

CHE 513

M.Sc. (IIIrd SEMESTER) EXAMINATION, 2024-25

(CBCS MODE)

CHEMISTRY

Spectroscopy-I

1471



Time : Three Hours]

[Maximum Marks : 75

Note: There are **three** sections (A, B and C) and

Candidate has to attempt questions from all sections. Marks are indicated against each section.

Section-A

1. Answer all the questions : 5×3=15
- (a) Define the terms Chromophore and auxochrome.
- (b) Write down 'Wierl'-equation and mention significance of all terms involved in it.
- (c) What do you mean by polarized and depolarized Raman lines ?
- (d) A powder diffraction pattern of lead was obtained with Cu-K α radiation

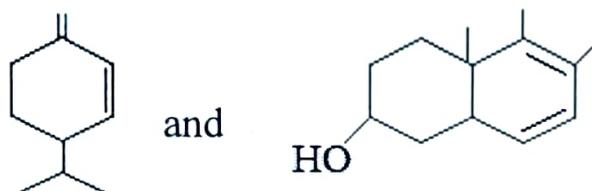
($\lambda = 1.539 \text{ \AA}$). Calculate the 'd' value of the inter planar distance which produces a first order line at $\sin\theta = 0.9210$

- (e) Explain Para magnetism and faro-magnetism on the basis of neutron diffraction.

Section-B

Note: Answer all questions of the following : $4 \times 5 = 20$

2. (a) On the basis of Woodward-Fieser rule calculate the λ_{max} of the following



Or

- (b) Write a note on symmetry restrictions in electronic transitions.
3. (a) Illustrate the Patterson method for the structure determination.

Or

- (b) Describe 'Low Energy Electron Diffraction' (LEED) technique.
4. (a) Explain the zero point energy.

Or

- (b) Explain two advantages of Raman spectroscopy over infrared spectroscopy.
5. (a) Discuss the advantages of neutron diffraction.

Or

- (b) How will you distinguish between maleic acid and fumaric acid by IR spectra ?

Section-C

Note: Answer any two questions of the following : $2 \times 20 = 40$

6. Discuss Woodward-Fieser rules for calculating absorption maxima in α, β -unsaturated carbonyl compounds with suitable examples.
7. Discuss in details about the principle and working of Fourier transform infra-red spectrophotometer.

8. Acetylene shows two C-H stretching vibrations, a symmetrical are ($\overrightarrow{H-C} \equiv \overrightarrow{C-H}$) at 3374 cm^{-1} and an asymmetrical are ($\overrightarrow{H-C} \equiv \overrightarrow{C-H}$) at 3287 cm^{-1}
- (i) Which of these will be Raman active ?
 - (ii) Calculate Raman wave number and Raman wave length if ν_{ex} is 22946 cm^{-1}
 - (iii) Calculate IR active frequency.
9. Describe the principle of electron diffraction and give its applications.

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