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SVS-N-312 B-18

B.Sc. Vth Semester Degree Examination

PHYSICS

(Atomic and Molecular Physics)

Paper -5.1

(New)

Time : 3 Hours

Maximum Marks : 80

**Instruction to Candidates:**

- i) Answer **ALL** Questions from section-A
- ii) Answer any **FIVE** in section- B
- iii) Answer any **FOUR** from section- C

**SECTION - A**

**I.** Answer **ALL** the following questions.

(15×1=15)

1. Mention two properties of cathode rays.
2. What is the mass of the electron?
3. Define critical Potentials.
4. What is Alkali Spectra?
5. What is meant by coupling?
6. What is Bohr Magneton?
7. What is the draw back of Fran-Hertz Experiment?
8. What are stokes and Anti-stokes lines.
9. State Larmor's theorem.
10. Write the expression for hande of factor.

11. Vibrational- Rotational spectrum falls in which region of electromagnetic radiation.
12. What is rigid rotator?
13. What is band head?
14. What is Rayleigh's scattering?
15. Mention two application of Ramen effect.

**SECTION - B**

**II.** Answer any **FIVE** of the following. **(5×5=25)**

16. Explain the construction and working of Dunnington's method to determine e/m of the electron.
17. Describe Frank-Hertz Experiment to determine critical Potentials.
18. Write a note on vector atom model.
19. Write a note on critical Potentials.
20. What is zeeman effect? Describe Experimental arrangement to study zeeman effect.
21. Write a note on vibrational Spectrum.
22. Write a note on Laser Raman Spectrometer.

**SECTION - C**

**III.** Answer any **FOUR** of the following. **(4×10=40)**

23. a) Explain Thomson method to determine e/m of an electron. **(7+3)**  
b) Calculate the wavelength separation between two component lines which are observed in the normal zeeman effect the magnetic field used is 0.4 wb/m<sup>2</sup> sp.  
charge= $1.76 \times 10^{-11}$  c/kg and  $\lambda = 6000 \text{ \AA}$ .
24. a) Explain quantum number associated with the vector atom model. **(7+3)**  
b) A beam of silver atom in Stern-Gerlach Experiment traverse a distance of 0.2m in a non-homogenous magnetic field of field gradient 50T/m if the velocity of the silver atoms in 400 m/s. calculate the separation between the two trace on the collector plate 0.5m from the pole-piece, mass of the silver atom is  $1.79 \times 10^{-25}$  kg,  $\mu_s = 9.2 \times 10^{-24}$  J/T.

25. a) Give the principle and theory of Stern- Gerlach Experiment. (6+4)  
b) Write a note on spin-orbit Interaction.
26. a) Give the theory of anomalous zeeman effect.  
b) Explain energy level diagram for sodium D-line in weak magnetic field. (10)
27. a) Explain Elementary theory of vibrational rotational spectra of diatomic molecule.  
b) Derive expression for energy of rotational starts of rigid rotator. (5+5)
28. a) Describe experimental study of Raman effect.  
b) Explain Raman effect on the basis of quantum theory. (5+5)
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