Roll No. _____ **Code No. Q-4319**

SECOND SEMESTER EXAMINATION 2021-22

M.Sc. Physics

Paper - IV

Atomic & Molecular Physics

Time : 3.00 Hrs. **Max. Marks : 80**

Total No. of Printed Page : 03 **Mini. Marks : 29**

Note: Question paper is divided into three sections. Attempt question of all three section as per direction. Distribution of Marks is given in each section.

Section - 'A'

Very short type question (in few words). **6x2=12**

Q.1 Attempt any six question from the following questions :

(i) Write down convergence limit of Pfund series.

(ii) State Pauli's principle.

(iii) Explain J.J. Coupling.

(iv) State spin orbit interaction.

(v) Write Paschan back effect.

(vi) Write selection rule for vibrational rotational spectrum.

(vii) Which quantum number gives the idea of the electron orbit ?

(viii) What is rotational energy ?

(ix) for $L = 1$ and $s = \frac{1}{2}$, the possible value of J are ....

(x) Complete the relation $Er = ...J(J+1)$.

Section - 'B'

Short answer question (In 200 words) **4x5=20**

Q.2 Attempt any four question from the following questions :

(i) Explain normal Zeeman effect.

(ii) Write short notes on alkali atomic spectra.

(iii) Explain Stark effect.

(iv) Write short notes on asymmetric top.

(v) Define Hyper fine structure.

(vi) What do you understand by equivalent and non equivalent electron.

(vii) Write short notes on Stark Modulated Micro-Wave spectrometer.

Section - 'C'

Long answer/Essay type question. **4x12=48**

Q.3 Attempt any four question from the following questions :

(i) Discuss in detail Bohrs theory of Hydrogen atom. Also draw the orbital and energy level diagram.

(ii) Define fine structure. Describe the fine structure of sodium D line in detail.

(iii) Develop the necessary theory for diatomic molecule as simple harmonic oscillator.

(iv) What is symmetric and a symmetric top ? How a molecule behaves like symmetric top molecule.

(v) Explain quantum treatment for vibrational IR spectrum.

(vi) What are the rigid rotators ? Describe rotational spectra of diatomic molecule.

(vii) Write notes on the following :

(a) Molecules as vibrating rotator.

(b) PGR branches.

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