Name: _____ Date: _____ CHEM 1A

Monday/Tuesday, October 14 & 15, 2019 - Stoichiometry (Chapter 3) Part 2

I. Warm-Up

1. How many significant figures does 0.000123045560 have?
2. $12.5849 / 2.4 =$
3. $432.5 - 24.3984 =$
4. $12.0(11.90 - 11.8) =$
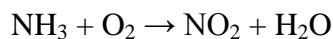5. $\dfrac{1.203 \times 10^6}{0.000360 - 2.40 \times 10^5} =$

Significant Figures Rules

Addition/Subtraction –

Multiplication/Division –


II. Limiting Reagents and Theoretical Yields

1. Consider the following unbalanced reaction – assume the reaction goes to completion in each scenario:

$NH_3 + O_2 \rightarrow NO_2 + H_2O$

a. How many moles of oxygen gas are required to make 12.8 moles of nitrogen dioxide?

b. How many grams of water can be produced from 9.64 g of ammonia?

c. Identify the limiting reagent if 3 moles of ammonia is combined with 5 moles of oxygen.

d. Identify the limiting reagent if 10.00 g of ammonia is combined with 28.00 g of oxygen.

e. How many grams of each species will be present if 10.00 g of ammonia is combined with 28.00 g oxygen?

2. Consider the following unbalanced reaction:

$$P_4O_{10} (s) + PCl_5 (g) \rightarrow POCl_3 (g)$$
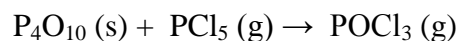
When 35 g of solid P_4O_{10} and 42 g of gaseous PCl_5 is combined 47 g of $POCl_3$ is produced. What is the percent yield for this process?

III. **Composition of Compounds**
Recall: Law of Def. & Multiple Prop.

3. Calculate the mass percent of Cl in NaCl.

4. A 1.40 g sample of silicon reacts with fluorine to produce 5.2 g of a product. What is the empirical formula of the compound?

EmpiricalFormula–

1. *Convert given values into moles for each element*
2. *Divide all moles by the smallest mole value*
3. *If you have all whole numbers you have the EF – if not try multiplying them all by 2 or 3 etc.*

Molecular Formula –

1. *Derive empirical formula*
2. *Determine the empirical mass*
3. $\frac{(Molar\ mass)}{(empirical\ mass)} = multiple$
4. *Multiply the empirical formula by the multiple*

5. The empirical formula for xylene is C_4H_5 and xylene has a molar mass of 106.16 g/mol. Determine the molecular formula for xylene.

6. An alkali metal oxide contains 83.01% metal by mass. Determine the identity of the metal.

7. Tryptophan is an amino acid that is 64.7% carbon, 5.9% hydrogen, 13.7% nitrogen and 15.7% oxygen. What is the empirical formula for tryptophan?

8. **The Combustion Problem -** A 0.4647-g sample of a compound known to contain only carbon, hydrogen, and oxygen was burned in oxygen to yield 0.8635 g of CO_2 and 0.1767 g of H_2O. If the molar mass is 213 g/mol, what is the molecular formula of the compound?

9. **Hmm…** Two compounds contain the same metal and oxygen. Compound I has 13.38% oxygen and Compound 2 has 9.334% oxygen.
   a. Calculate the mass of oxygen per 1.000 g of metal.

   b. If the first compound is MO_2 what is the formula of the second compound?

   c. Name the metal.