

M. Sc. DEGREE EXAMINATION, APRIL 2023
BRANCH IV- CHEMISTRY
SECOND SEMESTER

COURSE: MAJOR ELECTIVE

PAPER: POLYMER MATERIALS AND APPLICATIONS

TIME: 3 HOURS

MAX MARKS: 100

SECTION A

Answer All Questions:

(20 X 1 = 20)

Choose the correct answer:

1. The mass average molecular mass & number average molecular mass of a polymer are respectively 40,000 and 30,000. The polydispersity index of polymer will be
(a) < 1 (b) > 1 (c) 1 (d) 0
2. The characteristics of condensation polymerization are given below-
I. only $-C-C-$ linkages present in the polymer structure
II. use of bifunctional or polyfunctional monomers
III. elimination of a small by product molecule
Which of the following is true?
a) I, II, III b) II and III c) I and II d) Only III
3. What is the range of tensile strength, exhibited by fibres?
a) 300-3,000 b) 4,000-15,000 c) 20,000-150,000 d) 5,000-10,000
4. Which of the following kind of polymers are known for their high crystallinity?
a) isotactic b) syndiotactic c) atactic d) none of the mentioned
5. The impact strength is measure as
a) Elasticity b) Strength c) Permeability d) Toughness
6. For amorphous and semi-crystalline polymers, mixing leads to the formation of _____
a) Mechanical blends b) Solution-cast blends c) Latex blends d) Chemical blends
7. Fourier transform infrared spectroscopy is used to study _____
a) Quantitative determination of additives in polymers
b) Curing and degradation behaviour of cross-linked polymers
c) Determination of volatilities of plasticizers
d) Analysis of structural imperfections on the surface
8. Atomic force microscopy comes under the category of _____
a) Spectral analysis b) Thermal analysis
c) Mechanical testing d) Morphological analysis
9. Differential scanning calorimetry is useful for determining the _____
a) Melting temperature, glass transition temperature, heat of fusion etc
b) Volatilities of plasticizers and other additives
c) Quantitative determination of additives in polymers
d) Structural imperfections

10. A hydrophobic surface with low free surface energy gives a _____ with water.
- a) Low contact angle b) High contact angle
c) Zero contact angle d) Extremely low contact angle

Fill in the blanks

11. _____ polymerization is also known as pearl polymerization?

State whether true or false:

12. Higher molecular weight polymers are tougher and more heat resistant.

Match the following:

(Monomer Unit)	(Polymer)
13. Caprolactum	(i) Natural Rubber
14. 2-Chloro-1,3-butadiene	(ii) Buna -N
15. Isoprene	(iii) Nylon 6
16. Acrylonitrile	(iv) Neoprene

Answer in a line or two:

17. Give an example of a stabilizer?
18. What are flame retardants? Give examples
19. What is aspect ratio?
20. What are polymer additives?

SECTION B

Answer any five Questions :

(5x8=40)

21. a) Write briefly about IPN (4)
b) What do you mean by polymer degradation? Describe the types of polymers degradation (4)
22. a) Write an account on emulsion polymerisation. (5)
b) What are plasticisers. Mention their significance (3)
23. How will you determine the molecular weight of a polymer by viscosity method
24. Differentiate between the terms T_g, T_m, T_c of polymers
25. Illustrate impact properties of polymers
26. a) Explain with reaction how do polyethylene produced using Ziegler Natta catalyst differ from polyethylene produced using free radical initiators (4)
b) Explain the significance of Flory Higgins Theory (4)

27. a) A sample of polymer contains 50 molecules of molecular weight 5,000 and 70 molecules of molecular weight 10,000. Calculate the number average and weight average molecular weight of the sample.
- b) Discuss the relationship between degree of polymerisation and molecular weight of polymers.

SECTION C**Answer any two Questions:****(2x20 =40)**

28. a) How tacticity of the polymer defines its physical property of the polymers (5)
b) What is the role of inhibitor in free radical polymerisation explain (5)
c) Give the preparation properties and use of Polyurethane, Polymethylmethacrylate (5+5)
29. a) Explain of XRD & DSC methods for determination determining the crystallinity of polymers. (10)
b) What are mechanical properties of polymers? How mechanical properties are an important tool of polymer quality. Describe the tensile properties in detail. (10)
30. a) What is meant by glass transition temperature? Explain the various factors influencing the glass transition temperature. (6)
b) Explain how Osmometry is employed in determining the molecular weight of the polymers. (6)
c) Discuss briefly about the flow properties of polymer melts and solution. (8)
