59-240 Introductory Physical Chemistry Equation Summary, Mid-Term Exam #1

$$pV = nRT$$

$$c = \sqrt{\frac{3RT}{M}}$$

$$\bar{c} = \sqrt{\frac{8RT}{\pi M}}$$

$$z = \frac{\sigma \bar{c}_{\text{rel}} p}{kT} \quad , \quad \bar{c}_{\text{rel}} = \sqrt{2}\,\bar{c}$$

$$\lambda = \frac{kT}{\sqrt{2}\sigma p}$$

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

$$\Delta U = q + w$$

$$dw = -F\,dx$$

$$w = -\int_{V_i}^{V_f} p_{\text{ex}}\,dV$$

$$w_{\text{const.}p_{\text{ex}}} = -p_{\text{ex}}\Delta V$$

$$w_{\text{T,revers,ideal}} = -nRT\ln\left(\frac{V_f}{V_i}\right)$$

$$w_{\text{ad,ideal}} = C_V\Delta T$$

$$q_V = C_V\Delta T$$

$$\left(\frac{\partial U}{\partial T}\right)_V = C_V$$

$$dU_{\text{const.}V} = C_V\,dT$$

$$dU_{\text{ideal}} = C_V\,dT$$

$$H = U + pV$$

$$H_{\text{ideal}} = U_{\text{ideal}} + nRT$$

$$q_p = C_p\Delta T$$

$$\Delta H_{\text{const.}p} = q_p$$

$$\left(\frac{\partial H}{\partial T}\right)_p = C_p$$

$$C_{p,\text{ideal}} = C_{V,\text{ideal}} + nR$$

$$T_{f,\text{ad}} = T_{i,\text{ad}}\left(\frac{V_i}{V_f}\right)^{1/c} \quad , \quad c = \frac{C_{V,m}}{R}$$

$$\Delta_r H^\circ = \sum_{\text{products}} \nu\Delta_f H^\circ - \sum_{\text{reactants}} \nu\Delta_f H^\circ$$

$$\Delta_r H^\circ(T_2) = \Delta_r H^\circ(T_1) + (T_2 - T_1)\Delta_r C_p{}^\circ$$

$$dU = \left(\frac{\partial U}{\partial V}\right)_T dV + \left(\frac{\partial U}{\partial T}\right)_V dT$$

$$dU = \pi_T\,dV + C_V\,dT$$

$$\alpha = \frac{1}{V}\left(\frac{\partial V}{\partial T}\right)_p$$

$$dH = \left(\frac{\partial H}{\partial p}\right)_T dp + \left(\frac{\partial H}{\partial T}\right)_p dT$$

$$dH = \mu_T\,dp + C_p\,dT$$

$$\mu_T = \left(\frac{\partial H}{\partial p}\right)_T = -C_p\mu$$

$$\mu = \left(\frac{\partial T}{\partial p}\right)_H$$

$$\kappa_T = -\frac{1}{V}\left(\frac{\partial V}{\partial p}\right)_T$$

$$\frac{dV}{V} = \alpha\,dT - \kappa_T\,dp$$

$$C_{p,\text{gen}} = C_{V,\text{gen}} + \frac{\alpha^2 TV}{\kappa_T}$$