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MCH-022

**M. SC. IN CHEMISTRY
(MSCCHEM)**

Term-End Examination

June, 2026

**MCH-022 : SEPARATION AND
SPECTROSCOPIC METHODS**

Time : 2 Hours

Maximum Marks : 50

Note : *This question paper has two Parts—Part A
and Part B. Attempt number of questions
as instructed in each Part.*

Part—A

Note : *Answer any one of the following
questions.*

1. Briefly explain the extraction of metal ions using carboxylic acids and sulphonic acids giving suitable examples of acids used. 5

Or

2. Define R_f . List the factors affecting the R_f value. 5

Note : Answer any **five** of the following questions.

3. What are the characteristics of an optimum support material to be used as a stationary support in gas chromatography ? 4
4. Give the names and draw the shapes of various stationary phase packings used in HPLC. 4
5. Give a brief account of cation exchangers including the methods involved in their synthesis. 4
6. What is dextran ? How is sephadex manufactured from it ? 4
7. Briefly explain ultrafiltration as a membrane process. 4

8. Explain the important aspects of SDS-PAGE electrophoresis. 4

Part—B

Note : Answer any *five* of the following questions.

9. (a) Name the different types of UV-Vis. spectrometers and give a schematic diagram of any *one* of these. $2\frac{1}{2}$
- (b) What is the difference in the placement of monochromator in UV-Vis spectrometry and dispersive IR spectrometry ? Explain how is the modulation of signal achieved in IR spectrometry ? $2\frac{1}{2}$
10. (a) What is emission fluorescence spectrum? Explain what would happen if the wavelength of the excitation radiation is changed ? $2\frac{1}{2}$

- (b) List the factors affecting fluorescence and phosphorescence and describe in brief the effect of any *one* of the factors.

$2\frac{1}{2}$

11. (a) Draw a schematic labelled structure of a laminar flow flame indicating all the zones.

$2\frac{1}{2}$

- (b) Explain the concept of Fourier transformation in NMR. Why is it considered better than CW NMR ?

$2\frac{1}{2}$

12. (a) Name the types of relaxation mechanisms in NMR and describe in brief any *one* type.

$2\frac{1}{2}$

- (b) Write the full form of DEPT in ^{13}C NMR spectroscopy and name the *three*

types of spectra obtained for a full analysis in DEPT experiments. $2\frac{1}{2}$

13. (a) Differentiate between the homonuclear correlation spectroscopy and heteronuclear correlation spectroscopy. Illustrate your answer. $2\frac{1}{2}$

(b) Explain the principles of mass spectrometry. $2\frac{1}{2}$

14. (a) Taking a suitable example explain how is mass spectrometry helpful in determining the molecular formula of the analyte. $2\frac{1}{2}$

(b) List any *three* advantages of the hyphenated techniques. Give any *two* examples of interfaces used in these techniques. $2\frac{1}{2}$

15. (a) Name the different X-ray scattering techniques and state the specific use of each of these. $2\frac{1}{2}$

(b) Describe in brief the ways of plotting a 2D NMR spectrum. Illustrate your answer. $2\frac{1}{2}$

16. (a) Explain Bragg's law of X-ray diffraction technique. $2\frac{1}{2}$

(b) Describe in brief any *two* characteristic features of ^{13}C NMR spectroscopy. $2\frac{1}{2}$

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