2 1/2 hrs (60 Marks)

Note: 1 Please check whether you have received the right question paper
2. All questions are compulsory
3.. Figures to right indicate full marks
4. The use of log-table/nonprogrammable calculator is allowed.

Q 1 A Answer any **TWO** of the following (8)

a Explain the following terms with respect to chromatography: -
a. HETP b. Resolution

b Describe: "fluorescence detector" used in HPLC. Give its applications.

c Give an account of the stationary phase of GLC.

d Write note on "Normal and reversed phase chromatography in HPLC.

B Answer any **ONE** of the following (4)

a Explain the use of mass spectrometer as detector in chromatography.

b Discuss in brief " Chiral Chromatography"

Q 2 A Answer any **TWO** of the following (8)

a Describe the construction and working of ion - trap mass analyzer with suitable diagram.

b Give an account of chemical ionization source used in mass spectrometry with its advantages and limitations.

c What are different types of isotopic dilution methods? Explain any one in detail.

d Write note on : "powder method" and "rotating crystal method" used in X-ray diffraction analysis.

B Answer any **ONE** of the following (4)

a With the help of neat labeled diagram describe gas filled transducer used in X – ray spectroscopy.

b Explain the basic principle of mass spectrometer.

Q 3 A Answer any **TWO** of the following (8)

a What is tunneling Microscope? How is it used for surface analysis?

b Give the principle of "ESCA".

c Write note on "Transmission Electron Microscope (TEM)"

d What is Auger Electron? How is it produced?

B Answer any **ONE** of the following (4)

a Explain typical inductively coupled plasma source with suitable diagram.

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b Distinguish between Atomic emission and atomic absorption spectroscopy.

Q 4 A Answer any **TWO** of the following (8)

a Distinguish between controlled potential and controlled current Coulometry.

b What are bio catalytic membrane electrodes and enzyme based bio sensors?

c Write a note on - "effect of complex formation on polarographic wave".

d What is ion selective field effect transistors? Give their applications.

B Answer any **ONE** of the following (4)

a Calculate the diffusion current of a polarographic wave for 1×10^{-3} M dm^{-3} solution of divalent metal ions, if the mercury flow rate is 3.4 mg S^{-1}, drop time of 2.7 seconds and the diffusion coefficient of the compound is 0.9×10^{-5} cm^2s^{-1}.

b When a constant current of 0.175 A was passed for 15 minutes through an electrolytic cell, copper was deposited at cathode and oxygen was librated at the anode. What will be the amount of copper deposited at the cathode?
[1 Faraday = 96500 Coulombs, At. Wt of Cu = 63.54]

Q 5 Answer any **four** of the following (12)

a Describe the working of a detector, which is selective for the determination of pesticide containing phosphorous, by gas chromatography.

b Describe the different types of open tubular columns used in gas chromatography.

c Discuss wavelength dispersive instrument used in X-ray fluorescence spectroscopy.

d Give applications of single isotope dilution method

e Explain the working of SEM. Give its applications.

f What are the advantages and limitations of Atomic Absorption Spectroscopy.

g Discuss the advantages of typical wire net cylindrical design of cathode in electrogravimetry.

h Describe a gas sensing probe used in determination of dissolved CO_2 in a sample solution using schematic diagram.

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