

Chapter - 1 Chemical Reactions And Equations

The process in which new substances with new properties are formed from one or more substances is called **Chemical Reaction**.

- * The substances which take part in chemical reaction are called **Reactants**.
- * The substances which are formed in a chemical reaction are called **Products**.

Examples :

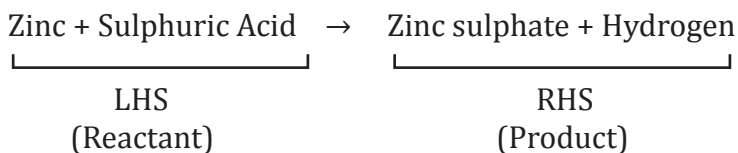
- Digestion of food
- Respiration
- Rusting of iron
- Burning of Magnesium ribbon
- Formation of curd

Chemical reaction involves :

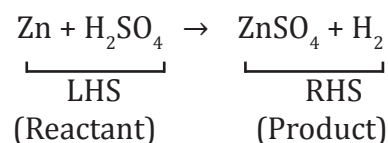
- Change in state
- Change in colour
- Change in temperature
- Evolution of gas

Ways of Representing a Chemical Reaction

Word Equation



Chemical Equation



Chemical Equation

- * A chemical reaction can be represented by chemical equation. It involves uses of symbol of elements or chemical formula of reactant and product with mention of physical state.
- * The necessary conditions such as temperature, pressure or any catalyst should be written on arrow between reactant and products.
e.g., Magnesium is burnt in air to form magnesium oxide.



Balancing Chemical Equation

- * Law of conservation of Mass. Matter can neither be created nor destroyed in a chemical reaction.
- * So number of elements involved in chemical reaction should remain same at reactant and product side.

STEPWISE BALANCING (Hit and Trial)

Step 1. Write a chemical equation and draw boxes around each formula.



- * Do not change anything inside the box.

Step 2. Count the number of atoms of each element on both the sides of chemical equation.

Element	No. of atoms at reactant side	No. of atoms at product side
1. Fe	1	3
2. H	2	2
3. O	1	4

Step 3. Equalise the number of atoms of element which has maximum number by putting in front of it.



Step 4. Try to equalize all the atoms of elements on reactant and product side by adding coefficient in front of it.



* Now all the atoms of elements are equal on both sides.

Step 5. Write the physical states of reactants and products.



Solid state = (s)

Liquid state = (l)

Gaseous state = (g)

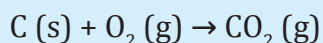
Aqueous state = (aq)

Step 6. Write necessary conditions of temperature, pressure or catalyst on arrow above or below.

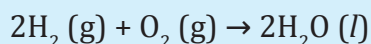
TYPES OF CHEMICAL REACTIONS

I. COMBINATION REACTION : The reaction in which two or more reactant combine to form a single product.

e.g. (i) Burning of coal



(ii) Formation of water



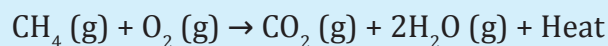
(iii) $\text{CaO (s)} + \text{H}_2\text{O (l)} \rightarrow \text{Ca(OH)}_2 \text{ (aq)}$

Quick lime

Slaked lime

Exothermic Reactions : Reaction in which heat is released along with formation of products.

e.g., (i) Burning of natural gas



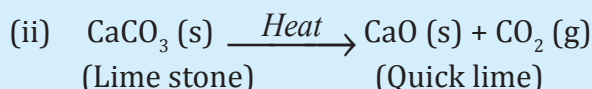
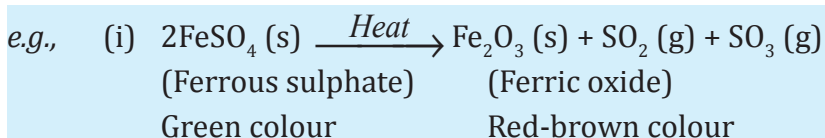
(ii) Respiration is also an exothermic reaction.



