

TB146690A

Reg. No.....

Name.....

B. Sc. DEGREE (C.B.C.S.S.) EXAMINATION, MARCH 2017

SEMESTER VI - PHYSICS

PHY6RS - RELATIVITY AND SPECTROSCOPY

Time: Three Hours

Maximum Marks: 60

PART A

I. Answer all questions. Each carries 1 mark.

1. What is an Inertial frame?
2. Give the significance of Michelson-Morley experiment.
3. What are the important experimental observations in favour of GTR?
4. What is Paschen –Back effect?
5. Why would not Bohr allow the quantum number n to take on the value zero?
6. What is Phosphorescence?
7. What is L-S coupling?
8. State the selection rule for the rotational spectra.

(8x1=8)

PART B

II. Answer any six questions. Each carries 2 marks.

9. Derive the Galilean transformation equations.
10. Explain Time dilation.
11. Prove that addition of any velocity to the velocity of light merely reproduces the velocity of light.
12. The energy of the electron in the n th orbit in hydrogen atom is negative .Explain.
13. Explain J-J coupling.
14. Explain the fine structure of Sodium D lines.
15. What is an absorption spectrum?
16. Cooking time is drastically reduced in microwave oven .Why ?
17. Explain the classical theory of Raman effect.
18. Discuss the difference between Raman spectra and IR spectra.

(6x2=12)

PART C

III. Answer any four questions. Each carries 4 marks.

19. Assuming that the rest radius of earth is 6,400 km and its orbital speed about the sun is 30 km/s, how much does earth's diameter appear to be shortened to an observer on the sun, due to earth's orbital motion?

20. A 100MeV electron moves along the axis of an evacuated tube of length 4m fixed to the laboratory frame. What length of the tube would be measured by the observer moving with the electron?
21. Calculate the energy that can be obtained from complete annihilation of 1 g of mass.
22. An electron collides with a hydrogen atom in its ground state and excites it to a state of $n=3$..how much energy was given to the hydrogen atom in this inelastic(KE not conserved) collision
23. Estimate the wavelength of radiation emitted from adjacent vibration energy levels of NO molecule. Assume the force constant $k = 1,550 \text{ N m}^{-1}$.
24. In the spectrum of HCl molecule ,having reduced mass $1.62 \times 10^{-27} \text{ kg}$,the first line falls at 20.68 cm^{-1} calculate the moment of inertia and bond length of the molecule.

(4x4=16)

PART D

IV. Answer any two questions. Each carries 12 marks.

25. Derive Lorentz transformation equations and show that at low velocities it reduces to Galilean transformation equations.
26. Explain Vector atom model.
27. Describe the rotational spectra of diatomic molecules.
28. Explain the working of IR spectrometer with schematic diagram.

(2x12=24)