

M.SC.(Physics) Semester - 2 (CBCS) Examination
May/June-2022 (NEW COURSE)
Atomic and Molecular Physics

Time: 2:30 Hours**Marks: 70****Instructions:**

1. All questions are compulsory.
2. Figures to the right indicate marks.

Q – 1: Answer the following questions: Any SEVEN out of TEN **14**

- (i) State the two methods to obtain total angular momentum of many electron atoms.
- (ii) Write down the order of energy of orbitals for hydrogen atom and for other atoms.
- (iii) What is j-j coupling? How will you represent it symbolically?
- (iv) Write down any main features of Stark Effect.
- (v) Transition originating from the level having which J value will have the maximum intensity?
- (vi) Quantum number J and K represents what?
- (vii) What are hot bands?
- (viii) Depict the normal vibrations of CO₂ molecule.
- (ix) What is the importance of monochromator in IR spectrometer?
- (x) What are near prolate and near oblate asymmetric rotors?

Q – 2: Answer the following questions (any TWO) **14**

- (a) Discuss the fine structure of hydrogen atom spectrum.
- (b) Discuss the spectrum of lithium: A hydrogen like species.
- (c) Discuss in detail: The building up principle.

Q – 3: Answer the following questions **14**

- (a) Discuss the magnetic moment of electron due to orbital motion and spin motion.
- (b) How will you explain the normal Zeeman Effect on the basis of quantum mechanical theory?
Discuss in detail.

OR

Q – 3: Answer the following questions

- (a) With necessary diagram, explain interaction of radiation with rotating molecule in detail.
- (b) For linear polyatomic molecules, derive for I and I' and explain the importance of their values.

Q – 4: Answer the following questions (any TWO) **14**

- (a) Discuss the Morse curve and the energy levels of a diatomic molecule.
- (b) Discuss the energy level correlation diagram for asymmetric rotor.
- (c) Using block diagram, discuss the working of a microwave spectrometer.

Q – 5: Write notes on any Two: **14**

- (a) Stark Effect and its experimental arrangement.
- (b) IR spectrophotometer
- (c) Diatomic vibrating rotator
- (d) Symmetric stretching, bending and asymmetric stretching in H₂O molecule
