

Time: Three hours

Maximum : 80 Marks

Answer **ALL** questions

PART A - (8 X 2 = 16 marks)

1. Which properties amount the following is false about electromagnetic waves?
 - A. The energy in an electromagnetic wave is divided equally between electric and magnetic vectors.
 - B. Both electric and magnetic field vectors are parallel to each other and perpendicular to the direction of propagation of the wave.
 - C. These waves do not require any material medium for propagation
 - D. Both electric and magnetic field vectors attain the maxima and minima at the same place and the same time
2. Photo conductors to be used in infrared are constructed from.
 - A. Lead sulphate
 - B. Lead selenide
 - C. Germanium
 - D. All are correct
3. For the identification of the following ions a high resolution mass spectrometer is required.
 - A. $C_2H_4^+$
 - B. N_2^+
 - C. CO^+
 - D. All
4. Synthetic ion exchange resins have widely been used for
 - A. Water softening
 - B. Water deionization
 - C. Ion separation
 - D. All
5. Sampling for quantitative infrared measurements is more difficult than in the UV and visible regions. Why?
6. Most absorption bands in the visible-UV spectra are very broad. Give reason.
7. Majority of mass spectral applications involve positive ions only. Why?
8. Channeled or loosely packed columns provide poor or insufficient separation. Why?

PART B - (4 X16 = 64 marks)

09. (a) Name the electrical signals that are considered analog. How is the information encoded in an analog? (16)

(OR)

- (b) Describe the differences between the following and list any particular advantages possessed by one over the other. (16)
- Hydrogen and deuterium discharge lamps as sources for ultra violet radiation.
 - Filters and monochromators as wavelength selector
 - Photovoltaic cells and phototubes as detectors for electromagnetic radiation.
 - Photodiode and photomultiplier tubes

10. (a) Discuss some of the challenges and considerations associated with sample preparation in FTIR spectroscopy. (16)

(OR)

- (b) Why molecules absorb in UV-Vis region? What are the types of electromagnetic transitions that can occur in a molecule? Discuss giving examples. (16)

11. (a) The amount of energy available in radio frequency radiation is sufficient for affecting the nuclear spin of an atom. It constitutes the most fundamental part of spectroscopy. Elucidate the above in detail. (16)

(OR)

- (b) Give the high resolution proton NMR spectrum of (16)
- Ethyl methyl ether.
 - Cyclohexane
 - Ethyl benzene
 - Toluene

12. (a) Mass spectrometry is an extremely versatile detection system for gas chromatography. However, interfacing an HPLC system to a mass spectrometer is a much more difficult task. Point out the major reasons for the difficulties in combination of HPLC with mass spectrometry than gas chromatography with mass spectroscopy? (16)

(OR)

- (b) Name the instruments involved in voltammetry, and select a suitable method of voltammetry for the analysis of anyone model sample. (16)