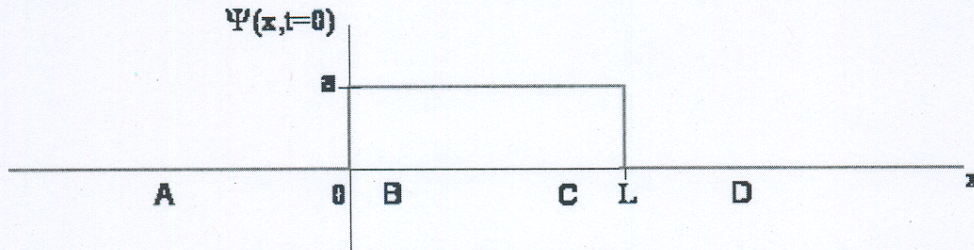


1. The electron wave function at time $t = 0$ is a square wave between 0 and L , as shown below (note $\psi(x,t)=0$ all the way out to $-\infty$ and $+\infty$):



i. How do the probabilities of finding the electron very close (within a very small distance dx) to $x=A$, B , C , and D compare? (A=Probability of finding the electron near point A)

- a. $A=B=C=D$
- b. $A < B < C < D$
- c. $A > B > C > D$
- d. $0 < (A=D) < (B=C)$
- e. $(0=A=D) < (B=C)$
- f. $(0=A=D) < B < C$

ii. In the graph, what does the value for "a" have to be?

$$\int_{-\infty}^{\infty} |\psi|^2 dx = 1 = \int_0^L a^2 dx = a^2 \int_0^L dx = a^2 x \Big|_0^L = a^2 L = 1 \Rightarrow a = \frac{1}{\sqrt{L}}$$

iii. What is the total probability of finding the electron between $x=0$ and $x=L/5$?

$$\int_0^{L/5} |\psi|^2 dx = \int_0^{L/5} a^2 dx = \int_0^{L/5} \frac{1}{L} dx = \frac{1}{L} x \Big|_0^{L/5} = \frac{1}{L} \cdot \frac{L}{5} = \frac{1}{5}$$

iv. Which of the following interpretations of this wave function are valid:

True False The electron's position is higher at $x=C$ than at $x=D$

True False The electron is initially moving to the right, moves up then moves down, and keeps going.

True False At time $t=0$, the electron has no chance of being found where $\psi(x,t)=0$

True False The electron is equally likely to be found anywhere between $x=0$ and $x=L$.