

# Non Sibi High School

## Andover's Chem 550/580: Advanced Chemistry

### Chapter 21, Review Quiz 1

**1**

Calculate the mass of caffeine,  $\text{C}_8\text{H}_{10}\text{N}_4\text{O}_2$ , that must be dissolved in 75.0 grams of dichloromethane,  $\text{CH}_2\text{Cl}_2$ , to create a 0.103  $m$  solution.

**2**

To create a 0.22  $m$  solution, how many grams of carbon disulfide must be used to dissolve 2.7 grams of  $\text{Br}_2$ ?

**3**

The freezing point of benzene,  $\text{C}_6\text{H}_6$ , is  $5.5^\circ\text{C}$  and the boiling point of benzene is  $80.1^\circ$ . Given that  $K_f = 5.12^\circ\text{C}/m$  and  $K_b = 2.53^\circ\text{C}/m$  for benzene, calculate the molality, the freezing point, and the boiling point of a solution containing 17 grams of camphor,  $\text{C}_{10}\text{H}_{16}\text{O}$ , dissolved in 66 grams of benzene.

**4**

Rank the following aqueous solutions in order from lowest to highest freezing point and from lowest to highest boiling point without performing detailed calculations:

0.018  $m$   $\text{K}_3\text{PO}_4$

0.020  $m$   $\text{SrBr}_2$

0.025  $m$   $\text{C}_6\text{H}_{12}\text{O}_6$

0.025  $m$   $\text{HI}$

0.025  $m$   $\text{HNO}_2$

## 5

- A molecular solute that does not ionize was found to be 38.7% carbon and 9.7% hydrogen by mass, with the remainder being oxygen. Determine the empirical formula of the solute.
- A solution containing 1.6 grams of the solute dissolved in 9.8 grams of water was found to freeze at  $-4.9^{\circ}\text{C}$ . If  $K_f$  for water is  $1.86^{\circ}\text{C}/m$ , determine the molar mass and molecular formula of the solute.

## 6

The vapor pressure of pure water at  $27^{\circ}\text{C}$  is 26.7 mmHg. Calculate the vapor pressure of water and the total vapor pressure above a solution containing 105 grams of nonvolatile glucose,  $\text{C}_6\text{H}_{12}\text{O}_6$ , dissolved in 765 grams of water at  $27^{\circ}\text{C}$ .

## 7

The vapor pressure of pure ethanol,  $\text{C}_2\text{H}_5\text{OH}$ , at  $40^{\circ}\text{C}$  is 128.6 mmHg. The vapor pressure of pure propanol,  $\text{C}_3\text{H}_7\text{OH}$ , at  $40^{\circ}\text{C}$  is 36.4 mmHg. For a liquid mixture containing 388 grams of ethanol and 323 grams of propanol at  $40^{\circ}\text{C}$ , calculate:

- The partial vapor pressures of ethanol and propanol above the mixture.
- The total vapor pressure above the mixture.
- The mole fractions of ethanol vapor and propanol vapor above the mixture.



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