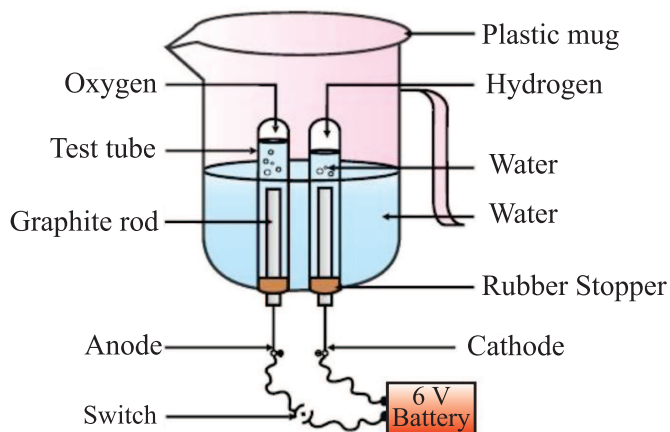
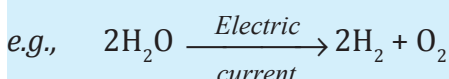
II. DECOMPOSITION REACTION : The reaction in which a compound splits into two or more simple substances is called decomposition reaction.



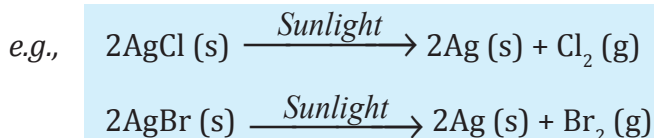
- **Thermal decomposition :** When decomposition is carried out by heating.



- **Electrolytic Decomposition :** When decomposition is carried out by passing electricity.



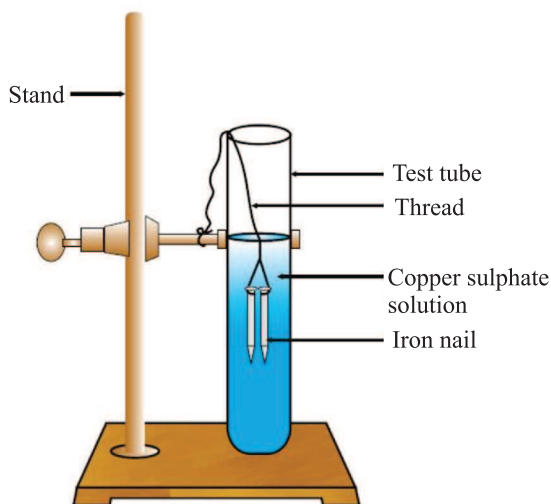
- **Photolytic Decomposition :** When decomposition is carried out in presence of sunlight.



* Above reaction is used in black & white photography.

- **Endothermic Reactions :** The reactions which require energy in the form of heat, light or electricity to break reactants are called endothermic reactions.

III. DISPLACEMENT REACTION : The chemical reaction in which more reactive element displaces less reactive element from its salt solution.

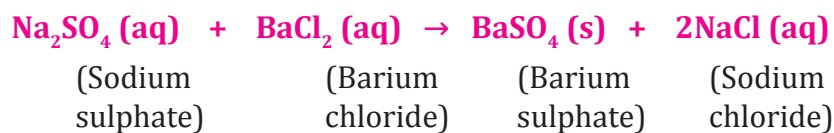


The iron nail becomes brownish in colour by deposition of Cu and blue colour of CuSO_4 changes dirty green colour due to formation of FeSO_4 .



Zn is more reactive than copper.

IV. DOUBLE DISPLACEMENT REACTION : A reaction in which new compounds are formed by mutual exchange of ions between two compounds.

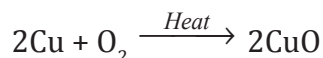
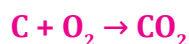


White precipitate of BaSO_4 is formed, so it is also called precipitation reaction.

V. OXIDATION AND REDUCTION :

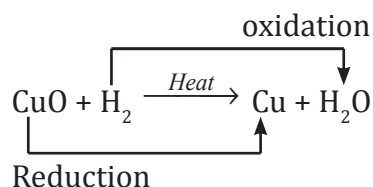
Oxidation : (i) The addition of oxygen to substance.

(ii) The removal of hydrogen from a substance.



Reduction : (i) The addition of hydrogen to substance.

(ii) The removal of oxygen from a substance.



In this reaction CuO is reduced to Cu and H_2 is oxidized to H_2O . So, oxidation and reduction taking place together is redox reaction.

Effects of Oxidation in Daily Life

1) Corrosion

- When a metal is exposed to substances such as moisture, acid etc. for some time, a layer of hydrated oxide is formed which weakens the metal and hence metal is said to be corrode
- Rusting of iron, black coating on silver and green coating on copper are examples of corrosion.
- Corrosion can be prevented by galvanization, electroplating or painting.

2) Rancidity : The oxidation of fats and oils when exposed to air is known as rancidity. It leads to bad smell and bad taste of food.

Methods to Prevent Rancidity

- By adding antioxidants
- Keeping food in air tight containers
- Replacing air by nitrogen
- Refrigeration