

Chapter 6: Chemical Reactions

Chemical reactions involve breaking and forming chemical bonds, resulting in new substances.

1. Types of Chemical Reactions

TYPE	DEFINITION	EXAMPLE
COMBINATION	Two or more substances combine to form a single product.	$2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$
DECOMPOSITION	A compound breaks down into simpler substances.	$2\text{H}_2\text{O} \rightarrow 2\text{H}_2 + \text{O}_2$
DISPLACEMENT	A more reactive element replaces a less reactive element in a compound.	$\text{Zn} + \text{CuSO}_4 \rightarrow \text{ZnSO}_4 + \text{Cu}$
DOUBLE DISPLACEMENT	Exchange of ions between two compounds, forming new compounds.	$\text{AgNO}_3 + \text{NaCl} \rightarrow \text{AgCl} + \text{NaNO}_3$

2. Reactivity Series of Metals

- Metals are arranged in order of their reactivity, with the most reactive at the top and least reactive at the bottom.
- A more reactive metal can displace a less reactive metal from its salt solution.
- Example:
 - Zinc (Zn) displaces Copper (Cu) from Copper Sulfate solution:
$$\text{Zn} + \text{CuSO}_4 \rightarrow \text{ZnSO}_4 + \text{Cu}$$
 - Since zinc is **more reactive** than copper, it replaces it.

3. Endothermic and Exothermic Reactions

- Endothermic Reaction:** Absorbs heat.
 - Example: **Photosynthesis**



- **Exothermic Reaction:** Releases heat.
 - Example: **Burning of methane (CH₄)**



4. Neutralization Reaction

- **When an acid reacts with a base to form salt and water.**
 - Example: $\text{HCl} + \text{NaOH} \rightarrow \text{NaCl} + \text{H}_2\text{O}$

5. Decomposition Reactions to Form Oxides

- Some compounds decompose upon heating, forming oxides.
 - Example: **Decomposition of calcium carbonate**



6. Classification of Oxides

Type	Definition	Example
Acidic Oxides	Non-metal oxides that react with bases to form salt and water.	CO_2, SO_2
Basic Oxides	Metal oxides that react with acids to form salt and water.	$\text{Na}_2\text{O}, \text{CaO}$
Amphoteric Oxides	Oxides that react with both acids and bases.	ZnO, PbO
Neutral Oxides	Oxides that do not react with acids or bases.	$\text{CO}, \text{H}_2\text{O}$

- **Example of Amphoteric Oxide Reaction:**
 - With acid: $\text{ZnO} + 2\text{HCl} \rightarrow \text{ZnCl}_2 + \text{H}_2\text{O}$
 - With base: $\text{ZnO} + 2\text{NaOH} \rightarrow \text{Na}_2\text{ZnO}_2 + \text{H}_2\text{O}$

