

B.Sc. 6th Semester (Honours) Examination, 2023 (CBCS)**Subject : Chemistry****Course : DSE-3 (OR)****(Polymer Chemistry)****Time: 2 Hours****Full Marks: 40**

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

1. Answer *any five* questions from the following: 2×5=10
- (a) How are polymers classified on the basis of structures of polymers?
 - (b) Differentiate between addition and condensation polymerisations.
 - (c) Write the monomers and monomeric repeating units of nylon 6, 6.
 - (d) What is functionality? What is its minimum value for branched polymer formation?
 - (e) Why is bakelite a thermosetting polymer? Write the uses of hard Bakelite.
 - (f) Is it possible to prepare an ideal solution of polymer? Give reason to justify your answer.
 - (g) What do you mean by glass transition temperature(T_g) of a polymer? What is glassy state of a material?
 - (h) What is conducting polymer? Give an example.
2. Answer *any two* questions from the following: 5×2=10
- (a) (i) Compare the structures of isotactic and syndiotactic configurations of polypropylene.
 - (ii) What is primary structure of a polymer? 4+1
 - (b) (i) Define viscosity average molecular weight of polymer. How can it be determined from intrinsic viscosity?
 - (ii) What is vulcanisation of rubber? 4+1
 - (c) (i) Differentiate natural rubber and synthetic rubber.
 - (ii) Between step-growth polymer and chain polymer which one will have generally the higher average molecular weight and why? 3+2
 - (d) (i) Classify copolymers depending upon the distribution of monomer units in the chain.
 - (ii) Write the properties of thermoplastic with example. 3+2

3. Answer any two questions from the following:

10×2=20

- (a) (i) Define monodisperse and polydisperse polymers. Draw the molecular weight distribution curves for them.
- (ii) Among the colligative properties only osmotic pressure is useful to determine the average molecular weight of polymer.— Why? Name the average molecular weight obtained from the osmotic pressure method. State its principle.
- (iii) Can enzyme be a polymer? (2+2)+(2+1+2)+1
- (b) (i) Show that the average degree of polymerisation is $\frac{1}{1-p}$, where p is the extent of polymerization.
- (ii) A hydroxy acid $\text{HO} - (\text{CH}_2)_5 - \text{COOH}$ is polymerised and the polymer has a number average molar mass of $20,000 \text{ g mol}^{-1}$. Find the average degree of polymerisation and the extent of reaction.
- (iii) What is free volume of polymer? How does it affect glass transition temperature, T_g ? 4+4+2
- (c) (i) Derive the rate expression for the step-growth polymerisation in terms of extent of reaction, considering an example of polyester formation in absence of catalyst.
- (ii) Could a copolymer be formed in both addition and condensation polymerisations? Explain with example.
- (iii) Discuss the enthalpy change in polymerisation process. 4+4+2
- (d) (i) How many types of intermolecular forces may be operating in polymers? State their effects.
- (ii) Define number average molecular weight and weight average molecular weight of polymer.
- (iii) What is PVC? How is it synthesized from its raw materials? Write its uses. 3+3+4