



Practising calculations in chemistry

Learning objectives

- 1 Calculate the relative formula mass of a compound given its formula and appropriate relative atomic masses.
- 2 Calculate the percentage by mass of an element from a given formula.
- 3 Calculate masses of reactants and products from balanced equations using the mole equation.

Introduction

In chemistry, it is not enough just to know which substances react, we also need to know how much of each substance is involved. This part of chemistry is called quantitative chemistry.

By mastering these skills, you will gain a deeper understanding of how chemists use maths to make chemistry precise, reliable and useful in the real world.

Data

All the information below can be found on the periodic table but is reproduced here for you to refer to.

Element	Symbol	Relative atomic mass	Element	Symbol	Relative atomic mass
Hydrogen	H	1	Potassium	K	39
Carbon	C	12	Calcium	Ca	40
Nitrogen	N	14	Iron	Fe	56
Oxygen	O	16	Copper	Cu	63.5
Sodium	Na	23	Zinc	Zn	65
Magnesium	Mg	24	Bromine	Br	80
Aluminium	Al	27	Silver	Ag	108
Sulfur	S	32	Iodine	I	127
Chlorine	Cl	35.5	Lead	Pb	207



Calculating relative formula masses

Calculate the relative formula mass of:

1.1 Methane, CH_4

1.2 Sodium hydroxide, NaOH

1.3 Sulfuric acid, H_2SO_4

1.4 Zinc nitrate, $\text{Zn}(\text{NO}_3)_2$

Calculating the percentage by mass of an element in a compound from a given formula

Calculate the percentage by mass of:

2.1 **Carbon, C** in methane, CH_4

2.2 **Calcium, Ca** in calcium carbonate, CaCO_3

2.3 **Oxygen, O** in sulfur dioxide, SO_2

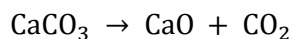
2.4 **Nitrogen, N** in ammonium sulfate, $(\text{NH}_4)_2\text{SO}_4$



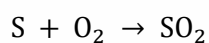
Calculating the mass of reactants and products from balanced equations using the mole equation

$$\text{moles} = \frac{\text{mass}}{M_r}$$

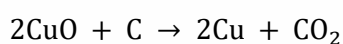
- 3.1** What mass of calcium oxide is formed when 10 g of calcium carbonate is completely decomposed?



- 3.2** What mass of sulfur dioxide is produced when 2.4 g of sulfur is burnt?



- 3.3** What mass of carbon is needed to react with 8 g of copper(II) oxide?



- 3.4** What mass of iron(III) oxide is needed to react with carbon monoxide to produce 112 g of iron?

