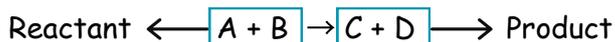


CHEMICAL REACTIONS AND EQUATIONS

Chemical Reaction: The transformation of chemical substance into another chemical substance. e.g. Rusting of iron, the setting of milk into curd.

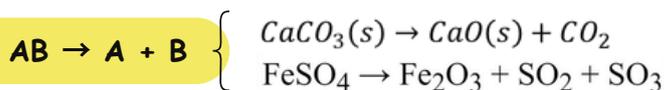
Chemical Equation: Representation of chemical reaction using symbols and formulae of the substances.



Characteristic	Example Reaction
Change in Colour	$Fe + CuSO_4(\text{Blue}) \rightarrow FeSO_4(\text{Blue-green}) + Cu$
Change in Temperature	$CaO + H_2O \rightarrow Ca(OH)_2 + \text{Heat (heat is generated)}$
Change in State	$H_2(g) + O_2(g) \rightarrow H_2O(l)$ (i.e., gas to liquid)
Evolution of Gas	$Zn(s) + H_2SO_4(aq) \rightarrow ZnSO_4(aq) + H_2(g)$
Formation of Precipitate	$Pb(NO_3)_2(aq) + KI(aq) \rightarrow PbI_2(s) + KNO_3(aq)$
Endothermic Reaction	$CaCO_3 + \text{Heat} \rightarrow CaO + CO_2$ (photosynthesis also)
Exothermic Reaction	$CaO + H_2O \rightarrow Ca(OH)_2 + \text{Heat}$ (digestion and respiration also)

The most effective way to test for CO_2 is to bubble the gas through lime water, which is a diluted solution of calcium hydroxide.

2. Decomposition Reaction: A single reactant decomposes to form two or more products.



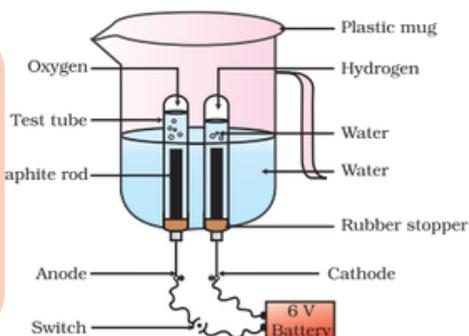
Thermal Decomposition $CaCO_3 \rightarrow CaO + CO_2$
(thermal energy)

Photolytic Decomposition $2AgBr \rightarrow 2Ag + Br_2$
(energy from sunlight) black & white photography

Electrolytic Decomposition $2H_2O \rightarrow 2H_2 + O_2$
(electrical energy)

Hydrogen (cathode) will produce a popping sound when a burning candle is brought close.

Oxygen (anode) will make the flame of the candle burn brighter.



Such important terms:

→ **Precipitate:** Insoluble solid formed after a chemical reaction.

→ **Exothermic Reaction:** Reaction releasing heat energy.

→ **Endothermic Reaction:** Reaction absorbing heat energy.

→ **Catalyst:** Speeds up a reaction without being consumed.

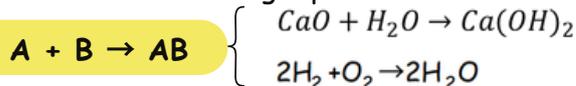
Balanced Chemical Equation: Number of atoms of each element in reactants = number of atoms of each element in products. **Law of Conservation of Mass:** Mass of reactants = Mass of products

Balance these: $Fe + H_2O \rightarrow Fe_3O_4 + H_2$
 $C_6H_{12}O_6 + O_2 \rightarrow CO_2 + H_2O$

- Draw boxes around formulas.
- Count atoms on both sides.
- Start with the biggest compound.
- Balance elements one by one.
- Use smallest whole numbers.
- Recheck for balance.

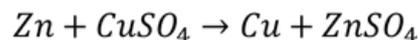
Types of Chemical Reactions:

1. Combination Reaction: Two or more reactants combine to form single products.

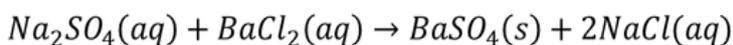


3. Displacement Reaction: a more reactive element displaces a less reactive element from its compound.

Single Displacement $A + BC \rightarrow AC + B$

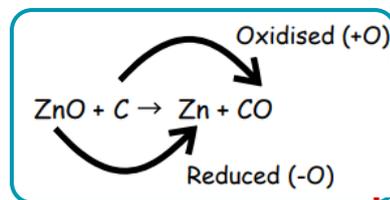


Double Displacement $AB + CD \rightarrow AD + CB$



Reaction	Observation
$Mg + O_2 \rightarrow MgO$	Magnesium ribbon burns with a dazzling white flame and forms a white powder (magnesium oxide).
$Pb(NO_3)_2 + KI \rightarrow PbI_2$	Yellow precipitate of lead iodide forms, and the solution changes from colorless to yellow.
$Zn + H_2SO_4 \rightarrow ZnSO_4 + H_2$	Bubbles of hydrogen gas form around the zinc metal. Heat is released during the reaction.
$CaO + H_2O \rightarrow Ca(OH)_2$	Calcium oxide reacts vigorously with water to produce slaked lime, releasing a large amount of heat.
$2FeSO_4 \rightarrow Fe_2O_3 + SO_2 + SO_3$	Initially green; turns white, then brown (ferric oxide) with the smell of burning sulfur.

Reaction	Observation
$2\text{AgCl} \rightarrow 2\text{Ag} + \text{Cl}_2$ (in sunlight)	White silver chloride turns grey in sunlight.
$\text{Fe} + \text{CuSO}_4 \rightarrow \text{FeSO}_4 + \text{Cu}$	The deep blue solution fades to light green, and the iron nail becomes covered with a red-brown layer of copper.
$\text{Na}_2\text{SO}_4 + \text{BaCl}_2 \rightarrow \text{BaSO}_4 + 2\text{NaCl}$	A white precipitate of barium sulfate forms.
$2\text{Cu} + \text{O}_2 \rightarrow 2\text{CuO}$	Black copper oxide (CuO) forms. Hydrogen gas can reduce CuO back to copper during a reverse reaction.



K
Na
Ca
Mg
Al
Zn
Fe
Pb
H
Cu
Hg
Ag
Au

Rancidity: the spoilage of fats and oils in food, leading to unpleasant taste and smell. Examples: Spoiled butter, Old cooking oil, Stale chips

Prevention: Adding antioxidants, storing foods in airtight containers, and refrigerating can help slow down or prevent the oxidation process and, consequently, rancidity

Effects of oxidation in daily life:

Corrosion: metals are gradually destroyed by chemical reactions with substances in their environment, such as moisture and acids. Examples: Rusting of iron, Tarnishing of silver, Green coating on copper

Prevention: Coating metals with protective layers (e.g., paint or galvanization) helps prevent direct exposure to oxygen and moisture, reducing the risk of corrosion.

- Silver develops a black coating after some time.
- Copper develops a green coating after some time.

4. Redox Reactions: **Oxidation:** + oxygen or - hydrogen
Reduction: - oxygen or + hydrogen

Oxidizing agent: An oxidizing agent is a substance that causes oxidation by accepting electrons; therefore, it gets reduced.

Reducing agent: A reducing agent is a substance that causes reduction by losing electrons; therefore it gets oxidized.

Issme batao:



Chapter ka KAZAANA:

- **Balancing (MCQs)**
- **Type of Reaction and Example (Specially Decomposition and Redox)**
- **Color Change Activities**