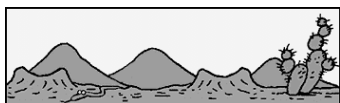


% Composition, Empirical Formulas, & Molecular Formulas



% Composition

- $\% = (\text{part} / \text{whole}) \times 100$
- When calculating the % composition, you are calculating the % of each element in a compound

% Composition

- Calculate the % Composition of MgO

% Composition

- Calculate the % Composition of iron (III) oxide

Empirical & Molecular Formulas

- **Empirical formula** – the _____
whole number ratio of elements
- **Molecular formula** – the _____
number of elements in a compound

Empirical Formula

- What is the empirical formula for H_2O_2 ?
- What is the empirical formula for $\text{C}_6\text{H}_{12}\text{O}_6$?

Steps for Calculating the Empirical Formula

1. List your givens
2. Change % to grams
3. Change grams to moles
4. Divide everything by the smallest number of moles
5. Write your formula

Empirical Formula Problem

- Calculate the empirical formula of a compound containing 40.05 % S and 59.95 % O.

Empirical Formula Problem

- Calculate the empirical formula for a compound containing 48.64 g C, 8.16 g H, and 43.20 g O.

Steps for Calculating Molecular Formula

1. Calculate the _____
2. Get the _____ of the empirical formula that you just determined
3. Divide the _____ by the molecular mass of the empirical formula
4. You will get a whole number
5. Multiply everything in the empirical formula by this number

Molecular Formula Problem

- Calculate the molecular formula of a compound containing 40.68% C, 5.08% H, and 54.25% O with an experimentally determined molecular weight of 118.1 g/mol

Molecular Formula Problem

- Calculate the molecular formula of a compound containing 57.84 g C, 3.64 g H, and 38.52 g O with an experimentally determined molecular mass of 249.21 g/mol

Empirical Formula with Combustion Data Steps

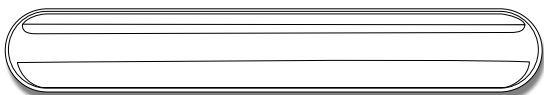
1. Calculate the number of grams of carbon
2. Calculate the % C
3. Calculate the number of grams of hydrogen
4. Calculate the % H
5. Calculate the % of any other element by subtracting % C & % H from 100.
6. Continue the empirical formula calculation as usual

Example

- A compound is comprised of carbon, hydrogen, and nitrogen. When 0.1156 g of this compound is reacted with oxygen, 0.1638 g of CO_2 and 0.1676 g of water are collected. Assuming that all of the carbon in the compound is converted into CO_2 , determine the empirical formula of the compound.

Another example

- A 0.3410 g sample of a carbon-hydrogen-oxygen hydrocarbon was combusted to produce 0.7500 g CO_2 and 0.1363 g H_2O . The molecular mass was determined to be 180 g/mol. Determine the empirical and molecular formulas of the compound.
- Both the empirical and molecular formulas are $\text{C}_9\text{H}_8\text{O}_4$.



One more example

- A 0.821 g hydrocarbon sample was combusted to yield 1.866 g CO_2 and 0.7639 g H_2O . The molecular mass was determined to be 116 g/mol. Determine the empirical and molecular formulas of the compound.
- $\text{C}_3\text{H}_6\text{O}$ is empirical formula
- $\text{C}_6\text{H}_{12}\text{O}_2$ is molecular formula

