Empirical & Molecular Formula

1. A compound is found to be 40% carbon, 6.7% hydrogen, and 53.5% oxygen. Its molecular mass is 60 g/mol. What is its molecular formula?

2. A compound is 64.9% carbon, 13.9% hydrogen, and 21.6 % oxygen. Its molecular mass is 75 g/mol. What is its molecular formula?

3. A compound is 54.5% carbon, 9.1% hydrogen, and 36.4 % oxygen. Its molecular mass is 88 g/mol. What is its molecular formula?

Name : _____ Date : _____

Empirical & Molecular Formula

1. A compound is found to be 40% carbon, 6.7% hydrogen, and 53.5% oxygen. Its molecular mass is 60 g/mol. What is its molecular formula?

Moles of C = 40 g / 12.01 g/mol = 3.33 moles/3.33 moles = 1

Moles of H = 6.7 g / 1.01 g/mol = 6.63 moles/3.33 moles = 2   Empirical formula = CH_2O

Moles of O = 53.5 g / 16.00 g/mol = 3.34 moles/3.33 moles = 1

Empirical formula mass = $(1 \times 12.01) + (2 \times 1.01) + (1 \times 16.00)$ = 30.02 g/mol

Ratio = Molar mass/Empirical formula mass = 62 g / 30.02 g/mol = 2

Molecular formula = $(CH_2O)_2 = C_2H_4O_2$

2. A compound is 64.9% carbon, 13.9% hydrogen, and 21.6 % oxygen. Its molecular mass is 75 g/mol. What is its molecular formula?

Moles of C = 64.9 g / 12.01 g/mol = 5.404 moles/1.35 moles = 4

Moles of H = 13.9 g / 1.01 g/mol = 13.762 moles/1.35 moles = 10   Empirical formula = $C_4H_{10}O$

Moles of O = 21.6 g / 16.00 g/mol = 1.35 moles/1.35 moles = 1

Empirical formula mass = $(4 \times 12.01) + (10 \times 1.01) + (1 \times 16.00)$ = 74 g/mol

Ratio = Molar mass/Empirical formula mass = 75 g / 74 g/mol = 1

Molecular formula = $C_4H_{10}O$

3. A compound is 54.5% carbon, 9.1% hydrogen, and 36.4 % oxygen. Its molecular mass is 88 g/mol. What is its molecular formula?

Moles of C = 54.5 g / 12.01 g/mol = 4.5 moles/2.28 moles = 2

Moles of H = 9.1 g / 1.01 g/mol = 9.01 moles/2.28 moles = 4   Empirical formula = C_2H_4O

Moles of O = 36.4 g / 16.00 g/mol = 2.28 moles/2.28 moles = 1

Empirical formula mass = $(2 \times 12.01) + (4 \times 1.01) + (1 \times 16.00)$ = 44 g/mol

Ratio = Molar mass/Empirical formula mass = 88 g / 44 g/mol = 2

Molecular formula = $(C_2H_4O)_2 = C_4H_8O_2$

Name : _____   Date : _____