

Jashore University of Science and Technology

Bachelor of Science Electrical and Electronic Engineering

1st semester of 1st year (2023 – 2024)

Course no.: PHY 1101

Course title: Physics

Class test no.: 02

Date: 23 December 2024

Roll:	
-------	--

1. If $\psi(x)$ is normalized, what is the physical significance of the area under a graph of $|\psi(x)|^2$ versus x between x_1 and x_2 ? What is the total area under the graph of when all x are included? Explain. [5]

2. A wave function has the value $\psi(x) = A \sin x$ in the region $0 < x < \pi$ and zero elsewhere. (a) Normalize the wave function. (b) Find the probability that the particle is between $x = 0$ and $x = \pi/2$. [5]

3. In what ways do photons resemble other particles such as electrons? In what ways do they differ? Do photons have mass? Do they have electric charge? [5]

4. A photon of green light has a wavelength of 520 nm. Find the photon's frequency, magnitude of momentum, and energy. [5]

5. A beam of x rays with wavelength 0.0500 nm is Compton scattered by the electrons in a sample. At what angle from the incident beam should you look to find x rays with a wavelength of (a) 0.0542 nm; 0.0500 nm? [5]

6. According to Bohr atom model, how many different wavelengths would appear in the spectrum of hydrogen atoms initially in the $n = 5$ state? [5]