Class 10 Science – Chemical Reactions and Equations – Topic: Types of Chemical Reactions (Topicwise Notes)

ALPHA CLASSES DEOBAND | Session 2026–27 | CBSE Board Pattern

Concept – The Big Picture

- Chemical reactions can be sorted into clear types based on how atoms rearrange — once you know the pattern (dhaancha), you can predict what products will form before the reaction even finishes.
- **Combination** reactions join substances together (jodna); **decomposition** reactions break them apart (todna) — they are mirror images of each other.
- In **displacement**, a stronger element pushes out a weaker one from its compound — think of it as the more reactive element winning the seat (zyada taaqatwar element kamzor ko bahar nikalta hai).
- **Double displacement** is an ion-exchange game — two compounds swap partners like a trade (tabaadla), and often a precipitate or water is produced.
- Every reaction either releases heat (**exothermic** — garmi deta hai) or absorbs heat (**endothermic** — garmi leta hai) — this energy angle appears in almost every board paper.

Key Definitions

Term	Definition
Combination Reaction	A reaction in which two or more substances combine to form a single product. General form: $A + B \rightarrow AB$. Example: $CaO + H_2O \rightarrow Ca(OH)_2$
Decomposition Reaction	A reaction in which a single reactant breaks down into two or more simpler products. General form: $AB \rightarrow A + B$. Energy must be supplied to break bonds.
Thermal Decomposition	Decomposition caused by heating. Symbol Δ is written above the arrow. Example: $CaCO_3 \xrightarrow{\Delta} CaO + CO_2$
Electrolytic Decomposition	Decomposition caused by passing electricity through a substance. Example: $2H_2O \xrightarrow{\text{electricity}} 2H_2 + O_2$
Photolytic Decomposition	Decomposition caused by light (sunlight or UV). Example: $2AgCl \xrightarrow{\text{sunlight}} 2Ag + Cl_2$
Displacement Reaction	A reaction in which a more reactive element displaces a less reactive element from its compound. General form: $A + BC \rightarrow AC + B$
Double Displacement Reaction	A reaction in which two compounds exchange their ions to form two new compounds. General form: $AB + CD \rightarrow AD + CB$
Precipitation Reaction	A double displacement reaction in which one of the products is an insoluble solid (precipitate) that settles out of the solution.
Neutralisation Reaction	A reaction between an acid and a base to form a salt and water. It is a special case of double displacement.
Exothermic Reaction	A reaction that releases energy (usually heat) to the surroundings. The temperature of the surroundings rises. Examples: combustion, respiration, neutralisation.
Endothermic Reaction	A reaction that absorbs energy (usually heat) from the surroundings. The temperature of the surroundings falls. Examples: thermal decomposition, dissolving NH_4Cl in water.

Important Equations

1. Combination Reaction

General form: $A + B \rightarrow AB$

Example — Burning of magnesium ribbon:

$2Mg(s) + O_2(g) \rightarrow 2MgO(s)$

Example — Quicklime reacting with water:

$CaO(s) + H_2O(l) \rightarrow Ca(OH)_2(aq)$ [Exothermic]

2. Decomposition Reaction

General form: $AB \rightarrow A + B$

Thermal:

$$2Pb(NO_3)_2(s) \xrightarrow{\Delta} 2PbO(s) + 4NO_2(g) + O_2(g)$$

Electrolytic:

$$2H_2O(l) \xrightarrow{\text{electricity}} 2H_2(g) + O_2(g)$$

Photolytic:

$$2AgCl(s) \xrightarrow{\text{sunlight}} 2Ag(s) + Cl_2(g)$$

3. Displacement Reaction

General form: $A + BC \rightarrow AC + B$

$Fe(s) + CuSO_4(aq) \rightarrow FeSO_4(aq) + Cu(s)$

4. Double Displacement Reaction

General form: $AB + CD \rightarrow AD + CB$

$Na_2SO_4(aq) + BaCl_2(aq) \rightarrow BaSO_4(s) \downarrow + 2NaCl(aq)$

5. Neutralisation

$NaOH(aq) + HCl(aq) \rightarrow NaCl(aq) + H_2O(l)$

Solved Examples

Example 1 — Identify the Type of Reaction

Q. Identify the type of chemical reaction in the following and give a reason:

$2Mg(s) + O_2(g) \rightarrow 2MgO(s)$

Solution:

Step 1: Count the reactants and products. Two substances (Mg and O_2) combine to form a single product (MgO).

