

- N.B. : (1) All questions are compulsory
 (2) Use of log table or nonprogrammable calculator is permitted.

1. (a) Attempt any Two of the following : 8
 (i) What is C^{13} NMR ? What are its advantages over normal NMR ?
 (ii) Discuss the applications of Near-IR absorption spectroscopy.
 (iii) Explain term precession of particles in a field involved in NMR spectroscopy.
 (iv) Give an account of mono-chromators used in IR spectrometer.
 (b) What are group frequencies? Discuss their use for identification of chemical compounds with suitable examples. 4

OR

- (b) Give applications of NMR in a quantitative analysis of the compounds. 4
2. (a) Attempt any Two of the following : 8
 (i) Explain determination of molecular weight and molecular formula of organic sample by using mass spectrometer.
 (ii) Describe the working of FT Raman spectrometer with a schematic diagram.
 (iii) Discuss the function of chemical ionization sources in mass spectrometer.
 (iv) Write note on surface-enhanced Raman spectroscopy.
 (b) Explain the use of resonance Raman spectroscopy for the study of biological molecule under physiologically significant conditions. 4

OR

- (b) Explain origin of meta-stable peaks in mass spectroscopy. 4
3. (a) Attempt any Two of the following : 8
 (i) Describe the different types of thermometric titration with suitable examples.
 (ii) What are radio release methods? Explain the role of radioactive kryptonates in radio release method.
 (iii) Describe the working of the Instrument used in DSC.

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(iv) Sketch the plot for the titration of radioactive silver as titrant with inactive chloride. If 10cm^3 of an unknown sample was used for the titration and equivalence point was obtained 5.7cm^3 of 0.1M solution of silver tagged with radioactive silver of negligible mass. Calculate the concentration of chloride in solution [Atomic wt. of Cl = 35.5]

(b) What is meant by substoichiometry in IDA? What are the requirements for the tracers employed in this technique? 4

OR

(b) Describe the working of instrument used in DTA with suitable diagram. 4

4 (a) Attempt any Two of the following : 8

(i) Explain the principle and working of ICP-OES.

(ii) Discuss the principle of GC-MS.

(iii) What is MS-MS coupling? What are the interfaces available for this purpose?

(iv) How is GC coupled with IR ?

(b) Give principle and working of HPLC-MS. 4

OR

(b) What are the interfaces available for ICP-MS? Discuss the applications of ICP-MS. 4

5. Attempt any Four of the following : 12

(i) Explain the method of handling of solid samples in Raman Spectroscopy.

(ii) What are the advantages of FTNMR measurement over a continuous wave measurement?

(iii) Explain the principle of Far-Infrared Spectroscopy.

(iv) Discuss the applications of mass spectroscopy.

(v) What is autoradiography ? How is it applied for a metallurgical specimens.

(vi) What is hyphenation ? Explain the need of it.

(vii) Draw a neat labeled diagram of the instrumentation used in X-ray radiography.

(viii) What are the applications of evolved gas analysis?