AQA GCSE Chemistry (Combined Science) Unit 5.3: Quantitative Chemistry Knowledge Organiser - Foundation

Conservation of Mass

No atoms can be created or made during a chemical reaction, so the mass of the reactants will equal the mass of the product.

Reactions can be shown as a word or symbol equation.

magnesium + oxygen → magnesium oxide

Mg + O → MgO

Symbol equations should also be balanced; they should have the same number of atoms on each side.

$2Mg + O_2 \rightarrow 2MgO$

Relative Formula Mass

The relative formulas mass is the sum of all the relative atomic masses of the atoms in the formula.

Examples:

HCl

A_r of H = 1

A_r of Cl = 35.5

1 + 35.5 = 36.5

H_2SO_4

A_r of H = 1

A_r of S = 32

A_r of O = 16

(1 × 2) + 32 + (16 × 4)

2 + 32 + 64 = 98

Calculating Percentage Mass of an Element in a Compound

percentage mass of an element in a compound =

$$A_r \times \frac{\text{number of atoms of that element}}{M_r \text{ of the compound}}$$

Find the percentage mass of magnesium in magnesium oxide.

A_r of magnesium = 24 A_r of oxygen = 16

M_r of MgO = 24 + 16

= 40

$$\% \text{ mass} = \frac{A_r}{M_r} = \frac{16}{40} = 0.4 \qquad 0.4 \times 100 = 40\%$$

Concentration of Solutions

Concentration is the amount of a substance in a specific volume of a solution. The more substance that is dissolved, then the more concentrated the solution is.

It is possible to calculate the concentration of a solution with the following equation:

concentration (g/dm³) = mass (g) ÷ volume of solvent (dm³)

The equation can be rearranged to find the mass of the dissolved substance:

mass (g) = concentration (g/dm³) × volume (dm³)

Conservation of Mass

Show that mass is conserved in a reaction.

$2Mg + O_2 \rightarrow 2MgO$

$(2 \times 24) + (2 \times 16) \rightarrow 2(24 + 16)$

$48 + 32 \rightarrow 2 \times 40$

$80 \rightarrow 80$

Total M_r on the left-hand side of the equation is the same as the M_r on the right-hand side.

Calculate the mass of the product.

8g of magnesium reacts with 6g of oxygen:

8 + 6 = 14g of magnesium oxide

During a reaction the mass can change. If one of the reactants is a gas, the mass can go up.

E.g.

magnesium + oxygen → magnesium oxide

Oxygen from the air is added to the magnesium (making the product) which will be heavier in mass.

If one of the products is a gas, the mass can go down.

E.g.

sodium carbonate → sodium oxide + carbon dioxide

When sodium carbonate is thermally decomposed, carbon dioxide gas is produced and released into the atmosphere.

AQA GCSE Chemistry (Combined Science) Unit 5.3: Quantitative Chemistry Knowledge Organiser - Higher

Conservation of Mass

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Reactions can be shown as a word or symbol equation.

magnesium + oxygen → magnesium oxide

Mg + O → MgO

Symbol equations should also be balanced; they should have the same number of atoms on each side.

$2Mg + O_2 \rightarrow 2MgO$

Relative Formula Mass

The relative formula mass (M_r) is the sum of all the relative atomic masses (A_r) of the atoms in the formula.

Examples:

HCl

A_r of H = 1

A_r of Cl = 35.5

M_r of HCl = 1 + 35.5 = 36.5

H_2SO_4

A_r of H = 1

A_r of S = 32

A_r of O = 16

M_r of H_2SO_4 = (1 × 2) + 32 + (16 × 4)

M_r of H_2SO_4 = 2 + 32 + 64

M_r of H_2SO_4 = 98

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It is possible to calculate the concentration of a solution with the following equation:

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Calculating Percentage Mass of an Element in a Compound

percentage mass of an element in a compound =

$$A_r \times \frac{\text{number of atoms of that element}}{M_r \text{ of the compound}}$$

Find the percentage mass of oxygen in magnesium oxide.

A_r of magnesium = 24 A_r of oxygen = 16

M_r of MgO = 24 + 16

= 40

$$\% \text{ mass} = \frac{A_r}{M_r} = \frac{16}{40} = 0.4 \quad 0.4 \times 100 = 40\%$$

Conservation of Mass

Show that mass is conserved in a reaction.

$2Mg + O_2 \rightarrow 2MgO$

$(2 \times 24) + (2 \times 16) \rightarrow 2(24 + 16)$

$48 + 32 \rightarrow 2 \times 40$

$80 \rightarrow 80$

Total M_r on the left-hand side of the equation is the same as the M_r on the right-hand side.

Calculate the mass of the product.

6g of magnesium reacts with 4g of oxygen:

6 + 4 = 10g of magnesium oxide

During a reaction the mass can change. If one of the reactants is a gas, the mass can go up.

E.g.

magnesium + oxygen → magnesium oxide

Oxygen from the air is added to the magnesium (making the product) which will be heavier in mass.

If one of the products is a gas, the mass can go down.

E.g.

sodium carbonate → sodium oxide + carbon dioxide

When sodium carbonate is thermally decomposed, carbon dioxide gas is produced and released into the atmosphere.