



K17U 0380

Reg. No. :

Name :

VI Semester B.Sc. Degree (CBCSS – Regular) Examination, May 2017
CORE COURSE IN PHYSICS
(2014 Admn.)
6B13 PHY : Quantum Mechanics

Time : 3 Hours

Max. Marks : 40

SECTION – A

Answer **all**, very short answer type, **each** question carries **1** mark.

1. Photoelectric current is directly proportional to the
2. Write down the time dependent Schrodinger equation for a particle of mass m moving in a potential $v(r, t)$.
3. The splitting of spectral lines by magnetic field is
4. For the Harmonic oscillator the levels are (1×4=4)

SECTION – B

Answer **any seven**, short answer type, **each** question carries **two** marks.

5. Explain the postulates of Bohr with regard to hydrogen atom.
6. What is Compton effect ?
7. Explain de Broglie's hypothesis.
8. State and explain uncertainty principle.
9. What are eigen functions and eigen values of an operator ?
10. Distinguish between coordinate and momentum representation.

P.T.O.



11. What does tunnelling mean ?
12. What is zero point energy of a harmonic oscillator ?
13. Sketch graphs of wave function ψ and of $|\psi|^2$ for the $n = 3$ and $n = 4$ states of a particle trapped in a potential well of infinite depth.
14. State Pauli-exclusion principle. (2×7=14)

SECTION – C

Answer **any four** short essay/problem, **each** question carries **three** marks.

15. X-rays with $\lambda = 1.0 \text{ \AA}$ are scattered from a metal block. The scattered radiation are viewed at 90° to the incident direction. Evaluate the Compton shift.
16. An electron has a speed of 500 m/s with an accuracy of 0.004%. Calculate the certainty with which we can locate the position of the electron.
17. Explain the significance of Ehrenfest's theorem.
18. Explain how barrier tunnelling accounts for α -decay by certain nuclei.
19. Find the expectation value $\langle x \rangle$ of the position of a particle trapped in a box L wide.
20. A sample of a certain element is placed in a 0.300 T magnetic field and suitably excited. How far apart are the Zeeman components of the 450 nm spectral line of this element ? (3×4=12)

SECTION – D

Answer **any two** long essay type, **each** question carries **five** marks.

21. Give an account of Einstein's explanation of photoelectric effect on the basis of quantum theory.
22. Explain quantum mechanical tunneling.
23. State and explain the postulates of quantum mechanics.
24. Discuss Zeeman effect. (5×2=10)