

Empirical Formula

- shows the smallest whole-number ratio of the atoms in the compound.

Example: H_2O_2 is hydrogen peroxide
 HO is the empirical formula for hydrogen peroxide

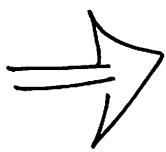
⇒ H_2O_2 is the molecular formula - the actual # of each kind of atom present in a molecule of the compound.

Molecular Formula

- is either the same as its experimentally determined empirical formula, OR

it is a simple whole-number multiple of its empirical formula

efm



empirical formula mass

⇒ it's the MOLAR MASS of the empirical formula

What is the empirical formula of the following compounds:

a) 36.1% Ca, 63.9% Cl

Because % means parts per 100, we can assume 36.1% means 36.1 g if we had 100 grams

!!!

$$36.1 \text{ g Ca} \left(\frac{1 \text{ mol Ca}}{40.1 \text{ g Ca}} \right) = 0.900 \text{ mol Ca}$$

$$63.9 \text{ g Cl} \left(\frac{1 \text{ mol Cl}}{35.5 \text{ g Cl}} \right) = 1.80 \text{ mol Cl}$$

Divide each by smaller # of moles to get whole number ratio

$$\frac{0.900}{0.900} = 1 \text{ mol Ca} \quad \frac{1.80}{.900} = 2 \text{ mol Cl}$$

so empirical formula is CaCl_2

b) 40.0% C, 6.7% H, 53.3% O

c) 3.7% H, 44.4% C, and 51.9% N

What is the molecular formula of a compound with the empirical formula CClN and a molar mass of 184.5?

$$\text{efm} = 12.0 + 35.5 + 14.0 = 61.5$$

$$\frac{\text{molar mass of compound}}{\text{efm}} = \frac{184.5}{61.5} = 3 = n$$

$$n(\text{empirical formula}) = \text{molecular formula} =$$

$$3(\text{CClN}) =$$



Calculate the molecular formula of
a compound whose molar mass is
60.0 g/mol and empirical
formula is CH_4N