Name _____Beth "Key"_____ Period _____

Review Worksheet

Solutions: Concentration and Precipitation Reactions

1. Calculate the molarity of the following aqueous solutions.

   a. 3.55 mol $MgCl_2$ in 2.5 L of solution

   $$\frac{3.55 \text{ mol } MgCl_2}{2.5 L} = \frac{1.4 \text{ mol}}{L} = \boxed{1.4M}$$

   b. 0.035 mol NaOH in 25.0 mL of solution

   $$25.0 mL \times \frac{1L}{1000 mL} = 0.0250 L$$

   $$\frac{0.035 \text{ mol NaOH}}{0.0250 L} = \frac{1.4 \text{ mol}}{L} = \boxed{1.4M}$$

   c. 145 g of $CaCl_2$ in 235.0 mL of solution

   mm $CaCl_2 = 110.98 g/mol$ 235.0 mL = 0.2350 L

   $$\frac{145g \; CaCl_2}{110.98 g/mol} = 1.31 \text{ mol } CaCl_2 \qquad \frac{1.31 \text{ mol}}{0.2350 L} = \boxed{5.57M}$$

   d. 35.00 mL of glycerol, $C_3H_8O_3$,(density = 1.265 g/mL) in 330 mL of
   solution. mm $C_3H_8O_3 = 92.11 g/mol$ $Vd = m$ $35.00 mL \times 1.265 g/mL$

   $$\frac{44.28 g}{92.11 g/mol} = \frac{0.4807 \text{ mol}}{0.33 L} = \boxed{1.5M} \qquad = 44.28 g \; C_3H_8O_3$$

2. How many grams of iron (III) sulfate are required to prepare each of the
   following:

   a. 3.00 L of 4.00M iron (III) sulfate   mm $Fe_2(SO_4)_3 = 399.91 g/mol$

   $$\frac{4.00 \text{ mol}}{1L} = \frac{x \text{ mol}}{3.00 L} \qquad x = 12.0 \text{ mol}$$

   $$12.0 \text{ mol} \times 399.91 g/mol$$

   $$= \boxed{4.80 \times 10^3 \; g \; Fe_2(SO_4)_3}$$

   b. 25.0 mL of 0.15M iron (III) sulfate

   $$\frac{0.15 \text{ mol}}{1L} = \frac{x \text{ mol}}{0.0250 L} \qquad x = 3.8 \times 10^{-3} \text{ mol}$$

   $$\times 399.91 g/mol$$

   $$\boxed{1.5 \; g \; Fe_2(SO_4)_3}$$

3. How would you prepare 500. g of an aqueous solution that is 4.5% NaOH by mass?

$4.5g\ NaOH\ /\ 100g\ SOL'N$

$500.g\ SOL'n\ \times\ 0.045\ =\ 22.5g\ NaOH$

$500.g\ SOL'N\ -22.5g\ NaOH\ =\ 478g\ H_2O$

MIX MASSES OF NaOH è H_2O

4. What is the mass percent of solute in each of the following solutions?
   a. 145 g of KBr in 875 g of water

$$\frac{145g\ KBr}{145g\ KBr\ +\ 875g\ H_2O}\ \times 100\ =\ \boxed{14.2\%\ KBr}$$

   b. 15.0 mL of ethanol (d = 0.789 g/mL) in 75.0 mL of water (d= 0.998 g/mL)

$dv = m$ $15.0mL\ eth\ \times\ 0.789\frac{g}{mL}\ =\ 11.8g\ eth$

$75.0mL\ H_2O\ \times\ 0.998\frac{g}{mL}\ =\ 74.9g\ H_2O$

$$\frac{11.8g\ eth}{(74.9g\ H_2O\ +\ 11.8g\ eth)}\ \times 100\ =\ \boxed{13.6\%\ eth}$$

5. What is the mass percent sodium chloride in a solution obtained by mixing 325 g of an aqueous solution that 4.55% sodium chloride by mass with 175 g of an aqueous solution that is 15.5% sodium chloride by mass?
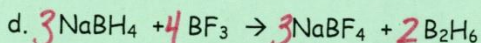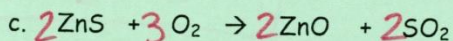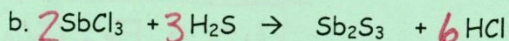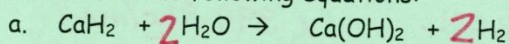
$325g\ SOL'N\ \times\ 0.0455\ =\ 14.8g\ NaCl$

