Total No. of Questions : 4] **SEAT No. :**

P1372 **[Total No. of Pages : 3**

[5123] -62
M.Sc -II (Semester - IV)
ANALYTICAL CHEMISTRY
CH -490: Analytical Spectroscopy
(2008 Pattern)

Time : 3 Hours] ***[Maximum Marks : 80***

Instructions to the candidates:

1) ***All questions are compulsory and carry equal marks.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of logarithmic table/non-programmable calculator is allowed.***

SECTION -I

Q1) Attempt any four of the following. **[20]**

a) What are ESCA satellite peaks? Why do we get satallite peaks?

b) What are transducers? Explain with schematic diagram principle and working of pneumatic detector.

c) Draw schematic diagram, explain the working of single beam spectrophotometer.

d) What are monochromators? Explain the working of prison as a monochromator.

e) The molar absorptivity of $KMno_4$ is 1.5×10^4 lit $mole^{-1}cm^{-1}$ in a1.00cm cell at 520nm. The transmittance of solution is 90% calculate the concentration of Km_no_4 solution.

Q2) Attempt any four of the following. **[20]**

a) Enlist the diffraction methods of crystal structure analysis. Describe the Braggs method for crystal analysis.

b) What is chemiluminescence? Explain the use of gas phase chemiluminescence in analysis.

P.T.O

c) Write a short note on chemiluminescence titrations.

d) An ESCA electron was found to have kinetic energy of 1054.5 ev, when ejected with Al, kα source (λ=8.34Å) and measured on spectrometer with work function 9-8 ev. Calculate the binding energy of electron.

[Given: Plancks constant = 6.625×10^{-34}Js;

Velocity of light = 3×10^{8} m/s]

e) A crystals of unknown compound was exposed to kα line of copper at 1.542Å, diffracted at an angle 28.5^{0} relative to the crystalline surface for first order diffraction. Calculate the spacing between the adjecent layers of nuclei in the crystal.

SECTION -II

Q3) Attempt any four of the following. **[20]**

a) Discuss the quantum theory of NMR spectroscopy.

b) Explain the following terms:

i) Chemical shifts in NMR

ii) Coupling constant in NMR

c) Draw a schematic diagram of NMR spectrometer. Explain the working of its components.

d) Calculate the number of multiplet for each proton and their relative peak areas in the NMR spectrum of CH_3 CHBr CH_3

e) A proton appears at a quartet at 4.5 δ with coupling constant 6 Hz on a 300 MHz instrument, indicates the line position in Hz of each line and give its relative intensities.

Q4) Attempt <u>any four</u> of the following. **[20]**

a) Discuss ENDOR and ELDOR techniques in EPR spectroscopy with suitable examples.

b) Explain the terms: fine splitting, hyper fine splitting, and super hyperfine splitting in EPR spectra.

c) Describe with suitable examples, the applications of EPR spectroscopy in qualitative analysis.

d) Discuss the principle of electron microscopy and give its important applications.

e) Calculate the resonance frequency of a free electron in a magnetic field of 250 kg.

[Given: g = 2.0023, $\mu_e = 9.285 \times 10^{-24}$ JT^{-1}]

▲ ▲ ▲