Name: _____   Due: _____

Unit 7 Academic Chemistry Study Guide (+ Unit 6 Review!)

Goals & Standards

- I can use dimensional analysis to convert between moles, particles, and grams.
- I can describe what a mole is using Avogadro's number.
- I can calculate the molar mass of any compound.
- I can calculate the percent composition of individual elements within a compound.
- I can determine the empirical and molecular formula of a compound.
- I can safely evaporate water from a hydrate to determine its initial composition.
- I can describe stoichiometric relationships between reactants and products.
- I can utilize the mole ratio to determine the limiting reactant of an equation.

Practice Problems

1) Draw the Stoichiometry Diagram Map with correct conversion factors.

2) Calculate the molar mass of each compound.
   a. $MgSO_4$

   b. CBr_2F_2

   c. $Ca(ClO_4)_2$

3) Complete the following simple mole conversions.
   a. 17.2 mol NaOH = ??? grams NaOH

   b. 9.92 mol Ne = ??? atoms Ne

4) Determine the percent composition for each element in carbon tetrachloride, CCl_4.
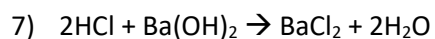
5) An unknown compound was found be composed of 24.74% K, 34.76% Mn, and 40.50% O. What is the empirical formula for the compound?

6) $3CuCl_2 + 2Al \rightarrow 2AlCl_3 + 3Cu$
    a. How many moles of $CuCl_2$ will react with 0.54 mol Al?

    b. How many moles of Cu would be produced if 1.2 mol of Al reacted?

7) $2HCl + Ba(OH)_2 \rightarrow BaCl_2 + 2H_2O$
    a. How many moles of HCl will react with 0.750 grams $Ba(OH)_2$?

    b. How many grams of $Ba(OH)_2$ should be used to produce 3.40 grams H_2O?

8) What is the definition of a limiting reactant?

9) The following equation represents a chemical reaction. Zn (s) + 2HCl (aq) → ZnCl$_2$ (aq) + H$_2$ (g). A 5.00-g sample of zinc is added to hydrochloric acid. The amount of hydrochloric acid is sufficient to allow the zinc to react completely. What mass of hydrogen gas does this reaction produce?

   a. 0.0308 g
   b. 0.0771 g
   c. 0.121 g
   d. 0.154 g

10) A cook needs 1 patty, 1 bun, 2 slices of cheese, and 5 pickles to make a cheeseburger. What is the maximum number of cheeseburgers that can be made if the cook only has 6 patties, 8 buns, 14 slices of cheese, and 10 pickles?
   a. 1 cheeseburger
   b. 2 cheeseburgers
   c. 4 cheeseburgers
   d. 6 cheeseburgers

11) How many moles of copper (Cu) would be produced from a reaction of 9.50 moles of iron (Fe) and an excess of copper (I) sulfate (Cu$_2$SO$_4$) according to the following reaction. You must balance the reaction first.

   _____ Fe + _____ Cu$_2$SO$_4$ → _____ Fe$_2$(SO$_4$)$_3$ + _____ Cu
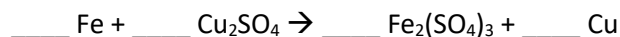
   a. 3.17 mol Cu
   b. 6.00 mol Cu
   c. 28.5 mol Cu
   d. 57.0 mol Cu

12. What is the limiting reactant when 3.0 moles of aluminum react with 6.0 moles of chlorine to form aluminum chloride based on the following reaction. You must balance the reaction first.

   _____ Al + _____ Cl$_2$ → _____ AlCl$_3$

   a. Aluminum
   b. Chlorine
   c. Aluminum Chloride
   d. There is no limiting reactant.

13. Calcium metal reacts with water to produce calcium hydroxide and hydrogen gas. Suppose 0.845 moles of calcium react with 1.650 moles of water. How many moles of hydrogen gas will be produced?

   Ca + 2 H$_2$O → Ca(OH)$_2$ + H$_2$
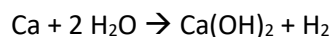
   a. 1.650 mol H$_2$
   b. 1.000 mol H$_2$
   c. 0.854 mol H$_2$
   d. 0.825 mol H$_2$