CBSE Test Paper-05

Class - 12 Chemistry (Polymers)

1. One of the following is used in speciality packaging, orthopaedic devices and in controlled release of drugs
   a. Buna – N
   b. Buna – S
   c. Polyvinyl chloride
   d. PHBV
2. Intermolecular forces of thermoplastic polymers are
   a. more than elastomers
   b. same as elastomers
   c. between elastomers and fibres
   d. more than fibres
3. Macromolecules are one of the following
   a. Esters
   b. Amines
   c. Polymers
   d. Ethers
4. Buna-S is obtained by the polymerization of butadiene and
   a. Adipic acid
   b. Chloroprene
   c. Hexamethylene diamine
   d. Styrene
5. Which one of the following is an example of co – polymer?
   a. Buna-S
   b. Teflon
   c. PVC
   d. Polypropylene
6. What is copolymerisation?
7. Classify following on Homopolymer and copolymer- PVC, Polystyrene, Buna - S, Neoprene, Buna - N, Teflon.

8. Give example of elastomers.

9. Arrange the following polymers in increasing order of their intermolecular forces.
   i. Nylon 6, 6, Buna-S, polythene
   ii. Nylon 6, Neoprene, polyvinyl chloride.

10. Write formulae of the monomers of polythene and Teflon.

11. a. What is the role of benzoyl peroxide in polymerisation of ethene?
    b. What are LDPE and HDPE? How are they prepared?

12. What is the difference between elastomers and fibres? Give one example of each.

13. What are LDPE and HDPE? How are they prepared?

14. Distinguish between chain growth polymerization and step growth polymerization and give one example of each process.

15. A monomer of a polymer upon ozonolysis gives one mole of methylglyoxal and two moles of formaldehyde.
    i. Identify the monomer of the polymer.
    ii. Give its free radical mode of addition polymerisation.

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Solutions

1. (d) PHBV

   Explanation: PHBV is used in speciality packaging, orthopaedic devices and in controlled release of drugs. PHBV undergoes bacterial degradation in the environment.
2. (c) between elastomers and fibres

   Explanation: Thermosetting polymers are the linear or slightly branched long chain molecules capable of repeatedly softening on heating and hardening on cooling. These polymers possess intermolecular forces are intermediate between elastomers and fibres. Some common thermoplastics are polythene, polystyrene, polyvinyls, etc.
3. (c) Polymers

   Explanation: Polymers are higher molecular weight macromolecules. These are formed by joining of repeating structural units on a large scale.
4. (d) Styrene

   Explanation: Buna-S is formed by copolymerisation of 1,3-butadiene and styrene

   $nCH_2 = CH - CH - CH_2 + nC_6H_5CH = CH_2 \rightarrow Buna - S$
5. (a) Buna-S

   Explanation: Buna-S is a copolymer of 1,3-butadiene and styrene.
6. The reaction in which a mixture of more than one monomeric species is allowed to polymerise & form a product called copolymer and process is known as copolymerisation e.g. Buna -S is formed by the reaction between 1,3 butadiene and styrene.
7.

Homopolymer	Copolymer
PVC	Buna – S
Polystyrene	Buna – N
Neoprene	
Teflon	

8. Buna-S
9. i. Buna-S < polythene < Nylon 6 6
   ii. Neoprene < polyvinyl chloride < Nylon 6
10. monomer of polythene is ethene $CH_2=CH_2$

    monomer of Teflon is tetrafluroethene $CF_2 = CF_2$
11. a. Benzoyl peroxide acts as an initiator in the chain reaction. It dissociates to give free radicals.
    b. LDPE is low density polyethylene and HDPE is high density polyethylene.

    LDPE is prepared by polymerisation of ethene at a temperature of 200^0 C and high pressure of 1000 atm in the presence of peroxide initiator. It is a branched chain polymer.

    HDPE is prepared by polymerisation of ethene at a temperature below 100^0 C and pressure less than 100 atm in the presence of Ziegler-Natta catalyst. It is a linear polymer.
12.

Elastomers	Fibres
1. These are rubber like solids with elastic properties.	1. These are the thread forming solids which possess high tensile strength and high modules.
2. These are held by the weakest inter-molecular forces. Example: Buna-S.	2. These are held together by strong intermolecular forces like hydrogen bonding. Example: Nylon 6, 6.

13. **LDPE:** Low-density polyethene. It is obtained by the polymerization of ethane under high pressure of 1000 to 2000 atm at 350 K to 570 K temperature in presence of an initiator.
    HDPE: High-density polyethene. It is obtained when polymerization is done in the presence of Ziegler Natta Catalyst at 333K to 343 K under 6-7 atm pressure.
14.

Chain growth polymerization	Step growth polymerization
1. Only one repeating unit is added at a time.	1. Any two species present can react.
2. Reaction is fast and polymer is formed at once. Example - polythene.	2. Polymer is formed in gradual steps. Example - nylon - 6, 6

15. i. As the monomer of ozonolysis gives one mole of methylglyoxal and two moles of formaldehyde, therefore, the monomer is isoprene.

$$H_2C = \underset{\text{Isoprene}}{\overset{CH_3}{\overset{|}{C}} - CH = CH_2} \xrightarrow[(ii)H_2O/Zn]{(i)O_3} 2H_2C = O + O = \overset{CH_3}{\overset{|}{C}} - CH = O$$

ii. The free radical mechanism of polymerisation of isoprene may be given as follows:

Initiation: $R - \overset{\curvearrowleft}{O} - \overset{\curvearrowleft}{O} - R \xrightarrow{\Delta} 2R\dot{O}$

Propagation:

$$R\dot{O} + CH_2 = \overset{\curvearrowleft}{C}H_2 \rightarrow R - O - CH_2 - \dot{C}H_2 \xrightarrow{nCH_2=CH_2} R - O(CH_2 - CH_2)_n - CH_2 - \dot{C}H_2$$

Termination:

$$2RO - (CH_2 - CH_2)_n - CH_2 - \dot{C}H_2$$

Combination

$$RO - (CH_2 - CH_2)_n - CH_2 - CH_2$$
$$-CH_2 - CH_2 - (CH_2 - CH_2)_n - OR$$

Disproportionation

$$RO - (CH_2 - CH_2)_n - CH = CH_2$$
$$+$$
$$RO - (CH_2 - CH_2)_n - CH_2 - CH_3$$