

U.G. 5th Semester Examination-2024**CHEMISTRY****[HONOURS]****Discipline Specific Elective (DSE)****Course Code : CHEM-H-DSE-T-1A****(Polymer Chemistry)**

Full Marks : 40

Time : 2½ Hours

*The figures in the right-hand margin indicate marks.**Candidates are required to give their answers in their own words as far as practicable.*

1. Answer any five questions: 2×5=10
- a) Draw the structure of the polymers synthesized from
- i) $\text{CH}_2=\text{CH}-\text{CO}_2\text{H}$ and
- ii) $\text{HO}-(\text{CH}_2)_5-\text{COOH}$
- b) Give an example of a co-polymer and a block-polymer.
- c) Define η_{I} , η_{sp} and LVN.
- d) Why hydrogen halides are not suitable initiators for ionic polymerization?

[Turn over]

- e) What is Zimm Plot?
- f) What is living polymerization?
- g) Write the Hildebrand equation and explain the terms.
- h) What is Carothel's equation?
- i) What are polyurethanes?
- j) Define Fluoro polymers.
- k) State lower and upper critical solution temperatures of polymer solution.

2. Answer any two questions: $5 \times 2 = 10$

- a) What is polydispersity index? If 5 g of a monodisperse polystyrene sample of molecular weight $10,000 \text{ g mole}^{-1}$ is mixed with 15 g of another monodisperse polystyrene sample of molecular weight $20,000 \text{ g mole}^{-1}$, calculate the polydispersity of the polymer mixture. $1+4$
- b) Compare the essential features of the step-growth and chain-growth polymerization processes. 5
- c) Define glass transition temperature (T_g) and state how to determine T_g . 5

- d) Compare the natures of different types of initiator and co-initiators used for ionic polymerization. 5

3. Answer any two questions: $10 \times 2 = 20$

- a) What are the absolute and relative methods for determining the molecular weight of polymers? What is osmosis? Describe how M_n can be determined from osmotic pressure of a polymer solution. $2+2+6$
- b) What is the difference between chain-growth and condensation polymerization? Explain why the DP_n value for step-growth polymerization changes slowly? Derive the kinetic rate expressions and DP_n for the catalyzed condensation reaction for a polyamide. $2+2+6$
- c) What are radical initiators? How they are generated in situ? Describe the mechanism and kinetics of free radical polymerization of styrene. $2+2+6$
- d) Write notes on conducting polymers such as polyaniline, poly p-phenylene sulphide, polypyrrole, polythiophene. 10