

Equation Sheet for Exam 2 (BMEN 343)

$$J = \frac{M}{At} \quad J = -D \frac{dC}{dx} = -D \frac{C_2 - C_1}{x_2 - x_1} \quad \frac{C_x - C_o}{C_s - C_o} = 1 - \operatorname{erf}\left(\frac{x}{2\sqrt{Dt}}\right) \quad N = \frac{N_A \rho}{A}$$

$$D = D_o \exp\left(-\frac{Q_d}{RT}\right) \quad N_v = N \exp\left(-\frac{Q_v}{kT}\right) \quad Q_v = -kT \ln\left(\frac{N_v}{N}\right) \quad \frac{N_v}{N} = \exp\left(-\frac{Q_v}{kT}\right)$$

$$C_1 = \frac{m_1}{m_1 + m_2} \times 100 \quad C_1' = \frac{n_{m1}}{n_{m1} + n_{m2}} \times 100 \quad C_1 = \frac{C_1' A_1}{C_1' A_1 + C_2' A_2} \times 100$$

$$C_1' = \frac{C_1 A_2}{C_1 A_2 + C_2 A_1} \times 100 \quad N_1 = \frac{N_A C_1}{\frac{C_1 A_1}{\rho_1} + \frac{A_1}{\rho_2} (100 - C_1)} \quad \sigma_T = \frac{F}{A_i} \quad \varepsilon_T = \ln \frac{l_i}{l_o}$$

$$\lambda = \frac{F}{A_o} = G\gamma \quad \gamma = \tan \theta \quad \sigma = \frac{F}{A_o} \quad \varepsilon = \frac{\Delta l}{l_o} = \frac{l - l_o}{l_o} \quad \sigma = E\varepsilon$$

$$\nu = -\frac{\varepsilon_x}{\varepsilon_z} = -\frac{\left(\frac{\Delta d}{d_o}\right)}{\left(\frac{\Delta l}{l_o}\right)} \quad \%EL = \left(\frac{L_f - L_o}{L_o}\right) \times 100 \quad \%RA = \left(\frac{A_o - A_f}{A_o}\right) \times 100 \quad E_r(t) = \frac{\sigma(t)}{\varepsilon_o}$$

$$E_c(t) = \frac{\sigma_o}{\varepsilon(t)}$$

Useful Info:

$$1^\circ\text{C} = 274 \text{ Kelvin}$$

$$K = 273 + ^\circ\text{C}$$

$$N_A = 6.023 \times 10^{23} \text{ atoms/mol}$$

$$R = 8.31 \frac{J}{\text{molK}} = 8.62 \frac{eV}{\text{atomK}}$$

$$k = 1.38 \times 10^{-23} \frac{J}{\text{atomK}} = 8.62 \times 10^{-5} \frac{eV}{\text{atomK}}$$

$$1\text{GPa} = 10^3 \text{MPa} = 10^9 \frac{N}{\text{m}^2} = 145,038 \text{psi}$$

$$1\text{MPa} = 10^6 \frac{N}{\text{m}^2} = 145 \text{psi}$$