**Terms**

Solution                          "like dissolves like"
Solvent                           Solubility
Solute                            Saturated
Suspension                        Unsaturated
Colloid                           Supersaturated
Tyndall Effect                    Colligative Properties
Dissociation Equations           Electrolyte
Dissolution                       Nonelectrolyte
Crystallization                   Freezing Point Depression
Miscible                          Boiling Point Elevation
Immiscible                        Endothermic
Dilute                            Exothermic
Concentrated                      Net Ionic Equations

*A) Write the formula for:*

Molarity      $M = \dfrac{moles\ solute}{Liter\ solution}$

molality      $m = \dfrac{moles\ solute}{kg\ solvent}$

*B) For the following calculations: 1) Show what formula you will be using. 2) Show all work. 3) Label with units. 4) Use Significant Figures.*

a) A solution contains 3.0 moles of NaCl in 6.0 Liters of solution. What is the Molarity? $\dfrac{3.0mol}{6.0L} = \boxed{0.50M}$

b) A solution has a concentration of 1.25 molal $NaNO_3$. How many grams of $NaNO_3$ are needed for every 2.5 kg of solvent?

$1.25m = \dfrac{x}{2.5kg}$        $3.125\ mol \times \dfrac{85g}{mol}$        $266g = 270g$

c) 60.0g of sodium sulfate is used to make 750mL of solution. What is the Molarity?

$60.0g\ Na_2SO_4 \times \dfrac{1\ mol}{142.1g} = \dfrac{0.422\ mol}{.750} = 0.563\ M$

C) An aqueous solution has __higher__ boiling point then pure water and a __lower__ freezing point than water.

a) Write the dissociation equation for each of the solutes below.

$NaCl \rightarrow Na^+ + Cl^-$

$MgCl_2 \rightarrow Mg^{+2} + 2Cl^-$

$AlCl_3 \rightarrow Al^{+3} + 3Cl^-$
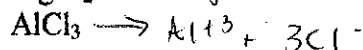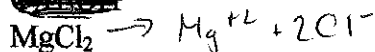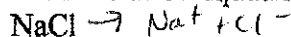
b) What is the boiling point of a 5.0 molal $NaNO_3$ aqueous solution?

$\Delta T_b = (0.512\ ^\circ C/m)(5.0m)(2)$

$\Delta T_b = 5.12\ ^\circ C$

$T_b = 100 + 5.12\ ^\circ C = 105.12\ ^\circ C$

D) *Use you solubility rules to predict the solubility of these substances:*

    a) $FeSO_4$   Soluble        c) $K_2S$   Soluble

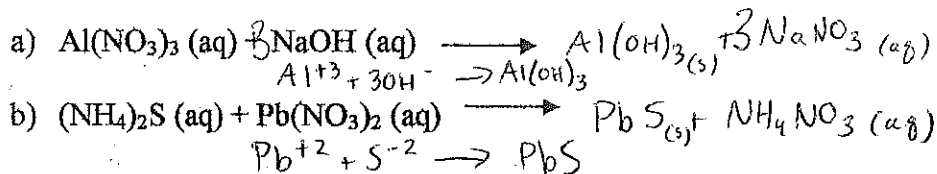    b) $MgCO_3$   Insoluble      d) $AgNO_3$   Soluble

E) *Use your solubility curves to answer the following:*

   a) A saturated solution of potassium chlorate contains __28__ g of solute in 100g of water at 60°C.

   b) A saturated solution of ammonia contains 20g of solute in 100g of water at __65__ °C.

   c) A solution of ammonium chloride containing 70 g of $NH_4Cl$ in 100 g of water at 60°C is (saturated, unsaturated, or~~supersaturated~~)?

   d) How many grams of $NaNO_3$ are needed to make a saturated solution with 300g of water at 12°C?   $82 \times 3 = 246 g$

F)

like dissolves like

   a) Explain why a mixture of oil and water is immiscible.   oil = nonpolar ; water = polar

   b) Why does iodine ($I_2$) dissolve in hexane, $C_8H_{18}$, but not in water?   $I_2$ = nonpolar    ↳ Nonpolar    ↳ polar

G) i) *Complete the double replacement reactions below. Include phase notation. ii) Write the net ionic equations for the reactions.*

   a) $Al(NO_3)_3$ (aq) + 3NaOH (aq) $\longrightarrow$ $Al(OH)_{3 (s)}$ + 3$NaNO_3$ (aq)

       $Al^{+3} + 3OH^- \longrightarrow Al(OH)_3$

   b) $(NH_4)_2S$ (aq) + $Pb(NO_3)_2$ (aq) $\longrightarrow$ $PbS_{(s)}$ + $NH_4NO_3$ (aq)

       $Pb^{+2} + S^{-2} \longrightarrow PbS$

H) A student is given three clear, colorless solutions in the lab, one is saturated, one is unsaturated, and one is supersaturated. Describe how the student can identify the degree of saturation of each solution. Add crystal.   If dissolves = Unsat   If sinks = sat   If grows = supersat

I) A student tests four solutions for conductivity of electricity. He gets the following results. Explain these observations.

| Sample | Result | |
|---|---|---|
| Distilled (Pure) Water | No conductivity | = no ions |
| Tap water | Slight conductivity | = some ions |
| 1.0 M NaCl | Good conductor | = 2.0 M ions |
| 1.0 M $C_2H_5OH$ | No conductivity | = no ions (no electrolyte) |