QP CODE: 25020391

25020391

Reg No : .....

Name : .....

# 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.
2. Write down the Galilean transformation equations.
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 Hα, Hβ, Hγ and Hδ lines of the Hydrogen spectrum.
8. Mention any two applications of vector atom model.
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?

(10×1=10)

### Part B

*Answer any **six** questions.*

*Each question carries **5** marks.*

13. Assuming Lorentz-Fitzgerald contraction, calculate the apparent length of a meter scale moving at a speed of $2.5 \times 10^8$ 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 $3\ ^2S_{1/2}$ and when it is in the first excited state is $3\ ^2P_{1/2}$. 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)