16 SOLUTIONS

Practice Problems

In your notebook, solve the following problems.

SECTION 16.1 PROPERTIES OF SOLUTIONS

1. The solubility of CO_2 in water at 1.22 atm is 0.54 g/L. What is the solubility of carbon dioxide at 1.86 atm? Assume that temperature is constant.

2. What mass of KCl will produce a saturated solution in 500.0 g of water at 20°C? The solubility of KCl at 20°C is 34.0 g/100 g H_2O.

3. A saturated solution of silver nitrate is prepared in 100.0 g of water at 20°C. The solution is then heated to 50.0°C. How much more silver nitrate must now be added to obtain a saturated solution? (**Use Table 16.1.**)

SECTION 16.2 CONCENTRATIONS OF SOLUTIONS

1. Calculate the molarity of each of the following solutions.

   a. 0.40 mol of NaCl dissolved in 1.6 L of solution

   b. 20.2 g of potassium nitrate, KNO_3, in enough water to make 250.0 mL of solution

2. Calculate the number of grams of solute needed to prepare each of the following solutions.

   a. 2500.0 mL of a 3.0M solution of potassium hydroxide, KOH

   b. 2.0 liters of 2.0M nitric acid, HNO_3, solution

3. What is the molarity of a solution that contains 212.5 g of sodium nitrate ($NaNO_3$) in 3.0 liters of solution?

4. You must prepare 300.0 mL of 0.750M NaBr solution using 2.00M NaBr stock solution. How many milliliters of stock solution should you use?

5. In order to dilute 1.0 L of a 6.00M solution of NaOH to 0.500M solution, how much water must you add?

6. What is the concentration in percent by volume, %(v/v), of the following solutions?

   a. 60.0 mL of methanol in a total volume of 500.0 mL

   b. 25.0 mL of rubbing alcohol (C_3H_7OH) diluted to a volume of 200.0 mL with water

7. How many grams of solute are needed to prepare each of the following solutions?

    a. 1.00 L of a 3.00% (m/m) NaCl solution?

    b. 2.00 L of 5.00% (m/m) KNO_3 solution?

SECTION 16.3 COLLIGATIVE PROPERTIES OF SOLUTIONS

1. How many particles in solution are produced by each formula unit of potassium carbonate, K_2CO_3?

2. How many moles of particles would 3 mol Na_2SO_4 give in solution?

3. What is the boiling point of a solution that contains 2 mol of magnesium chloride in 100.0 g of water?

4. An equal number of moles of NaCl and $CaCl_2$ are dissolved in equal volumes of water. Which solution has the lower

    a. freezing point?

    b. boiling point?

SECTION 16.4 CALCULATIONS INVOLVING COLLIGATIVE PROPERTIES

1. Calculate the mole fraction of solute in each of the following solutions.

    a. 3.0 moles of lithium bromide, LiBr, dissolved in 6.0 moles of water

    b. 125.0 g of potassium nitrate, KNO_3, dissolved in 800.0 g of water

2. How many grams of sodium chloride must dissolve in 750.0 g of water to make a 0.50 molal solution?

3. How many grams of lithium sulfide must be dissolved in 1600.0 g of water to make a 2.0 molal solution?

4. Find the molality of each of the following solutions.

    a. 2.3 moles of glucose dissolved in 500.0 g of water

    b. 131 g of $Ba(NO_3)_2$ dissolved in 750.0 g of water

5. Find the boiling points of the following solutions.

    a. 2.00m solution of sodium chloride, NaCl

    b. 1.50m solution of calcium chloride, $CaCl_2$

6. Find the freezing points of the following solutions.

    a. 0.35 moles of sodium chloride, NaCl, dissolved in 900.0 g of water

    b. 126.0 g of table sugar, $C_{12}H_{22}O_{11}$, dissolved in 2500.0 g of water