B.Sc DEGREE (CBCS) EXAMINATION, APRIL 2021

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

66274391

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.   Write down inverse Lorentz transformation equations.

4.   Explain gravitational red shift.

5.   Explain why scattering of α particles by thin foils take place.

6.   What are the different regions of the electromagnetic spectrum?

7.   Name all the quantum numbers employed in the vector atom model.

8.   Is LS coupling applicable to all the atoms?

9.   What is asymmetric top molecule? Give an example.

10. Why does the glass tube of a fluorescent lamp is coated with phosphor?

11. What is Rayleigh scattering?

12. Define ESR.

(10×1=10)

Part B

*Answer any **six** questions.*

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

13. What is the mean life of a meson travelling with a velocity 70% of the velocity of light? The proper mean life time is 2.2×10^{-8}s.

14. A particle of rest mass m_0 moves with speed .707 c, Calculate its mass, momentum, total energy and KE.

15. Calculate the kinetic energy of an electron moving with a velocity 0.98 times the velocity of light in the laboratory system.

16. The first member of the Balmer series of Hydrogen spectrum has a wavelength of 656.3 nm. Compute the wavelength of the second member of the Paschen series.

17. Prove that M shell can contain a maximum of 18 electrons. Represent (n, l, m_l, m_s) values of these 18 electrons.

18. Derive an expression for Lande g factor.

19. Calculate the zero point energy of HCl molecule. Given $m_H = 1.673 \times 10^{-27}$ kg , $m_{Cl} = 58.06 \times 10^{-27}$ kg and force constant is 481 N/m.

20. [a]What is meant by the term induced dipole moment?
    [b]Give the expression for induced dipole moment of a molecule exposed to external radiation.

21. Explain the principle of NMR and obtain the resonance condition.

$(6\times5=30)$

Part C

*Answer any **two** questions.*
*Each question carries **10** marks.*

22. Describe Michelson-Morley experiment and explain the results.

23. Deduce relativistic law of addition of velocities and prove that the velocity of light is the maximum attainable velocity in nature.

24. Discuss the theory of Paschen-Back Effect.

25. Explain the construction of Microwave and Raman spectroscopes.

$(2\times10=20)$