

**B.Sc. CHEMISTRY
SIXTH SEMESTER
POLYMER CHEMISTRY
BSC - 606A [SPECIAL REPEAT]
[USE OMR FOR OBJECTIVE PART]**

**SET
A**

Duration: 3 hrs.

Full Marks: 70

Time: 30 min.

(Objective)

Marks: 20

Choose the correct answer from the following:

1X20=20

- Which technique is used for the determination of M_z ?
 - Osmometry
 - Ultra centrifugation techniques
 - Viscometry
 - None of these
- The monomer units of PTFE are
 - $\text{Cl}_2\text{CH}-\text{CH}_3$
 - $\text{F}_2\text{C}=\text{CF}_2$
 - $\text{FCIC}=\text{CF}_2$
 - $\text{F}_3\text{C}-\text{CF}_3$
- Neoprene is also known as
 - Polybutadiene
 - Polychloroprene
 - Polyisoprene
 - Polyacetylene
- Which can be used as a monomer in a polymerization reaction?
 - C_2H_4
 - C_2H_6
 - $\text{C}_2\text{H}_5\text{Cl}$
 - $\text{C}_6\text{H}_5\text{Cl}$
- Polymerization of chloroethylene gives the polymer
 - Polythene
 - PVC
 - Teflon
 - Nylon
- An example of biopolymer is
 - Teflon
 - Neoprene
 - Nylon-6,6
 - DNA
- PMMA is the polymer of
 - Methylmethacrylate
 - Methylacrylate
 - Methacrylate
 - Ethylacrylate
- A diisocyanate is used to prepare
 - Polyamide
 - Polyurethanes
 - Polycarbonates
 - Polyester
- Low density polythene is prepared by
 - Free radical polymerization
 - Cationic polymerization
 - Anionic polymerization
 - Zeigler-Natta polymerization
- Monomer of natural rubber is
 - 1,3-butadiene
 - Isoprene
 - Styrene
 - Chloroprene

11. The advantage of using teflon (PTFE) is
1. Highly water resistant polymer
 2. Highly Chemical Resistant polymer
 3. A biodegradable polymer
 4. A thermosetting polymer
- a. 1 and 2 are correct option b. 1 and 3 are correct option
 c. 1, 2 and 3 are correct option d. None of the above
12. Which of the following are characteristics of thermosetting polymers?
- (i) Heavily branched cross linked polymers.
 - (ii) Linear slightly branched long chain molecules.
 - (iii) Become infusible on moulding so cannot be reused.
 - (iv) Soften on heating and harden on cooling, can be reused.
- a. (i) and (ii) are correct option b. (i) and (iii) are correct option
 c. (ii) and (iii) are correct option d. All are correct
13. Match the polymer of column I with correct monomer of column II.

Column I	Column II
(i) High density polythene	(a) Isoprene
(ii) Neoprene	(b) Tetrafluoroethene
(iii) Natural rubber	(c) Chloroprene
(iv) Teflon	(d) Acrylonitrile
(v) Acrilan	(e) Ethene

- a. (i)- (e)
 (ii)- (a)
 (iii)- (c)
 (iv)- (d)
 (v) - (b)
- b. (i)- (e)
 (ii)- (c)
 (iii)- (a)
 (iv)- (b)
 (v) - (d)
- c. (i)- (e)
 (ii)- (d)
 (iii)- (a)
 (iv)- (b)
 (v) - (c)
- d. (i)- (d)
 (ii)- (c)
 (iii)- (b)
 (iv)- (a)
 (v) - (e)

14. In the following questions a statement of assertion followed by a statement of reason is given. Choose the correct answer out of the following choices.
- Assertion:** Network polymers are thermosetting.
Reason: Network polymers have high molecular mass.
- a. Assertion and reason both are correct statement but reason does not explain assertion. b. Assertion and reason both are correct statements and reason explains the assertion.
 c. Both assertion and reason are wrong statement d. Assertion is correct statement and reason is wrong statement.

