

AP Chemistry – Colligative Properties / Colloids – 38

Name _____ Per ____

1. How does increasing the concentration of a nonvolatile solute in water affect the following properties?

- (a) vapor pressure
- (b) freezing point
- (c) boiling point
- (d) osmotic pressure

2. Calculate the vapor pressure of water above a solution prepared by dissolving 35.0 g of glycerine ($C_3H_8O_3$) in 125 g of water at 343K. The vapor pressure of water is 233.7 torr at 343K.

3. Seawater contains 3.4 g of salts for every liter of solution. Assuming that the solute consists entirely of NaCl (over 90% is), calculate the osmotic pressure of seawater at $20^\circ C$.

4. Explain how each of the following factors helps determine the stability or instability of a colloidal dispersion:

- (a) particulate mass
- (b) hydrophobic character
- (c) charges on colloidal particles

5.

TABLE 13.4 Molal Boiling-Point-Elevation and Freezing-Point-Depression Constants

| Solvent | Normal Boiling Point (°C) | K_b (°C/ <i>m</i>) | Normal Freezing Point (°C) | K_f (°C/ <i>m</i>) |
|---|----------------------------------|--------------------------|-----------------------------------|--------------------------|
| Water, H ₂ O | 100.0 | 0.51 | 0.0 | 1.86 |
| Benzene, C ₆ H ₆ | 80.1 | 2.53 | 5.5 | 5.12 |
| Ethanol, C ₂ H ₅ OH | 78.4 | 1.22 | -114.6 | 1.99 |
| Carbon tetrachloride, CCl ₄ | 76.8 | 5.02 | -22.3 | 29.8 |
| Chloroform, CHCl ₃ | 61.2 | 3.63 | -63.5 | 4.68 |

Using the data above, calculate the freezing and boiling points of each of the following solutions:

(a) 0.40 *m* glucose in ethanol

(b) 20.0 g of C₁₀H₂₂ in 455 g of chloroform

(c) 0.45 moles ethylene glycol and 0.15 moles KBr in 150 g water

6. Write the balanced molecular and net ionic equations for each of the following neutralization reactions:

(a) Aqueous acetic acid is neutralized by aqueous potassium hydroxide.

(b) Solid chromium(III) hydroxide reacts with nitric acid.

(c) Aqueous hypochlorous acid and aqueous calcium hydroxide react.

7. As potassium oxide dissolves in water, the oxide ion reacts with water molecules to form hydroxide ions. (a) Write the molecular and net ionic equations for this reaction.

(b) Based on the definitions of acid and base, what ion is the base in this reaction?

(c) What is the acid?

(d) What is the spectator ion?

8. What is the oxidation number for the indicated element in each of the following compounds:

(a) Ti in TiO_2

(b) Sn in SnCl_4

(c) C in $\text{C}_2\text{O}_4^{2-}$

(d) N in $(\text{NH}_4)_2\text{SO}_4$

(e) N in HNO_2

(f) Cr in $\text{Cr}_2\text{O}_7^{2-}$