Chemical Reactions & Equations

Reaction :- The change occur in any substance corresponding of the time are called Reaction.

Reaction are two types

1) Physical Reaction :-
   1. Physical Change occur
   2. Chemical properties of substance doesn't change
   Ex :- 1. Melting of Ice
   2. Burning of Candle [Melting of wax]

2) Chemical Reaction :-
   1. Chemical Change occur
   2. Chemical properties of substance change
   Ex :- 1. Burning of wood
   2. Burning of Candle [Evalouation of gases [CO_2 & H_2O]]

The Change visible when a chemical reaction take place

1. Change in state
   Ex :- 1. $H_{2(g)} + O_{2(g)} \rightarrow H_2O_{(l)}$

   2. $Zn_{(s)} + HCl_{(aq)} \rightarrow ZnCl_{2(aq)} + H_{2(g)}$

2. Change in colour
   Ex :- 1. $Fe_{(s)} + CuSO_{4(aq)} \rightarrow FeSO_{4(aq)} + Cu_{(aq)}$
   [Blue] [Green]

3. Change in Temperature :-

Ex :- 1. $CaO_{(s)} + H_2O_{(l)} \rightarrow Ca(OH)_{2(aq)} + Heat$

4. Evalsuation of gases :-

Ex :- $Ca(OH)_{2(aq)} + CO_{2(g)} \rightarrow CaCO_{3(g)} + H_2O_{(g)}$

$Zn_{(s)} + HCl_{(e)} \rightarrow ZnCl_{2(aq)} + H_{2(g)}$

5. formation of presipitate :- When the reactents are liquid, gas, aquas and one product is solid the reaction is known as presipitate [in soluble]

Ex = 1. $Pb(NO_3)_2 + KI \longrightarrow PbI_2 + KNO_3$

Lead Nitrate — Pottassium Iodide — lead Iodide (Yellow precipitate) — Pottassium nitrate

Equation :- The writing pattern of any reaction is called an equation

Equations are tweo types

1. Word Equation :- The Equation in which every element of reactant and product are represented by their name

Ex = 1. Hydrogen + Oxygen → Water

2. Carbon + Oxygen → Carbon dioxide

(2) Symbolic Equation :- The Equation in which every element of reactant and product are represented by their symbol [According to Periodic table] are called Symbolic Equation.

Ex = (1) $H_2 + O_2 \rightarrow H_2O$

(2) $C + O_2 \rightarrow CO_2$

Q Why we need to balance a chemical Equation?

Ans We need to balance a chemical Equation because according to the law of conservation of mass. The mass neither be created nor be destroyed in any chemical Equation. It means the number of molecules or atom at reactant side is always equals to the number of atoms & molecules of the product side.

$H_2 + O_2 \rightarrow H_2O$

↳ Skeletal chemical Equation

Skeletal chemical Equation

The Unbalanced chemical Equation In which the number of atom at reactant side are not equal to the number of atom at product side are called Skeletal chemical Equation

Ex = $Mg_{(s)} + O_{2(g)} \rightarrow MgO_{(s)}$

{Magnesium} {oxygen} {Magnesium Oxide}

Balanced Chemical Equation

The Chemical Equation in which the number of atom at reactant side are equal to the number of atom at product side

It follows the law of Conservation of Mass

Note :-

Nuclear Reation doesn't follow the law of Conservation of mass

How to balance a Skeletal Chemical Equation

To balance a Skeletal Chemical Equation we use a method called Hit & trial method.

Note:- The value of coefficient place is change while using Hit & trial method.

Types of Chemical Reaction

1) Combination Reaction :- The Reaction in which two Reactants react to form a single product are called Combination Reaction

$$A + B \rightarrow AB$$

Ex: $H_{2(g)} + O_{2(g)} \rightarrow H_2O_{(L)}$

[Hydrogen] (oxygen) [water]

$$C_{(s)} + O_{2(g)} \rightarrow CO_{2(g)}$$

[Carbon] (Oxygen) [Carbon dioxide]

[Acidic oxide]

$Mg_{(s)} + O_{2(g)} \longrightarrow MgO_{(s)}$

[Magnesium] [oxygen] [Magnesium oxide]

$CaO_{(s)} + H_2O_{(l)} \longrightarrow Ca(OH)_{2(aq)}$

[Calcium oxide] [water] [Calcium Hydroxide] [Slaked lime]

$C_6H_{12}O_6 + 6O_2 \longrightarrow 6CO_2 + 6H_2O + 36/38\ ATP$

2) Disassosiation / Decompesition Reaction :- The type of reaction in which a single reactant react to form two or more then two product by providing external energy are called decompesition / Disassosiation reaction.

