Review List (AP Chem) Name_____
Chapter 3-Mass Relationships in Chemical Reactions Period_____ Date_____

Topics:

- atomic mass, calculating average atomic mass from % abundances of isotopes, mass spectrometers
- molar mass, moles, conversions between grams, moles and # of particles
- percent composition of compounds (finding % composition of each element when given a chemical formula and finding total mass of an element in a sample when given chemical formula)
- Determine the empirical formula of a compound. The following types of questions are possible:
- Find empirical formula when given % composition of each element in compound.
- Find empirical formula when given experimental data obtained by reacting compound (often by combustion of compound)
- Find empirical formula of a hydrate when given experimental data concerning the heating of hydrate
- Find Molecular Formula (once you know empirical formula, use molar mass to find molecular formula.)
- Write chemical equations when given chemical names of reactants and products. Understand the following labels: (g), (l), (s), (aq)
- Balance chemical equations.
- Stoichiometry
  a) Determine the limiting reactant (if necessary)
  b) Convert from amounts of one substance in a reaction to amounts of another substance in the reaction. This usually requires the conversion from *grams A → moles A → moles B → grams B*, but problems could also require calculation of the volume of a substance when given density. *(If one has found the amount of a product, this is called the theoretical yield.)*
  c) Determine percent yield of a product when given the actual (experimental) yield.

***You will be given a polyatomic ion chart. However, you will need to know the following molecular formulas, H_2O, NH_3, CH_4, and the following diatomic elements: H_2, N_2, O_2, F_2, Cl_2, Br_2, I_2 (HOFBrINCl's)*

Review HW for Chapter3: **Everything is required except for Study Guide questions.**

- **Multiple Choice Review WKS**
- **In text book**: p111 # 104, 107, 131*, 134, 136 *Hint for # 131: $BaCl_2 + H_2SO_4 \rightarrow BaSO_4 + 2\ HCl$
- **Additional Required Questions:**

1. 0.755 g sample of hydrated copper(II) sulfate is heated carefully until it had changed completely to anhydrous copper(II) sulfate with a mass of 0.483 g. Determine the value of *x* in the formula of the hydrate, $CuSO_4 \cdot x\ H_2O$. *(What would you have done in the lab to be sure that no water was left in the sample after heating?)*
2. Write the balanced chemical equation for the following reactions:
   a. calcium metal reacts with water to produce aqueous calcium hydroxide and hydrogen gas.
   b. barium hydroxide reacts with sulfuric acid to produce barium sulfate and water.
   c. iron(III) sulfide reacts with hydrogen chloride to form iron(III) chloride and hydrogen sulfide.
   d. carbon disulfide reacts with ammonia to produce hydrogen sulfide and ammonium thiocyanate.
3. Hydrogen peroxide can be produced by the following reaction:

$$BaO_2\ (s) + 2\ HCl\ (aq) \rightarrow H_2O_2\ (aq) + BaCl_2\ (aq)$$

   a. What is the theoretical yield (in grams) of hydrogen peroxide when 1.50g of barium peroxide is treated with 25.0 mL of a hydrochloric acid solution containing 0.0272g of HCl per mL?
   b. How many grams of the excess reactant are left unreacted?
4. Methyl isothiocyanate (MITC), an organosulfur compound which contains only C, H, N, and S, is used in agriculture as a soil fumigant, mainly for protection against fungi and nematodes. Find the empirical formula for MITC if combustion analysis of a 0.2415-g sample gives 0.2907 g CO_2, 0.08926 g H_2O, a mixture of nitrogen oxides, and 0.2116 g SO_2.

- **In Study Guide (optional)**: Chap 3--Exercises and Problems (p.50) – all are good, but particularly #2, 4, 9, 10b, 11, 12b, 13, 15, 16, 18, 20, 23, 24, 26, 28, 31 (Note: 10b & 12b answers are incorrect; corrections will be posted on my website)