C 2076

(Pages : 2)

Name...

Reg. No...................................

FOURTH SEMESTER M.Sc. DEGREE (REGULAR) EXAMINATION MARCH 2021

(CBCSS)

Polymer Chemistry

PCH 4E 03 2—POLYMER NANOTECHNOLOGY

(2019 Admissions)

Time : Three Hours

Maximum : 30 Weightage

General Instructions

1. *In cases where choices are provided, students can attend* **all** *questions in each section.*

2. *The minimum number of questions to be attended from the Section/Part shall remain the same.*

3. *There will be an overall ceiling for each Section/Part that is equivalent to the maximum weightage of the Section/Part.*

Part A

Answer any **eight** *questions.*
Each question carries a weightage of 1.

1. What is the meant by biomimetic nano composites? Give one example.

2. Why it is not possible to image nano objects with X-rays ?

3. Give one example of nanomaterials used for DLC coatings.

4. What is meant by nanotechnology ?

5. Give two examples of nano materials used in structural and civil applications.

6. Explain the basic principle of AFM ?

7. What are the three main requirements for an X-ray diffraction experiment ?

8. What are the different types of CNT's ?

9. What is TEN in nano chemistry ?

10. What are dendrimers ? Mention its important application.

11. What is PNC ? Give its applications.

12. Mention any *two* applications of nanocomposites in the field of defense.

(8 × 1 = 8 weightage)

Turn over

Part B

Answer any **four** *questions.*
Each question carries a weightage of 3.

13. Discuss the stress-strain relationship with respect to mechanical properties of nanocomposites.

14. What are nano fillers ? Discuss its classification.

15. Differentiate hot melt impregnation and solution impregnation methods.

16. Discuss the Joslin-Oliver method of nano indentation.

17. Differentiate direct and layer by layer self assembly.

18. Discuss the principle and working of scanning tunneling microscope.

19. Write short note on the applications of nanocomposites in the field of catalysis and health care.

(4 × 3 = 12 weightage)

Part C

Answer any **two** *questions.*
Each question carries a weightage of 5

20. What are nanocomposites ? Discuss its classification with examples.

21. Write an essay on the various electron microscopies for the characterization of nanomaterials.

22. Discuss the various methods for the synthesis of nanocomposite materials.

23. Write an essay on the different processing techniques of nanocomposites.

(2 × 5 = 10 weightage)

FOURTH SEMESTER M.Sc. DEGREE (REGULAR) EXAMINATION MARCH 2021

(CBCSS)

Polymer Chemistry

PCH 4E 02—TESTING AND CHARACTERISATION OF POLYMERS

(2019 Admissions)

Time : Three Hours

Maximum : 30 Weightage

General Instructions

1. *In cases where choices are provided, students can attend* **all** *questions in each section.*

2. *The minimum number of questions to be attended from the Section/Part shall remain the same.*

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Part A

Answer any **eight** *questions.*
Each question carries a weightage of 1.

1. What is glass transition temperature ?

2. What is meant by tensile strength ?

3. Explain X-ray diffraction technique of polymers.

4. What is shear stress and shear rate ?

5. Short note on impact testing of polymers.

6. Explain heat ageing of rubbers.

7. How FT-IR analysis is useful for polymer identification ?

8. Role of raman spectroscopy in polymers.

9. What is storage modulus with respect to polymers ?

10. Mention about the optical properties of polymers.

11. Discuss about light scattering method.

12. Explain molecular weight determination of polymers.

(8 × 1 = 8 weightage)

Turn over

Part B

*Answer any **four** questions.*
Each question carries a weightage of 3.

13. How NMR spectrum useful for the structural determination of polymers ?

14. Define Scorch. How is it useful to a processor ?

15. Write a short note on the rheology of polymers.

16. Enlist the changes after vulcanization of rubber.

17. Discuss about dielectric loss and dissipation factor.

18. Explain about the tribology of polymers.

19. Explain environmental impact of polymers.

(4 × 3 = 12 weightage)

Part C

*Answer any **two** questions.*
Each question carries a weightage of 5.

20. Explain Gel permeation chromatography

21. What is the difference between DTA and DSC ? With the neat sketch explain how the analysis of polymers is done with a DSC, giving a typical thermogram.

22. How do you measure the visco-elastic properties of Polymers ?

23. Distinguish between TEM and SEM. Describe the method of studying the morphological properties of polymeric materials using SEM.

(2 × 5 = 10 weightage)

FOURTH SEMESTER M.Sc. DEGREE (REGULAR) EXAMINATION MARCH 2021

(CBCSS)

Polymer Chemistry

PCH 4C 12—PHYSICAL CHEMISTRY OF POLYMERS

(2019 Admissions)

Time : Three Hours   Maximum : 30 Weightage

General Instructions

1. *In cases where choices are provided, students can attend* **all** *questions in each section.*

2. *The minimum number of questions to be attended from the Section/Part shall remain the same.*

3. *There will be an overall ceiling for each Section/Part that is equivalent to the maximum weightage of the Section/Part.*

Part A

Answer any **eight** *questions.*
Each question carries a weightage of 1.

1. What is meant by configuration of a polymer chain ? Give examples.

2. What are theta conditions ?

3. What are the merits and demerits of Rouse-Bueche theory.

4. Why Is it not possible to prepare perfectly crystalline polymers ?

5. What are the different ways of constructing liquid crystalline polymers ?

6. What are mesogens and mesophases ?

7. Define glass transition temperature ? Why is it considered as a second order transition ?

8. Write briefly on the thermodynamic theory of glass transition.

9. What are the advantages and disadvantages of free volume theory ?

10. Differentiate between creep and stress relaxation.

11. What are the importatit pheribmena involved in the rheological properties of polymers ?

12. Write down the thermodynamic equation of state for rubber elasticity and explain the terms.

(8 × 1 = 8 weightage)

Turn over

Part B

Answer any **four** *questions.*
Each question carries a weightage of 3.

13. Explain the different stages in polymer dissolution.

14. Write a short note on the conformation of polymer chains.

15. Derive Avrami equation.

16. Mention the significance of time-temperature superposition principle for viscoelastic materials.

17. Explain the firinged micelle and spherulitic models.

18. Explain the different stages in polymer dissolution.

19. What are the molecular bases of creep and stress relaxation ?

(4 × 3 = 12 weightage)

Part C

Answer any **two** *questions.*
Each question carries a weightage of 5.

20. (a) Derive Flory Huggins Equation.

    (b) How Flory-Krigbaum theory is applied to polymer solutions.

21. Give a detailed account of side chain liquid crystalline polymers.

22. Illustrate the Maxwell and Voigt models suggested for the viscoelastic behavior of polymers.

23. (a) What are the factors that influence the T_g of a polymer ?

    (b) Explain any one method for the determination of glass transition temperature.

(2 × 5 = 10 weightage)