[Time: 2½ Hours]   [Marks: 60]

Please check whether you have received the right question paper.

N.B.   1) All questions are compulsory.
              2) Figures to the right indicate full marks.
              3) Use of logarithmic table/non programmable calculator is allowed.

Q.1 **A)** Attempt **any two** of the following:

a) Give a comparative account of different types of detectors used in gas chromatography with emphasis on
(i) the mechanism of operation   (ii) advantages and limitation **4**

b) Discuss the classification of chromatographic techniques based on phases involved. **4**

c) Discuss in brief, 'Chiral chromatography' **4**

d) Give a brief account of the variables that affect the column performance in chromatography. **4**

B) Attempt **any one** of the following:

a) What is van Deemter equation? Explain the effect of mass transfer between the phases on band broadening. **4**

b) Explain the use of mass spectrometer as a detector in chromatography. **4**

Q.2 **A)** Attempt **any two** of the following:

a) With the help of labeled diagram, describe lithium drifted silicon detector used in X-ray spectroscopy. **4**

b) Describe chemical ionization source used in mass spectrometry. Give its advantages and disadvantages. **4**

c) Discuss wavelength dispersive instrument used in X-ray fluorescence spectroscopy. **4**

d) What are different types of isotopic dilution method? Explain any one in detail. **4**

B. Attempt **any one** of the following:

a) With the help of a neat labeled diagram, explain the principle of mass spectrometer. **4**

b) Describe following techniques with respect to compensation of matrix effect in X-ray spectroscopy
            i) External standard calibration
            ii) Use of internal standard **4**

Q.3 **A)** Attempt **any two** of the following:

a   Explain the principle of Scanning Tunneling Microscope. **4**

b   Discuss the applications of Auger Electron Spectroscopy. **4**

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c	Draw a schematic diagram of Scanning Electron Microscope and explain the function of each component.	4
d	Give the principles of ESCA.	4

B) Attempt **any one** of the following:

a)	What are the various chemical interferences encountered in AAS? How are they minimized?	4
b)	Explain typical inductively coupled plasma source with suitable diagram	4

Q.4 A) Attempt **any two** of the following:

a)	What are ion selective electrodes? How are they classified? In what respect they differ from other metallic electrodes?	4
b)	Derive Ilkovic equation starting with Cottrell equation	4
c)	How ion selective field effect transistors are useful in determination of pH?.	4
d)	Explain in detail controlled potential electrogravimetry.	4

B) Attempt **any one** of the following:

a)	A constant current 0f 0.750 A was used to deposit copper at cathode and oxygen at the anode of an electrolytic cell. Calculate the mass of each product that was formed in 14.5 minutes. Assuming that no other redox reactions occurs. (Given: I Faraday = 96500 Coulombs. At. Wt. Cu = 63.55, O= 16)	4
b)	Calculate the concentration of Pb^{+2} solution which gave a diffusion current of 64μA. (Given: Diffusion coefficient for Pb^{+2} = 8.7 x $10^{-5}cm^2s^{-1}$, Rate of flow of mercury drops = 3.5 mg s^{-1}, drop time = 3.2 s)	4

Q.5 Attempt **any four** of the following: **12**

a) Describe the plate theory of chromatograohy

b) What are the desirable properties of the liquid phase in GLC.

c) Describe powder method used in X-ray diffraction analysis.

d) Explain the terms i) absorption edge   ii) Mass absorption coefficient used in X-ray spectroscopy.

e) Explain a three electrode direct current plasma source.

f) Give the principle of Transmission Electron Microscopy

g) What is coulometry? Explain its principle.

h) Explain the effect of complex formation on polarographic wave.

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