36529

V Semester B.Sc. Degree Examination, September/October 2020

PHYSICS

Paper V (5.1) – Atomic and Molecular Physics

(CBCS)

Time : 3 Hours Max. Marks : 70

Instructions : *1) Answer* ***all*** *questions from Section – A* ***and five*** *from Section – B and* ***any three*** *from Section – C.*

2) Write answers to Section A questions in the first two pages only.

SECTION – A

Answer the following : **(15 × 1 = 15)**

1. What is the specific charge of an electron?
2. Define impact parameter.
3. What is the nature of the path of a particle in the Thomson experiment?
4. What is the total energy of an electron for $n = \infty$?
5. Define ionization potential.
6. Who discovered the nucleus of the atom?
7. Who proposed the nuclear model for an atom?
8. What are stationary orbits?
9. State Paullie's exclusion principle.
10. Can principal quantum number is zero?
11. What is Stark effect?
12. What is Fluorescence?
13. Define normal Zeeman effect.
14. What is optical pumping?
15. What are stokes lines?

SECTION - B

Answer **any five** questions : **(5 × 5 = 25)**

16. Discuss Thomson's and Rutherford's model of an atom.

17. Describe the Frank-Hertz experiment for the determination of critical potentials.

18. Write a note on space quantization.

19. Explain quantum theory of Raman effect.

20. Write any five applications of Laser.

21. Explain the principle, working of He-Ne Laser.

22. Explain the use of Raman effect in determining the molecular structure.

SECTION - C

Answer **any three** questions : **(3 × 10 = 30)**

23. (a) Derive an expression for the radius of the electron orbit for hydrogen atom.

    (b) Calculate the ionization potential for hydrogen atom. **(6 + 4)**

24. (a) With necessary theory explain J.J. Thomson's method to determine the specific charge of an electron.

    (b) A water droplet of radius 10^{-6} m is charged with one electron. Calculate the electric field required to keep it stationary $\rho_w = 1000\ kg\,m^3$ $e = 1.6 \times 10^{-19}$ C. **(8 + 2)**

25. (a) Explain the different quantum numbers associated with vector atom model.

    (b) Write a note on Pauli's exclusion principle. **(5 + 5)**

26. (a) Describe Stern-Gerlach experiment.

    (b) Explain quantum theory related to normal Zeeman effect. **(5 + 5)**

27. (a) Give the theory of pure rotational spectra.

    (b) The J = 0 to J = 1 absorption line in the carbon monoxide occurs at a frequency 1.163×10^{11} Hz. Calculate the moment of inertia and bond length. **(6 + 4)**