

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Fourth Semester M.Sc Chemistry Degree Examination, April 2025

MCH4C12 – Instrumental Methods of Analysis

(2022 Admission onwards)

Time: 3 hours

Max. Weightage : 30

Section A Short Answer**Answer 8 Questions out of 12.****Each question carries a weightage of 1 (8 X 1 = 8)**

- 1) How many significant figures are there in the following? i) 250.00 ii) 6.02×10^{23} .
- 2) What are adsorption indicators? Give any two examples.
- 3) What are the excitation sources used in Atomic emission spectrometry ?
- 4) What is meant by ion selective electrodes? Give any one example.
- 5) Explain significance of differential pulse wave polarographic technique.
- 6) What is the importance of selectivity coefficient for bio-sensing electrode?
- 7) What are the advantages of fluorimetry?
- 8) What is the criterion for the choice between nephelometry and turbidometry?
- 9) Explain the applications of ion exchange chromatography.
- 10) Briefly explain the preparation of GC columns.
- 11) Differentiate column and thin layer chromatography.
- 12) Write important applications of gel permeation chromatography.

Section B Short Essay**Answer 4 Questions out of 7.****Each question carries a weightage of 3 (4 X 3 = 12)**

- 13) Explain the features of solid, liquid, gas sensing electrodes.
- 14) Explain the principles and applications of stripping voltametry
- 15) Differentiate Thermogravimetric analysis (TGA) and Differential Scanning Colorimetric (DSC) analysis.
- 16) Briefly discuss the principle and applications of Atomic fluorescence spectroscopy.
- 17) Describe the instrumentation of IR spectroscopy. Differentiate dispersive and nondispersive IR spectroscopy
- 18) Compare TCD and FID detectors used in gas chromatography.
- 19) Explain the principle and instrumentation of Thermomechanical analysis (TMA)

Section C Essay

Answer 2 Questions out of 4.

Each question carries a weightage of 5 (2 X 5 = 10)

20. a) Write a note on
 - i) Student t-test ii) Student f-test
 - b) Briefly explain classification of errors.
- 21) a) What is co-precipitation? Illustrate different mechanisms of co-precipitations.
b) Explain adsorption indicators with examples.
- 22) Discuss the theory, principle and applications of coulometry.
- 23) Explain theory, principle, instrumentation and applications of SEM and TEM

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Name:

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Fourth Semester M.Sc Chemistry Degree Examination, April 2025

MCH4E06 – Natural Products and Polymer Chemistry

(2022 Admission onwards)

Time: 3 hours

Max. Weightage : 30

Section A Short Answer

Answer 8 Questions out of 12.

Each question carries a weightage of 1 (8 X 1 = 8)

- 1) Mention any three important constituents of Turpentine oil. Write the structure of each.
- 2) Write a note on the classification of terpenoids.
- 3) Write the structure of Testosterone, Corticosterone, Cortisone, Ergosterol and Androsterone.
- 4) Explain briefly how to establish the nature and position of side chain in Abeitic acid.
- 5) Mention any two sources of Flavanols. Mention any three flavanols and write their structure.
- 6) Write a note on Chlorin dye.
- 7) What is kinetic chain length? How is it related to degree of polymerization?
- 8) How is the solvent in solution polymerization more useful to overcome the disadvantages of bulk polymerization?
- 9) What are the advantages of Kaminsky catalyst over Zeigler Natta catalyst for the polymerization of olefins?
- 10) Why PVC has low crystallinity? Give any two applications of PVC.
- 11) Write a short note on polymer solutions.
- 12) Write down the advantages of using polystyrene in solid phase synthesis.

Section B Short Essay

Answer 4 Questions out of 7.

Each question carries a weightage of 3 (4 X 3 = 12)

- 13) Write the steps involved in conversion of Cholesterol to Androsterone.
- 14) Elucidate the structure of Testosterone.
- 15) Write a note on Squarenes, Cyanines and Phthalocyanines.
- 16) Explain the forces involved in molecular recognition.

- 17) What is chain transfer constant? How can it be measured?
- 18) Explain Gel Permeation Chromatography for the determination of molecular weight of polymers.
- 19) Explain the synthesis, structure and applications of Silicones.

Section C Essay

Answer 2 Questions out of 4.

Each question carries a weightage of 5 (2 X 5 = 10)

- 20) Discuss in detail the classification of natural products.
- 21) Explain biosynthesis of quinine.
- 22) a) Briefly explain
 - i) Flory – Huggins equation
 - ii) Flory - Reiner equation
- b) How will you determine degree of cross-linking in polymers.
- 23) Explain polymeric liquid crystals and their applications.

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FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Fourth Semester M.Sc Chemistry Degree Examination, April 2025

MCH4E09 – Advanced Topics in Chemistry

(2022 Admission onwards)

Time: 3 hours

Max. Weightage : 30

Section A Short Answer

Answer 8 Questions out of 12.

Each question carries a weightage of 1 (8 X 1 = 8)

1. Discuss briefly the quantum size effects in nanomaterials.
2. What are the key advantages of the top-down approach in nanofabrication?
3. Distinguish between STO and GTO basis sets.
4. Write Z-matrix for Ammonia.
5. How do hydrogen bonds contribute to the formation of supramolecular architectures?
Write example.
6. How do cation receptors work? Write some common examples?
7. Describe the common synthetic route for Paracetamol production. What are the main chemical reactions involved?
8. How does chemisorption differ from physisorption in terms of energy requirements and bond strength?
9. Explain the principle of SEM.
10. Write a brief note on Fisher-Tropsch process.
11. How does charge transport occur in organic semiconductors compared to conventional silicon-based semiconductors?
12. How is the mercury intrusion method used to characterize the porosity of catalysts?

Section B Short Essay
Answer 4 Questions out of 7.
Each question carries a weightage of 3 (4 X 3 = 12)

13. Write a note on different types of Pople's style basis sets.
14. Briefly discuss Hartree-Fock SCF method.
15. Discuss various methods used for determining the surface area and pore structure of catalysts.
16. Compare the stability and reusability of nanocatalysts and polymer-supported catalysts.
17. What are different film deposition techniques in organic electronics? Discuss
18. How do solar heaters and solar cookers utilize solar energy differently? Explain.
19. What fabrication methods are commonly used for organic sensors, and organic memory devices

Section C Essay
Answer 2 Questions out of 4.

Each question carries a weightage of 5 (2 X 5 = 10)

20. Discuss the principle and uses of following techniques in nanomaterial Characterization
(a) Dynamic light scattering (DLS) (b) Energy Dispersive X-ray analysis (EDAX)
(c) X-ray photoelectron spectroscopy (XPS) (d) Scanning Electron Microscopy (SEM)
21. Discuss the concept of host-guest chemistry, emphasizing the types of interactions involved and its applications in catalysis.
22. Describe the working principle and fabrication process of DSSCs using TiO_2 as the semiconductor material. Discuss the role of TiO_2 in enhancing the efficiency of the solar cell.
23. Explain the role of QSAR in virtual screening for identifying potential drug candidates?

[2x4=8 Weightage]