

## Empirical formula(EF) and molecular formula (MF)

EF:

**Simplest ratio of atoms of each element in the compound**

Example:



MF:

**Actual ratio of atoms of each element in the compound**

Example:



**molar mass**

**molar mass**

**molecular formula =  $n$ (Empirical formula)**

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d. A compound  $P$  that consists of carbon, hydrogen and oxygen has a molar mass of  $60.0 \text{ g mol}^{-1}$ . If the complete combustion of  $1.470 \text{ g}$  of compound  $P$  produced  $2.156 \text{ g}$  of  $\text{CO}_2$  and  $0.882 \text{ g}$  of  $\text{H}_2\text{O}$ , determine

- The empirical formula of compound  $P$ .
- The molecular formula of compound  $P$

If it is  
**burning/combustion**,  
the reaction will  
involve Oxygen gas



Mass of the C in  $\text{CO}_2$  is the mass of C in the P. Use molar mass ratio method to determine the mass of C in  $\text{CO}_2$

Mass of the H in  $\text{H}_2\text{O}$  is the mass of H in the P. Use molar mass ratio method to determine the mass of H in  $\text{H}_2\text{O}$

$$\text{Mass of C in } \text{CO}_2 = \frac{\text{molar mass C}}{\text{molar mass } \text{CO}_2} \times \text{mass } \text{CO}_2$$
$$= \frac{\boxed{\phantom{000}} \text{g/mol}}{\boxed{\phantom{000}} \text{g/mol}} \times \boxed{\phantom{000}} \text{g}$$
$$= \boxed{\phantom{000}}$$



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

$$\text{Mass of H in H}_2\text{O} = \frac{\text{molar mass H}}{\text{molar mass H}_2\text{O}} \times \text{mass H}_2\text{O}$$
$$= \frac{\boxed{\phantom{000}} \text{g/mol}}{\boxed{\phantom{000}} \text{g/mol}} \times \boxed{\phantom{000}} \text{g}$$
$$= \boxed{\phantom{000}}$$

$$\text{Mass of P} = \text{mass C} + \text{mass H} + \text{mass O}$$

$$\text{mass O} = \boxed{\phantom{000}}$$

Element	C	H	O
Mass, g	<input type="text"/>	<input type="text"/>	<input type="text"/>
Mole	$\frac{\text{Mass C}}{\text{Molar mass C}} = \frac{\text{Mass C}}{\text{Molar mass C}} = \frac{\text{Mass C}}{\text{Molar mass C}}$ <input type="text"/>	$\frac{\text{Mass H}}{\text{Molar mass H}} = \frac{\text{Mass H}}{\text{Molar mass H}} = \frac{\text{Mass H}}{\text{Molar mass H}}$ <input type="text"/>	$\frac{\text{Mass O}}{\text{Molar mass O}} = \frac{\text{Mass O}}{\text{Molar mass O}} = \frac{\text{Mass O}}{\text{Molar mass O}}$ <input type="text"/>
Ratio of mole	$\frac{\text{Mole of C}}{\text{Smallest mole}} = \frac{\text{Mole of C}}{\text{Smallest mole}} = \frac{\text{Mole of C}}{\text{Smallest mole}}$ <input type="text"/>	$\frac{\text{Mole of H}}{\text{Smallest mole}} = \frac{\text{Mole of H}}{\text{Smallest mole}} = \frac{\text{Mole of H}}{\text{Smallest mole}}$ <input type="text"/>	$\frac{\text{Mole of O}}{\text{Smallest mole}} = \frac{\text{Mole of O}}{\text{Smallest mole}} = \frac{\text{Mole of O}}{\text{Smallest mole}}$ <input type="text"/>
Simplest ratio	<input type="text"/>	<input type="text"/>	<input type="text"/>

Empirical formula of P = C<sub>█</sub>H<sub>█</sub>O<sub>█</sub>

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

$$\boxed{\phantom{000}} = \boxed{\phantom{000}}$$

$$n = \boxed{\phantom{000}}$$

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

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