

**Ph.D. IN CHEMISTRY
(PHDCHEM)**

Term-End Examination

December, 2022

**RCH-003 : ANALYTICAL TECHNIQUES IN
CHEMISTRY-II**

Time : 3 hours

Maximum Marks : 100

Note : *Answer all the questions.*

1. Differentiate between the following : 10

(a) Chromatograph and Chromatogram.

(b) Column and Flash chromatography

Illustrate your answers with appropriate diagrams.

2. What is the significance of Plate theory in liquid chromatography ? What are its benefits and shortcomings ? 10

Illustrate your answer with appropriate diagrams.

3. Which out of packed and capillary columns is preferred in gas chromatography and why ? Explain the purpose of derivatisation in this technique and give two examples. 10
4. What is Isocratic and Gradient Elution ? Describe the role of weak and strong mobile phases during elution in liquid chromatography. 10
5. What is Mössbauer spectroscopy ? Explain the Mössbauer parameters, with suitable examples and diagrams. 10
6. Explain hyperfine interactions in the context of EPR spectroscopy. Which nuclei will interact in this spectroscopy ? Draw the EPR spectrum of benzene radical anion, giving justifications. 10
7. Explain the following terms with respect to EPR spectroscopy : 2×5=10
- (a) g values
 - (b) Anisotropy
8. With the help of a suitable example, explain Miller indices. How does the X-Ray crystallographic technique help in structure elucidation ? 10

9. In X-Ray diffraction, how can the number of peaks be modified ? How do you infer whether the crystal is fcc or bcc ? 10
10. With the help of suitable examples, give the differences between SEM and TEM methods. 10

OR

Explain the different surface analytical techniques. 10
