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Sr. No. of Question Paper : 7971

F-2

Your Roll No.....

Unique Paper Code : 1141201

Name of the Course : B.Tech. Polymer Science

Name of the Paper : Polymer Chemistry (DC-1.3)

Semester : II

Duration : 3 Hours

Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt **five** questions in all.
3. Question No. 1 is compulsory.
4. Use of calculator is allowed and log table may be provided.

1. (a) Are the following statements true or false ? Justify your answer

- (i) Same type of initiator are used in suspension and emulsion polymerization of vinyl chloride.
- (ii) Poly(vinyl alcohol) is prepared by free radical polymerization of vinyl alcohol.
- (iii) Broad molecular weight distribution is observed in anionic polymerization alkyl methacrylates.
- (iv) Vinyl acetate and vinyl chloride are the most favored copolymerization components for vinyl ethers, but both of them reluctant to copolymerize with styrene.
- (v) Maleic anhydride does not homopolymerize but react with styrene to form alternating copolymer. (1,1,1,2,1)

P.T.O.

- (b) Show chemical crosslinking reactions for cast elastomers of Polyurethane.
 - (c) A ethylene polymerization process gives no ethyl or butyl braches and methyl groups upto 3/1000 carbons in polymer. Discuss the said process.
 - (d) In spite of similarities with HDPE, i-PP differs in many respects. Explain.
 - (e) Write equations for *CABAC* block copolymer synthesis. where A, B, and C represent styrene, butadiene, and isoprene, respectively.
 - (f) Estimate the feed and copolymer compositions for the azeotropic copolymerization of Acrylonitrile ($r_1 = 0.04$) and styrene ($r_2 = 0.4$) at 60°C .
 - (g) Contrary to the high selectivity shown in cationic and anionic polymerization, radical initiators may bring about polymerization of any carbon-carbon double bond. Explain, giving reasons.
 - (h) For emulsion polymerization it is assumed that spoke like free radicals produces in aqueous enter micelles rather than emulsified monomer droplets. How would justify this assumption ? (7×3)
2. (a) Derive the expression for polymerization rate for an anionic polymerization where termination occurs simultaneously with propagation.
- (b) Discuss Sioplas process for crosslinking of Polyethylene.
- (c) Illustrate the low stereo selectivity of $\beta\text{-TiCl}_3$ in Ziegler Natta polymerization. (5,4,3)
3. (a) The following data were obtained for the polymerization of methyl methacrylate in benzene at 77°C with azo-bis-isobutyronitrile initiator. Assuming that the initiator efficiency is independent of monomer concentration, are the data consistent with the model for the rate of polymerization by free radical mechanism.

[M] (kmol/m ³)	[I] (mol/m ³)	-d[M]/dt (mol/m ³ · sec)
9.04	0.235	0.193
8.63	0.206	0.170
7.19	0.255	0.165
6.13	0.228	0.129
4.96	0.313	0.122
4.75	0.192	0.0937
4.22	0.230	0.0867
4.17	0.581	0.130
3.26	0.245	0.0715
2.07	0.211	0.415

- (b) Discuss properties of silicon fluids.
- (c) What are Telechelic polymers ? How are these prepared ? (5,4,3)
4. (a) Write chemical equations for the polymerization of the following :
- (i) Acrylonitrile by NaOCH₃
- (ii) Isobutylene by BF₃/H₂O
- (b) Discuss relative physical properties of impact polystyrene, ABS resins and polystyrene.
- (c) Discuss modification of epoxies with amino resins with suitable reactions. (5,4,3)
5. (a) Explain by equations the polymerization of phenol formaldehyde (resol) to form a crosslinked structure.
- (b) For a chain growth polymerization of a monomer, the following observations were made in chain transfer reaction

- Molecular weight becomes broader &
- No of polymer molecules remain same

Suggest name of monomers and give reaction for such transfer reaction.

- (c) The preparation of poly(ethylene terephthalate) from terephthalic acid and ethylene glycol is stopped at 99% conversion. Calculate :

(i) The number-average degree of polymerization.

(ii) The weight-average degree of polymerization. (5,4,3)

6. (a) Discuss the thermal degradation behavior of following with appropriate reactions :

(i) Polystyrene

(ii) PVC

- (b) Suggest methods for control of molecular weight in Zeigler Natta polymerization.

- (c) Complete the following reactions

