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End Semester Examination of Semester–III, 2015
Subject : CHEMISTRY (PG)
Paper : CEM–304 (Org. Spl) (Th)
Full Marks : 40
Time : 2 Hrs

The figures in the margin indicate the marks corresponding to the question

Candidates are requested to give their answers in their own word as far as practicable.

Illustrate the answers wherever necessary.

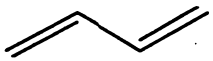
Answer **one question** from each Group

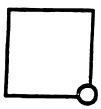
Group A

Answer **any one** question : 10X1=10

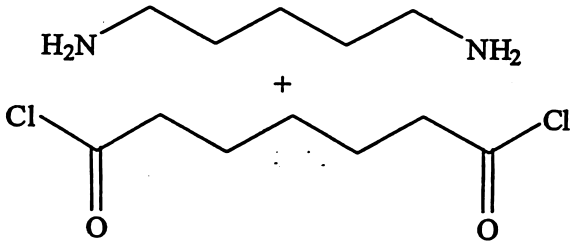
1. a) Write the expressions of Mw, Mn, Mv, for a polydisperse sample and rank according to their values. 4

   b) Draw the repeat unit of the polymer that would be obtained in the polymerization of the following monomers. 3

   i) 

   ii) 

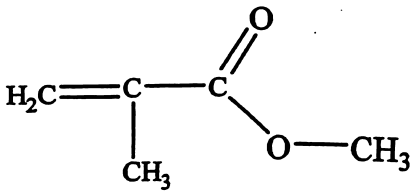
iii)



c) Given A and B are two monomers. Write the generic structures of Random, Alternating and Block copolymers. 3

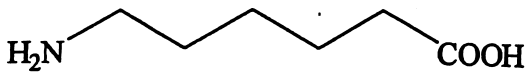
2. a) Write the structure of polymers that are synthesized using following monomer(s). 3

i)



ii)

iii)



b) Write the chemical structures of the following polymers : 3

i) Poly (Vinyl alcohol)

ii) Poly (butylenes terephthalate)

iii) Polypropylene

c) Write short notes on : 4

i) glass-transition of polymers.

ii) Melting of polymers.

Group B

Answer **any one** question : 10X1=10

3. a) Show that the time required to go from 98% to 99% conversion is very close to the time required to reach 98% conversion from the start of the polymerization for an external acid. Catalyzed polymerization of an equimolar mixture of a diol and a diacid. 4

b) A step-growth polymerization was stopped at 60% conversion. What are the ingredients would be present in the reaction mixture? Explain briefly. 3

c) Calculate the Mn of a mixture of adipic acid (Mw = 146) hexamethylene diamine (Mw = 116) for extent of reaction (p) = 0·99. Molar ratio of adipic acid to hexamethylene diamine taken in the feed is 0·95 : 1·0. There is no side reaction. 3

4. a) In a synthesis of polyester from 2 moles of terephthalic acid, 1 mol of butylenes glycol and 1 mol of ethylene glycol, the reaction was stopped at 99·5% conversion. Determine Mw and Mn of the resulting polymer. 4

b) Write three main differences between step-growth and chain growth polymerization. 3

c) Write the ingredients present in a reaction mixture if a radical chain polymerization (initiated thermally) is stopped at a conversion of 40%. Explain briefly. 3

Group C

Answer **any one** question : 10X1=10

5. a) Derive an expression for the rate of polymerization in a radical polymerization reaction. Assume steady state, termination of reaction is only by bimolecular reaction between propagating species, equal reactivity of different propagating species. 6

b) Arrange in increasing order of Mn of the polymers obtained by polymerization of styrene initiated by thermal decomposition of benzayl peroxide at 80^0C in the following solvents, benzene, 1-butanethiol, isopropyl benzene, CCl_4. Explain your answer. 4

6. a) What is the effect of (i) initiator concentration, (ii) monomer concentration, (iii) temperature on the molecular weight and rate of polymerization in a radical polymerization initiated by thermal dissociation of an initiator. 6

b) Write two advantages and two disadvantages of solution polymerization over bulk polymerization. 4

Group D

Answer **any one** question : 10x1=10

7. a) Write a short note on the comparison between radical and ionic chain polymerization. 4

   b) Explain whether the following monomers can be polymerized by radical, anionic and cationic polymerization. 6

   i) CH_2–CHCN

   ii) CH_2–CHPh

   iii) CH_2–$CHOCH_3$

   iv) CH_2–$CHOCOCH_3$

8. a) What is the principle behind the measurement of polymer molecular weight by gel permeation chromatography?What type of detector can be used in this measurement technique – give three example. 4

   b) Write short notes on the following two polymer molecular weight measurement techniques. 6

   i) Light Scattering

   ii) Viscosity

   [Mention the Principle, final equation to be used, type of determination (absolute or relative) and applicable range of molecular weight]