

E 3274

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Reg. No.....

Name.....

B.Sc. DEGREE (C.B.C.S.S.) EXAMINATION, MAY 2022

Sixth Semester

Core Course—RELATIVITY AND SPECTROSCOPY

(Common for B.Sc. Physics Model I, Physics Model II, Physics EEM and Physics Instrumentation)

(2013 – 2016 Admissions)

Time : Three Hours

Maximum Marks : 60

Part A

Answer all questions.

Each question carries 1 mark.

1. Accelerated frames are called _____ frames.
2. The speed of light is the same in all _____ frames.
3. In light atoms _____ coupling is observed.
4. The Zeeman Effect is a clear confirmation of _____ quantization.
5. ESR spectroscopy lies _____ region of the electromagnetic spectrum.
6. Vibrational energies produce _____ spectra.
7. The Raman lines are _____ polarized.
8. Incandescent gases and vapors of elements produce _____ spectra.

(8 × 1 = 8)

Part B

Answer any six questions.

Each question carries 2 marks.

9. Distinguish inertial and non-inertial frames.
10. Write down Lorentz transformation equations.
11. Define length contraction in relativity.
12. Briefly explain LS coupling.
13. Explain j-j coupling.
14. Give the postulates of special theory of relativity.
15. What is Paschen Back effect?

Turn over

16. Define NMR.
17. What is called phosphorescence?
18. Why classical theory of Raman Effect fails?

(6 × 2 = 12)

Part C

*Answer any four questions.
Each question carries 4 marks.*

19. Write a note on general theory of relativity.
20. The moment of inertia of CO molecule is $1.46 \times 10^{-46} \text{ kg m}^2$. Calculate the energy in ev.
21. Describe about the quantum numbers associated with vector atom model.
22. Calculate the vibration energy levels of HCl molecule, assuming the force constant to be 516 Nm^{-1} .
23. Write a note on fine structure of Sodium D-line.
24. Explain rotational spectra in terms of rigid rotator.

(4 × 4 = 16)

Part D

*Answer any two questions.
Each question carries 12 marks.*

25. Describe about composition of velocities in relativity and also explain the concept of mass energy equivalence.
26. What is electron spin resonance? Describe the principle and working of an ESR spectrometer.
27. Describe about Microwave spectroscopy in detail.
28. Discuss the theory of normal Zeeman Effect with experimental setup.

(2 × 12 = 24)