

(For candidates admitted from 2008 - 2015 Batch)

M.Sc. DEGREE EXAMINATION, NOVEMBER 2022.

PHYSICS - Elective

ATOMIC AND MOLECULAR PHYSICS

Time: Three hours

Maximum: 75 marks

PART A — (10 × 2 = 20)

Answer ALL questions.

1. What is meant by fine structure?
2. State Pauli's exclusion principle.
3. Define Stark effect.
4. What is Vander Waals interactions?
5. Write a note on diatomic vibrating rotator.
6. State non-rigid rotor.
7. Define Raman Effect.
8. Give the selection rules of Raman Effect.
9. What is Chemical Shift?
10. State Hyperfine Structure.

PART B — (5 × 5 = 25)

Answer ALL questions, choosing either 'a' or 'b'

11. a) Explain Hund's rules with examples.
(OR)
b) Write a brief note on fine structure of alkali spectra.
12. a) Explain Born-Oppenheimer approximation theory.
(OR)
b) State and explain Paschen – Back effect.
13. a) Describe about the vibrating diatomic molecule.
(OR)
b) Write a note on symmetric top molecules.

14. a) Discuss about the quantum theory of Raman Effect.
(OR)
b) Describe about the electronic spectra of diatomic molecule.
15. a) Derive Block equation.
(OR)
b) Explain the factors responsible for the hyperfine structure in ESR spectra.

PART C — (3 × 10 = 30)
Answer any THREE Questions

16. Explain how atomic states are represented in L-S and J-J coupling.
17. What is normal Zeeman Effect? Describe the quantum mechanical explanation of normal Zeeman Effect.
18. With a neat diagram explain the working of Microwave spectrometer.
19. Write a note on rotational fine structure of electronic vibration transition.
20. Describe ESR spectrometer.