$+\ 175g\ SOL'N\ \times\ 0.155\ =\ 27.1g\ NaCl$
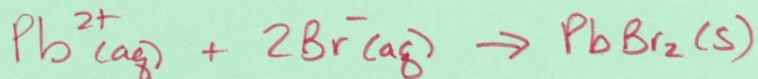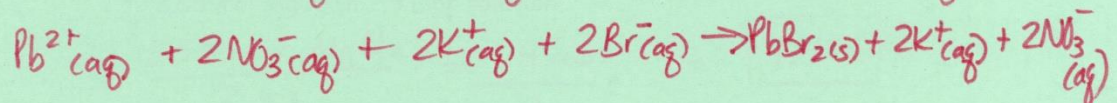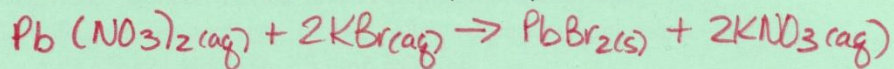
$500g\ SOL'N\ TOTAL\ \qquad\qquad 41.9g\ NaCl$

$$\frac{41.9g\ NaCl}{500.g\ SOL'N}\ \times\ 100\ =\ \boxed{8.38\%}$$

6. Balance the following equations:
   a. $CaH_2\ +\ 2H_2O\ \rightarrow\ Ca(OH)_2\ +\ 2H_2$

   b. $2SbCl_3\ +\ 3H_2S\ \rightarrow\ Sb_2S_3\ +\ 6HCl$

   c. $2ZnS\ +\ 3O_2\ \rightarrow\ 2ZnO\ +\ 2SO_2$

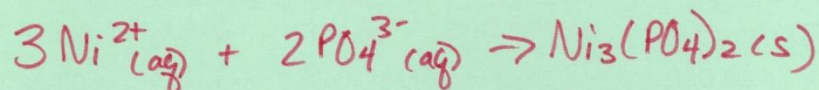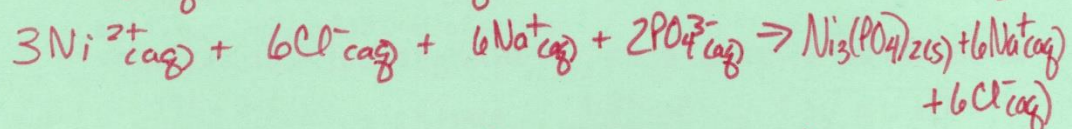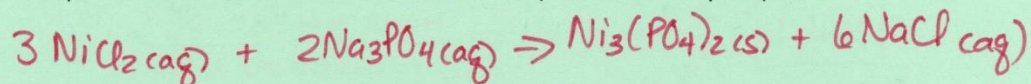   d. $3NaBH_4\ +\ 4BF_3\ \rightarrow\ 3NaBF_4\ +\ 2B_2H_6$

7. Write molecular, complete ionic and net ionic equations when the following react.

a. aqueous lead (II) nitrate reacts with aqueous potassium bromide

$$Pb(NO_3)_2 \text{(aq)} + 2KBr\text{(aq)} \rightarrow PbBr_2\text{(s)} + 2KNO_3 \text{(aq)}$$

$$Pb^{2+}_{\text{(aq)}} + 2NO_3^-\text{(aq)} + 2K^+_{\text{(aq)}} + 2Br^-\text{(aq)} \rightarrow PbBr_2\text{(s)} + 2K^+_{\text{(aq)}} + 2NO_3^-_{\text{(aq)}}$$

$$Pb^{2+}_{\text{(aq)}} + 2Br^-\text{(aq)} \rightarrow PbBr_2\text{(s)}$$

b. aqueous nickel (II) chloride reacts with aqueous sodium phosphate

$$3NiCl_2\text{(aq)} + 2Na_3PO_4\text{(aq)} \rightarrow Ni_3(PO_4)_2\text{(s)} + 6NaCl\text{(aq)}$$

$$3Ni^{2+}_{\text{(aq)}} + 6Cl^-_{\text{(aq)}} + 6Na^+_{\text{(aq)}} + 2PO_4^{3-}_{\text{(aq)}} \rightarrow Ni_3(PO_4)_2\text{(s)} + 6Na^+_{\text{(aq)}} + 6Cl^-_{\text{(aq)}}$$

$$3Ni^{2+}_{\text{(aq)}} + 2PO_4^{3-}_{\text{(aq)}} \rightarrow Ni_3(PO_4)_2\text{(s)}$$

8. The reagent shelf in a general chemistry lab contains aqueous solutions of the following substances; silver nitrate, sodium chloride, potassium chromate, barium nitrate, sodium sulfate, hydrochloric acid, lead nitrate, sodium hydroxide, and sodium carbonate. Suggest how you might prepare the following pure substances using these reagents. If it is not possible to prepare on of the following, indicate why.

a. $BaCrO_4$
b. $AgCl$
c. $PbSO_4$

a) $Ba(NO_3)_2\text{(aq)} + K_2C_2O_4\text{(aq)} \rightarrow BaCrO_4\text{(s)} + 2KNO_3\text{(aq)}$
   Filter $BaCrO_4\text{(s)}$ from sol'n

b) $AgNO_3\text{(aq)} + NaCl\text{(aq)} \rightarrow AgCl\text{(s)} + NaCl\text{(aq)}$
   Filter $AgCl\text{(s)}$

c) $Pb(NO_3)_2\text{(aq)} + Na_2SO_4\text{(aq)} \rightarrow PbSO_4\text{(s)} + 2NaNO_3\text{(aq)}$
   Filter $PbSO_4\text{(s)}$