

Problems that involve percentages, mass or moles of elements: Follow the poem. Show your work. Fill in the chart. Sometimes, the multiplier is 1. After a while, you will not need the chart to help you with the problems. One last reminder: the empirical formula and the molecular formula are related by a whole number ratio

1. A compound is 24.7% Calcium, 1.2% Hydrogen, 14.8% Carbon, and 59.3% Oxygen. Write the empirical formula and name the compound.

Element	%→mass	Molar mass	mass→moles moles	Divide by small Mole ratio	Multiply until whole	Final ratio
C	14.8g	12.01 g/mol	1.23 mol	2		2
H	1.2g	1.01 g/mol	1.19 mol	2		2
O	59.3g	15.99	3.71 mol	6		6
Ca	24.7g	40.08	.616 mol	1		1

Ca₁C₂H₂O₆

Show your work for the calculation of empirical formula here

$$14.8g C \left(\frac{1 \text{ mol}}{12.01g} \right) = \frac{1.23 \text{ mol C}}{.616}$$

$$1.2g H \left(\frac{1 \text{ mol}}{1.01g} \right) = \frac{1.19 \text{ mol H}}{.616}$$

$$59.3g O \left(\frac{1 \text{ mol}}{15.99g} \right) = \frac{3.71 \text{ mol O}}{.616}$$

$$24.7g Ca \left(\frac{1 \text{ mol}}{40.08g} \right) = \frac{.616 \text{ mol Ca}}{.616}$$

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2. Excessive physical activity, lactic acid molecular mass 90.08 g per mole, forms in muscle tissues and is responsible for muscle soreness. Elemental analysis shows that this compound has 40.0% carbon 6.71% hydrogen and 53.3% oxygen. Determine the empirical formula of lactic acid. Determine the molecular formula.

Element	%→mass	Molar mass	mass→moles moles	Divide by small Mole ratio	Multiply until whole	Final empirical ratio
C	40.0g	12.01 g/mol	3.33 mol	1		1
H	6.71g	1.01 g	6.64 mol	2		2
O	53.3g	15.99g	3.33 mol	1		1

Show your work for the calculation of empirical formula here

$$CH_2O \quad \frac{\text{mm of mol form}}{\text{mm of emp form}} = \text{multiplier} \quad \frac{90.08}{30.02} = 3$$

$$3(CH_2O) = C_3H_6O_3$$

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3. A compound is 21.20% Nitrogen, 6.06% Hydrogen, 24.30% Sulfur, and 48.45% Oxygen. Write the empirical formula for the compound.

Element	%→mass	Molar mass	mass→moles moles	Divide by small Mole ratio	Multiply until whole	Final empirical ratio
N		14.01	1.51	2		2
H		1.01	6.06	8		8
S		32.06	.758	1		1
O		15.99	3.03	4		4

Show your work for the calculation of empirical formula here

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4. Nicotine is an addictive compound found in tobacco leaves. Elemental analysis of nicotine gives the following data: 74.0% C, 8.65% H, 17.35% N. What is the empirical formula of nicotine? The molar mass of nicotine is less than 170 g/mol. What is the molecular formula?

Element	%→mass	Molar mass	mass→moles moles	Divide by small Mole ratio	Multiply until whole	Final empirical ratio
C						
H						
N						

Show your work for the calculation of empirical formula here

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5. A sample of an unknown compound contains 0.21 moles of zinc, 0.14 moles of phosphorus, and 0.56 moles of oxygen. What is the empirical formula?

Element	%→mass	Molar mass	Mass→moles	Divide by small	Multiply until whole	Final empirical ratio
Zn			.21/14	1.5 X 2		3
P			.14/14	1 X 2		2
O			.56/14	4 X 2		8

Show your work for the calculation of empirical formula here



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CH_4 - nonmetals (covalent)

$NaCl$ - metal + nonmetal (ionic)

CO_2



Nov 2-8:00 AM

Nov 2-9:31 AM