D.K.M. COLLEGE FOR WOMEN (AUTONOMOUS), VELLORE-1

POLYMER CHEMISTRY (Elective Paper)

UNIT-I

Classification and polymerization techniques

Section-A (6 marks)

1. What are monomers and polymers? Give suitable examples
2. Define the term polymerization. What do you mean by copolymer and give two examples?
3. How are polymers are classified on the basis of their structure?
4. Is –[-CH_2=CH(C_6H_5)-]n – a homoplymer or copolymer? Write the name of monomer.
5. Give one example of (a) addition polymer, (b) condensation polymer, (c) copolymer
6. Differentiate the following pair of polymers based on the property mentioned against each. (i) Novolac and Bakelite (structure) (ii) Buna-s and Terylene (intermolecular force
7. Write name of monomers of the following polymers and classify them as addition or condensation polymersTeflon, Bakelite, Natural rubber
8. What is the role of benzyl peroxide in polymerization of ethane?
9. What are LDPE and HDPE? How they are prepared?
10. Draw the structure of the monomer each of the following polymers- (a) Poly(vinyl chloride), (b) Nylon-6.
11. Write down the addition polymerization and condensation polymerization.
12. Explain the terms polymer and monomer.
13. What are natural and synthetic polymers? Give two examples of each type.
14. Distinguish between the terms homopolymer and copolymer and give an example of each.
15. How do you explain the functionality of a monomer?

16. Define the term polymerisation.
17. Explain the term copolymerisation and give two examples.

Section-B (15 marks)

18. In which classes, the polymers are classified on the basis of molecular forces?
19. How can you differentiate between addition and condensation polymerisation?
20. Write the free radical mechanism for the polymerisation of ethene.
21. Write the name and structure of one of the common initiators used in free radical addition polymerisation.
22. How does the presence of double bonds in rubber molecules influence their structure and reactivity?
23. What is a biodegradable polymer? Give an example of a biodegradable aliphatic polyester.
24. How are polymers classified on the basis of structure?
25. Describe the initiation process in free radical polymerization. What is the evidence for the mechanism? What is cage effect?
26. What are the chain transfer agents? Describe their role and effect on molecular weight obtained in their presence
27. Derive the expression for the overall rate of polymerization as a function of conversion
28. Write a note on kinetic chain length in free radical polymerization
29. Comment on cross propagation rate constant in controlled radical copolymerization. Discuss its significance
30. Write copolymer composition equation and explain the assumption under which its derived
31. For the following values of r1 and r2 what type of polymers will be expected?
    a. a). r1=0, r2=0

b. b). r2>>0, r2>>1
c. c). r1 infinity, r2 infinity
d. Justify Your answer

32. Why do monomer show different reacting tendencies in binary copolymerization? Which factors influence their relative reactivities?
33. Write a detailed note on the different termination processes in radical polymerizations
34. Describe the role of retarders, inhibitors and chain transfer agents in free radical polymerizations
35. Describe the expression for overall rate of polymerization as a function of conversion in free radical polymerization
36. Compare and explain the steps involved in cationic and anionic polymerization
37. Compare and contrast dependence of rate of reaction on temperature in case on anionic polymerizations
38. What reactivity ratio values would you require for obtaining the following copolymers:
    a).Random copolymers
    b). Block of 1 with a short group of 2
    c). Long block of 1 seperated by one unit of 2

UNIT-II

Characterization

Section-A (6 marks)

1. Write a short note on Dye partition technique.
2. Write a short note on Dye interaction technique.
3. Discuss in detail about the X-ray diffraction.
4. Write a short note on DSC and TGA.

5. Explain in detail about the osmometry method in determining the molecular weight of polymers.

Section-B (15 marks)

6. Explain in detail about the light scattering method in determining the molecular weights of polymers.

7. Explain in detail about the Glass transtition temperature and factors affecting it.

8. How will you determine the molecular weight of the polymers using ultracentrifuge method?

9. Give a brief account on gel permeation chromatography.

UNIT-III

Polymer reactions and Degradation

Section-A (6 marks)

1. How will you synthesize the graft and block copolymers ?
2. Discuss in detail about the vulcanization process.
3. Explain in detail about the various types of polymer degradation.
4. Write short note on hydrolysis, acidolysis and hydrogenation reactions.
5. Describe in detail about the photodegradation.

Section-B (15 marks)

6. Explain in detail about addition reactions and substitution reactions(5) Describe in detail about the cyclisation and cross-linking reactions(10)
7. How will you synthesise the graft copolymers by various approaches(15)
8. Describe in detail about the thermal degradation process(15).
9. Give a brief account on mechanical and oxidative degradation(15).
10. What are photostabilisers and antioxidants?. Explain briefly with examples (15)

UNIT-IV

Physical properties and polymer processing

SECTION-A (6 Marks)

1. Explain the Physicochemical parameters.
2. Explain the types of moulding process of polymers.
3. Discuss the calendaring process of polymer.
4. Which types of polymers are used in calendaring process.
5. Write note on casting of films.
6. Explain the retardation and relaxation process.
7. Explain the blow moulding
8. Explain the extrusion moulding.
9. Explain the injection moulding.
10. Write a note on rotational moulding.
11. Write a short note on BOD and COD methods.
12. Explain the DO and EC methods for determine the water quality standards

SECTION-B(15 Marks)

13. Discuss in detail about the stress Vs strain measurement of polymers.
14. i. Explain the retardation and relaxation process. (5)
15. ii. How to determine the water quality standard by BOD,COD and EC methods (10)
16. i. Describe the types of moulding of polymers. (10)

    ii. Write note on calendaring process.(5)

UNIT-V

Applications of Polymers

SECTION-A(6 Marks)

1. Explain about natural rubber and synthetic rubber.

2. Explain about PAN.
3. Give an account of Nafion.
4. Explain about the advantages of TEFLON.
5. Explain the preparation and uses of poly styrene.

SECTION-B(15 Marks)

6. Give an account on conducting polymers.
7. Explain about ion exchange resins
8. Account on the following
    a. Polyisoprene
    b. PVC
    c. PAN
9. What are carbon fibers? Explain its industrial applications.
10. Explain the industrial uses of polyacrylates, polyester and polyaniline.