Empirical formula(EF) and molecular formula (MF)

EF:
Simplest ratio of atoms of each element in the compound

Example:
H_2O
CH_3
NO_2
$C_3H_8O_2$

MF:
Actual ratio of atoms of each element in the compound

Example:
H_2O
C_2H_6
N_2O_4
$C_3H_8O_2$

$$\text{molecular formula} = n(\text{Empirical formula}), \quad n = \frac{\text{molar mass}}{\text{molar mass}}$$

An organic compound M contains only carbon, hydrogen and oxygen. A sample of 2.40 g of M is combusted completely in excess oxygen to produce 5.28 g of CO_2 and 2.88 g of H_2O.

Based on the combustion data, determine the empirical formula of M.

If it is **burning or combustion**, the rection will involves Oxygen gas

$$M + O_2 \rightarrow CO_2 + H_2O$$

2.40g — 5.28g — 2.88g

Mass of the C in CO_2 is the mass of C in the P. Use molar mass ratio method to determine the mass of C in CO_2

Mass of the H in H_2O is the mass of H in the P. Use molar mass ratio method to determine the mass of H in H_2O

Mass of C in CO_2 = $\frac{\text{molar mass C}}{\text{molar mass } CO_2}$ x mass CO_2

= $\frac{\square \text{ g/mol}}{\square \text{ g/mol}}$ x $\square$ g

= $\square$

Do you know why we cannot use the **same method @ molar mass ratio of O** to determine the mass of Oxygen in compound P?

Mass of H in H_2O = $\frac{\text{molar mass H}}{\text{molar mass } H_2O}$ x mass H_2O

= $\frac{\square \text{ g/mol}}{\square \text{ g/mol}}$ x $\square$ g

= $\square$

Mass of ibuprofen = mass C + mass H + mass O

mass O = $\square$

Element	C	H	O
Mass, g			
Mole	$\frac{\text{Mass C}}{\text{Molar mass C}} =$	$\frac{\text{Mass H}}{\text{Molar mass H}} =$	$\frac{\text{Mass O}}{\text{Molar mass O}} =$
Ratio of mole	$\frac{\text{Mole of C}}{\text{Smallest mole}} =$	$\frac{\text{Mole of H}}{\text{Smallest mole}} =$	$\frac{\text{Mole of O}}{\text{Smallest mole}} =$
Simplest ratio			

Empirical formula ibuprofen = $C_{\square}H_{\square}O_{\square}$

molar mass molecular formula = molar mass n(Empirical formula)

$\square = n \square$

$n = \square$

$M_r = C_{\square}H_{\square}O_{\square}$