0102E1298

Candidate's Seat No :_____

MSc Sem.-1 Examination

401

Polymer Scdience

Time : 2-30 Hours] **February-2025** **[Max. Marks : 70**

General Instructions

1. *All question is compulsory*
2. *Draw neat figure wherever necessary*

Q-1(a) Write mechanism of step growth polymerization. **7 Marks**

OR

Q-1(a) Write kinetics of free radical polymerization. **7 Marks**

Q-1(b) Write mechanism of free radical polymerization with proper example. **7 Marks**

OR

Q-1(b) Define terms: monomer, polymer, polymerization, degree of polymerization, and functionality of monomer. **7 Marks**

Q-2(a) Write bimetallic mechanism of Natta for coordination polymerization. **7 Marks**

OR

Q-2(a) Write mechanism of anionic polymerization. **7 Marks**

Q-2(b) Write kinetics of cationic polymerization. **7 Marks**

OR

Q-2(b) Write note on "living polymerization" **7 Marks**

Q-3(a) Discuss "Trommsdorff–Norrish effect" observed in free-radical bulk polymerization system **7 Marks**

OR

Q-3(a) Derive "copolymer equation" by considering free radical copolymerization. **7 Marks**

Q-3(b) Explain any one method for determination of reactivity ratios. **7 Marks**

OR

Q-3(b) Define reactivity ratio. Discuss effect of monomer reactivity ratio on copolymer composition. **7 Marks**

Q-4(a) Write note on "suspension polymerization". **7 Marks**

OR

Q-4(a) What are the different reactors used in polymerization. With schematic diagram discuss any one reactor in details. **7 Marks**

Q-4(b) What is chemical reaction of polymers? Discuss crosslinking reactions of polymer with proper example. **7 Marks**

OR

Q-4(b) Write note on "microbial degradation of polymers" **7 Marks**

QUESTION –5 ANSWER ANY SEVEN QUESTIONS OUT OF TWELVE

[Max. marks: 7×2=14 MARKS]

(i) Minimum functionality of monomer (*f*) should be _____for polymerization. (Fill in the Blank)

(ii) Which of the following is/are copolymer(s)?

A) ABS B) PE C) Nylon-6, 6 D) Poly(butadiene styrene)

Correct option is: (i) A only (ii) A and D only (iii) A, C and D only (iv) B and C only

(iii) Chemical substances which is capable of inhibiting or killing the chain grown by combining with the free radicals and forming either stable or inactive free radical is known as:

A) Initiator B) Chain transfer agent C) Catalyst D) Inhibitor

(iv) Degree of polymerization =_____, when termination occurs by coupling.

A) $2v$ B) v C) $v/2$ D) Noe of the above

(v) For "azeotropic copolymerization":

A) $r_1 = r_2 = 1$ B) $r_1 = r_2 > 1$ C) $r_1 = <1, r_2 > 1$ D) $r_1 = r_2 = 0$

(vi) Monomer droplets are suspended in water, and emulsifier is added less than CMC, this polymerization system become

(A) Suspension polymerization

(B) Emulsion polymerization

(C) Bulk polymerization

(D) Condensation polymerization

(vii) In co-ordination polymerization the active Centre, where the chain growth start is

(A) Metal ion

(B) Carbon atom of catalyst

(C) Metal-Carbon bond

(D) Carbon-Carbon bond

(viii) Give one-one example of the catalyst used for anionic and cationic polymerization.

(ix) Which of the following polymers can be easily hydrolyzed in presence of acids and alkali.

(A) Polyamide

(B) Polyester

(C) Polyvinyl pyrrolidone

(D) All of the above

(x) Block copolymer can be prepared through

(A) Cationic polymerization

(B) Free radical polymerization

(C) Anionic polymerization

(D) None of the above

(xi) The reaction volume of a batch reactor is given by

(A) $V_r = Q_0 (t + t_0)$

(B) $V_r = Q_0 / (t + t_0)$

(C) $1/ V_r = Q_0 (t + t_0)$

(D) $V_r = Q_0 (t + t_0)^2$

(xii) All polymers are macromolecules but all macromolecules are not polymer (**True or False**)

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