

- a) Shape and density
- b) Density and volume
- c) Shape and size
- d) Shape and elemental composition

3. Choose the most commonly used mineral in polarizer for circular dichroism CO2 [K1]

- a) Magnetite
- b) Mica
- c) Calcite
- d) Quartz

4. Match the analytical instrument List I with List II CO2 [K4]

List I	List II
A. UV -Visible spectrophotometer	i. Excitation and Absorption properties
B. IR spectrophotometer	ii. Size of the particles
C. Nephelometer	iii. Functional groups
D. Fluorometer	iv. Absorption properties

- a) A-i, B-iii, C-ii, D-iv
- b) A-iv, B-iii, C-ii, D-i
- c) A-iv, B-ii, C-iii, D-i
- d) A-i, B-ii, C-iii, D-i

5. Although Electrospray ionization (ESI) is an easy method to generate ions for mass spectrometric analysis, it is NOT the most suitable ionization methods for biomolecular analysis. State is the reason. CO3 [K3]

- a) Time consuming process
- b) Biomolecules are dissociated during the spraying process
- c) Cannot be integrated with Liquid chromatography
- d) Costly

6. If the number of neutrons plus the number of protons is odd, then the nucleus has overall spin of CO3 [K3]

- a) No spin
- b) Integer spin
- c) a half-integer spin
- d) Either half integer or integer spin

7. Assertion (A): The retention (or capacity) factor (k) is a means of measuring the retention of an analyte on the chromatographic column. CO4 [K4]

Reason (R): A compound having high k value will get eluted first.

- a) Both A and R are true, R is the explanation for A
- b) Both A and R are true, R is NOT the explanation for A
- c) A is true R is false
- d) A is false R is true

8. An isocratic elution in HPLC is one in which the composition of the solvent... CO4 [K3]

- a) Constant
- b) Changes in series of steps
- c) Changes continuously
- d) Mixed solvents flow

23. Elaborate on the instrumentation and principle of MALDI-ToF mass spectrometer with neat sketch. 5 CO3 [K2]
24. How does proton NMR help to predict the structure of organic molecules? And add note on the following (i) solvents used for preparation of sample (ii) Role of TMS in NMR result interpretation. 3 + 2 CO3 [K3]
25. You are working on project involving essential oil extraction from a medicinal plant. As part of this project, you are informed to purify and characterize the various compounds (essential oils) from the source. Which type of chromatography you will employ and explain its principle, instrumentation. 5 CO4 [K3]
26. Explain the sequential steps involved in “Gating” of flow cytometry result with suitable illustrations. 5 CO5 [K_L]

**Answer any FOUR Questions
PART D (4 x 10 = 40 Marks)**

27. Elaborate on detection proteins using fluorescent microscopy. 10 CO1 [K2]
28. UV-Visible spectrophotometer is one of the most widely used analytical method for characterization of compounds. Design and explain an experiment where the above instrument is used. 10 CO2 [K3]
29. Summarize the steps involved in prediction of unknown protein using “peptide mass fingerprinting (PMF)” data. 10 CO3 [K₂]
30. How is tandem mass spectroscopy used to get the m/z data for structure prediction? Illustrate the production and selection of precursor ion and product ion. 10 CO3 [K₃]
31. Write the significance of “ cell counting and identification” in disease diagnosis and treatment using flow cytometer. 10 CO5 [K₂]