Step 2: Match the pattern. This fits the general form $A + B \rightarrow AB$.

Step 3: Check for energy change. Burning magnesium produces intense white light and heat — energy is released.

∴ This is a **combination reaction** and it is **exothermic**.

Example 2 — Observations in a Displacement Reaction

Q. An iron nail is placed in a beaker containing copper sulphate solution. State two observations you would make and identify the type of reaction.

Solution:

Step 1: Iron is more reactive than copper (higher in the reactivity series), so iron displaces copper from $CuSO_4$.

$$Fe(s) + CuSO_4(aq) \rightarrow FeSO_4(aq) + Cu(s)$$

Step 2: Observations: (i) The blue colour of the copper sulphate solution gradually fades and turns green (due to formation of $FeSO_4$). (ii) A reddish-brown deposit of copper metal appears on the surface of the iron nail.

∴ This is a **displacement reaction** — a more reactive metal (Fe) has displaced a less reactive metal (Cu) from its salt solution.

Example 3 — Balancing and Classifying a Decomposition Reaction

Q. When lead nitrate is heated, it produces lead oxide, nitrogen dioxide (a brown gas), and oxygen. Write the balanced equation and identify the type of reaction.

Solution:

Step 1: Write the word equation. Lead nitrate → Lead oxide + Nitrogen dioxide + Oxygen

Step 2: Write the unbalanced equation with formulae. $Pb(NO_3)_2 \rightarrow PbO + NO_2 + O_2$

Step 3: Balance the equation.

$$2Pb(NO_3)_2(s) \xrightarrow{\Delta} 2PbO(s) + 4NO_2(g) + O_2(g)$$

Step 4: Classify — a single compound breaks into simpler substances on heating.

∴ This is a **thermal decomposition reaction** (heating is the energy source, shown by Δ).

Example 4 — Word Problem: Neutralisation / Double Displacement

Q. When a sodium hydroxide solution is mixed with hydrochloric acid, the solution becomes warm and a salt is formed. Write the balanced equation, name the salt produced, and identify the type of reaction.

Solution:

Step 1: Identify the reactants. Sodium hydroxide (NaOH) is a base; hydrochloric acid (HCl) is an acid.

Step 2: Write the balanced equation.

$$\mathrm{NaOH}(aq) + \mathrm{HCl}(aq) \rightarrow \mathrm{NaCl}(aq) + \mathrm{H_2O}(l)$$

Step 3: Name the salt. The salt formed is **sodium chloride** (common salt).

Step 4: Classify the reaction. - The ions of NaOH and HCl exchange partners → **double displacement reaction**. - Since an acid reacts with a base to form salt and water → this is specifically a **neutralisation reaction**. - The solution becomes warm → energy is released → it is also **exothermic**.

∴ This is a **neutralisation reaction** (a special case of double displacement), and it is **exothermic**.

Example 5 — Board-Level: Photolytic Decomposition and Real-Life Application

Q. Silver chloride turns grey when left in sunlight. (a) Write the chemical equation for the reaction. (b) Identify the type of reaction. (c) Why are silver chloride and silver bromide stored in dark-coloured bottles?

Solution:

Step 1: Write the balanced equation.

$$2\mathrm{AgCl}(s) \xrightarrow{\text{sunlight}} 2\mathrm{Ag}(s) + \mathrm{Cl_2}(g)$$

Step 2: Identify the type. A single compound (AgCl) breaks down into simpler substances (Ag and Cl_2) in the presence of sunlight.

∴ (b) This is a **photolytic decomposition** (or photochemical decomposition) reaction.

Step 3: Explain the grey colour. The grey colour is due to the formation of **silver metal (Ag)**, which deposits on the surface of the compound.

Step 4: Reason for dark-coloured bottles. (c) Silver chloride and silver bromide decompose in the presence of light. To prevent this unwanted decomposition, they are stored in **dark-coloured bottles** that do not allow light to pass through.