Total No. of Questions :4]

SEAT No. :

P1878

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

Time : 3 Hours] *[Max. Marks : 80*

Instructions to the candidates:

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

SECTION-I

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

a) Enlist the electromagnetic spectral regions that are useful for chemical analysis with electromagnetic radiation spectrum.

b) Explain the terms :

i) Molar absorptivity

ii) Radiant power

c) Give principle of ESCA with schematic diagram explain essential components of ESCA instrument.

d) Calculate the mass absorptive coefficient of an alloy which consists of 60% Zn, 32% Fe and 8% Cu. The mass absorptive coefficient for pure elements are 840, 570 and 740 cm^2/gm respectively for Zn, Fe and Cu.

e) Calculate the molar extinction coefficient of 1.30×10^{-4} M solution, which shows 45% transmittance in a 0.9 cm cell.

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

a) What is meant by x-ray fluorescence? With schematic diagram explain energy dispersive x-ray fluorometer.

b) Explain the principle of chemiluminescence? Mention their types. Give an account of chemiluminescence titrations.

c) Draw and explain the energy level diagram of x-ray induced electron emission.

d) Write a short note on electro-chemiluminescence.

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e) Calculate 1S electron binding energy of nitrogen in tetra methyl ammonium ion from the incident x-ray photon that was used to create the inner shell vacancy had a wavelength of 1.90Å. The work function of spectrometer was 7.2 eV and the kinetic energy of measured electron was 802.1 eV. (Given : h = 6.626×10^{-34} J.s, C = 3×10^{8} m/s)

SECTION-II

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

a) Write note on ^{31}P and ^{19}F in the field of biochemistry.

b) Explain the following term :

i) Coupling constant in NMR spectroscopy.

ii) Solvent used in NMR spectroscopy.

c) Write note on nuclear Overhauser effect.

d) Calculate energy of radiation that is required for excitation in each of the following two allowed transitions for a ^{14}N nucleus if applied field has flux density of 10,000 G. [For N, $\mu = 0.40357$, $m_I = 1$, $\beta = 5.0505\times10^{-31}$ J/G, I = 1].

e) Determine the ratio of the number of ^{19}F nuclei in the upper energetic level to lower energetic level at 25°C in a magnetic field with flux density of 15,000 G [$\mu = 2.6272$, I = ½, $\beta = 5.0505\times10^{-31}$J/G, $k = 1.381\times10^{-23}$J/k].

Q4) Attempt any **four** of the following : **[20]**

a) Explain the following term in ESR.

i) g-factor

ii) hyperfine splitting

b) Write note on magic T.

c) Explain principle of ESR. Explain Instrumentation used in ESR.

d) With suitable example give any two applications of ESR.

e) If a resonance was observed for an unpaired electron at a magnetic flux density of 0.33T and frequency of 9.5 GHz. Calculate '*g*' factor for unpaired electron.

(Given : h = 6.626×10^{-34}Js, Be = 9.285×10^{-24} J/T).

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