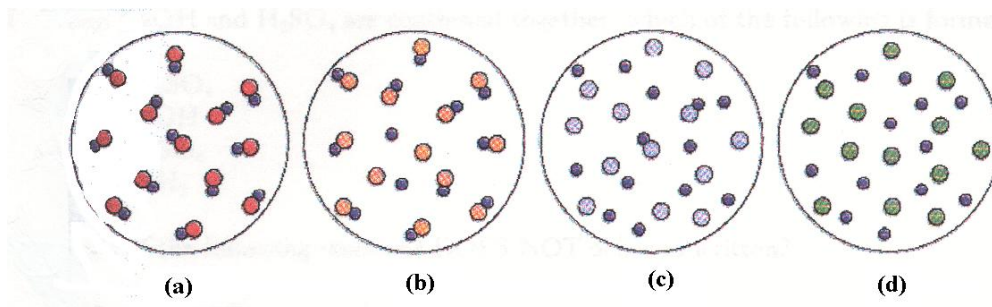


REVIEW QUESTIONS

Chapter 8

1. Identify each of the diagrams below as strong electrolyte, weak electrolyte or non-electrolyte:



- (a) **Non-electrolyte (no ions present)**
 (b) **Weak electrolyte (few ions present)**
 (c) **Strong electrolyte (mostly ions present)**
 (d) **Strong electrolyte (only ions present)**

2. Identify the predominant particles in each of the following solutions and write the equation for the formation of the solution:

- a) Li_2CO_3 **Ions (strong electrolyte)**



- b) CCl_4 **Molecules (non-electrolyte)**



- c) H_2S **Molecules (weak electrolyte)**



3. How many equivalents are present in 5.0 g of Al^{3+} ?

$$5.0 \text{ g Al}^{3+} \times \frac{1 \text{ mol}}{27.0 \text{ g}} \times \frac{3 \text{ Eq}}{1 \text{ mol}} = 0.56 \text{ Eq}$$

4. An intravenous replacement solution contains 4.0 mEq/L of Ca^{2+} ions. How many grams of Ca^{2+} are in 3.0 L of the solution?

$$3.0 \text{ L soln} \times \frac{4 \text{ mEq}}{1 \text{ L soln}} \times \frac{1 \text{ Eq}}{10^3 \text{ mEq}} \times \frac{1 \text{ mol Ca}^{2+}}{2 \text{ Eq}} \times \frac{40.1 \text{ g}}{1 \text{ mol}} = 0.24 \text{ g Ca}^{2+}$$

5. Calculate the mass percent (m/m or m/v) for each of the following solutions:

- a) 25 g of KCl in 125 g H_2O

$$\text{mass of solution} = 25 \text{ g} + 125 \text{ g} = 150 \text{ g}$$

$$\text{mass \%} = \frac{25 \text{ g}}{150 \text{ g}} \times 100 = 17\% \text{ (m/m)}$$

- b) 75 g of NaOH in 325 mL of solution

$$\text{mass \%} = \frac{75 \text{ g}}{325 \text{ mL}} \times 100 = 23\% \text{ (m/v)}$$

6. Calculate the molarity of the following solutions:

- a) 0.50 mol sugar in 270 mL of solution.

$$\text{Volume of solution} = 270 \text{ mL} = 0.27 \text{ L}$$

$$\text{molarity} = \frac{0.50 \text{ mol}}{0.27 \text{ L}} = 1.9 \text{ M}$$

- b) 17.0 g of AgNO_3 in 0.500 L of solution.

$$\text{moles of solute} = 17.0 \text{ g} \times \frac{1 \text{ mol}}{169.9 \text{ g}} = 0.100 \text{ mol}$$

$$\text{molarity} = \frac{0.100 \text{ mol}}{0.500 \text{ L}} = 0.200 \text{ M}$$

7. Calculate the moles of solute needed to prepare each of the following solutions:

a) 450 mL of 0.20 M KBr solution.

