

Time: $2\frac{1}{2}$ hrs

Marks: 60

Please check whether you have received the right question paper

- Note:** 1) All questions are compulsory
 2) Figures to right indicate full marks
 3) The use of log-table/nonprogrammable calculator is allowed.

- Q 1** **A** Answer any **TWO** of the following (8)
- Name the different types of detectors used in gas chromatography. Explain mechanism of any one detector.
 - Give the classification of chromatographic techniques based on mobile and stationary phases involved.
 - Explain the following terms with respect to chromatography: -
 a. HETP b. Resolution
 - Discuss in brief "Ion chromatography"
- B** Answer any **ONE** of the following (4)
- Explain the use of mass spectrometer as detector in chromatography.
 - Give a brief account of sample injection system in gas chromatography.
- Q 2** **A** Answer any **TWO** of the following (8)
- Describe powder method and rotating crystal method used in X-ray diffraction analysis.
 - Give an account of Fast atom bombardment source used in mass spectrometry.
 - Describe the construction and working of quadrupole mass analyzer with suitable diagram.
 - What are different types of isotopic dilution methods? Explain any one in detail.
- B** Answer any **ONE** of the following (4)
- Discuss wavelength dispersive instrument used in X-ray fluorescence spectroscopy.
 - Describe chemical ionization source used in mass spectrometry with its advantages and limitations.
- Q 3** **A** Answer any **TWO** of the following (8)
- Explain the working principle of Scanning Tunneling Microscope (STM).
 - Explain the working of electron spectrometer used in ESCA.
 - What is Auger Electron? How is it produced?

- d With the help of schematic diagram explain the functions of each component of Scanning Electron Microscope.

B Answer any **ONE** of the following

(4)

- a Explain Inductively coupled plasma source with a suitable diagram.
b Make a comparison between ICP-AES and AAS

Q 4 A Answer any **TWO** of the following

(8)

- a Write note on – “ Bio-catalytic membrane electrodes”
b Discuss instrumentation of controlled current Coulometry.
c What are the various factors affecting the nature of deposit in electrogravimetry?
d What are ion selective electrodes? How are they classified?

B Answer any **ONE** of the following

(4)

- a An organic substance is reduced polarographically. A $1 \times 10^{-3} \text{ M dm}^{-3}$ solution gave the diffusion current of $23.7 \mu\text{A}$ with a mercury flow rate of 3.4 mg S^{-1} and drop time of 2.7 sec. If the diffusion coefficient of the compound is $0.9 \times 10^{-5} \text{ cm}^2 \text{ s}^{-1}$, calculate the number of electrons transferred in the reduction reaction.
b Calculate the time required to deposit 0.125 gm. of Co (II) as elemental cobalt on the cathode surface, on passing the constant current of 0.426A, through the solution.

[Given – assume 100% current efficiency, 1 Faraday = 96500 coulombs and At. Wt of Co = 58.9]

Q 5 Answer any **four** of the following

(12)

- a Explain the effect of mass transfer between the phases on band broadening.
b Write a short note on diode array detector used in HPLC
c Explain the basic principle of mass spectrometer.
d Explain the terms with respect to X-ray spectroscopy: -
a. Absorption edge
b. Mass absorption coefficient
e Discuss the applications of Auger Electron Spectroscopy.
f What is the principle of Transmission Electron Microscope?
g Write a note on - Effect of complex formation on polarographic wave.
h Give applications of enzyme and gas sensing electrodes.
