QP CODE: 25020391

B.Sc DEGREE (CBCS) REGULAR / REAPPEARANCE / MERCY CHANCE

EXAMINATIONS, FEBRUARY 2025

Sixth Semester

CORE COURSE - PH6CRT10 - RELATIVITY AND SPECTROSCOPY

Common for B.Sc Physics Model I, B.Sc Physics Model II Applied Electronics, B.Sc Physics Model II Computer Applications & B.Sc Physics Model III Electronic Equipment Maintenance

2017 Admission Onwards

34BE7BC9

Time: 3 Hours

Max. Marks: 60

Part A

Answer any ten questions. Each question carries **1** mark.

- 1. Explain newtonian relativity.
- Write down the Galilean transformation equations. 2.
- 3. What is length contraction?
- 4. Calculate the rest energy of the electron.
- 5. Discuss the results obtained from aplha particle sacttering experiment.
- 6. What is a Band Spectrum?
- 7. Write the transitions which produce H α , H β , H γ and H δ lines of the Hydrogen spectrum.
- Mention any two applications of vector atom model. 8.
- 9. How molecules are classified based on their moment of inertia?
- 10. What do you understand by the terms rotational and vibrational quantum numbers?
- 11. Distinguish between absorption spectrum and emission spectrum.
- 12. Why Raman spectrum is not used to make the analysis of atoms?

 $(10 \times 1 = 10)$

Part B

Answer any six questions. Each question carries 5 marks.

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- Assuming Lorentz-Fitzgerald contraction, calculate the apparent length of a meter scale moving at a speed of 2.5x10⁸ m/s.
- 14. Show that for values of v << c, Lorentz transformation reduces to the Galilean transformation.
- 15. Write a note on general theory of relativity.
- 16. Prove that M shell can contain a maximum of 18 electrons. Represent (n, l, m_l, m_s) values of these 18 electrons.
- 17. The term symbol of the valance electron of Sodium when it is in the ground state is 3 ${}^{2}S_{1/2}$ and when it is in the first excited state is 3 ${}^{2}P_{1/2}$. List the possible quantum numbers n, l, j and m_j of the outer electron in each case.
- 18. How is anomolous Zeeman Effect is exaplained using quantum theory?
- 19. Obtain a simple relation for the relative intensity of Stokes lines and anti Stokes lines. How does the intensity varies with temperature?
- 20. Write a note on medical application of NMR.
- 21. Explain the theory of ESR and the construction of ESR spectrometer.

(6×5=30)

Part C

Answer any **two** questions. Each question carries **10** marks.

- 22. Discuss the addition of velocities and prove that nothing can travel faster than c.
- 23. Using the relativity theory arrive at the expression for variation of mass with velocity.
- 24. Derive an expression for frequencies obtained in anomalous Zeeman effect. What is the significance of the Lande g factor?
- 25. Explain the origin of Stokes lines and anti Stokes lines based on the classical theory of Raman effect. Why do we go for a quantum theory of Raman scattering?

(2×10=20)