

(FOR THE CANDIDATES ADMITTED

SUBJECT CODE **23 UPS 509**

DURING THE ACADEMIC YEAR 2023-24 ONLY)

REG.NO.

N.G.M.COLLEGE (AUTONOMOUS) : POLLACHI

END-OF-SEMESTER EXAMINATIONS : NOVEMBER – 2025

B.Sc. – PHYSICS

MAXIMUM MARKS: 75

SEMESTER: V

TIME : 3 HOURS

PART – III

RELATIVITY & QUANTUM MECHANICS

SECTION – A (10 X 1 = 10 MARKS)

ANSWER THE FOLLOWING QUESTIONS.

(K1)

1. Which one of the followings is in-variant under Galilean transformations?
(a) acceleration (b) force (c) co-ordinates (d) all of the mentioned
2. Identify De-Broglie's wave equation.....
(a) $\lambda = \frac{h}{P}$ (b) $\lambda = P$ (c) $\lambda = h^2P$ (d) $\lambda = h^2P^2$
3. Why is a gamma ray microscope used in Heisenberg's uncertainty principle experiment?
(a) Gamma rays are slow (b) Gamma rays have short wavelengths
(c) Gamma rays have low energy (d) Gamma rays have longer wavelengths
4. Where is the probability of finding the particle is zero in an infinite square well?
(a) at the centre of the well (b) at the walls of the well
(c) everywhere inside the well (d) nowhere—it is always non-zero
5. Which quantum numbers come from solving Schrödinger's equation for hydrogen atom ?
(a) only one quantum number (b) only spin quantum number
(c) all quantum numbers except spin (d) None of the mentioned

ANSWER THE FOLLOWING IN ONE (OR) TWO SENTENCES.

(K2)

6. What is called frames of reference?
7. Define Phase velocity.
8. Define Heisenberg's Uncertainty principle.
9. What is meant by Linear Harmonic oscillator.
10. What is Principal Quantum number?

(CONTD 2)

SECTION – B (5 X 5 = 25 MARKS)
ANSWER EITHER (a) OR (b) IN EACH OF THE FOLLOWING QUESTIONS.
(K3)

11. a) Describe Galilean transformations and their limitations.
(OR)
b) Discuss the concept of Length contraction.
12. a) Give detailed account of Inadequacy of Classical mechanics.
(OR)
b) Deduce an expression for group velocity.
13. a) Illustrate Heisenberg uncertainty principle by using gamma ray microscope.
(OR)
b) List the Postulates of wave mechanics and explain.
14. a) Discuss the term infinite square well potential with an illustration.
(OR)
b) Describe the process of barrier penetration in Quantum Mechanics.
15. a) What is known as separation of variable method? Explain.
(OR)
b) Set up schrodinger equation for Hz atom and give in energy expression.

SECTION – C (5 X 8 = 40 MARKS)
ANSWER EITHER (a) OR (b) IN EACH OF THE FOLLOWING QUESTIONS.
(K4 (Or) K5)

16. a) Describe Michelson Morley experiment with neat diagram and explain the method of determination of velocity of light..
(OR)
b) Discuss the concept of Variation of Mass with velocity in relativity and deduce the associated relation.
17. a) Obtain an expression for de-Broglie wavelength.
(OR)
b) Explain with neat diagram about G. P. Thomson's experiment.
18. a) Discuss the diffraction of a beam of electrons by a slit to illustrate un-certainty principle.
(OR)
b) Derive time independent Schrodinger equation.
19. a) Apply Schrodinger's wave equation to obtain the expression for Potential Step.
(OR)
b) Discuss briefly the concept of Linear Harmonic oscillator and obtain its expression.
20. a) Obtain an expression for energy of hydrogen atom using Schrodinger's equation.
(OR)
b) Summarize the Orbital Quantum number and Magnetic Quantum number.