21CHE3C9L

M.Sc. III Semester Degree Examination, April/May - 2023
CHEMISTRY
Spectroscopy
(NEW SYLLABUS)

Time : 3 Hours | Maximum Marks : 70

Note : Answer **any five** of the following questions with Question No.**1 (Q. 1) Compulsory**, each question carries **equal** marks.

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1. (a) Explain the rotational spectra of diatomic molecules. **5+5+4**

(b) Deduce an expression for vibration of a diatomic molecule (simple harmonic oscillator model).

(c) Give an account on intensity of spectral lines, in rotational & vibrational spectra.

2. (a) Explain the applications of IR spectroscopy in the structural elucidation of amides, anhydrides, esters and carboxylic acids. **5+5+4**

(b) Briefly explain the factors affecting the stretching frequencies in IR spectroscopy.

(c) State the basic principle and vibrations involved in IR Spectroscopy.

3. (a) Explain theory and instrumentation of ^{1}H NMR spectrometer. **5+5+4**

(b) Discuss the criteria for the selection of solvents used for ^{1}H NMR spectrum. How solvent shifts the chemical shift values in the spectrum.

(c) Sketch the ^{1}H NMR spectra for :

(i) diethyl ether

(ii) $CH_2Cl-CH_2-CH_2OH$

4. (a) Explain the selection rules applicable for Rotational and Vibrational Raman spectra. **5+5+4**

(b) Write note on ^{13}C-2D NMR spectroscopy and its applications.

(c) Explain the principle and applications of ^{31}P NMR spectroscopy in the study of HPF_2.

5. (a) State and explain Bragg's law and Miller indices law. **5+5+4**

(b) Discuss the principle and working of Debye-Schemer method.

(c) Write a note on the principle and working of XPS.

6. (a) From the following ^{1}HNMR data, deduce the structure of the compound whose molecular formula : $C_5H_{10}O$: **5+5+4**

(i) δ:2.32(2H),triplet

(ii) δ:2.02(3H),singlet

(iii) δ:1.56(2H),multiplet

(iv) δ:0.89(3H),triplet

(b) Predict the IR stretching frequency of alkanes, alkenes, alkynes and C-H compounds.

(c) Differentiate between functional group region and finger print region. Explain their importance and applications.

7. (a) What is Chemical Shift ? Explain the various factors influencing the chemical shift. **5+5+4**

(b) What is polarisibility ? Discuss the Quantum theory of Raman Effect.

(c) Explain the working principle of SEM.

8. (a) Explain the modes of vibration encountered in IR spectroscopy. **5+5+4**

(b) Briefly describe the principle and applications of X-ray absorption spectroscopy.

(c) Explain the Karplus rule in NMR spectroscopy and its applications.

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