CBSE Test Paper-02

Class - 12 Chemistry(Polymers)

1. Nylon – 2 – Nylon – 6 is
   a. condensation polymer
   b. copolymer
   c. biodegradable polymer
   d. homopolymer
2. In vulcanisation of rubber,
   a. sulphur cross-links are introduced
   b. sulphur adds new protective layer over rubber
   c. rubber becomes brittle
   d. sulphur reacts to form a new compound
3. Identify the type of polymer: —A—B—B—A—A—A—B—A—
   a. Copolymer
   b. Homopolymer
   c. Cross – linked polymer
   d. Condensation polymer
4. Reaction of hexamethylenediamine with adipic acid to manufacture Nylon 6, 6 needs the following conditions to proceed
   a. high pressure and high temperature
   b. water at high pressure
   c. peroxide catalyst
   d. presence of either an acid or a base catalyst
5. Terelyne is a polymer of
   a. glycol and terephthalic acid
   b. urea and formaldehyde
   c. 1,3-butadiene and acrylonitrile
   d. glycol and phthalic acid

6. Write two uses of bakelite.

7. Draw the molecular structure of monomer of PVC.

8. Give the formula of monomer of Nylon - 6.

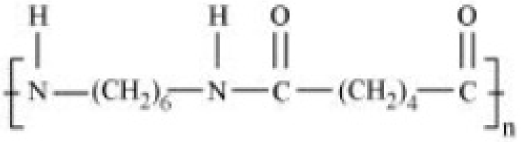
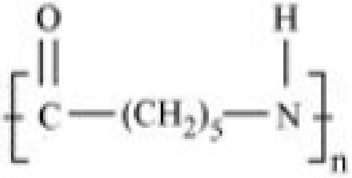
9. In which classes, the polymers are classified on the basis of molecular forces?

10. Explain the term vulcanisation of rubber.

11. Define polymers.

12. Write the modes of free radical polymerization of an alkene.

13. Draw the structure of monomer of each of the following polymer:
    i. Polyvinyl chloride (PVC)
    ii. Nylon - 6

14. Write the names of monomers of the following polymers:
    i. 
    $$\left[\overset{H}{\overset{|}{N}} - (CH_2)_6 - \overset{H}{\overset{|}{N}} - \overset{O}{\overset{||}{C}} - (CH_2)_4 - \overset{O}{\overset{||}{C}} \right]_n$$
    ii. 
    $$\left[\overset{O}{\overset{||}{C}} - (CH_2)_5 - \overset{H}{\overset{|}{N}} \right]_n$$
    iii. $\left[CF_2 - CF_2 \right]_n$

15. a. Explain the term of Elastomer.
    b. What do you understand by condensation polymer and addition polymer?

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Solutions

1. (c) biodegradable polymer

   Explanation: Nylon2-nylon6 is an alternating polyamide copolymer of glycine (H_2N–CH_2–COOH) and amino caproic acid [$H_2N(CH_2)_5COOH$] and is biodegradable. Biodegradable polymers contain functional groups similar to the functional groups present in biopolymers.
2. (a) sulphur cross-links are introduced

   Explanation: The process of vulcanisation consists of heating a mixture of raw rubber with sulphur and an appropriate additive at a temperature range between 373 K to 415 K. On vulcanisation, sulphur forms cross links at the reactive sites of double bonds and thus the rubber gets stiffened.
3. (a) Copolymer

   Explanation: This is copolymer which is a polymer made up of different monomeric units.
4. (a) high pressure and high temperature

   Explanation: Formation of Nylon 6,6 is carried out at high pressure and high temperature (553 K)

   $nHOOC(CH_2)_4COOH + nH_2N(CH_2)_6NH_2 \rightarrow$ -[-NH-$(CH_2)_N$H-CO-$(CH_2)_4$-CO-]-$_n$
5. (a) glycol and terephthalic acid

   Explanation: Terylene or dacron is formed by the interaction of ethylene glycol and terephthalic acid by condensation polymerisation
6. Two uses of bakelite are
   1. For making combs
   2. For making electrical switches

