

Chemistry 1410 Spring 2005
Quiz 1, Section 2, 20 pts

Name _____ (please print)

Equations: $c = kP$ $P_1 = X_1 P_1^\circ$ $\Delta P = X_2 P_1^\circ$ $K = \text{Degrees C} + 273$
 $\Delta T_b = K_b m$ $\Delta T_f = K_f m$ $\pi = MRT$ $R = 0.0821 \text{ L}\cdot\text{atm}/\text{Mole}\cdot\text{K}$

1.(2pts) Which of the following compounds should be soluble in CCl_4 ?

- A. NaCl B. H_2O C. NaOH **(D.) SiBr_4** E. None of these

2.(2pts) The solubility of CO_2 gas in water

- (A.)** increases with increasing gas pressure.
 B. increases with decreasing gas pressure.
 C. decreases with increasing gas pressure.
 D. is not dependent on pressure.

3. 4pts Calculate the percent by mass of potassium nitrate in a solution made from 45.0 g KNO_3 and 295 g of water.

$$\left(\frac{45.0 \text{ g}}{(45.0 \text{ g} + 295 \text{ g})} \right) \times 100 = 13.2 \text{ mass \%}$$

4. 4pts Find the freezing point of a solution containing 15.0 g of naphthalene in 250 g of benzene. (K_f for benzene is $5.12^\circ\text{C}/m$, K_b is $2.53^\circ\text{C}/m$. The boiling point and freezing point of benzene are 80.1°C and 5.5°C , respectively.)

$\Delta T_f = K_f m$ $m = \text{moles solute} / \text{Kg solvent}$

$\text{moles solute} = 15.0 \text{ g} \times \frac{1 \text{ mole}}{128 \text{ g}} = 0.117 \text{ moles naphthalene}$

$250 \text{ g} = 0.250 \text{ Kg benzene (solvent)}$; $m = \frac{0.117 \text{ moles}}{0.250 \text{ Kg}} = 0.469$

$\Delta T_f = (5.12^\circ\text{C}/m)(0.469m) = 2.4^\circ\text{C}$

Freezing point = $5.5^\circ\text{C} - 2.4^\circ\text{C} = 3.1^\circ\text{C}$

5. $\frac{4}{ph}$ The vapor pressure of water at 20°C is 17.5 mmHg. What is the vapor pressure of water over a solution prepared from 2.00×10^2 g of sucrose ($\text{C}_{12}\text{H}_{22}\text{O}_{11}$) and 3.50×10^2 g water?

$$P_{\text{H}_2\text{O}} = X_{\text{H}_2\text{O}} P_1^0$$

solution

$$\text{moles H}_2\text{O} = 3.50 \times 10^2 \text{ g} \times \frac{1 \text{ mole}}{18.0 \text{ g}}$$

$$\text{moles H}_2\text{O} = 19.4$$

$$\text{moles sucrose} = 200 \text{ g} \times \frac{1 \text{ mole}}{342 \text{ g}} = 0.585 \text{ moles}$$

$$X_{\text{H}_2\text{O}} = \frac{19.4 \text{ moles H}_2\text{O}}{19.4 \text{ moles H}_2\text{O} + 0.585 \text{ moles sucrose}} = 0.971$$

$$P_{\text{solution}} = (0.971)(17.5 \text{ mmHg}) = 17.0 \text{ mm Hg}$$

6. $\frac{4}{ph}$ What is the osmotic pressure of a solution that contains 13.7 g of propyl alcohol ($\text{C}_3\text{H}_7\text{OH}$) dissolved in enough water to make 500 mL of solution at 10°C ?

$$\pi = MRT$$

$$M = 13.7 \text{ g} \times \frac{1 \text{ mole}}{60.0 \text{ g}} = \frac{0.228 \text{ moles}}{0.500 \text{ L}} = 0.457 \text{ moles/L}$$

$$\pi = (0.457 \text{ moles/L})(0.0821 \text{ L atm/mole}\cdot\text{K})(283 \text{ K})$$

$$\pi = 10.6 \text{ atm}$$