

(FOR THE CANDIDATES ADMITTED
DURING THE ACADEMIC YEAR 2023-24 ONLY)

SUBJECT COD **23PPS310**
REG.NO.

N.G.M.COLLEGE (AUTONOMOUS): POLLACHI

END-OF-SEMESTER EXAMINATIONS: NOVEMBER 2024

M.Sc. – PHYSICS

MAXIMUM MARKS: 75

SEMESTER: III

TIME: 3 HOURS

MOLECULAR SPECTROSCOPY

SECTION – A (10 X 1 = 10)

ANSWER THE FOLLOWING QUESTIONS. (K1)

- Which of the followings is not a symmetry operations?
(a) Identity operation (b) Rotation-reflection
(c) Inversion through a point (d) Rotation-refraction
- For a linear molecule, $I_a =$
(a) 0 (b) 1 (c) -1 (d) infinity
- In Raman Spectrometer, the dispersed radiation is detected by
(a) piezo-electrical method (b) photo-electrical method
(c) photo-conductive method (d) photo-emissive method
- In ESR Spectrometer, Klystron Oscillator produces
(a) mono-chromatic radiation (b) X - radiation (c) UV radiation (d) IR radiation
- To understand the vibrational coarse structure, which of the following energy term is dropped from expression for total energy?
(a) vibrational (b) rotational (c) vibrational-rotational (d) kinematic

ANSWER THE FOLLOWING IN ONE (OR) TWO SENTENCES. (K2)

- Define: Symmetry elements.
- Write about the Moment of inertias of Oblate type Symmetric Top Molecules.
- What is called zero point energy?
- Give the equation for Nuclear Magneton.
- State the Principle of Mossbauer Spectroscopy.

(CONTD 2)

SECTION – B**(5 X 5 = 25)****ANSWER EITHER (a) OR (b) IN EACH OF THE FOLLOWING QUESTIONS.
(K3)**

11. (a) Write a note on Point Groups.
(OR)
(b) Discuss the Multiplication table of a Group.
12. (a) Give the block diagram of a MW Spectrometer and explain the function of any two blocks.
(OR)
(b) Get an expression for Moment of Inertia of Polyatomic Molecules.
13. (a) Explain the Principle of FTIR Spectroscopy.
(OR)
(b) Write a note on Quantum theory of Raman Effect.
14. (a) With a diagram, explain the principle of NMR Imaging.
(OR)
(b) Get the condition for Resonance and explain.
15. a) Explain the Quadrupole moment of a nucleus.
(OR)
(b) Describe the anyone application of Mossbauer Spectroscopy.

SECTION – C (5 X 8 = 40)**ANSWER EITHER (a) OR (b) IN EACH OF THE FOLLOWING QUESTIONS.
(K4/K5)**

16. (a) State and explain the Great Orthogonality theorem.
(OR)
(b) Write a note on (i) Improper axes and Improper rotations.
(ii) Proper axes and proper Rotations.
17. (a) Discuss the Spectrum of Non-Rigid Rotator, with the diagram of energy level transitions. .
(OR)
(b) Write a note on rotational spectra of a Rigid diatomic molecule.
18. (a) Explain the working of a Diatomic Vibrating Rotator, with diagram.
(OR)
(b) Explain the theory associated with vibrational Raman spectra with appropriate diagrams.
19. (a) Obtain Bloch equations.
(OR)
(b) What is chemical shift? Explain its Role in NMR instrumentation.
20. (a) Explain the transition for axially symmetric systems.
(OR)
(b) (i) State and explain Frank-Condon principle.
(ii) What is Fortrat Parabola? Explain.