

# ALL ABOUT EMPIRICAL FORMULAE

**Empirical Formula** - A formula that gives the simplest whole-number ratio of atoms in a compound.

## Steps for Determining an Empirical Formula,

Read the question. You should be given either a mass or percentage of all the elements present in a compound.

Active calculation

1. Organize the elements present into columns. Take each percentage or mass and convert it to a numbers of moles. Do this by;

**DIVIDING EACH MASS OR PERCENTAGE BY THE MOLAR MASS OF THE ELEMENT**

2. Find the relative proportions.

**DIVIDE EACH RESULT BY THE LOWEST RESULT.**

3. Write the empirical formula. The lowest whole number ratio of the elements present
4. Note the empirical formula is not usually the actual chemical formula. If the molecular mass of the compound is known you will be able to check

An example

A compound was analyzed and found to contain 13.5 g Ca, 10.8 g O, and 0.675 g H.

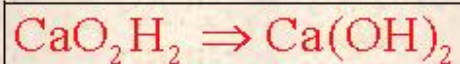
13.5 g Ca  
10.8 g O  
0.675 g H

$$13.5 \cancel{\text{g Ca}} \times \frac{1 \text{ mol Ca}}{40.1 \cancel{\text{g Ca}}} = 0.337 \text{ mol Ca}$$
$$10.8 \cancel{\text{g O}} \times \frac{1 \text{ mol O}}{16.0 \cancel{\text{g O}}} = 0.675 \text{ mol O}$$
$$0.675 \cancel{\text{g H}} \times \frac{1 \text{ mol Ca}}{1.01 \cancel{\text{g H}}} = 0.668 \text{ mol H}$$

$$= \frac{0.337}{0.337} \text{ mol Ca} \Rightarrow 1.00$$

$$\frac{0.675}{0.337} \text{ mol O} \Rightarrow 2.00$$

$$= \frac{0.668}{0.337} \text{ mol H} \Rightarrow 1.98 \approx 2.00$$



An unknown compound is analyzed and in a 100.0g sample, we have 40.0g of carbon, 53.3g of oxygen, and 6.7g of hydrogen. Find the Empirical formula

**NutraSweet has 57.14% C, 6.16% H, 9.52% N, and 27.18% O. Calculate the empirical formula of NutraSweet and find the molecular formula. (The molar mass of NutraSweet is 294.30 g/mol)**

<http://www.chem.tamu.edu/class/majors/tutorialnotefiles/empirical.htm>

For the answer