C 22600

(Pages : 2)

FOURTH SEMESTER M.Sc. DEGREE (REGULAR/SUPPLEMENTARY) EXAMINATION, APRIL 2022

(CBCSS)

Polymer Chemistry

PCH 4E 03 2—POLYMER NANOTECHNOLOGY

(2019 Admission onwards)

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. *The instruction if any, to attend a minimum number of questions from each sub section / sub part / sub division may be ignored.*

4. *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 are nanocomposites ?

2. How can we determine the stress-strain relationship of nanomaterials ?

3. Mention the important applications of ceramic nanocomposites.

4. Explain the term DLC coating in Nanotechnology.

5. What is the limitation of powder mixing processing of nanocomposites ?

6. Give one example for salt in filtration processing of nanocomposites.

7. Give the formula for calculating the size of nanomaterials from XRD pattern and explain the symbols.

8. For an experiment Vicker's hardness number is represented as 440HV30/20. What it indicates ?

9. Give two applications of nanocomposites in defense field.

Turn over

10. What are the advantages of magnetic nanoparticles in medicine ?

11. What are the different types of CNT's used as nano fillers ?

12. What are nano sensors ?

(8 × 1 = 8 weightage)

Part B

Answer any **four** *questions.*

Each question carries a weightage of 3.

13. Discuss the mechanical properties of nanocomposite materials.

14. Write short note on biologically inspired nanocomposites.

15. Explain the intrusion method for the processing of nanomaterials.

16. How is TEM different from SEM ?

17. What are the basic differences between molecular machines and macroscopic machines ?

18. Explain the principle and application of Oliver and Pharr type of nano indentation.

19. Write short note on thin film nanocomposites.

(4 × 3 = 12 weightage)

Part C

Answer any **two** *questions.*

Each question carries a weightage of 5.

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

21. Explain the various gel-casting impregnation techniques for the processing of nanomaterials.

22. Discuss the principle, instrumentation and applications of AFM.

23. Write an essay on applications of nanocomposites in industry, homeland security and structural applications.

(2 × 5 = 10 weightage)

(Pages : 2)

Name...

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

FOURTH SEMESTER M.Sc. DEGREE [REGULAR/SUPPLEMENTARY] EXAMINATION, APRIL 2022

(CBCSS)

Polymer Chemistry

PCH4E02—TESTING AND CHARACTERISATION OF POLYMERS

(2019 Admission onwards)

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. *The instruction if any, to attend a minimum number of questions from each sub section/sub part/ sub division may be ignored.*

4. *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 difference between 'surface resistivity and 'volume resistivity' ?

2. Why does storage modulus decrease with increase in temperature ?

3. What is the significance of tan delta from DMA curve ?

4. Write a note on haze.

5. Give the importance of strain rate in mechanical testing.

6. What is the difference between engineering stress and true stress ?

7. Explain luminous transmittance and optical clarity of polymers.

8. Why is gel permeation chromatography used.

9. What is the role of reduced mass in IR spectroscopy.

10. How can percentage crystallinity of polymers be found ?

Turn over

11. Define environmental stress cracking.

12. Explain the use of capillary rheometer and cone and plate rheometer.

13. What is yield stress ?

<div align="right">(8 × 1 = 8 weightage)</div>

Part B

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

14. Explain creep and stress relaxation.

15. Write short note on Dielectric strength of polymers. Name any two dielectric polymeric materials used in capacitors.

16. Expain how DSC can be used to characterize polymers.

17. Explain the test methods for determination with their practical significance for the following tests : (a) Heat build up ; and (2) Flex cracking.

18. What information do you get from glass transition temperature of a polymer. Explain it with a graph.

19. Explain loss modulus from DMA curve with example.

20. Define Vicat softening point and heat deflection temperature.

<div align="right">(4 × 3 = 12 weightage)</div>

Part C

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

21. Explain UV spectroscopy and Fluorescence spectroscopy with diagrams.

22. Explain the different impact testing methods of polymers.

23. Give the principle of IR spectroscopy. Describe the applications of IR spectroscopy in polymer characterization.

24. Give the principle of NMR spectroscopy.

<div align="right">(2 × 5 = 10 weightage)</div>

FOURTH SEMESTER M.Sc. DEGREE (REGULAR/SUPPLEMENTARY) EXAMINATION, APRIL 2022

(CBCSS)

Polymer Chemistry

PCH 4C 12—PHYSICAL CHEMISTRY OF POLYMERS

(2019 Admission onwards)

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. *The instruction if any, to attend a minimum number of questions from each sub section/sub part/sub division may be ignored.*

4. *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 theta temperature ?

2. What are stereoregular polymers ?

3. Define conformation of a polymer chain.

4. What are spherulites ?

5. Briefly explain the molecular arrangement in amorphous polymers.

6. Show graphically the five regions of viscoelastic behavior.

7. Using suitable examples show the effect of aliphatic side groups on Tg.

8. What are the important techniques used to measure glass transition ?

9. What is the importance of gel point ?

10. What is Weissenberg effect ?

11. Explain the shear stress against shear rate curves of pseudoplastic and dilatants fluids ?

12. How will you construct a liquid crystalline polymer from mesogens ?

(8 × 1 = 8 weightage)

Part B

Answer any **four** *questions.*

Each question carries a weightage of 3.

13. Explain Flory-Krigbaum theory.

14. Write a short note on fringed micelle concept.

15. Explain the first order transitions observed in a liquid crystalline polymer with the help of a neat diagram.

16. Discuss the effect of plasticisers and copolymers on Tg.

17. Differentiate between creep and stress relaxation.

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

19. Explain the different stages in polymer dissolution.

(4 × 3 = 12 weightage)

Part C

Answer any **two** *questions.*

Each question carries a weightage of 5.

20. (a) Write a note on Rouse-Bueche theory.

    (b) Illustrate the isotactic, syndiotactic and atactic polymers with suitable examples.

21. Explain the classification of liquid crystals based on mesophase. Give a method each for the synthesis of main chain and side chain liquid crystals.

22. (a) Explain the free volume theory of glass transition.

    (b) Briefly explain the terms tensile strength, tensile strength at yield, tensile strength at break, tensile modulus, tear strength and flexure strength.

23. (a) Explain power law.

    (b) What are the important shear dependent phenomena observed in polymers ? Explain.

    (c) Explain the principle of capillary viscometers and rotational viscometers.

(2 × 5 = 10 weightage)