PC-964/MH

BS/2051

SPECTROSCOPIC TECHNIQUES–II

Paper–C-10-BHB-19

(Semester–IV)

Time : Three Hours]   [Maximum Marks : 74

Note : Attempt *two* questions each from Section A and B. Section C will be compulsory.

SECTION–A

I.   (a)   What is spectroscopy? Explain the types of electronic transitions.   (4)

     (b)   Discuss Frank Codon Principle involving in electronic transitions.   (5)

     (c)   How will you evaluate the absorption intensity for electronic spectroscopy?   (2)

II. (a)   Discuss the radiative and non-radiative transitions take place in emission spectroscopy.

     (b)   What do you mean by fluorophores? How will you calculate the quantum yield of a fluorescent process?

                                                          (6+5)

III. (a) Explain Kasha's rule of the quantum yield of Luminescence.

(b) Draw the well labeled diagram of jablonski with explanation. (5+6)

IV. (a) Classify the electronic transitions and elaborate the selection rule of it. (4)

(b) Determine the term symbol for Ni^{2+}, Ce^{3+}, Zn^{2+}, Eu^{2+}. (4)

(c) The energy difference between the two electronic states is 23.06 kcal/mole. What will be the frequency of radiation absorbed when the electronic transition occurs from lower energy state to the higher energy state? (3)

SECTION–B

V. (a) Elaborate Ultravioler photoelectron spectroscopy (UPES). (5)

(b) What do you mean by photoelectron effect? Discuss in detail the electron binding energy in case of X-ray photoelectron spectroscopy. (6)

VI. (a) Write a short note on gyromagnetic ratio. (3)

(b) Discuss the magnetic properties of electron like particles in EPR spectroscopy. (4)

(c) What is the main principle of Auger electron spectroscopy? (4)

VII. (a) Indicate the type of protons and their multiplicity in the proton NMR spectra of following compounds $C_3H_3Cl_5$, $C_4H_{10}O$, $C_4H_8O_2$, C_3H_7Cl. (5)

(b) Describe Stern-Gerlach's experiment. (6)

VIII. (a) What do you mean by coupling constant? What are the factors affecting coupling constant? (5)

(b) How the magnetic moment of nucleus can be predicted with NMR spectroscopy? (4)

(c) Define Larmor frequency. (2)

SECTION–C

IX. All questions are compulsory :

(a) Calculate the energy associated with a radiation having wavelength 6000 A°. Give your answer in Kcal/mole and in KJ/mole.

(b) Deduce the structure for the compound that fit the following proton NMR data $C_5H_{10}O$ δ 0.95, 6H doublet; δ2.10 3H singlet; δ2.43 1H multiplet.

(c) Why is the charge transfer transition of Gd^{3+} not seen in solids?

(d) What is Russel Saunders spin-orbit coupling?

(e) Define stake's shift and antistoke's shift.

(f)   What is the principle of photoelectron spectroscopy?

(g)   What is deactivation and de-excitation process?

(h)   Define chemical shift.

(i)   Define shielding and deshielding effect.

(j)   Define binding energy.

(k)   Why the transition elements are colored in nature?

(l)   What do you mean by Phosphorescence?

(m) Find the ground state term symbol of d^2 system.

(n)   What is the chemical scale?

(o)   What do you mean by Laporte selection rule ?

$(15 \times 2 = 30)$

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