$$0.45 \text{ L} \times \frac{0.20 \text{ mol}}{1 \text{ L}} = 0.090 \text{ mol}$$

b) 2.0 L of 1.5 M NaOH solution.

$$2.0 \text{ L} \times \frac{1.5 \text{ mol}}{1 \text{ L}} = 3.0 \text{ mol}$$

8. Calculate the mass of solute needed to prepare each of the following solutions:

a) 2.0 L of 1.8 M NaOH solution.

$$2.0 \text{ L} \times \frac{1.8 \text{ mol}}{1 \text{ L}} = 3.6 \text{ mol}$$
$$3.6 \text{ mol} \times \frac{40.0 \text{ g}}{1 \text{ mol}} = 140 \text{ g} \quad (2 \text{ sig figs})$$

b) 250 mL of 1.0 M CaCl₂ solution.

$$0.25 \text{ L} \times \frac{1.0 \text{ mol}}{1 \text{ L}} \times \frac{111 \text{ g}}{1 \text{ mol}} = 28 \quad (2 \text{ sig figs})$$

c) 750 mL of 3.5% (m/v) K₂CO₃ solution.

$$750 \text{ mL} \times \frac{3.5 \text{ g K}_2\text{CO}_3}{100 \text{ mL}} = 26 \text{ g} \quad (2 \text{ sig figs})$$

9. What volume (mL) of a 4.0 M solution of KCl contains 0.100 moles of solute?

$$0.100 \text{ mol} \times \frac{1 \text{ L}}{4.0 \text{ mol}} \times \frac{10^3 \text{ mL}}{1 \text{ L}} = 25 \text{ mL}$$

10. What volume (mL) of a 1.5 M solution of NaCl contains 25.0 g of solute?

$$25.0 \text{ g} \times \frac{1 \text{ mol}}{58.45 \text{ g}} = 0.428 \text{ mol}$$

$$0.428 \text{ mol} \times \frac{1 \text{ L}}{1.5 \text{ mol}} \times \frac{10^3 \text{ mL}}{1 \text{ L}} = 290 \text{ mL} \quad (2 \text{ sig figs})$$

11. How many liters of a 5.0% (m/v) glucose solution would contain 75 g of glucose?

$$75 \text{ g glucose} \times \frac{100 \text{ mL}}{5.0 \text{ g glucose}} \times \frac{1 \text{ L}}{10^3 \text{ mL}} = 1.5 \text{ L}$$

12. A patient receives an IV containing 2.5% (m/v) glucose solution at the rate of 35 mL in 1 hour. How many grams of glucose does this patient receive after 12 hours?

$$12 \text{ hr} \times \frac{35 \text{ mL}}{1 \text{ hr}} \times \frac{2.5 \text{ g glucose}}{100 \text{ mL}} = 11 \text{ g} \quad (2 \text{ sig figs})$$

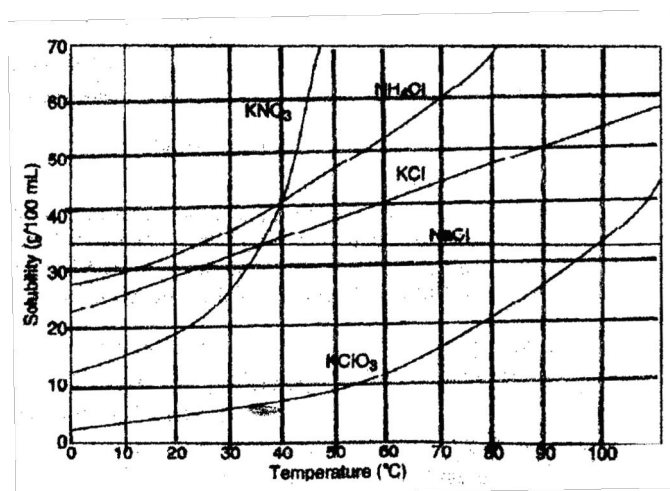
13. Use the solubility graph below to answer the following questions:

- a) Which substance has the greatest solubility at 30°C?

