

B. SC. (CHEMISTRY) EXAMINATION, 2022

(3rd Year, 6th Semester, CBCS Syllabus)

POLYMER CHEMISTRY

PAPER – DSE/CHEM/TH/04

Time : Two hours

Full Marks : 40

UNIT: 6042-O

(Use a separate Answer script for each group)

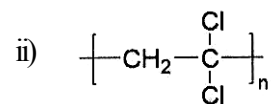
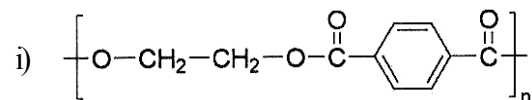
Group – A

1. Draw a mechanism for acid-catalyzed polymerization of a dicarboxylic acid and a diol and derive a kinetic equation for the degree of polymerization vs reaction time. Show that the degree of polymerization for the said process increases with the reaction time and reaction temperature? 2+3
2. Differentiate among the followings with examples.
 - a) Plastics, Elastomers and Fibres
 - b) Isotactic polymers, Syndiotactic polymers, and Atactic polymers
3.
 - a) What are the T_m and T_g of a polymer? Explain why the flexibility of amorphous polymers is reduced drastically when they are cooled below the T_g . 1+2
 - b) How does step-growth polymerization differ from chain-growth polymerization? 2

[2]

Group – B

4. a) Equal number of molecules with $M_1 = 10,000$ and $M_2 = 100,000$ are mixed. Calculate the number-average molecule weight. 1
- b) Two ends of each polymer molecules of a sample Nylon-6 are capped with -COOH groups 6 g of this sample is found to contain 6×10^{-3} mol of COOH groups by titration with alcoholic KOH. Calculate the corresponding average molecular weight from the given information? 2
- c) What is the no. average degree of polymerization (DP) of each of the following polymers with $M_n 254,000$? 1



- d) Write the Flory-Huggins equation for Gibbs free energy change of mixing of a polymer solution describing all the terms. Write two limitations of this equation with brief explanation. 2
5. a) Explain briefly the different regions of viscoelastic behavior shown by polymers with the help of a suitable diagram. 3

[3]

- b) Why extrapolation is required for the Zimm plot while determining M_w ? 2
- c) What are the different factors that influence the glass transition temperature of a polymer? 2

Group – C

6. a) What do you understand by the terms ‘Spherulites’ and ‘Tic molecules’ in polymers? 1+1
- b) Write down the industrial method of preparation of acetylene and phenol. 1+1
- c) Explain the different degradation pathways of polyvinyl chloride (PVC) with plausible mechanisms. 3
- d) Depict the synthetic mechanism of action of homogeneous Ziegler-Natta catalysts for the synthesis of polyethylene. 3
- e) Why polyvinyl alcohol is not synthesized from vinyl alcohol as monomer? How do you synthesize the monomers for PTFE and PMMA (Polymethylmethacrylate). 1+2
