

Calculating Empirical Formula Worksheet



1. A compound contains 24.0 grams of carbon (C), 4.0 grams of hydrogen (H), and 32.0 grams of oxygen (O). Determine its empirical formula.

2. A sample of a compound is found to contain 21.6% sodium (Na), 33.3% chlorine (Cl), and 45.1% oxygen (O) by mass. Determine its empirical formula.

3. A compound is composed of 40% carbon (C), 6.7% hydrogen (H), and 53.3% oxygen (O) by mass. Determine its empirical formula.

4. A compound is composed of 27.3 g aluminum (Al), 48.1 g sulfur (S), and 96.64 g oxygen (O) by mass. Determine its empirical formula.

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Answers

1. A compound contains 24.0 grams of carbon (C), 4.0 grams of hydrogen (H), and 32.0 grams of oxygen (O). Determine its empirical formula.

Moles of Carbon (C): $24.0 \text{ g} / 12.01 \text{ g/mol} = 2.0 \text{ moles} / 2.0 \text{ moles} = 1$

Moles of Hydrogen (H): $4.0 \text{ g} / 1.01 \text{ g/mol} = 3.96 \text{ moles} / 2.0 \text{ moles} = 2$

Moles of Oxygen (O): $32.0 \text{ g} / 16.00 \text{ g/mol} = 2.0 \text{ moles} / 2.0 \text{ moles} = 1$

The empirical formula is CH_2O .

2. A sample of a compound is found to contain 21.6% sodium (Na), 33.3% chlorine (Cl), and 45.1% oxygen (O) by mass. Determine its empirical formula.

Moles of Sodium (Na): $21.6 \text{ g} / 22.99 \text{ g/mol} = 0.939 \text{ moles} / 0.939 \text{ moles} = 1$

Moles of Chlorine (Cl): $33.3 \text{ g} / 35.45 \text{ g/mol} = 0.939 \text{ moles} / 0.939 \text{ moles} = 1$

Moles of Oxygen (O): $45.1 \text{ g} / 16.00 \text{ g/mol} = 2.818 \text{ moles} / 0.939 \text{ moles} = 3$

The empirical formula is NaClO_3 .

3. A compound is composed of 40% carbon (C), 6.7% hydrogen (H), and 53.3% oxygen (O) by mass. Determine its empirical formula.

Moles of Carbon (C): $40 \text{ g} / 12.01 \text{ g/mol} = 3.33 \text{ moles} / 3.33 \text{ moles} = 1$

Moles of Hydrogen (H): $6.7 \text{ g} / 1.01 \text{ g/mol} = 6.63 \text{ moles} / 3.33 \text{ moles} = 2$

Moles of Oxygen (O): $53.3 \text{ g} / 16.00 \text{ g/mol} = 3.33 \text{ moles} / 3.33 \text{ moles} = 1$

The empirical formula is CH_2O .

4. A compound is composed of 27.3 g aluminum (Al), 48.1 g sulfur (S), and 96.64 g oxygen (O) by mass. Determine its empirical formula.

Moles of Aluminum (Al): $27.3 \text{ g} / 26.98 \text{ g/mol} = 1.01 \text{ moles} / 1.01 \text{ moles} = 1 \times 2 = 2$

Moles of Sulfur (S): $48.1 \text{ g} / 32.07 \text{ g/mol} = 1.5 \text{ moles} / 1.01 \text{ moles} = 1.5 \times 2 = 3$

Moles of Oxygen (O): $96.64 \text{ g} / 16.00 \text{ g/mol} = 6.03 \text{ moles} / 1.01 = 5.98 \times 2 = 12$

The empirical formula is $\text{Al}_2\text{S}_3\text{O}_{12}$