$AB \rightarrow A + B$

Ex = $CaCO_{3(s)} \xrightarrow{\Delta} CaO_{(s)} + CO_{2(g)}$

[Calcium Carbonate] [Calcium Oxide] [Carbon dioxide]

[lime stone] [Quick lime]

Types of decompesition Reaction :-

1) Thermal Decompesition :- The type of Decompesition Reaction in which Single Reactant React in the presence of Heat energy to form two or more than two product

$CaCO_{3(s)} \xrightarrow{\Delta} CaO_{(s)} + CO_{2(g)}$

[Calcium Carbonate] [Calcium oxide] [Carbon dioxide]

[lime stone] [Quick lime]

2) Photolytic Decomposition :- The type of Decomposition Reaction in which Single Reactant React in the presence of light energy to form two or more than two product are called photolytic Decomposition.

$$H_2O_{2(l)} \xrightarrow{h\nu} H_2O_{(l)} + O_{2(g)}$$

[Hydrogen peroxide] [water] [oxygen]

$$AgCl_{(s)} \longrightarrow Ag_{(s)} + Cl_{2(g)}$$

[Silver Chloride] [White] [Silver] [grey] [Chlorine gas]

$$AgBr_{(s)} \longrightarrow Ag_{(s)} + Br_{2(g)}$$

[Silver Bromide] [Silver] [Bromine]

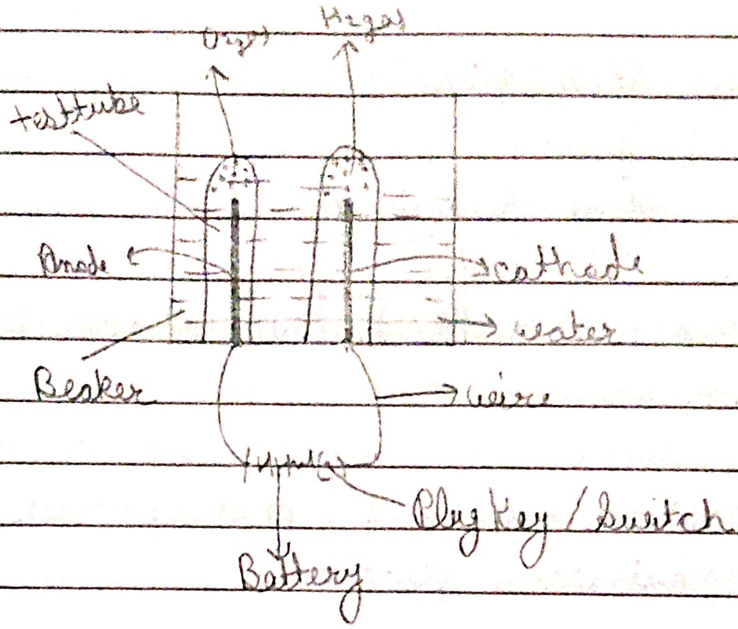
Use in Black and white photography

3. Electrolytic decomposition :- The type of decomposition in which Single Reactant react with Electric energy to form two or more than two products are called electrolytic Decomposition.

$$H_2O_{(l)} \xrightarrow{ele.} H_2(g) + O_2(g)$$

[water] [Hydrogen gas] [oxygen gas]

{at cathode} {at anode}



Type of reaction on the basis of Heat

1. Exothermic Reaction

Ex → Exhale, O → of, thermic → Heat / Energy

~~By product + Heat~~

The type of reaction in which heat is produced with product are called Exothermic Reaction

Mostly combination reactions, respiration are the examples of Exothermic reaction.

Ex = $C_{(s)} + O_{2(g)} \rightarrow CO_{2(g)}$
[Carbon] [oxygen] [carbon dioxide]

$CaO + H_2O \rightarrow Ca(OH)_2 + \Delta\Delta$
[Calcium oxide] (water) [Calcium hydroxide] (Heat)

$C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O + 36/38\ ATP$

(2) ## Endothermic Reaction :-

End O Thermic
↓ ↓ ↓
End of Heat / Energy

The type of reaction in which heat is absorb to complete the reaction.

mostly decomposition reactions, photosynthesis are the examples of Endothermic Reaction.