15. As the crystallinity increases the strength, density and flexibility of the polymer
- a. Strength and density increases, flexibility decreases
 - b. Strength and density decreases but flexibility increases
 - c. Strength, density and flexibility all are increases
 - d. All are decreases
16. The crystalline behaviors of polymer is studied by using ---- method
- a. FTIR study
 - b. TGA study
 - c. DSC study
 - d. DTA study
17. Which of the following act as an initiator in free-radical polymerisation
- a. Benzoyl peroxide
 - b. Lewis acids
 - c. Grignard reagent
 - d. Potassium amide
18. Which polymerization technique is mainly used in surface coatings and paint industry
- a. Bulk polymerisation
 - b. Solution polymerisation
 - c. Suspension polymerisation
 - d. Emulsion polymerisation techniques.
19. The Ziegler Natta catalyst is formed between _____
- a. Triethyl aluminium and titanium halide
 - b. Triethyl aluminium and silver halide
 - c. Triethyl aluminium and platinum halide
 - d. Triethyl aluminium and carbon halide
20. Which of the following statements is correct for fibres?
- (A) Fibres possess high tensile strength and high modulus
 - (B) Fibres impart crystalline nature
 - (C) Fibers have strong intermolecular forces like hydrogen bonding
- a. Only A is correct
 - b. Only A & B is correct
 - c. Only C is correct
 - d. All are correct

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(Descriptive)

Time : 2 hrs. 30 mins.

Marks : 50

[Answer question no.1 & any four (4) from the rest]

1.
 - a. What is degree of polymerization? Explain with diagram. 2+3+1+2
 - b. Explain two chain transfer mechanism for branching in LDPE. +2=10
 - c. What is polydispersity index of a polymer?
 - d. Write the applications of PVC and HDPE.
 - e. What is degree of polymerisation?

2.
 - a. Write a note on conducting polymer citing three examples. 5+5=10
 - b. Discuss the structure, properties and applications of Bakelite.

3.
 - a. The y-intercept obtained from the plot of viscosity of a series of polymer solutions against the concentration is 0.05. The proportionality constant 'K' and exponent 'a' for this polymer-solvent pair are 5×10^{-5} and 0.5 respectively. What is the molar mass of the polymer in g mol^{-1} ? 3+4+3
=10
 - b. Write down the preparation method of polyamides.
 - c. Give the structure of repeating unit in polyaniline (PANI) mentioning the reduced and oxidized part.

4.
 - a. Explain the osmotic pressure method to determine the molecular weight M_n . 4+4+2
=10
 - b. Consider a polymer sample comprising of 5 moles of polymer molecules having molecular weight of 40,000 g/mol and 15 moles of polymer molecules having molecular weight of 30,000 g/mol. Calculate M_n , M_w and PDI.
 - c. Discuss how molecular weight and linearity and non-linearity of polymeric chains influence the properties of a polymer.

5.
 - a. What do you mean by lower and upper critical solution temperature? Explain with a phase diagram of polystyrene in toluene. 5+2+2+1
=10
 - b. Differentiate between rubbers and plastics on the basis of intermolecular forces.
 - c. Low density polythene and high density polythene, both are polymers of ethene but there is marked difference in their properties. Explain.
 - d. Give two examples of biodegradable polymers.

6. a. Write the advantages of crosslinked polymers than the linear polymers. $2+2+2+2=10$
b. Classify the polymers on the base of the repeating units. Give examples.
c. Write the differences between thermosetting plastics and thermoplastic.
d. Write the applications of Teflon, Bakelite, Kevlar and nylon 6,6.
e. Write about the condensation polymerization. Explain with examples.
7. a. Taking an example, explain the mechanism of free radical polymerisation techniques. $3+2+2+3=10$
b. Explain the ring opening polymerisation with an example.
c. What is Ziegler-Natta catalyst. Explain its importance in polymer industry.
d. What is gel effect found in bulk polymerisation technique? What are techniques used to minimize this gel effects.
8. a. What is Solution Polymerisation techniques? Write the merits and demerits of this techniques. $3+4+3=10$
b. Write short-notes on Suspension Polymerization and emulsion polymerization technique.
c. What is crystalline and amorphous polymers? How crystallinity changes affect the properties of a polymer?

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