Name: _____ Date: _____ CHEM 1A

Monday, October 7, 2019 – Stoichiometry Part 1 (Chapter 3)

I. **Warm-Up –** Compound X_2Y is 60% X by mass. Calculate the percent Y by mass of the compound XY_3?

II. What is a mole? A mole is a number; it is of something.

(Hint: You will need your periodic table for these problems.)

Molar Mass/Atomic Mass =

Average Atomic Mass =

Percent by mass =

1. How many moles in 5.23×10^{23} atoms?

2. How many moles of copper in 3.20 g?

3. How many moles of O in 3.4 mol of $CuSO_4$?

4. **Average Atomic Mass Values -** Three naturally occurring isotopes of potassium are ^{39}K, 38.963707 amu, ^{40}K, 39.963999 amu, and ^{41}K. The natural abundances of ^{39}K and ^{41}K are 93.2581% and 6.7302%, respectively. Determine the atomic mass of ^{41}K.

5. In a sample of 200 chlorine atoms, it is found that 151 are ^{35}Cl (34.969 amu), and 49 are another isotope. What is the other naturally occurring isotope of chlorine?

6. For which of the following compounds does 1.00 g represent 3.32×10^{-2} mol?

   a. NO_2 b. H_2O c. C_2H_6 d. NH_3 e. CO

7. A single atom of an element weighs 5.81×10^{-23} g. Identify the isotope.

8. How many hydrogen atoms are in 6.3 mg sample of methane? (Methane is CH_4).

Chemical Equations

9. Balance the following equations:

(a) _ __Fe + _ __Cl_2 → _ __$FeCl_3$

(b) _ __Fe + _ __O_2 → _ __Fe_2O_3

(c) _ __$FeBr_3$ + _ __H_2SO_4 → __$Fe_2(SO_4)_3$ + _ __HBr

(d) ___$C_4H_6O_3$ + ___H_2O → __ $C_2H_4O_2$

(e) ___C_2H_4 + __ O_2 → __ CO_2 + __ H_2O

(f) _ __H_2SiCl_2 + _ __H_2O → ___$H_8Si_4O_4$ + _ _HCl

(g) __C_7H_9 + _ HNO_3 → __$C_7H_6(NO_2)_3$ + _ H_2O

(h) __$C_5H_8O_2$ + _ _ NaH+ _ _HCl → __$C_5H_{12}O_2$ + _ _NaCl

Methodology for Reaction Stoichiometry Problems
1. Write a balanced chemical reaction
2. Convert given value(s) into moles (you may have to ID the limiting reagent)
3. Use reaction coefficients as a molar ratio
4. Convert moles of your unknown into the desired units

Limiting Reagent ⇒ Limits the amount of product that is produced due to running out
1st - The limiting reagent is used to determine the maximum yield of product/s aka the theoretical yield and the maximum consumption of reactants aka the theoretical consumption

Identifying Limiting Reagents:
1. Convert all given values of reactants into moles
2. Divide each mole value by the coefficient
3. The smallest number identifies the LR