

B.Sc. DECREE (C.B.C.S.S.) EXAMINATION, MARCH 2017**Sixth Semester**

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

Core Course—RELATIVITY AND SPECTROSCOPY

(2013 Admission onwards)

Time : Three Hours

Maximum Marks : 60

Part A

Answer all questions. 1 mark each.

1. An ——— frame has to be non-accelerating and non-rotating.
2. The speed of light is the same in all ——— frames.
3. The length ——— is appreciable only when the velocities are comparable to the velocity of light.
4. The size of the Bohr radius is about ——— nm.
5. In Zeeman Effect the spectral lines split up into several components distributed ——— about the original lines.
6. In light atoms ——— coupling is observed.
7. The spectrum of a rigid molecule consists of ——— spaced lines.
8. Raman scattering is due to collision between the photon and the ——— of the scatterer.

(8 × 1 = 8)

Part B

Answer any six questions. 2 marks each

9. What is time dilation ?
10. Write down the Galilean transformation equations.
11. What is the importance of M-M experiment ?
12. What is Pauli's exclusion principle ?
13. Explain j-j coupling.
14. What is NMR ?
15. What is the difference between absorption and emission spectra ?
16. What is phosphorescence ?
17. What are the properties of a linear molecule ?
18. What are Stokes and anti-Stokes lines ?

(6 × 2 = 12)

Turn over

Part C

Answer four questions. 4 marks each.

19. Obtain Galilean transformation equations.
20. The half life of a particle moving with a velocity $0.6c$ relative to the laboratory is 3×10^{-8} s. Find its proper life.
21. Determine the wavelength of spectral line due to CO molecule by collecting the required data. Wave number difference between the successive absorption lines is 384 m^{-1} .
22. Bring out the quantum mechanical explanation for anomalous Zeeman Effect.
23. Discuss molecular spectra in terms of harmonic oscillator principle.
24. Give an account on liquid crystals.

$(4 \times 4 = 16)$

Part D

Answer two questions. 12 marks each.

25. Obtain the Lorentz transformation equations and arrive at GT equations.
26. Describe the theory of Raman Effect with experimental setup.
27. Obtain the expression for the rotational energy levels of a diatomic molecule taking it as a rigid rotator. Give the relevant selection rules.
28. Discuss the vibration rotation spectral formation due to a diatomic molecule.

$(2 \times 12 = 24)$