

Chapter 11 Study Questions

CONCENTRATION

1. How many moles of sodium chlorate are in 284 grams of a 12.0% sodium chlorate solution?
2. Calculate the mole fraction of ethylene glycol ($C_2H_6O_2$) when 120. grams of ethylene glycol are dissolved in 1.20 kilograms acetone (C_3H_6O).
3. The density of a 6.90 M potassium hydroxide solution is 1.29 g/cm^3 . Find the mass percent of solute and molality of this solution.
4. A solution is prepared by mixing 12.8 grams of methanol (density = 0.791 g/mL) and 144 grams of water (density = 1.00 g/mL). Assuming volumes are additive, what is the molarity of methanol in the solution?

SOLUBILITY

5. How does the solubility of gases vary with temperature? Give an example from everyday life that demonstrates this.
6. You are given a solution of sucrose. How would you determine whether the solution was unsaturated, saturated or supersaturated?

COLLIGATIVE PROPERTIES (Use Table 11.5, page 532, as needed.)

7. What is the freezing point of a solution containing 0.110 moles of a nonelectrolyte in 55.0 g of water?
8. What is the freezing point of a solution containing 27.8 g of calcium chloride in 250. g of water? (Is calcium chloride an ionic or molecular solute and why is this important?)
9. What is the molar mass of a nonelectrolyte if 80.0 g of the substance dissolved in 200.0 g of water has a freezing point of -4.65°C ?
10. What is the boiling point of a solution containing 0.500 moles of a nonelectrolyte in 200.0 g of benzene?
11. What is the molar mass of a nonelectrolyte if a solution containing 45.0 g of the nonelectrolyte in 75.0 g of benzene boils at 90.2°C ?

Other definitions and concepts: solute, solvent, electrolytes & nonelectrolytes, solution equilibrium, solute-solvent interactions, vapor pressure lowering. "like dissolves like", hydrophobic, hydrophilic

Summary of Chapter 11: Properties of Solutions

solute

solvent

concentration

 molarity

 mass percent

 mole fraction

 molality

conversions between concentration units

molecular and ionic solutes

nonpolar and polar solutes and solvents

hydrophobic and hydrophilic substances

electrolytes and nonelectrolytes

Saturated, supersaturated and unsaturated solutions

solubility and temperature

solubility and pressure

Henry's Law

Raoult's Law

colligative properties

 vapor pressure lowering

 boiling point elevation

 freezing point depression

van't Hoff factor

calculate number of moles, concentration or molar mass from boiling or freezing point