WKS 3-3 – Chem 1
Definite & Multiple Proportions

NAME Answer Key
Period _____ **Date** _____

Read Ch. 3.4, pp. 75-77 (No math for multiple proportions) in your text then answer the following questions.

1. Explain how the Law of Definite Proportions applies to compounds.
   It describes the constant ratio of elements in a compound.

2. How is the Law of Definite Proportions important in distinguishing compounds from physical mixtures?
   It shows that all samples of the same compound contain the same ratio of elements; in a compound, there can be any ratio of the elements.
3. How is percent composition of a sample determined?
   Divide the mass of the element by the mass of the compound and multiply by 100.

4. A 75.00 g sample of aspirin (acetylsalicylic acid) contains 45.00 g C, 3.36 g H, and the remainder O. What is the % composition of aspirin?
   Mass O = 75.00 g - (45.00 g + 3.36 g) = 26.64 g

   $$\%C = \frac{45.00\text{ g C}}{75.00\text{ g Asp}} \times 100\% = \boxed{60.00\%\text{ C}};\quad \%H = \frac{3.36\text{ g C}}{75.00\text{ g Asp}} \times 100\% = \boxed{4.48\%\text{ H}}$$

   $$\%O = \frac{26.64\text{ g O}}{75.00\text{ g Asp}} \times 100\% = \boxed{35.52\%\text{ O}};\quad \text{Check: } 60.00 + 4.48 + 35.52 = 100.00$$

5. From the %mass in the previous problem, what mass of O is in a 2.00 g sample of aspirin?

   $$?\text{ g O} = 2.00\text{ g Asp} \times \frac{35.52\text{ g O}}{100\text{ g Asp}} = 0.7104\text{ g O} = \boxed{0.710\text{ g O}}$$

6. What types of compounds are compared in the law of multiple proportions?
   It relates the compositions of two *different* compounds composed of the same elements.

7. Which of the following compounds demonstrate the law of Multiple Proportions (there may be more than one)?
   a. C_2H_6 & $C_{10}H_8$
   b. Li_2O & Li_2CO_3
   c. P_2O_5 & H_3PO_4
   d. N_2O & N_2O_5

8. Complete the following table and then analyze the data to determine if compounds I and II are the same compound. Show all your work below the table.

Analysis Data of Two Iron Compounds					
Compound	**Total Mass (g)**	**Mass Fe (g)**	**Mass O (g)**	**Mass % Fe**	**Mass % O**
I	75.00	52.46	22.54	69.95%	30.05%
II	56.00	43.53	12.47	77.73%	22.27%

Compound I: $\%Fe = \frac{52.46\text{ g}}{75.00\text{ g}} \times 100\% = 69.95\%;\ \%O = \frac{22.54\text{ g}}{75.00\text{ g}} \times 100\% = 30.05\%$

Compound II: $\%Fe = \frac{43.53\text{ g}}{56.00\text{ g}} \times 100\% = 77.73\%;\ \%O = \frac{12.47\text{ g}}{56.00\text{ g}} \times 100\% = 22.27\%$

The compounds are *not* the same since the mass % of each element is different.