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Chemical Reactions and Equations: Chapter Introduction

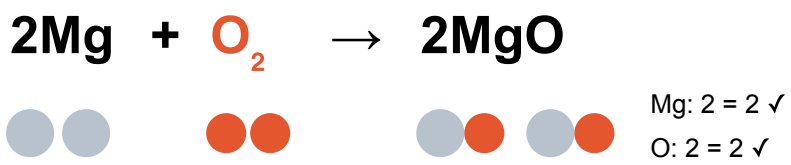
1. Where did the metal go?

A magnesium ribbon burns with a dazzling white flame and leaves a white powder, **magnesium oxide**. The magnesium did not vanish: its atoms joined oxygen atoms from the air in a new arrangement. When old substances (reactants) change into new substances (products), it is a **chemical reaction**.

2. Signs of a reaction

- Evolution of a **gas** (bubbles)
- Change in **colour**
- Change in **temperature**
- Formation of a **precipitate** (insoluble solid)
- Change in **state**

3. Writing and balancing



Step	Mg (left / right)	O (left / right)
$Mg + O_2 \rightarrow MgO$	1 / 1	2 / 1 ✗
$Mg + O_2 \rightarrow 2MgO$	1 / 2 ✗	2 / 2
$2Mg + O_2 \rightarrow 2MgO$	2 / 2 ✓	2 / 2 ✓

A balanced equation has the same number of atoms of each element on both sides (law of conservation of mass).

4. Types of reactions

Type	Pattern	Example
Combination	A + B → AB	$CaO + H_2O \rightarrow Ca(OH)_2$
Decomposition	AB → A + B	$CaCO_3 \rightarrow CaO + CO_2$
Displacement	A + BC → AC + B	$Fe + CuSO_4 \rightarrow FeSO_4 + Cu$
Double displacement	AB + CD → AD + CB	$Na_2SO_4 + BaCl_2 \rightarrow BaSO_4 + 2NaCl$
Redox	oxidation + reduction together	$CuO + H_2 \rightarrow Cu + H_2O$

5. In daily life

Corrosion: iron rusts in moist air (painting, oiling and galvanising prevent it). **Rancidity:** oils and fats in food oxidise and smell bad; chips packets are flushed with **nitrogen** to prevent it.

Solved example

Q. Balance $H_2 + O_2 \rightarrow H_2O$.
A. O is 2 on the left, 1 on the right → $2H_2O$. Now H is 4 on the right → $2H_2$. **$2H_2 + O_2 \rightarrow 2H_2O$**.

Practice questions

1. (MCQ) $CaCO_3 \rightarrow CaO + CO_2$ is (a) combination (b) decomposition (c) displacement (d) redox
2. (Very short) Name the white powder formed when magnesium burns.
3. (Short) Give two signs that show a chemical reaction has occurred.
4. (Numerical) Balance $Fe + H_2O \rightarrow Fe_3O_4 + H_2$.
5. (Short) Why are chips packets flushed with nitrogen?
6. (Short) Identify the type: $Zn + CuSO_4 \rightarrow ZnSO_4 + Cu$.

Answer key

1. (b).
2. Magnesium oxide (MgO).
3. Any two: gas evolved, colour change, temperature change, precipitate formed, change of state.
4. $3Fe + 4H_2O \rightarrow Fe_3O_4 + 4H_2$.
5. Nitrogen keeps oxygen out, so the oils in the chips do not oxidise (no rancidity).
6. Displacement: zinc displaces copper.

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