



Continuous Assessment Test (CAT - II), May 2022

Programme	: B.Tech	Semester	: Winter 2021-22
Course Title	: Engineering Physics	Course Code	: BPHY101L
School	: School of Advanced Sciences	Slot	: A1
Duration	: 90 mins	Max. Marks	: 50
Class No	:		

Part – A (5 x 10 = 50)

Answer ALL Questions

Sl. No	Questions	Max Marks	CO	BL
1	What are the reasons considered by de Broglie to propose his hypothesis? Do electrons have wave nature? Justify your answer with supporting experiment. Key: reasons 3 M. Electron wave 1M, exp 6M.	10	CO2	
2	Give short notes on Ψ . Introduce the wave mechanical concept and obtain Schrodinger equation when the potential is not dependent on time. Key: properties of Ψ 3 M. Schrodinger eqn 7 M.	10	CO2	
3	i. Explain why Compton effect is observed for X-rays and gamma rays. 5M ii. Show that the spread of velocities caused by Heisenberg Uncertainty principle does not have measurable consequences for a 100 g ball confined to a room of 15 m on a side. Assume the ball is moving at 2m/s along the x direction. 5M. key: $\Delta p_x = 3.5 \times 10^{-36}$ kgm/s. So $\Delta v_x = 3.5 \times 10^{-35}$ m/s, $\Delta v/v = 1.8 \times 10^{-35}$ which is not measurable.	10	CO2	
4	Examine the following statements: i. Nanomaterials can be used in the place of copper wire to carry high currents. ii. Nanomaterials will play a significant role as biomedical implants Key: High electrical and thermal cond. Improved mech prop. Nanomaterials have the reqd properties of a biomedical implant like strength, elastic moduli, ductility, electrical cond, increased surface roughness. Cells in our body are accustomed too interact with	10	CO2	



	nanostructured surfaces. 6M II).A particle in a 1D box has potential energy $V=2a^2\hbar^2x^2/m$ and $\Psi(x)=b\exp(-ax^2)$, where a and b are constants. Find particle energy. 4M key: Using Ψ find out $d^2\Psi/dx^2$ and substitute in Schrodinger eqn, we get $E= 3a\hbar^2/m$			
5	For a particle in a box, apply Schrodinger equation to evaluate the eigen values, eigen functions, probability of locating the particle in different energy states with necessary diagrams. Key: expression for energy, soln for Sch eqn in terms of Ψ and Ψ^2 with diagrammatic representation for energy, Ψ, Ψ^2 .	10	CO2	