Roll No.							

24-PH-24

M.Sc. II SEMESTER [MAIN/ATKT] EXAMINATION
JUNE - JULY 2024

PHYSICS
Paper - IV
[Atomic and Molecular Physics]

[Max. Marks : 75] *[Time : 3:00 Hrs.]* *[Min. Marks : 26]*

Note : Candidate should write his/her Roll Number at the prescribed space on the question paper.
Student should not write anything on question paper.
Attempt five questions. Each question carries an internal choice.
Each question carries **15 marks.**

Q. 1 State and explain Pauli's exclusion principle. Apply it to determine the maximum number of electrons that can exist in a shell. Also explain how it accounts for the periodic classification of elements and their spectra.

OR

State and explain spin - orbit interaction energy for one electron atom.

Q. 2 a) What is the wave length of the x-rays emitted when 100 Kev electrons strike a target ? What is the frequency.

b) Discuss the characteristics of X-rays spectra in emission and absorption how do they differ from optical spectra.

OR

a) An x-ray machine produce, 0.1 A^0 x-rays. What is accelerating voltage its employ ?

b) Discuss Moseley's law and explain it on the basis the Bohr model for the atom.

Q. 3 a) The force constant of the HCl molecule is 4.8 x 10^5 dyns/cm. Find the energy required to increase the nuclear separation by $1A^0$.

b) Explain diatomic vibrating rotator with energy level diagram. Explain P, Q, R branches.

OR

a) Deduce the expression for zero point energy in a Morse potential energy calculation. Discuss two types of Anharmonicity.
Calculate the amplitude of vibration in $v = 0$ level of CO molecule which has a constant of 1870 ?

b) Explain two kinds of sources which has been used in IR Spectrometers.

P.T.O.

Q. 4 Write short note **on two** -

i) Lamb Shift.

ii) Stark effects.

OR

Write short note **on two** -

i) Photo a coustic spectroscopy.

ii) Mossbauer spectroscopy.

Q. 5 Write short notes on **any three** of the following -

i) L-S and J-J coupling.

ii) Energy level and spectra of non rigid rotator.

iii) Diatomic molecule as a simple harmonic oscillator.

iv) Principle of Ultra violet.

v) Paschen - Back

vi) Sterm - Garlach experiments.

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