

## Worksheet 4.2

# Empirical and molecular formula calculations

NAME:

CLASS:

### INTRODUCTION

The **empirical formula** of a compound is defined as the simplest whole-number ratio of atoms of the elements in the compound.

The **molecular formula** of a compound is defined as the actual number of atoms of elements covalently bonded in a molecule, and is a whole-number ratio of the empirical formula.

The **percentage composition** of a compound can be determined from its formula or from experimental mass proportion data.

No.	Question	Answer
1	Titanium oxide, $\text{TiO}_2$ , is widely used as a pigment in high-quality artists' paints due to its brilliant white colour. Determine the percentage composition of $\text{TiO}_2$ .	
2	Calculate the percentage by mass of each element present in the following compounds. a $\text{Fe}_2\text{O}_3$ b $\text{Na}_2\text{S}_2\text{O}_3$ c $\text{Ba}(\text{HSO}_4)_2$	
3	An oxide of sulfur contains 60% oxygen. Determine the empirical formula of the compound.	
4	A group 1 metal chloride contains 47.6% chlorine. What is the formula of this ionic compound?	

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No.	Question	Answer
5	Write empirical formulas for each of the following. a CH <sub>4</sub> b N <sub>2</sub> H <sub>4</sub> c H <sub>2</sub> SO <sub>4</sub> d C <sub>2</sub> H <sub>4</sub> O <sub>2</sub>	
6	Write the chemical formulas of three molecules that have an empirical formula of CH <sub>2</sub> .	
7	A molecule has an empirical formula C <sub>2</sub> H <sub>4</sub> O and a relative molecular mass of 88. What is its molecular formula?	
8	0.300 mole of a sample of a hydrocarbon is found to have a mass of 24.6 g. If the empirical formula of the compound is C <sub>3</sub> H <sub>5</sub> , determine its molecular formula.	
9	A student is given a 2.486 g sample of a purple crystalline solid. Upon analysis it is found to consist of potassium (0.614 g), manganese (0.863 g) and oxygen (1.006 g). Determine the empirical formula of the compound.	
10	A compound undergoes analysis to establish the following elemental composition: Carbon: 40.0% Hydrogen: 6.67% Oxygen: 53.3% If the compound, known as a carbohydrate, has a molecular mass of approximately 60, determine both its empirical and molecular formulas.	