7. $CH_2 = CHCl$

8. The monomer of Nylon -6 is caprolactam($C_6H_{11}NO$).

9. On the basis of magnitude of intermolecular forces present in polymers, they are

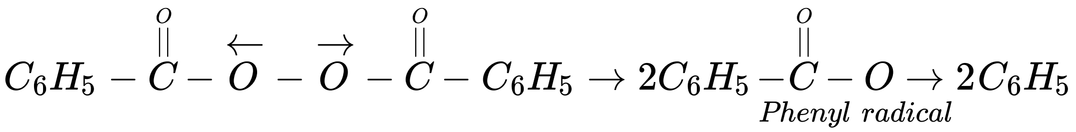
classified into the following groups:

i. Elastomers - in elastomer polymer chain linked by weak binding force. Example: neoprene
ii. Fibres-in fibres polymer chain linked by strong force. Example: Nylon-6,6
iii. Thermoplastic polymers- they become soft on heating and hard on cooling. Example: poly vinyl chloride
iv. Thermosetting polymers- on heating undergo cross-linking. Example: bakelite

10. To improve upon the physical properties of natural rubber a process of vulcanization is carried out. This process consists of heating a mixture of raw rubber with sulphur and an appropriate additive at a temperature range between 373K to 415K. On vulcanization, sulphur form cross-links at the reactive sites of double bonds and thus the rubber get stiffened.

11. Polymers are defined as the very large molecules having high molecular mass which are formed by joining of repeating structural units on a large scale.

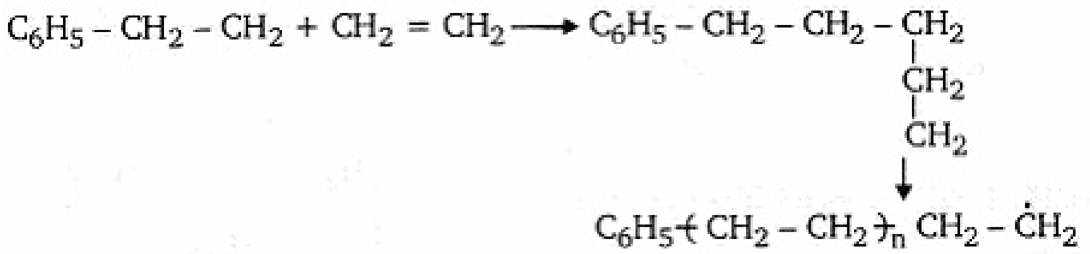
12.



$$C_6H_5 - \overset{O}{\overset{||}{C}} - \overset{\leftarrow}{O} - \vec{O} - \overset{O}{\overset{||}{C}} - C_6H_5 \rightarrow 2C_6H_5 \underset{Phenyl\ radical}{- \overset{O}{\overset{||}{C}} - O} \rightarrow 2C_6H_5$$

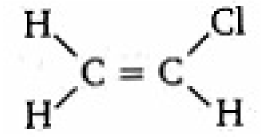
C_6H_5 + CH_2 = CH_2 → C_6H_5 - CH_2 - CH_2

Chain propagating step



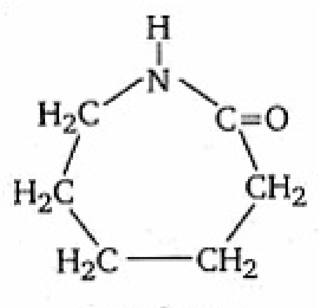
13. i. Monomer of PVC is vinylchloride.

Structure:



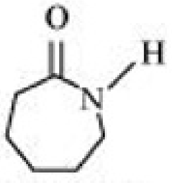
ii. Monomer of Nylon-6 is caprolactam.

Structure:



Carpolactum

14. i. Hexamethylenediamine $[H_2N-(CH_2)_2-NH_2]$ and adipic acid $[HOOC-(CH_2)_4-COOH]$

    ii. 

    Caprolactam

    iii. Tetrafluoroethene $(CF_2=CF_2)$

15. a. Elastomer: These are the polymers having the weakest intermolecular forces of attraction between the polymer chains. The weak forces permit the polymer to be stretched. A few cross links are introduced between the chains, which help the polymer to retract to its original position after the force is released as invulcanised rubber. e.g., Buna-S, buna-N, neoprene etc.

    b. i. Condensation polymers: The condensation polymers are formed by the repeated condensation reaction between different bifunctional or trifunctional monomer units usually with elimination of small molecules such as water, alcohol, HCl etc. e.g., Nylon 6,6, nylon 6.

       ii. Addition polymers: Addition polymers are formed by repeated addition of same or different monomer molecules. The monomer used are unsaturated compounds, e.g., alkenes, alkadienes. e.g., Polythene.