

Quiz #9
Name _____

Week: Nov. 14 – Nov. 16
Chemistry 331

Equations and constants:

$$R = 8.31 \text{ J/mol-K} = 0.08206 \text{ L-atm/mol-K,}$$

$$\text{For water: } \Delta H_{\text{vap}} = 41.6 \text{ kJ/mol, } T_{\text{vap}} = 100 \text{ }^\circ\text{C, } \Delta H_{\text{fus}} = 6 \text{ kJ/mol}$$

$$\text{For THF: } \Delta H_{\text{vap}} = 27.9 \text{ kJ/mol, } T_{\text{vap}} = 66 \text{ }^\circ\text{C}$$

$$a = \omega^2 x, \quad s = \frac{m(1 - v_2 \rho)}{f}, \quad D = kT/f, \quad f = 6\pi\eta r, \quad M = \frac{RTs}{D(1 - v_2 \rho)}$$

$$\Delta E = \frac{RT}{nF} \ln\left(\frac{c_o}{c_i}\right), \quad \Delta G^\circ = -nF\Delta E, \quad \Pi = cRT, \quad P_i = K_{H,i}x_i$$

$$P_i = K_{H,i}c_i, \quad a_i = \gamma_i x_i, \quad P_i = x_i P_i^*, \quad P_i = y_i P_{\text{total}}, \quad \sqrt{\langle d^2 \rangle} = L\sqrt{N}$$

$$\frac{P_2}{P_1} = e^{-\Delta E/kT}, \quad P_{\text{in}} = P_{\text{out}} + \frac{2\gamma}{r}, \quad k = Ae^{-E_a/RT}, \quad k = \frac{k_B T}{h} e^{-\Delta G^\ddagger/RT}$$

1. Assuming that THF makes an ideal solution in water calculate the partial pressure of THF at its nominal boiling point of 66 °C if its mole fraction is 0.4.

Vapor pressure = _____ (atm)

2. Calculate the concentration of CO₂ in water using the Henry's law constant (k_{H,CO₂} = 1600 atm) and given the partial pressure is P_{CO₂} = 3.6 x 10⁻⁴ atm.

Calculation of CO₂ = _____ (M).

3. Calculate the molar mass of a protein of unknown structure at 20 °C given the following data for the protein.

Sedimentation constant: 3.5×10^{-13} sec
Diffusion coefficient: 7.0×10^{-7} cm²/sec
Protein Density: 1.32 g/cm³
Relative friction coefficient: 2.6
Viscosity: 0.2 Ns/m²

Molar mass = _____ (g/mol).