

Chemistry 101
In-Class Assignment 9 (Due by Oct. 29)
Concentrations of Solutions

1. Identify the solute and solvent in each of the following:
 - (a) A solution made from 50.0 g of silver and 3.5 g of mercury
 - (b) A solution made from 10 mL of hydrogen peroxide (H₂O₂) and 150 mL of water
 - (c) A solution made from 15 g of KI and 75 mL water.
2. Carbon tetrachloride (CCl₄) is a non-polar solvent. Are the following compounds more likely to be soluble in carbon tetrachloride or water?
 - (a) KCl
 - (b) I₂
 - (c) benzene C₆H₆ (nonpolar)
 - (d) NaNO₃
 - (e) heptane, C₇H₁₄

Calculating % Concentrations for Solutions - (% m/m)

$$\text{mass \% (\%m/m)} = \frac{\text{grams solute}}{\text{grams solution}} \times 100\%$$

3. Calculate the mass percent (% m/m) for the solute in each of the following:
 - (a) 55 g of KCl in 250 g of solution
 - (b) 0.235 g of NaNO₃ in 10.0 g of solution
 - (c) 45 g of sucrose in 1.00 kg of solution
 - (d) A solution made from 2.35 g of glucose and 200.0 mL (200.0 g) of water?

Calculating % Concentrations for Solutions - (% v/v)

$$\text{volume \% (\%v/v)} = \frac{\text{volume solute}}{\text{volume solution}} \times 100\%$$

4. Calculate the volume percent (% v/v) for the solute in each of the following:

(a) 1.25 mL of acetic acid in 250 mL of solution

(b) 10.0 mL of methanol in 1.00 L of solution

Calculating % Concentrations for Solutions - (% m/v)

$$\text{mass/volume \% } (\%m/v) = \frac{\text{grams solute}}{\text{milliliters solution}} \times 100\%$$

5. Calculate the mass/volume percent (% m/v) for the solute in each of the following:

(a) 2.50 g of KCl in 75.0 mL of solution

(b) 0.023 g of NaBr in 13.2 mL of solution

Using Solution Concentrations

6. Calculate the amount of solute (in mL) needed to prepare 450 mL of a 15.0% (v/v) isopropyl alcohol solution.

7. Calculate the amount of solute (in g) needed to prepare 500 mL of a 5.0% (m/v) glucose solution.

8. A patient needs to receive 75 g of glucose in the next 8 hours. How many mL of a 5% (m/v) glucose solution must be given?

9. (BONUS Question) Calculate the amount of isopropanol (in g) that I need to add to 75.0 grams of water to prepare a 5.0% (m/m) solution of isopropanol in water.

Molarity, Another Common Concentration Unit

$$\text{Molarity (M)} = \frac{\text{moles solute}}{\text{Liters of solution}}$$

10. Calculate the molarity of a solution prepared by dissolving 3.14 moles of NaOH in water and diluting to a total volume of 4.00 L.

11. Calculate the molarity of a solution prepared by dissolving 0.282 moles of CaCl₂ in water and diluting to a total volume of 0.500 L.

12. Calculate the molarity of a solution prepared by dissolving 0.0635 moles of KNO₃ in water and diluting to a total volume of 250.0 milliliters.

13. Calculate the molarity of a solution prepared by dissolving 41.8 grams of NaCl in water and diluting to a total volume of 2.00 L.

14. Calculate the molarity of a solution prepared by dissolving 15 milligrams of RbBr in water and diluting to a total volume of 2.00 L.

15. Calculate the number of moles of FeCl₃ in 2.2 L of a 0.250 M solution of FeCl₃.

16. Calculate the number of moles of Na₂CO₃ in 10.0 mL of a 1.27 M solution of Na₂CO₃.

17. Suppose 0.182 moles of KCl are needed for a reaction. If 0.50 molar KCl is available, how many milliliters of the solution will we have to add to our reaction mixture to add the correct number of moles?