

EMPIRICAL FORMULA

1. A compound contains 13.87 grams of magnesium (Mg), 11.79 grams of phosphorus (P), and 24.35 grams of oxygen (O). Determine its empirical formula.
2. An organic compound of carbon, hydrogen, and nitrogen contains elements having a mass percentage of 66.67%, 7.41%, and 25.92%, respectively. What is the empirical formula?
3. A compound comprises 62.63% nitrogen (N) and 37.37% oxygen (O). Determine the empirical formula.
4. . A compound contains 25.02% carbon (C), 8.39% hydrogen (H), and 66.6% oxygen (O). Find the empirical formula.

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Answers

1. A compound contains 13.87 grams of magnesium (Mg), 11.79 grams of phosphorus (P), and 24.35 grams of oxygen (O). Determine its empirical formula.

$$\text{Moles of Magnesium (Mg): } 13.87 \text{ g} / 24.31 \text{ g/mol} = 0.57 \text{ moles} / 0.38 \text{ moles} = 1.5 \times 2 = 3$$

$$\text{Moles of Phosphorus (P): } 11.79 \text{ g} / 30.97 \text{ g/mol} = 0.38 \text{ moles} / 0.38 \text{ moles} = 1 \times 2 = 2$$

$$\text{Moles of Oxygen (O): } 24.35 \text{ g} / 16.00 \text{ g/mol} = 1.52 \text{ moles} / 0.38 \text{ moles} = 4 \times 2 = 8$$

The empirical formula is $\text{Mg}_3\text{P}_2\text{O}_8$.

2. An organic compound of carbon, hydrogen, and nitrogen contains elements having a mass percentage of 66.67%, 7.41%, and 25.92%, respectively. What is the empirical formula?

$$\text{Moles of Carbon (C): } 66.67 \text{ g} / 12.01 \text{ g/mol} = 5.56 \text{ moles} / 1.85 \text{ moles} = 3$$

$$\text{Moles of Hydrogen (H): } 7.41 \text{ g} / 1.01 \text{ g/mol} = 7.41 \text{ moles} / 1.85 \text{ moles} = 4$$

$$\text{Moles of Nitrogen (N): } 25.92 \text{ g} / 14.01 \text{ g/mol} = 1.85 \text{ moles} / 1.85 \text{ moles} = 1$$

The empirical formula is $\text{C}_3\text{H}_4\text{N}$.

3. A compound comprises 62.63% nitrogen (N) and 37.37% oxygen (O). Determine the empirical formula.

$$\text{Moles of N} = 62.63\% / 14.01 \text{ g/mol} = 4.46 \text{ moles} / 2.34 \text{ moles} = 2$$

$$\text{Moles of O} = 37.37\% / 16.00 \text{ g/mol} = 2.34 \text{ moles} / 2.34 \text{ moles} = 1$$

The empirical formula is N_2O .

4. . A compound contains 25.02% carbon (C), 8.39% hydrogen (H), and 66.6% oxygen (O). Find the empirical formula.

$$\text{Moles of C} = 25.02 / 12.01 \text{ g/mol} = 2.08 \text{ moles} / 2.08 \text{ moles} =$$

$$\text{Moles of H} = 8.39 / 1.01 \text{ g/mol} = 8.39 \text{ moles} / 2.08 \text{ moles} = 4$$

$$\text{Moles of O} = 66.6 / 16.00 \text{ g/mol} = 4.16 \text{ moles} / 2.08 \text{ moles} = 2$$

The empirical formula is CH_4O_2 .

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