]^2\right)\right\} x100$ $\quad N_v = N\exp\left(\dfrac{-Q}{kT}\right)$ $\quad D = D_o \exp\left(\dfrac{-Q}{RT}\right)$

$\dfrac{C_X - C_0}{C_s - C_0} = 1 - erf\left(\dfrac{x}{2\sqrt{Dt}}\right)$ $\quad d_{hkl} = \dfrac{a}{\sqrt{h^2 + k^2 + l^2}}$ $\quad N = 2^{n-1}$ $\quad J = -\dfrac{M}{At}$

$J = -D\dfrac{dc}{dx}$ $\quad \dfrac{dC}{dt} = D\dfrac{d^2c}{dx^2}$ $\quad C_1 = \dfrac{m_1}{m_1 + m_2} x100$

$\tau = \dfrac{F}{A_0} = G\gamma$ $\quad \%El = \left(\dfrac{l_f - l_0}{l_o}\right) x100$ $\quad E = 2G(1+\nu)$

$\nu = -\dfrac{\varepsilon_x}{\varepsilon_z} = -\dfrac{\varepsilon_y}{\varepsilon_z}$ $\quad \%AR = \left(\dfrac{A_o - A_i}{A_o}\right) x100$ $\quad U_r = \dfrac{1}{2}\sigma_y\varepsilon_y = \dfrac{\sigma_y^2}{2E}$

$\tau = G\gamma$ $\quad \%crystallinity = \dfrac{\rho_c(\rho_s - \rho_a)}{\rho_s(\rho_c - \rho_a)} x100$ $\quad TS = TS_\infty - \dfrac{A}{\overline{M}_n}$

$K_{1c} = Y\sigma\sqrt{\pi a}$ $\quad \sigma_{fs} = \sigma_o \exp(-nP)$ $\quad E = E_o(1 - 1.9P + 0.9P^2)$

$\sigma_{fs} = \dfrac{3F_f L}{2bd^2}$ $\quad \sigma_{fs} = \dfrac{F_f L}{\pi R^3}$ $\quad E = \dfrac{F}{\delta}\dfrac{L^3}{4bd^3}$ $\quad E = \dfrac{F}{\delta}\dfrac{L^3}{12\pi R^4}$

$\Delta V = I\,R$ $\quad R = \dfrac{\rho L}{A} = \dfrac{L}{A\sigma}$ $\quad \rho_{total} = \rho_{thermal} + \rho_{impurity} + \rho_{def}$ $\quad \rho_{thermal} = \rho_o + aT$

$\rho_{impurity} = Ac_i(1 - c_i)$ $\quad \sigma = n|e|\mu_e + p|e|\mu_h$ $\quad C = \dfrac{dQ}{dT}$ [J/mol - K] $\quad \sigma_{TH} = E\alpha_l\Delta T$

$C_V = \left(\dfrac{\delta q}{dT}\right)_V$ $\quad C_P = \left(\dfrac{\delta q}{dT}\right)_P$ $\quad \dfrac{\Delta L}{L_o} = \alpha(T_2 - T_1)$ $\quad q = -k\dfrac{dT}{dx}$ $\quad TSR \cong \dfrac{\sigma_f k}{E\alpha_l}$

$E = h\nu = hc/\lambda$

Constants

$N_A = 6.023 \times 10^{23}$ atoms/mol speed of light = 3×10^8 m/s
$k = 8.62 \times 10^{-5}$ eV/atom-K or 1.38×10^{-23} J/atoms-K
Planck's constant = 6.63×10^{-34} J-s = 4.13×10^{-15} eV-s
R = 8.314 J/(mol.K)