

Unique Paper Code : **32177906**
Name of the Paper : **DSE - Polymer Chemistry**
Name of the Course : **B. Sc. (Prog.) L.Sc. / P.Sc. /Analytical Chemistry/Industrial Chemistry**
Semester : **VI**
Duration : **3 Hours**
Maximum Marks : **75**
Medium of setting the Question paper : **English**

Instructions for Candidate

All questions carry equal mark. Attempt any four questions out of six.

Q 1. a) Explain the factors affecting the crystallinity of polymers. Describe one method for experimental determination of crystallinity of polymers,

b) Describe in brief the determination of molar mass of a sample of polymer by light scattering method? What type of average molar mass is determined by this method?

c) What is solubility parameter? Explain the effect of molecular weight, crystallinity and bulkiness of substituent on solubility of polymers.

d) Explain how reactivity ratios of monomers effects the copolymerization behavior.

(5, 4.75, 5, 4)

Q2. Explain the following terms:

- i) Ring –opening polymerization
- ii) Redox Polymerization
- iii) Crystalline and Amorphous Polymers
- iv) Structure – property relationship of Polymers
- v) Telomerization

(4, 4, 4, 4, 2.75)

Q3. a) Determine the number average, weight average molar masses and PDI of a sample of poly(vinyl alcohol) from the following data:

Average molar mass (Kg/mol)	12.6	15.8	17.4	22.4	27.4	32.3
Mass (g)	8.6	7.7	7.9	6.6	3.8	2.5

b) Explain mechanism and kinetics of cationic polymerization. By applying steady state approximation, prove that degree of polymerization is independent of initiator concentration and when chain transfer to monomer predominates, it's independent of monomer concentration also.

c) Explain why anionic polymerization is called living polymerization?

(8, 8, 2.75)

Q4 a) Differentiate between the following (*any three*)

- (i) Atactic and isotactic polymers
- (ii) Emulsion and suspension polymerization
- (iii) Nylon 6,6 and Nylon 6
- (iv) Free radical and ionic polymerization

b) What do you understand by Differential Scanning Calorimetry (DSC). How it is useful in thermal characterization of polymers.

c) What is kinetic chain length? How it is related to degree of polymerization?

d) Write down the structure of a graft and block copolymer obtained from the monomers, methyl acrylate and acrylonitrile.

(9, 5, 2.75, 2)

Q5 a) Discuss the effect of the following on T_g of polymer with one example

- (i) Molecular weight of polymer
- (ii) Homo and random copolymer
- (iii) Addition of plasticizers
- (iv) Intermolecular interactions

b) Explain the following:

- (i) Aramides possesses high melting point.
- (ii) Polymers like polyacrylonitrile and polyacrylates are often prepared by anionic polymerization.
- (iii) Polyisobutylene does not show stereoregularity whereas polypropylene does.
- (iv) Carbon tetrachloride and disulphides like RSSH are efficient chain transfer agents.

c) _____ can be determined experimentally using any colligative property like osmotic pressure, lowering in vapor pressure.

(8, 10, 0.75)

Q6 a) Write the structure of monomer and repeat unit of the following polymers:

- (i) Polyisoprene
- (ii) Buna- N
- (iii) Polyacetylene
- (iv) Polymethacrylic acid

(b) Describe the method of preparation, properties and important application of polyvinyl alcohol (PVA) and Polyaniline.

(c) What do you understand by crystalline melting point (T_m) of a polymer? Why the glass transition temperature (T_g) is not the same as crystalline melting point (T_m) of a polymer? Discuss the factors affecting crystalline melting point.

(d) Benzoyl peroxide is used to initiate the Polymerization of olefinic monomers.

(6, 6, 6, 0.75)