Percent Composition and Empirical Formulas

Example Problem: Find the % by mass of oxygen in water.

Percentage by mass of element in a compound =
(mass of element in 1 mol of compound ÷ molar mass of compound) x 100 %

Lab One:

I. Fill in the data table below as you watch the lab on the video.

mass of sodium bicarbonate	
mass before reaction	
mass after reaction	

II. Write a balanced equation for the reaction that took place. (Hint: the narrator on the video will help you with this.)

III. Conclusion Questions: Answer each question completely. SHOW ALL WORK!

- Calcuate the mass of carbon dioxide produced in the experiment. (Hint: Think about what bubbled away.)

- Use molar masses to calculate the percent of carbon in carbon dioxide using the following formula.

$$\%C \text{ in } CO_2 = \frac{\text{mass of } C}{\text{mass of } CO_2} X\ 100\%$$

- Calculate the mass of carbon in the sample of carbon dioxide using the same formula and your answers to the previous two calculations.

- Calculate the percentage of carbon that was in the original sample of sodium bicarbonate using the following formula.

$$\%C \text{ in } NaHCO_3 = \frac{\text{mass of } C}{\text{mass of } NaHCO_3} \times 100\%$$

IV. Practice Problems. SHOW ALL WORK!

- Calculate the percentage sodium in sodium oxide.

- Calculate the percentage aluminum in aluminum phosphate.

- Calculate the percentage hydrogen in hydrogen peroxide.

- Calculate the percentage nitrogen in dinitrogen pentoxide.

(after completing lab #1) Find the % of carbon in sodium bicarbonate ($NaHCO_3$).

Find the % composition of aluminum oxide. (This means to find the % of each element in the compound.)

Empirical Formula: simplest _____ number _____ of_____ in a _____

Example Problem: Find the empirical formula for a compound containing 56.6g of K, 8.7g of C, and 34.7g of O.

Step #1: Convert each mass into moles of the element.

Step #2: Divide each by the smallest to find a simple whole number ratio.

Lab Two:

I. Fill in the data table below as you watch the lab on the video.

mass of empty test tube	
mass of test tube with copper oxide (before reaction)	
mass of test tube with copper (after reaction)	

II. Calculations: SHOW ALL WORK IN THE SPACE PROVIDED.

- Use the data to calculate the mass of copper oxide.
- Use the data to calculate the mass of copper.
- Use the two previous calculations to calculate the mass of the oxygen that was driven off.
- Using molar masses, calculate the moles of copper and oxygen.

Mass of copper oxide		g
Mass of copper		g
Mass of oxygen		g
Moles of copper		mol
Moles of oxygen		mol

III. Conclusion Questions: Answer each question completely. SHOW ALL WORK!

1. Within bounds of experimental error, use the mole ratio to write the formula of the compound.

2. What is the name of this compound? (Hint: you need a Roman numeral in the name)

3. A compound of calcium and bromine is analyzed in the lab. A 20.0 g sample contains 4.00 g calcium. What is the empirical formula of the compound?

4. Find the empirical formula of a compound found to contain 26.56 % potassium, 35.41 % chromium, and the remainder oxygen.

Ex. Problems:.

_____ % Na

_____ % S

_____ % O

(Hint: When % are given, assume you have 100g of the compound, and the % changes to grams.)

P_xO_y

_____ g sample

_____ g P

(Hint: After step 2, if the ratio is still not whole numbers, multiply both subscripts by a number, such as "2" to get rid of fractions, such as "0.5".)

The Chemistry Quiz

CR1._____

CR2._____

1._____

2._____

3._____

4._____

5._____