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SUBJECT CODE NO:- B-2029
FACULTY OF SCIENCE AND TECHNOLOGY
B.Sc. T.Y (Sem-VI)
Examination November/December- 2022
Physics Paper-XIX
(Atomic, Molecular Physics & Laser)

[Time: 1:30 Hours]   [Max. Marks: 50]

Please check whether you have got the right question paper.

N.B
1. All questions are compulsory.
2. All questions carry equal marks.

Q. 1   a)   Draw energy level diagram and explain series of spectral line in Bohr's theory of   10
             hydrogen atom.

       b)   Discuss "Vector atom model" in detail.   10

                                            OR

       a)   What is Raman effect. Explain stokes and antistokes lines in Raman spectrum.   10

       b)   What is LASER? Explain construction and working of CO_2 LASER.   10

Q. 2   a)   Write a short note on Thomsons atom model.   05

       b)   Write a short note on Rayleigh's law of scattering.   05

       c)   Calculate the radius of electron in Bohr's first orbit of hydrogen atom. Given   05
             $-e = 1.6 \times 10^{-19}\,C, m = 9.1 \times 10^{-31}kg, h = 6.625 \times 10^{-34}J.s,$
             $\epsilon_0\, 8.85 \times 10^{-12}C^2/Nm^2$

       d)   Calculate the rotational energy of diatomic molecule corresponding to J=2 level, it the   05
             rotational energy corresponding to J=1 level is $0.7 \times 10^{-32}J$.

                                            OR

       a)   Explain L-S coupling scheme with vector diagram.   05

       b)   What are properties of LASER beam?   05

       c)   Calculate the wavelength separation between component lines of wavelength 6000 A.U.   05
             in normal Zeeman Effect. The magnetic field used is 0.2 wb/m^2 , specific charge is
             $1.76 \times 10^{11}\, c/kg$

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    d) Find the ratio of population inversion of the two states in a He-Ne LASER, that produces 05
       a light of wavelength 6328 A. U at 27° C.

Q. 3   Choose the correct answer.   10

1. The splitting of the spectral lines under the influence of magnetic Field is _____

a) Stark effect   b) Photoelectric effect   c) Zeeman effect   d) Compton effect

2. The wavelength of Lyman series is obtained in _____

a) Visible region   c) Ultraviolet region

b) Infrared region   d) Far-infrared region

3. The value of magnetic spin quantum number are_____

a) $\dfrac{+1}{2}, 0$ b) $\dfrac{-1}{2}, 1$ c) $1, -1$ d) $\dfrac{-1}{2}, \dfrac{+1}{2}$

4. The Zeeman effect is a _____phenomenon in which spectral lines are split-up into several components.

a) Magnetic   b) Optical   c) Electrical   d) Magnetooptical

5. In rotational spectra all frequency lines are_____

a) Equally spaced   b) Unequally spaced

c) an integral multiple of ν_0.

d) equally spaced and an integral multiple of ν_0.

6. Rotational spectra are observed in _____

a) Visible region   c) Far infrared region

b) Microwave region   d) Microwave and far infrared region.

7. The process by which atoms are raised from lower level to upper level is called_____

a) Light amplification   c) Laser pumping

b) Population inversion   d) Stimulated emission

8. A LASER beam consist of _____

a) Light material particles   c) Highly coherent photons

b) Electrons   d) Cosmic rays

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9. If 'r' is radius of first Bohr's orbit then the radius of second Bohr's orbit is _____

   a)   r   b)   2r   c)   3r   d)   4r

10. If $L = 1, S = \frac{3}{2}$ then $j =$?

   a) $\frac{3}{2}$ b) $\frac{5}{2}$ c) $\frac{7}{2}$ d)   3