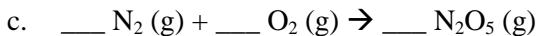
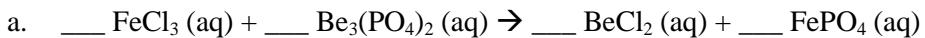


Name: \_\_\_\_\_

Section: \_\_\_\_\_

**CHM 151 Exam 3: Chapters 3 and 4****You must show all work to receive credit. Clearly mark your final answer!**

1. (11 pts) Balancing equations:



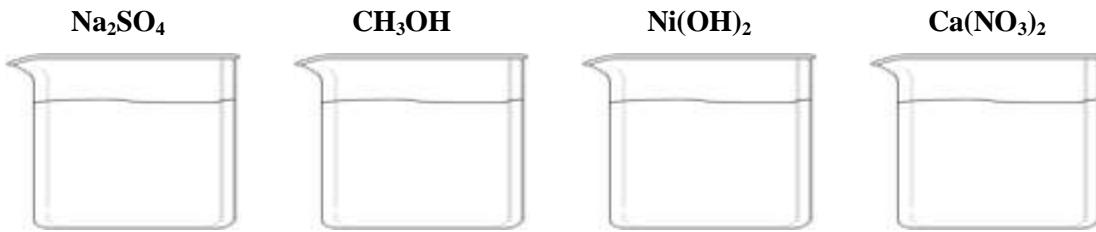
2. (6 pts) You are working in a chemistry stockroom and are asked to prepare a demo of 1 mole of the following substances. Indicate what type of particle each formula represents (atom, molecule, formula unit). Also determine what mass you must measure to show 1 mole of each of the following.

<u><b>particle type</b></u>	<u><b>mass</b></u>
-----------------------------	--------------------

- |                      |       |       |
|----------------------|-------|-------|
| a. $\text{CCl}_4$ :  | _____ | _____ |
| b. $\text{Ca}$ :     | _____ | _____ |
| c. $\text{Fe(OH)}_3$ | _____ | _____ |

3. (4 pts) How many molecules of water are in 1.000 teaspoon? (1 teaspoon = 4.914 g at room temperature)

4. (6 pts) Draw what 1 mole of the following compounds would look like if dissolved in each beaker of water.



5. (9 pts) A student is asked to combine copper (II) nitrate and sodium carbonate in a lab experiment. Complete the molecular equation with products (including phases) and balancing. Then write the complete ionic and net ionic equations for this reaction.

Molecular:  $\text{Cu}(\text{NO}_3)_2(\text{aq}) + \text{Na}_2\text{CO}_3(\text{aq}) \rightarrow$  \_\_\_\_\_

Ionic: \_\_\_\_\_

Net Ionic: \_\_\_\_\_

Name: \_\_\_\_\_

Section: \_\_\_\_\_

6. (13 pts) For the following reactants,

- a) Determine what type of reaction will occur
    - Combination (C), Decomposition (D), Single-replacement (SR), Double-Replacement/Precipitation (P), Double-replacement/Acid-Base Neutralization (AB), Combustion (B) or No Reaction (NR)
  - b) Predict the product(s) of the reaction
  - c) Write correct phases of the product(s)
  - d) Balance the equation

<b>Reaction Type</b>	<b>Reactants</b>	<b>Products</b>
_____	____Ag(s) + ____Zn(NO <sub>3</sub> ) <sub>2</sub> (aq) → _____	
_____	____K(s) + ____Cl <sub>2</sub> (g) → _____	
_____	____C <sub>4</sub> H <sub>10</sub> (l) + ____O <sub>2</sub> (g) → _____	
_____	____Ca(s) + ____HCl(aq) → _____	

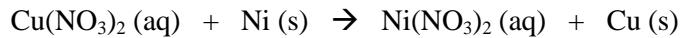
\_\_\_\_ 7. (5 pts) When  $\text{H}_2\text{SO}_4$  reacts with  $\text{NaOH}$ , which of the following represents the net ionic equation?

- a. No net ionic equation (no reaction)
  - b.  $\text{Na}^+(\text{aq}) + \text{SO}_4^{2-}(\text{aq}) \rightarrow \text{Na}_2\text{SO}_4(\text{s})$
  - c.  $\text{Na}^+(\text{aq}) + \text{SO}_4^{2-}(\text{aq}) \rightarrow \text{Na}_2\text{SO}_4(\text{aq})$
  - d.  $\text{H}^+(\text{aq}) + \text{OH}^-(\text{aq}) \rightarrow \text{H}_2\text{O}(\text{l})$
  - e.  $\text{H}^+(\text{aq}) + \text{OH}^-(\text{aq}) \rightarrow \text{H}_2\text{O}(\text{aq})$

8. (5 pts) Identify the oxidation number of **each element** in the following substances:



9. (5 pts) In the following equation, identify the a) species being reduced, b) species being oxidized, c) reducing agent, and d) oxidizing agent.



Oxidized: \_\_\_\_\_

Oxidizing agent: \_\_\_\_\_

Reduced: \_\_\_\_\_

Reducing agent: \_\_\_\_\_

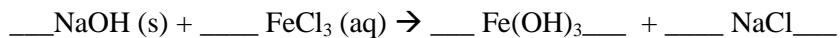
\_\_\_ 10. (5 pts) What will be the concentration (in M) of a solution made by adding 2.3656 g of NaOH to 500.00 mL of deionized water?

- a. 0.0047312 M
  - b. 0.059143 M
  - c. 0.11829 M
  - d. 1.1828 M

11. (2 pts) What is the concentration of the above solution if you add 500.0 mL of water to it?

Name: \_\_\_\_\_ Section: \_\_\_\_\_

12. (14 pts) In lab, you are asked to combine solid NaOH and aqueous FeCl<sub>3</sub> in a beaker and separate the precipitate. Complete the equation by indicating the phases of the products and balancing it. Then determine the theoretical mass of precipitate.



a) (10 pts) Determine the theoretical mass of precipitate formed if 2.6890 g of NaOH are reacted with 25.54 mL of 0.5012 M FeCl<sub>3</sub>.

b) (2 pts) Calculate the percent yield if 1.2556 g of precipitate are actually formed.

14. (8 pts) Complete the equation below with products, phases, and balancing:



You begin a titration with 1.012 M of base in a buret. From the buret, you deliver 14.53 mL of the base to a flask containing 30.00 mL of acid in order to reach a nice, light pink end point. Based on your data, what is the concentration of the acid?

15. (7 pts) Find the empirical formula of pentane (a major component of a fuel mixtures) if it contains 85.62% Carbon and 14.37% Hydrogen.

What is the molecular formula of pentane if its actual molar mass is 70.135 g/mol?