

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.)

1. How many moles in  $5.23 \times 10^{23}$  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  $3.32 \times 10^{-2}$  mol?

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

*Molar Mass/Atomic Mass =*

*Average Atomic Mass =*

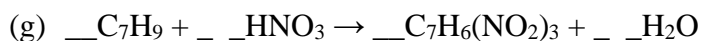
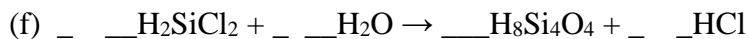
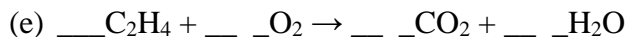
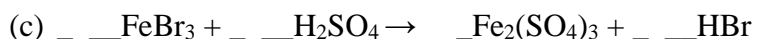
*Percent by mass =*

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

8. How many hydrogen atoms are in 6.3 mg sample of methane? (Methane is  $\text{CH}_4$ ).

### Chemical Equations

9. Balance the following equations:



### 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  $\Rightarrow$  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