M.Sc.DEGREE EXAMINATION,APRIL 2020
I Year II Semester
Spectroscopy

Time : 3 Hours **Max.marks :75**

Section A $(10 \times 2 = 20)$ Marks

Answer any **TEN** questions

1. Define Fermi Resonance.
2. State the selection rule for rotational spectra.
3. Define zero point energy.
4. What is Davydov or dynamic crystal field effect?
5. Define Stokes and anti Stokes lines.
6. What is molecular polarizability?
7. List out any four basic requirements of a typical NMR spectrometer,
8. Define chemical shift.
9. What is meant by axial symmetry?
10. Mention some of the chemical applications of Mossbauer spectroscopy.
11. What is Stark effect?
12. A Mossbauer nucleus ^{57}Fe makes the transition from the excited state of energy 14.4 keV to the ground state. What is its recoil energy?

Section B $(5 \times 5 = 25)$ Marks

Answer any **FIVE** questions

13. Classify the molecules based on the relative values of principle moments of inertia. Give suitable examples
14. Explain the different fundamental normal modes of vibration of the CO_2 molecule by drawing suitable diagrams.
15. Describe vibrational Raman spectra of diatomic molecule.
16. Discuss quantum theory of ESR.
17. Describe regenerative continuous wave oscillator method for the detection of NQR frequencies.
18. Describe resonance Raman scattering with energy level diagram.
19. Discuss proton NMR spectrum of 1-Nitro propane.

Section C $(3 \times 10 = 30)$ Marks

Answer any **THREE** questions

20. Discuss in detail the rotational spectrum of a rigid diatomic molecule and obtain an expression for the rotational energy levels. Draw the energy levels and the allowed transitions between them.
21. Deduce an expression for a vibrating diatomic molecule taking a simple harmonic oscillator as example.
22. With neat diagram, explain the principle and working of RAMAN spectrometer
23. Discuss quantum theory of NMR spectroscopy and obtain Bloch equations.
24. Explain the basic concept of Mossbaur effect. Discuss chemical isomer shift and its use in molecular structure analysis.

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