Total No. of Questions : 6]

SEAT No. :

P2025

[Total No. of Pages : 3

[4923] - 415
M.Sc. - II
ANALYTICAL CHEMISTRY
CHA - 490 : Analytical Spectroscopy
(2013 Pattern) (Semester - IV)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate Answer books.***
2) ***All Questions are compulsory.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic table/Non - programmable calculator is allowed.***

SECTION - I

Q1) Answer the following questions: **[10]**

a) Explain the term electron shakeup and electron shakeoff.

b) Give the application of ESCA.

c) Draw the schematic diagram of X-ray tube.

d) Distinguish between flat crystal monochromator and curved crystal monochromator.

e) What are the limitation of human eyes? How it overcome by X-ray microscopy?

Q2) Attempt any two of the following: **[10]**

a) What is Bremsstrahlung? Draw and explain the typical X-ray absorption spectrum.

b) Draw the schematic diagram showing the essential components of ESCA. How the beam of electron is analysed with the help of magnetic field?

P.T.O.

c) What is TEM? Discuss the construction and working of TEM.

d) The time was recorded for the copper analyte and the Standard to yield a detector count of 7500 by X-ray fluorescence. The 100 ppm standard reached 7500 counts in 29.3 s and the analyte reached the count in 15.8 s. Determine the concentration of copper in the analyte.

Q3) Attempt any one of the following: **[5]**

a) Explain with schematic diagram the difference between the wavelength dispersive and Energy dispersive X-ray fluorescence.

b) The 1 ‘s’ electron of Na ion has binding energy of 1072.0 eV. Estimate the work function of electron spectrometer if incident radiation is the K_α line of magnesium and kinetic energy of measured electron is 176.7eV.

[Given : Plancks constant = 6.625×10^{-34}Js. λ for MgK_α = 1.89 $\mathring{A}$].

SECTION - II

Q4) Answer the following questions: **[10]**

a) What is luminescences? Enlist the different type of luminescences.

b) Define and explain luminescences efficiency.

c) Explain the term-E-type delayed fluorescence and p-type delayed fluorescence.

d) Enlist the various solvent used in NMR.

e) Why TMS is used as reference in NMR?

Q5) Attempt any two of the following: **[10]**

a) What is chemiluminescence? Explain the phenomenon of electrochemiluminescence.

b) Discuss the qualitative and quantitative analysis of NMR spectroscopy.

c) Draw labled diagram of a instrument used to measure photoluminescences and discuss its major components.

d) The ^1H NMR of a compound with empirical formula $C_5H_{10}O_2$ shows doublet at δ 1.2, singlet at δ 2.0, and multiplet at δ 5.0. The integration of each peak shows 6 : 3 : 1 ratio respectively. Identify the compound.

Q6) Attempt any one of the following: **[5]**

a) What is 2-D NMR? Explain in brief HETCOR and COSY.

b) The standard addition technique was used for the fluorometric assay of a Al^{3+} sample. From the data listed in the table, calculate the concentration of Al^{3+} in the sample.

Added Conc^n (mM) of Al^{3+}	Fluorescence Intensity
0	3.8
1.20	5.5
2.50	7.2
4.04	9.5
6.00	12.2
7.50	14.3