M.Sc. DEGREE EXAMINATION,NOVEMBER 2018
I Year II Semester
Core Major
SPECTROSCOPY

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

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

Answer any **TEN** questions

1. Describe symmetric and asymmetric top molecules.
2. Define hyperfine structure.
3. Define normal vibrations.
4. Explain IR region in electromagnetic spectrum.
5. Define Stokes and anti Stokes lines
6. State mutual exclusion principle.
7. What is meant by axial symmetry?
8. Mention the relaxation effects in NMR.
9. Define hyper fine splitting constant.
10. Mention few applications of NQR spectroscopy.
11. What is meant by isomer shift?
12. Define Gyro magnetic ratio.

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

Answer any **FIVE** questions

13. Obtain rotational energy levels and transitions for a rigid diatomic molecule. Discuss the isotope effect in rotational spectra.
14. Describe the interferometer arrangement of Fourier transform spectrometer. Mention some of its applications.
15. Discuss resonance Raman scattering with energy level diagram.
16. Describe NMR spectrometer with neat block diagram and explain its working.
17. Explain the concept of nuclear quadruple energy levels for axial symmetric systems.
18. Explain recoilless emission and absorption of gamma rays.
19. Discuss quantum theory of ESR spectroscopy.

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

Answer any **THREE** questions

20. Explain the splitting of the rotational energy levels of a molecule by Stark effect. Discuss first and second order Stark effect.
21. Deduce expression for energy levels and selection rule for a vibrating diatomic molecule as simple harmonic oscillator. Explain the drawbacks and hence discuss anharmonic oscillator and deduce expression for energy levels.
22. Discuss in detail the principle, working and construction 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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