

Empirical Formula

the **simplest formula** for a compound
(the lowest term ratio)

Ex: **CH₂O** is **empirical**

Ex: **C₆H₁₂O₆** and **C₁₁H₂₂O₁₁** are **not** empirical
(but they have the same empirical formula - CH₂O)

**Knowing the percent composition,
the empirical formula can be determined**

Ex: A compound contains 40.0% carbon,
6.71% hydrogen and 53.3% oxygen.
What is this compound's empirical formula?

1. Assume you have 100 grams of the compound.
You would have: 40.0 g C 6.71 g H 53.3 g O

2. Convert these amounts to moles.

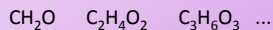
$$\frac{40.0 \text{ g C}}{12.0 \text{ g}} = 3.33 \quad \frac{6.71 \text{ g H}}{1.01 \text{ g}} = 6.64 \quad \frac{53.3 \text{ g O}}{16.0 \text{ g}} = 3.33$$

3. Divide each mole amount by the smallest value.
(usually will give you a whole number ratio)

$$\frac{3.33}{3.33} = 1 \quad \frac{6.64}{3.33} = 2 \quad \frac{3.33}{3.33} = 1$$



Actual molecular formula could be:



Molecular Formulas

- States the number and kind of each atom present in the molecule
- Ex: C₆H₁₂O₆ is the molecular formula for glucose

**Knowing the empirical formula
and molecular (molar) mass,
molecular formula can be determined.**

Ex: The empirical formula for a compound is AgCO₂.
Its molecular mass is 304 g/mol. What is its molecular formula?

1. Find the mass of the empirical formula

$$\text{AgCO}_2 \quad 107.9 + 12.0 + 32.0 = 151.9 \text{ g/mol}$$

2. Divide the molecular mass by this mass

$$\frac{304}{151.9} = 2$$

3. Multiply each subscript in the empirical formula by this number.

