12th Standard Chemistry

Polymers

1. A polymer is a large molecule of high molecular mass formed by the repetitive bonding of many small molecules called **monomers**. The process by which the monomers are transformed into polymers is called **polymerisation**. As polymers are single big size molecules, they are also called **macromolecules**.

2. Classification of polymers on the basis of source:

(a) Natural polymers: Proteins, cellulose, starch, resins and rubber.
(b) Semi-synthetic polymers: Cellulose derivatives as cellulose acetate (rayon) and cellulose nitrate, etc.
(c) Synthetic polymers: Plastic (polythene), synthetic fibres (nylon 6, 6) and synthetic rubbers (Buna-S).

3. Classification based on structure of polymers:

(a) Linear polymers: They consists of long and straight chains, e.g., high density polythene and PVC.
(b) Branched chain polymers: They contain linear chains having some branches, e.g., low density polyethene.
(c) Cross linked or Network polymers: Those are formed from bifunctional and tri-functional monomers and contain strong covalent bonds between various linear polymer chains e.g, bakelite and melamine.

4. Classification based on mode of polymerisation:

(a) Addition polymers: They are formed by the addition reactions between monomers having multiple bonds, e.g., polythene.
(b) Condensation polymers: They are formed by the condensation reactions between two monomers, each monomers having two functional groups, with the elimination of small molecules such as water, alcohol and ammonia, e.g., Nylon 6,6.

5. Classification based on molecular forces:

(a) Elastomers
(b) Fibres
(c) Thermoplastics.
(d) Thermosetting plastics

6. There are two broad types of polymerisation reaction:

(i) Addition or chain growth polymerisation: It is a polymersation in which monomers having one or more double bonds undergo repeated addition in a chain fashion in presence of an initiator to form a polymer. It is governed by free radical mechanism.

(ii) Condensation polymerisation or Step growth polymerisation: It occurs when monomers condense in a stepwise manner with elimination of water or other small molecules.

7. Copolymerisation: It is a process in which a mixture of more than one monomeric species polymerize to form a copolymer. A copolymer contains multiple units of each monomer in the same polymeric chain. For example, styrene and methacrylate form a copolymer.

8. Natural rubber is cis 1,4-polyisoprene. It is a linear 1,4-polymer of isoprene. It is manufactured from rubber latex which is a colloidal suspension of rubber in water.

9. The process of heating a mixture of raw rubber and sulphur at 373 K to 415 K is known as **vulcanisation of rubber**. The process of vulcanisation is accelerated by additing additives such as ZnO.

10. Biodegradable polymers: PHBV and Nylon 2- Nylon-6 are developed to minimise the environmental hazards of synthetic polymeric wastes.