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

PSCHT13 - Paper-XIII : Spectroscopy

P. Pages : 3 **GUG/W/23/11448**

Time : Three Hours * 6 4 4 4 * Max. Marks : 80

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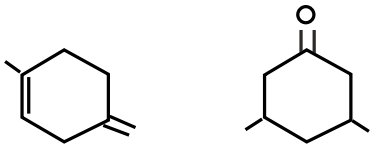
1. a) Explain Fisher-Woodward rules with suitable examples and calculate values of λ_{max} - from the following molecules. **8**

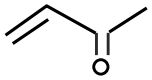


b) What is photoelectron spectroscopy. Explain its application related to the structure determination. **8**

OR

c) Write note on Auger electron spectroscopy. **4**

d) Explain all possible electronic transition in a given molecule **4**



with suitable diagram.

e) How will you differentiate between structural isomers on the basis of UV-Vis spectroscopy? **4**

f) How will you get chemical information from ESCA? **4**

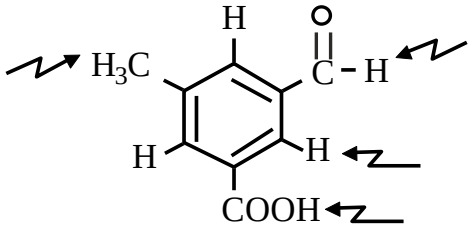
2. a) Explain the principle of NMR spectroscopy & conditions for Nuclei to be NMR active and inactive. **8**

b) What is coupling constant? How Karplus equation is effective for coupling constant with dihedral angle. **8**

OR

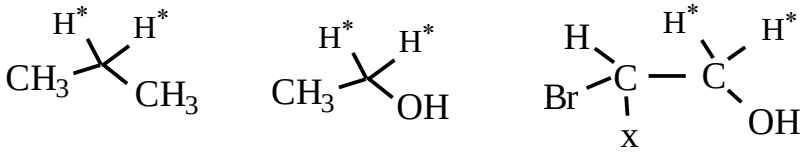
c) Differentiate between first order and second order spectra. **4**

d) Do correct pairing of chemical shift values with protons C hydrogen atom. **4**



7.0 ppm
9.0 ppm
11.8 ppm
2.1 ppm

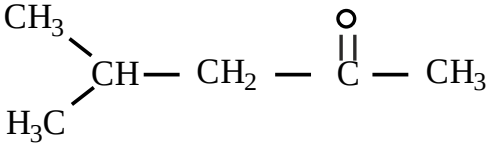
e) Identify homotopic, enantiotopic and diastereotopic protons in the given molecules. **4**



f) Determine the structure of given molecule from NMR data M.F. C_3H_6O **4**

1H δ = 9.2 ppm t
2H δ = 2.3 ppm multiplate
3H δ = 1.1 ppm triplete

3. a) Explain DEPT (Distortionless enhancement by polarization transfer) in a given molecule at 45, 90 and 135. **8**



b) Explain following terms with suitable example. **8**

i) Nuclearoverhauser effect
ii) Nuclear quadrupole resonance

OR

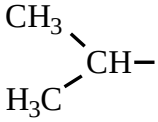
c) What is FT-NMR-technique and explain its advantages. **4**

d) Describe COSY. NMR spectroscopy. **4**

e) Elucidate the structure of organic molecule from given NMR data. **4**

M. F. = $C_6H_{14}O$, δ = 1.1 ppm, doublet, 12H
δ = 3.2 ppm septate 2H

f) Pair the splitting pattern from the following. **4**

i)	CH_3-CH_2-	a)	doublet septate
ii)	CH_3-CH-	b)	doublet quartete
iii)	$-CH-CH-$	c)	triplete quartete
iv)		d)	doublet – doublet

4. a) Explain Ramchandram Plot to determine the structure of proteins. **8**

b) Explain Bragg's method for determining the crystal structure of solid. **8**

OR

c) Explain Wierl. Equation of electron diffraction technique. **4**

d) Explain Laue method for the x-rays analysis. **4**

e) A first order reflection from the (111) planes of a cubic crystal was observed of a glancing angle 11.2° using Cu-x-ray radition. Calculate the length of unit cell. **4**

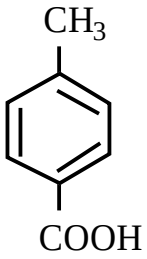
f) Differentiate between electron and neutron diffraction in brief. **4**

5. a) Write note on hypsochromic shift. **2**

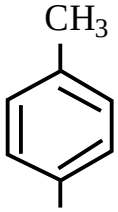
b) Which transition from the following required lower amount of energy. **2**

$\sigma - \sigma^*$ $\pi \rightarrow \pi^*$ $\pi \rightarrow x$

c) How many types of protons present in the given molecule & indicate their chemical shift value. **2**



d) Which protons from the following molecules are most shielding and desheided. **2**



e) Chemical shift of proton is 1.2 ppm convert this value in H_z . Instrumental frequency is $60MH_z$ **2**

f) Which carbon signal or peak disappear in DEPT spectrum at 45° in proton decoupled spectrum. **2**

g) Give Braggs equation and name the term involve in the equation. **2**

h) What is neutron diffraction? **2**

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