

CHEMICAL REACTIONS AND EQUATIONS

1. Chemical changes / Chemical reactions:

- (i) Changes in which new substances are formed with entirely new properties are called chemical changes/chemical reactions.
- (ii) Chemical reactions are characterised by some easily observable features like evolution of a gas, formation of precipitate and change in colour, temperature or state.

2. Thermodynamics of chemical reactions:

The reactions in which heat is evolved are known as exothermic reactions while the reactions in which heat is absorbed are known as endothermic reactions.

3. Chemical Equation:

- (i) A balanced chemical equation is an equation which has equal number of atoms of each element on both reactant and product sides.
- (ii) A chemical equation can be made more informative by mentioning physical states of the substances involved, heat changes involved in the reaction and conditions under which the reaction takes place.

4. Types of chemical reactions:

→ Combination Reaction

The reaction in which two or more reactants combine together to form a single product is called combination reaction.

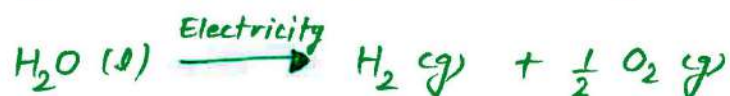
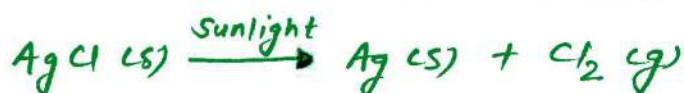
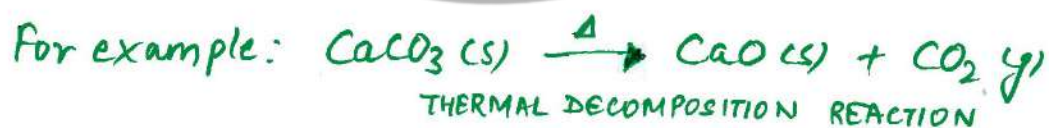
Generally, in all combination reactions, heat is evolved i.e., almost all combination reactions are exothermic.



→ Decomposition Reaction

The reaction in which a single reactant breaks down to give two or more simpler products is called a decomposition.

For decomposition reactions, energy must be supplied either in the form of heat, light or electricity i.e., decomposition reactions are generally endothermic in nature.



→ Displacement Reaction

The reaction in which a more reactive element displaces a less reactive element from its salt solution is called displacement reaction.



→ Double Displacement Reaction

The reaction in which two compounds react by an exchange of ions to form two new compounds is called a double displacement reaction.

For example: $\text{BaCl}_2(\text{aq}) + \text{Na}_2\text{SO}_4(\text{aq}) \rightarrow \text{BaSO}_4\downarrow + 2\text{NaCl}(\text{aq})$

Acid-Base neutralization reactions are double displacement reactions.

→ Oxidation is defined as:

- (a) Addition of oxygen
- (b) Removal of hydrogen
- (c) Loss of electron

→ Reduction is defined as:

- (a) Removal of oxygen
- (b) Addition of hydrogen
- (c) Gain of electron

→ Redox reaction

A reaction in which both oxidation and reduction occur simultaneously is known as redox reaction.

For example: $\text{CuO} + \text{H}_2 \xrightarrow{\Delta} \text{Cu} + \text{H}_2\text{O}$

Here, CuO is getting reduced to Cu

H_2 is getting oxidised to H_2O

→ Oxidizing Agent

A substance that oxidises other chemical substance and reduces itself.

→ Reducing Agent

A substance that reduces other chemical substance and oxidises itself.

For example:



Here, SO_2 is reduced to sulphur,
So it is an oxidizing agent.

H_2S is oxidized to sulphur,
So it is a reducing agent.

For example:



Here, Fe_2O_3 is reduced to Fe,
So it is an oxidizing agent.

Al is oxidized to Al_2O_3 ,
So it is a reducing agent.

5. Redox Reactions in everyday life:

i) Some common effects of oxidation reactions observed in our daily life are corrosion and rancidity.

ii) Corrosion is the slow degradation of metal surfaces by the action of air, moisture, or a chemical on their surface.

iii) Some of the examples of corrosion are the development of green coating on copper, tarnishing of silver, and rusting of iron.

civ) Formation of brown material on the surface of iron objects is called rusting and the brown material is called Rust.

Rust is mainly the hydrated ferric oxide.
Its general formula is $\text{Fe}_2\text{O}_3 \cdot x\text{H}_2\text{O}$.

Rusting of Iron occurs in the presence of both moisture and air. Rusting does not occur in dry air or water free from air.

(v) Rusting can be prevented or the metal can be protected from rusting by Galvanisation, electroplating, tin plating, alloy formation, application of paint, and grease.

evi) Rancidity is the aerial oxidation of fat/oil - containing food materials indicated by unpleasant smell and taste.