

Chemical Changes and Reactions



Chemical Change

A chemical change is a permanent change in which the chemical composition of a substance is changed and one or more substances with different chemical compositions and different properties are formed.

Characteristics of a chemical change

1. Permanent and Reversible
2. Exothermic and Endothermic
3. Total mass of reactants is equal to total mass of products

Necessary conditions for a chemical change

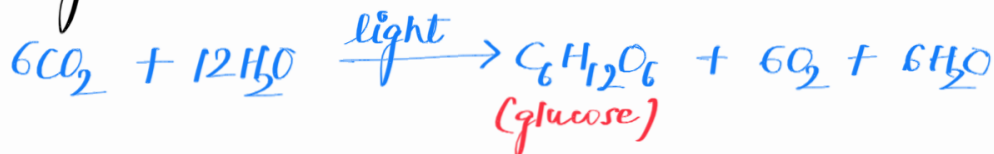
1. Mixing (close contact)



2. Solution



3. Light



4. Electricity



5. Pressure



A reaction in which two or more substances combine together to form a single substance.

- Element + Element \longrightarrow Product
 $C(s) + O_2(g) \longrightarrow CO_2(g)$
- Element + Compound \longrightarrow Product
 $O_2(g) + CO(g) \longrightarrow CO_2(g)$
- Compound + Compound \longrightarrow Product
 $NH_3(g) + HCl(g) \longrightarrow NH_4Cl(s)$

2. Decomposition Reaction

A reaction involves the breaking up of a compound either into elements or simpler compounds.

Types:

- Thermal decomposition
 $CaCO_3(s) \xrightarrow{\Delta} CaO(s) + CO_2(g)$
- Photolytic decomposition
 $AgCl(s) \xrightarrow{\text{Sunlight}} Ag(s) + Cl_2(g)$
- Electrolytic decomposition
 $H_2O(l) \xrightarrow{\text{Electric current}} H_2(g) + O_2(g)$

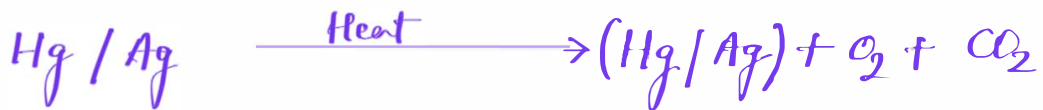
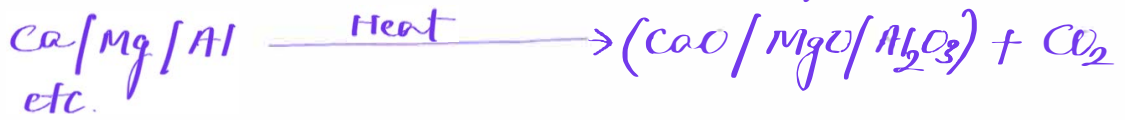
Thermal decomposition of metal compounds

(i) Hydroxides

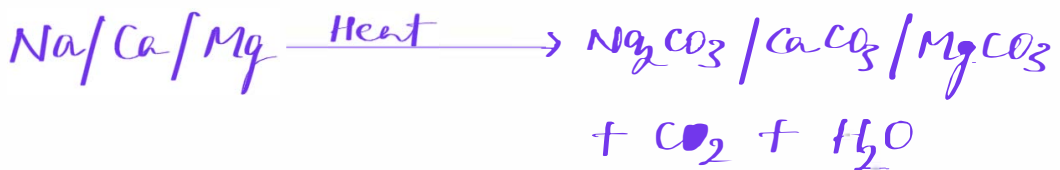




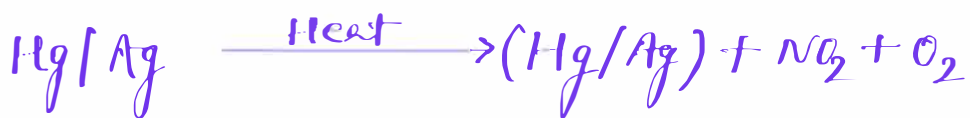
cii) Carbonates



ciii) Bicarbonates



civ) Nitrates



Reversible Reaction :-

A reaction in which the direction of reaction can be reversed by changing the conditions under which reaction is taking place.

for example:



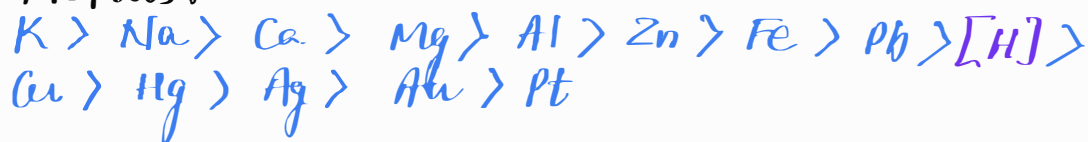
3. Displacement Reaction

A reaction in which a more reactive element displace a less reactive element from its salt solution.



Reactivity / Activity Series of Elements

Metals:



Non-Metals:



4. Double displacement Reaction

A reaction in which two compounds in a solution react to form two new compounds by mutual exchange of radicals.

Types:

(a) Precipitation Reaction

(b) Neutralization Reaction

Precipitation Reaction:

A reaction in which two compounds in their aqueous state react to form an insoluble salt (a precipitate) as one of the products.

for example:





Neutralization Reaction:

A reaction in which an acid and a base react with each other to form salt and water.

For example:



Energy change in chemical Reactions

1. Exothermic Reaction

A reaction in which heat is released during the reaction.

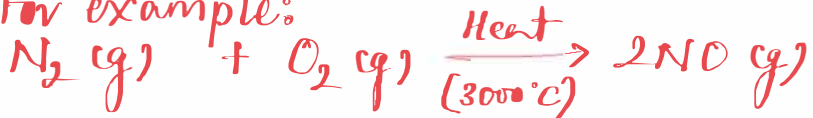
For example:



2. Endothermic Reaction

A reaction in which heat is absorbed during the reaction.

For example:



Photochemical Reaction

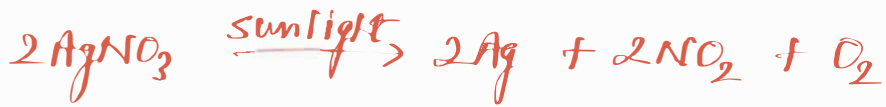
It is a reaction that occurs with the absorption of light energy.

For examples:

Photosynthesis:



Decomposition of Silver Nitrate



Electrochemical Reactions

It is a reaction that occurs with the absorption of electrical energy.

For examples:

