Chemistry: Percent Composition by Mass Notes

Scientists often analyze compounds to determine what elements they are made of and how much of each element is in the compound. Before we get into calculating the composition of chemical compounds let’s calculate the percent composition by mass of a bacon and cheese omelet.

Bacon & Cheese Omelet Recipe
- 3 jumbo eggs
- 3 slices of bacon
- 2 slices of cheese
- 2 fluid ounces of milk

Here are some helpful equalities:
- 1 jumbo egg = 71 grams
- 1 slice of bacon = 17 grams
- 1 slice of cheese = 7.5 grams
- 1 oz. milk = 31 grams

1. What is the mass of each item in the omelet?
   a. eggs

   b. bacon

   c. cheese

   d. milk

2. What is the total mass of the omelet?

3. What is the percentage of each ingredient, by mass, in the omelet?
   a. eggs

   b. bacon

   c. cheese

   d. milk
**Percent Composition by Mass**

Process steps:
1. Determine the total mass of the sample.
2. Determine the identity of each element in the sample.
3. Determine the mass of each element in the sample.
4. Calculate the percent composition for each element:

   \[
   \% \text{Composition} = \frac{\text{mass of element}}{\text{total mass of sample}} \times 100\%
   \]

Chemists can calculate theoretical or experimental percent composition by mass.

<table>
<thead>
<tr>
<th><strong>Experimental</strong></th>
<th><strong>Theoretical</strong></th>
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<tbody>
<tr>
<td>Lab analysis is done to chemically separate and measure the mass of each element in a compound. Then the mass of each element is calculated as a percentage of the total sample mass.</td>
<td>The chemical formula is used to determine the total mass of one “formula unit” of the compound, and the mass of each element in the formula unit. Then the mass of each element is calculated as a percentage of the total sample mass.</td>
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**Examples**

A chemist took a 125 g sample of water and separated it into 13.5 g of hydrogen and 111.5 grams of oxygen. What is the experimental percent composition by mass of each element? What is the theoretical percent composition by mass of hydrogen and oxygen in water (H₂O)?