NH₄Cl

- b) What is the solubility of KCl at 60°C?

40 g/100 g H₂O (40%)



- c) A sample of KNO₃ with a mass of 50.0 g is added to 150 mL of water at 40°C. Is this solution saturated or unsaturated. Give explanation or show calculations.

Solubility of KNO₃ at 40°C = 40 g KNO₃/100 g water (40%)

150 mL of water = 150 g since density of water is 1.0 g/mL

$\frac{50.0 \text{ g KNO}_3}{150 \text{ g water}} = 33.3\%$ Therefore, solution is unsaturated

14. Indicate whether each of the following is soluble or insoluble in water:

a) MgSO₄ soluble.

b) KCl soluble.

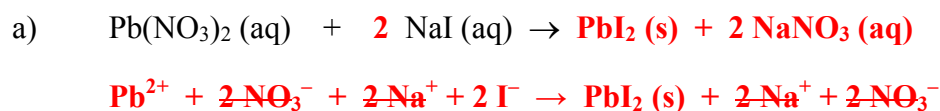
c) (NH₄)₂ CO₃ soluble.

d) PbS insoluble.

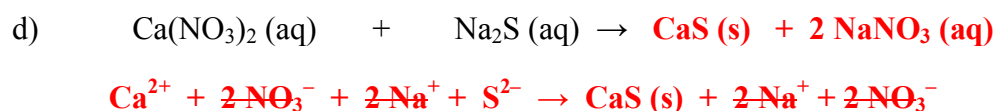
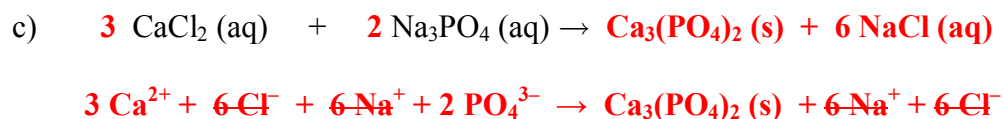
e) Ca(OH)₂ soluble.

f) Na₃PO₄ soluble.

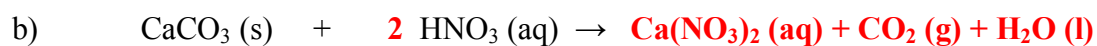
15. For each reaction below, write the net ionic equation to show the formation of a precipitate. If no precipitate occurs, write "No Reaction" after the arrow.



No precipitate forms since the two possible products formed (Na_2SO_4 and NH_4Cl) are both soluble



16. Complete and balance the following chemical equations:



17. How many mL of a 15 M NH₃ solution is needed to prepare 50. mL of a 6.0 M NH₃ solution?

$$V_2 = \frac{M_1 V_1}{M_2} = \frac{(6.0 \text{ M})(50. \text{ mL})}{15 \text{ M}} = 20. \text{ mL}$$

18. Calculate the molarity of a solution prepared by mixing 250 mL of 0.75 M H₂SO₄ with 150 mL of water.

$$V_2 = 250 \text{ mL} + 150 \text{ mL} = 400 \text{ mL}$$
$$M_2 = \frac{M_1 V_1}{V_2} = \frac{(0.75 \text{ M})(250 \text{ mL})}{400 \text{ mL}} = 0.47 \text{ M}$$

19. What is the final volume, in mL, when 5.00 mL of 12.0 M NaOH is diluted to 0.600 M?

$$V_2 = \frac{M_1 V_1}{M_2} = \frac{(12.0 \text{ M})(5.00 \text{ mL})}{0.600 \text{ M}} = 100. \text{ mL}$$

20. Determine the osmolarity and tonicity of each of the following solutions:

a) 0.15 M KCl (i = 2) 0.30 osmol (isotonic)

b) 0.12 M sucrose (i = 1) 0.12 osmol (hypotonic)

c) 0.080 M FeCl₃ (i = 4) 0.32 osmol (hypertonic)

d) 0.10 M Ca(NO₃)₂ (i = 3) 0.30 osmol (isotonic)