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Engineering Physics

Tutorial 7

1) $E_n = \frac{n^2 h^2}{8mL^2}$

The energy difference between $n=4$ and $n=5$ is then,

$$\Delta E = E_5 - E_4 = \frac{5^2 h^2}{8mL^2} - \frac{4^2 h^2}{8mL^2}$$

$$\Delta E = \frac{9h^2}{8mL^2}$$

$$= \frac{9 \times (6.626 \times 10^{-34})^2}{8 (6.3 \times 10^{-26}) (3 \times 10^{-2})^2}$$

$$\Delta E = 8.70 \times 10^{-39} \text{ J}$$

2) $E = \frac{n^2 h^2}{8mL^2}$

For E_1

$n = 1$, $L_0 = L$

$\therefore E_1 = \frac{h^2}{8mL^2}$

For E_2,

$n = 2$, $L' = 3L$

$\therefore E_2 = \frac{4h^2}{8m(3L)^2}$

$$\therefore \frac{E_1}{E_2} = \frac{k^2}{8mL^2} \times \frac{8m(3k)^2}{4mk^2} = \frac{9}{4}$$

$$\therefore \frac{E_1}{E_2} = \frac{9}{4}$$

3) $E_1 = 1.8\ eV$

$E_1' = 1.8 - 0.42 = 1.38\ eV$

$$E \propto \frac{1}{L^2}$$

$$\therefore \frac{E_1}{E_1'} = \left(\frac{L'}{L}\right)^2$$

$$\therefore (L')^2 = \frac{E_1}{E_1'} \times L^2$$

$$= \frac{1.8}{1.38} \times (10)^2$$

$$(L')^2 = 130.43$$

$$\therefore L' = 11.42\ cm$$

$\therefore$ Change in width $= L' - L$

$= 11.42 - 10$

$= 1.42\ cm$

$e^{i(kx - \omega t)}$

4) ~~$\sin(kx - \omega t)$~~ represents a free particle moving along positive x-axis.

5) The matter wave are represented by a complex wave fun.

6) Physically significant is not a characteristic of wave function.

7) Square of magnitude of wave function is called probability density.