



K25P 1906

Reg. No. :

Name :

Second Semester M.Sc. Degree (C.B.C.S.S.-OBE – Reg./Supple./Imp.)

Examination, April 2025

(2023 and 2024 Admissions)

PHYSICS/PHYSICS WITH COMPUTATIONAL AND NANO SCIENCE

SPECIALIZATION PROGRAMME

MSPHY02C11/MSPHN02C11 : Spectroscopy

Time : 3 Hours

Max. Marks : 60

SECTION – A

Answer any 5. Each one carries 3 marks.

1. Interpret normal and anomalous Zeeman effects.
2. Explain spin multiplicity. Give its significance.
3. Discuss how the rotational spectra of a rigid rotator vary from that of a nonrigid rotator.
4. Give an expression for the rotational constant B. Explain how you will find out bond length of molecules if you know molecular masses and B.
5. Explain Why anti-Stokes lines less intense than Stokes lines.
6. Discuss the major applications of NMR. **(5×3=15)**

SECTION – B

Answer any 3. Each one carries 6 marks.

7. Derive an expression for the Lande' g-factor formula. Calculate the Lande g factor for an atom has a $S = 0$.
8. A spin zero atom emits an electromagnetic radiation is kept in a magnetic field. With the help of necessary theory, explain what happens to the electromagnetic radiation.

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9. Explain Frank-Condon principle.
10. With the help of polarizability ellipsoid, discuss the vibrational Raman activity in the H_2O molecule.
11. Discuss the importance of intensity and width of ESR absorption peaks. Explain their origin and importance. (3×6=18)

SECTION – C

Answer any 3. Each one carries 9 marks.

12. Define the Stark effect and explain the experimental setup used by Stark to study this phenomenon. Illustrate how the Zeeman effect is more useful than the Stark effect.
 13. Discuss the pure rotational spectra of molecules like carbon monoxide, by considering their bond length is fixed.
 14. Explain the theory of a diatomic vibrating rotor and the breakdown of Born-Oppenheimer approximation.
 15. Explain Raman effect. Give Quantum mechanical and classical explanation for the Raman effect.
 16. Explain the theory and experimental setup to observe Mossbauer Spectroscopy. Discuss the quadrupole effect in the application of Mossbauer spectroscopy. (3×9=27)
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