

E 6169



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Reg. No.....

Name.....

B.Sc. DEGREE (C.B.C.S.S.) EXAMINATION, SEPTEMBER 2024

Sixth Semester

Core Course—RELATIVITY AND SPECTROSCOPY

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

[Prior to 2013 Admissions]

Time : Three Hours

Maximum Weight : 25

Part A

Answer all questions.

Weight 1 for each bunch.

BUNCH I

1. The special theory of relativity was proposed in the year _____.
2. The Cartesian co-ordinate system attached to the reference fixed body is called a _____.
3. _____ electron is responsible for ESR spectroscopy.
4. Raman scattering is due to collision between the photon and the _____ of the scatterer.

BUNCH II

5. The law of inertia is valid in an _____.
6. The size of the first and the smallest Bohr orbit is _____ nm.
7. In _____ effect the spectral lines are split up under the influence of magnetic field.
8. Molecular spectroscopy is the interaction of _____ waves and matter.

BUNCH III

9. _____ is invariant under Galilean transformation.
10. In heavy atoms _____ coupling is observed.
11. The spectrum of a rigid molecule consists of _____ spaced lines.
12. Incandescent gases and vapors of elements produce _____ spectra.

Turn over





E 6169

BUNCH IV

13. In light atoms _____ coupling is observed.
14. A molecular rotation or vibration will be Raman active, only if it is accompanied by _____ change.
15. The lowest energy corresponds to _____ spectra.
16. The _____ rotational spectra are in the microwave and infrared regions.

(4 × 1 = 4)

Part B

Answer any five questions.

Weight 1 for each.

17. State the postulates of special theory of relativity.
18. Mention the consequences of Lorentz Transformations.
19. What is the difference between absorption and emission spectra ?
20. What is LS coupling ?
21. What are the components of electromagnetic spectrum ?
22. What do you mean by NMR ?
23. Differentiate between phosphorescence and fluorescence.
24. What is Raman Effect ?
25. What are Stokes and anti-Stokes lines ?

(5 × 1 = 5)

Part C

Answer any four questions.

Weight 2 for each.

26. Write a note on general theory of relativity.
27. A metro of eight compartments each of length 7 m. speeds at 30m/s. Determine its contraction.
28. Write a note on fine structure of Sodium D-line.
29. Bring out the quantum mechanical explanation for anomalous Zeeman Effect.





E 6169

30. Explain rotational spectra in terms of rigid rotator.
31. Calculate the vibration energy levels of HCl molecule, assuming the force constant to be 516 Nm^{-1} .

(4 × 2 = 8)

Part D

Answer any two questions.

Weight 4 for each.

32. Derive the basic equations of Lorentz transformation.
33. With principle and experimental setup explain Stern-Gerlach experiment and give its significance.
34. Describe the classical and quantum theory of Raman Effect.

(2 × 4 = 8)

