

[4]

SECTION 'C'

4 × 10 = 40

Long Answer questions (Word limit 400-450 words.)

Q. 1. Determine the expression for energy in Sommerfeld mode.

OR

Calculate spin-orbit interaction energy for a single non-penetrating violence electron.

Q. 2. Determine the expression for the strong-field magnetic interaction energy with diagram.

OR

Discuss the stane –effect components of H₂ line of hydrogen.

Q. 3. Obtain an expression for the rotational energy levels of a diatomic molecule.

OR

Discuss anharmonic oscillator and determine absorption wave number.

Q. 4. Explain electronic spectra of a diatomic molecule and discuss vibration eigen functions.

OR

Explain Bern Oppenheim's approximation.

[1]

ROLL NO.....

PHY. 402/21

IV SEMESTER EXAMINATION, 2021

M.Sc. (PHYSICS)

PAPER-II

ATOMIC AND MOLECULAR PHYSICS

TIME: 3 HOURS

MAX.- 80
MIN.- 16

Note: The question paper consists of three sections A, B & C. All questions are compulsory.

Section A- Attempt all MCQ questions

Section B- Attempt one question from each unit.

Section C- Attempt one question from each unit.

SECTION 'A'

2 × 8 = 16

Multiple Choice Questions

- The ionisation potential of He⁺ is -
 - equal to the value of H₂ atom
 - Two times the value of H₂ atom
 - Three times the values of H₂ atom
 - Four times the value of H₂ atom
- A single degenerate level of configuration up 4d is splitted into
 - Two level
 - Six level
 - Twelve level
 - Eighteen level

[2]

3. In space quantization of the orbital angular momentum vector I , If $l = 2$ then -
(a) $m_e = h$ as no value (b) m_e has 5 value
(c) m_e has 3 value (d) m_e has one value
4. In Paschen-Back effect is due to -
(a) strong magnetic field (b) weak magnetic field
(c) strong electric field (d) weak electric field
5. The pure rotational specters
(a) observed in for infrared resins.
(b) molecules that have permanent dipole moment
(c) heteronuclear diatomic molecules
(d) all the above
6. In a series of equispaced discrete vibrational level, the common separation being -
(a) w (b) $2w$ (c) $3w$ (d) $4w$
7. R, P and Q branch ΔJ is -
(a) -1, 0, 1 (b) 1, -1, 0 (c) 0, -1, 1 (d) 1, 0, -1
8. In electronic transition the energy interval between two consecutive energy state G -
(a) 5 eV (b) 0.5 eV (c) 0.05 eV (d) 0.005 eV

[3]

4 × 6 = 24

SECTION 'B'

Short Answer Type Questions

Q.1. Explain Bohr's postulates.

OR

Explain L-S coupling vector model.

Q.2. Explain normal and anomalous Zeeman's effect.

OR

Describe nuclear magnetic resonance.

Q.3. Explain linear, symmetric top and asymmetric top with example.

OR

Explain isotope effects in harmonic oscillator.

Q.4. Write difference between electronic bonds and vibration –Rotational bonds.

OR

State Franck-Condon principle and give its wave mechanical interpretation.