SHORT NOTES: CLASS 10

CHAPTER 1: CHEMICAL REACTIONS AND EQUATIONS

Whenever a chemical change occurs, a chemical reaction takes place.

A chemical reaction is responsible for:

(i) Change in state, (ii) Change in color, (iii) Evolution of a gas, (iv) Change in temperature.

CHEMICAL EQUATIONS:

A complete chemical equation represents the reactants, the products and their physical states symbolically. The substances that undergo chemical change in the reaction are called reactants and the new substances formed are called products.

e.g., when Magnesium is burnt in Oxygen, it gets converted to Magnesium Oxide.

Chemical Equation: $Mg + O_2 \rightarrow MgO$

BALANCED CHEMICAL EQUATION: A Chemical Equation is balanced so that the numbers of atoms of each type involved in a Chemical Reaction are the same as on the reactant and product sides of the equation.

e.g., $Zn + H_2SO_4 \rightarrow ZnSO_4 + H_2$

Element	No. of atoms in the Reactants	No. of atoms in the Products
Zn	1	1
H	2	2
S	1	1
O	4	4

Precipitation Reaction: Any Reaction that produces precipitate (Insoluble Salts) is called precipitation Reaction.

Exothermic & Endothermic Reactions:

Exothermic Reactions: The chemical reactions which proceed with the evolution of heat energy are called Exothermic Reactions. $A + B \rightarrow C + D + q$

Endothermic Reactions: The Chemical Reactions which proceed with the absorption of heat energy are called Endothermic Reactions. $A + B + q \rightarrow C + D$

Where A & B are Reactants, C & D are Products and q is the amount of heat energy released or absorbed during the reaction.

Photochemical Reactions: The Chemical Reactions which take place in the presence of light are called Photochemical Reactions. e.g. Photosynthesis.

Reversible & Irreversible Reactions:

Reversible Reactions: The reactions in which the Reactants react to form Products under certain conditions and Products react to form Reactants under the same conditions are called Reversible Reactions. These Reactions can take place in both the forward & backward directions.

e.g., $N_2 + 3H_2 \rightleftharpoons 2NH_3$ (*A doubly half headed arrow is the sign of reversibility).*

Irreversible Reactions: The chemical reactions in which the products formed don't give back the reactants are called Irreversible reactions. e.g., $2KClO_3 \rightarrow 2KCl + 3O_2$

TYPES OF CHEMICAL EQUATIONS:

(i)Combination Reactions: The Reactions in which a single product is formed from two or more reactants are known as Combination Reactions. Heat is evolved in a combination reaction (exothermic in nature).

e.g.,

$CaO(s) + H_2O(l) \rightarrow Ca(OH)_2(aq)$

(Quick Lime) (Slaked Lime) CaO is used in the manufacture of cement.

$2Mg + O_2 \rightarrow 2MgO$

(Grey) (White)

(ii)Decomposition Reactions: These Reactions are opposite to Combination reactions. In a Decomposition reaction, a single substance decomposes to give two or more substances. Decomposition reactions require energy either in the form of heat, light or electricity for breaking down the reactants. Heat (energy) is

absorbed in a Decomposition reaction(endothermic in nature). When a Decomposition reaction is carried out by heating, it is called **Thermal Decomposition.**

e.g., $2FeSO_4$ (s) → Fe_2O_3(s) + SO_2 (g) + SO_3 (g)
(green) (brown) (smell of burning Sulphur)

$CaCO_3$(s)→ CaO(s) + CO_2(g)
(turns lime water milky)

$2Pb(NO_3)_2$(s) → 2PbO(s) + $4NO_2$(g) + O_2(g)
(yellow) (brown)(brown fumes)

2AgCl(s)→ 2Ag(s) + Cl_2(g)
(white) (grey)

2AgBr(s) → 2Ag(s) + Br_2(g)

$2H_2O$ → $2H_2$ + O_2
(catches fire & burns with pop sound)(match stick burns brightly)

(iii)Displacement Reactions: When an element displaces another element from its compound, a Displacement reaction occurs. More reactive element displaces less reactive element.

e.g., Fe(s) + $CuSO_4$(aq)→ $FeSO_4$(aq) + Cu(s)
(greyish black)(blue) (pale green) (brown)

Zn(s) + $CuSO_4$(aq) → $ZnSO_4$(aq) + Cu(s)

Pb(s) + $CuCl_2$(aq)→$PbCl_2$(aq) + Cu(s)

Zn + 2HCl → $ZnCl_2$ + H_2
(conical flask becomes hot) (bubbles are observed)

Fe, Zn, & Pb are more reactive than Cu so, they displace Cu from its compounds. Reverse reactions will not take place.

(iv) Double Displacement Reactions: The Reactions in which, there is an exchange of ions between the reactants are called Double Displacement Reactions.

e.g., Na_2SO_4(aq) + $BaCl_2$(aq) → $BaSO_4$(s) + 2NaCl(aq)
(White ppt)

$Pb(NO_3)_2$(aq) + 2KI(aq) → PbI_2(s) + $2KNO_3$(aq)
(yellow)

REDOX REACTIONS: The Reactions in which Oxidation or Reduction of substances take place are called Redox Reactions.

(i)Oxidation: If a substance gains Oxygen during a reaction or loses Hydrogen, it is said to be oxidized.
In an Oxidation Process: (a) Oxygen/electronegative element is added.
(b) Hydrogen/electropositive element is removed.
(c) Loss of electrons take place.

(ii)Reduction: If a substance loses Oxygen or gains Hydrogen during a reaction, it is said to be reduced.
In a Reduction process: (a) Hydrogen/electropositive element is added.
(b) Oxygen/electronegative element is removed.
(c) Gain of electrons takes place.

e.g., CuO + H_2 → Cu + H_2O ZnO + C → Zn + CO MnO_2 + 4HCl → $MnCl_2$ + $2H_2O$ + Cl_2

EFFECTS OF OXIDATION REACTIONS:

Corrosion: When a metal is attacked by substances around it such as moisture, acids etc., it is said to corrode, and this process is called Corrosion. The black coating on silver, green coating on copper and rusting of iron are examples of corrosion. In this process, metals get oxidized to metal oxides and oxygen gets reduced to oxide ion.

Rust: Hydrated Iron (III) Oxide: $Fe_2O_3.xH_2O$- leads to wastage of tons of Iron.

Prevention of Rusting: paint, oiling, greasing, galvanization, Cr coating.

Rancidity: When fats and oils are oxidized, they become rancid and their smell & taste change.

To prevent Rancidity (Oxidation of fats & oils): a) Antioxidants are added. (e,g; Chips are packed in Nitrogen)

b) Keeping food in airtight containers help to slow down oxidation.

c) By reducing the temperature (food is kept in refrigerators to slow down the process of oxidation).