

Modern Physics

Problem Set 8

JC-39) Energy of a Confined Electron

(15 points) An electron is trapped in a one-dimensional region of width 0.050 nm. Find the three smallest possible values allowed for the energy of the electron.

JC-40) Particle in a Well

A particle is trapped in an infinite one-dimensional well of width L . If the particle is in its ground state, evaluate the probability to find the particle

- (10 points) between $x = 0$ and $x = L/3$;
- (10 points) between $x = L/3$ and $x = 2L/3$;
- (10 points) between $x = 2L/3$ and $x = L$.

JC-41) Electron Wave Function

Consider the electron wave function given below where x is in cm.

$$\psi(x) = \begin{cases} c \sqrt{1 - x^2} & |x| \leq 1 \text{ cm} \\ 0 & |x| \geq 1 \text{ cm} \end{cases}$$

- (10 points) Determine the normalization constant c . Express your answer using 2 significant figures.
- (5 points) Draw a graph of the wave function over the interval $-2 \text{ cm} \leq x \leq 2 \text{ cm}$. Provide numerical scales on both axes and note the value of the wave function at $x = 0$.
- (5 points) Draw a graph of the probability density over the interval $-2 \text{ cm} \leq x \leq 2 \text{ cm}$. Provide numerical scales on both axes and note the value of the probability density at $x = 0$.

Talk 1) Outline

(20 points) Produce an outline of your talk using the guidelines given in class. Reminder: Outlines must be typed.

(over)