Ex = $H_2O_{2(l)} \xrightarrow{h\nu} H_2O_{(l)} + O_{2(g)}$
[water] [water] [oxygen]

$CaCO_3 \xrightarrow{\Delta} CaO + CO_2$
[Calcium Carbonate] [Calcium oxide] [carbon dioxide]

$6CO_{2(g)} + 6H_2O_{(l)} \xrightarrow[Chl]{h\nu} C_6H_{12}O_{6(aq)} + 6O_2$
[Oxygen]

Displacement Reaction :-

The Reaction in which higher reactive element displace lower Reactive element from its compound are called Displacement Reaction.

Ex = $Fe_{(s)} + CuSO_{4(aq)} \longrightarrow FeSO_{4(aq)} + Cu_{(s)}$
[Iron] [Copper Sulphate] [Iron Suphate] [Copper]

$Zn_{(s)} + CuSO_{4(aq)} \rightarrow ZnSO_{4(aq)} + Cu_{(s)}$
[Zinc] [copper sulphate] [zinc suphate] [Copper]

$Zn_{(s)} + H_2SO_{4(aq)} \rightarrow ZnSO_{4(aq)} + H_{2(g)}$

$Zn_{(s)} + CuCl_{2(aq)} \rightarrow ZnCl_{2(aq)} + Cu_{(s)}$

Double Displacement Reaction :- The Reaction in which Exchanges of ions occur between two compounds are called Double displacement Reaction

$Ex = Na_2SO_{4(aq)} + BaCl_{2(aq)} \rightarrow NaCl_{(aq)} + BaSO_{4(aq)}$

Redox Reaction

Reduction	Oxidation
Addition of hydrogen	Removal of hydrogen
Removal of oxygen	Addition of oxygen
Addition of electron	Removal of electron
$Ex = H_2 + Cl_2 \rightarrow HCl$	$Ex = Mg + O_2 \rightarrow MgO$ $C + O_2 \rightarrow CO_2$

The Reaction in which both reduction & Oxidation occur are called Redox Reaction

Oxidation

$Ex = Mg + O_2 \rightarrow MgO$

Reduction [Addition of e^-] [Mg ⇄ O]

Oxidation

$H_2 + Cl_2 \rightarrow HCl$

Reduction [Addition of e^-] [

Corrosion :- When some metal (Iron, copper, silver) come in contact with Atmospheric gases (water vapour, CO_2, Sulphur), Acids and bases and often that the upper layer of the metal get rusted. Corred are called corrosion

Ex = Rusting of Iron

$$Fe + H_2O + O_2 \rightarrow Fe_2O_3 \cdot xH_2O$$

[Iron] [water] [oxygen]

Black coating on silver

$$Ag + S \rightarrow Ag_2S$$

Green coating on copper

$$Cu + Co_2 \rightarrow CuCO_3$$

Prevention method from corrosion

1) **Physical method** :-
   - (i) Oil paint
   - (ii) Oiling & greasing
   - (iii) Physical Barrier [Air tight Packing of Articles]

2) **Chemical method**

(i) Alloy :- The mixing of two metal in which one is reactive metal and second is non-reactive / less reative are called Alloy

Ex = Amalgum [Alloy of mercury (Hg)]

↳ HgCu, HgAg, HgFe

(iii) Electroplating :- The method from prevension from erosion in which layer of less reactive metal is apply on higher reactive metal with the help of electricity [Electrolysis]

There are two types which majorly use in electroplating.

(i) Galvanization :-

Plating of Zn [Zinc]

(ii) Anodization :-

Plating of Al [Aluminium]

Rancidity :- When the fatty food come in the contact with atmospheric gases [oxygen] and start producing Bad smell. This food is called Rensid food and the process are called Rencidity

Method of prevention from Rancidity

Physical method :- Using of salt and oil to prevent pickles, vegetables, fish

Ex = Using air tight packing

Chemical method :-

i. Using non reactive or less reactive gases in packed food items

Ex = Chips, Kurkure [N_2 & Ar]

(ii) Using chemicals in packed food items like ketchup, fruit juice, cold drink, sauses.