M.Sc.(Chemistry) (Part - II) (CBCS Pattern) Fourth Semester CBCS

PSCHT13 / MSc 2431 - Spectroscopy Paper - XIII

P. Pages : 3 **GUG/W/18/11448**

Time : Three Hours * 3 5 3 6 * Max. Marks : 80

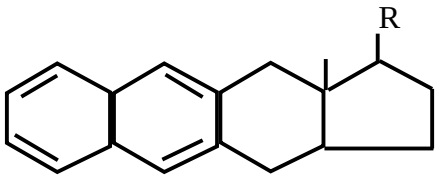
Notes : 1. All questions are compulsory
2. All questions carry equal marks.
3. Use of calculator is allowed.

UNIT – I

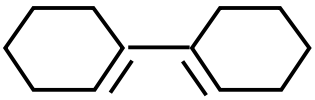
1. a) State the principle of Beer-Lambert Law, and explain detail what are the limitations of Beer – Lambert Law. **8**

b) Explain the Fiesher Woodward rules for dienes? And also calculate the λ_{max} value for the following compounds? **8**

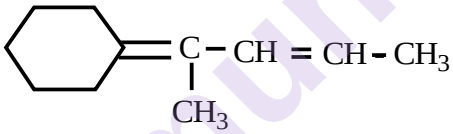
i)



ii)



iii)



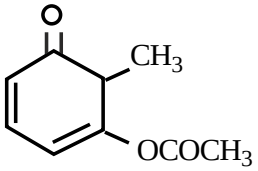
OR

c) State and explain the Auger electron spectroscopy. **4**

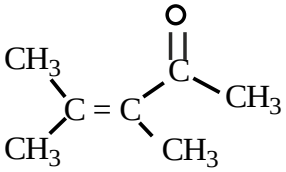
d) Discuss the basic principle and chemical information from ESCA. **4**

e) Calculate the λ_{max} value using Fiesher Woodward rules. **4**

i)



ii)



f) Explain the effect of solvent on various electronic transition. **4**

2. a) Explain the following terms: **8**

i) Deuterium exchange reaction.

ii) Shielding mechanism with suitable example.

b) Discuss the 31_P NMR Spectroscopy in details. **8**

OR

c) Explain Geminal and vicinal coupling with suitable examples. **4**

d) Explain the hybridization effect on NMR spectroscopy. **4**

e) Explain the magnetic Anisotropy effect with example. **4**

f) Explain the spin-spin interaction with example. **4**

3. a) A sample of Dacron (Terylene) and a sample of Nylon were hydrolyzed and in each case the single carbozylic acid component was isolated from the reaction mixture. Deduce the structure of these two acidic compounds from their spectral data: **8**

From Dacron (Terylene)

Molecular formula $C_8H_6O_4$

Proton NMR : δ 8.2 (4H, S), 12.5 (1H, Broad singlet),

13_C NMR : δ 130 (4c, d), 140 (2c, s), 176 (2c, s)

From Nylon

Molecular formula $C_6H_{10}O_4$

Proton NMR : δ 1.5 (4H, distorted triplet),
2.3(4H,distorted triplet),
11 (1H, broad singlet)

13_C NMR : δ 26 (2c, t), 37 (2c, t), 182 (2c, s)

b) Discuss the following terms: **8**

i) Solvent used in NMR

ii) Nuclear overhauser effect (NOE)

OR

c) Explain the application of NMR spectroscopy. **4**

d) Explain the INERT technique in brief. **4**

e) Identify the compound with molecular formula C_3H_7NO with shows following data. **4**

i) UV : 238 nm E_{max} 10500

ii) IR : 3428 (m), 2940 – 2855 (w),
1681 (s) and 1452 cm^{-1} (w)

iii) NMR : 8.13 δ singlet (1H);
2.70 δ singlet (3H), and
1.9 δ singlet (3H)

f) i) Three isomeric dimethyl cyclopropens gives respectively two, three and four NMR signals. Draw a stereoisomeric formula for the isomer giving rise to each number of signals **4**

ii) How many NMR signals would you expect from cyclohexane? why?

4. a) Discuss the Laue method of x-ray analysis and Bragg's law is used to determine the structure of crystal in x-ray diffraction. **8**

b) Explain the magnetic scattering and elucidation of structure of magnetically ordered unit cell. **8**

OR

c) Derive the wierl equation of electron diffraction technique. **4**

d) How Bragg's x-ray spectrometer method is used in the determination of crystal structure. **4**

e) The glancing angle for the first order x-ray reflection from a given lattice plane is 9.8°. Calculate the glancing angle for the second order reflection from the same plane. **4**

f) Give the identification of unit cell from the systematic abscence in the diffraction pattern? **4**

5. a) Give the application of U.V. spectroscopy. **2**

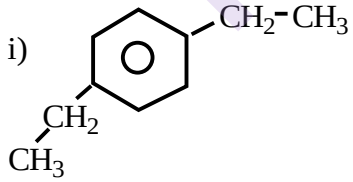
b) Draw the diagram of NMR spectrophotometer. **2**

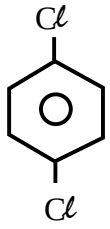
c) State the principle of Photo-electron spectroscopy. **2**

d) Explain chemical shift. **2**

e) How will you differentiate between Propanal and Propanone by using NMR. **2**

f) Show the total numbers of NMR signals in the following compounds. **2**

i) 

ii 

g) What is Miller indices. **2**

h) Give the application of LEED. **2**

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