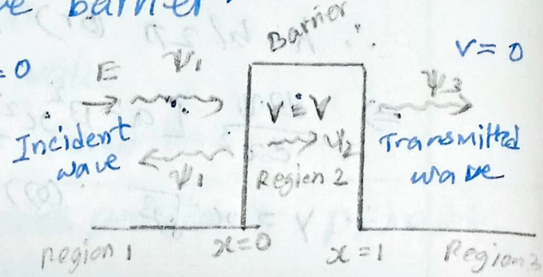
04-12-23

Day 59

Tunneling.

If the energy of particles like electrons is lesser than potential barrier. It can easily cross over the potential barrier having a finite width even without climbing over the barrier by tunneling through the barrier.



Barrier penteration and Quantum tunnelling.

- For region - I

$$\frac{d^2\psi}{dx^2} + \frac{2m}{h^2}(E-0)\psi = 0$$

$\therefore V = 0$

$$\frac{d^2\psi}{dx^2} + \frac{2m}{h^2}E\psi = 0 \rightarrow (1)$$

$\Rightarrow$ solution

$$\psi_1 = Ae^{i\alpha x} + Be^{i\alpha x} \rightarrow (2)$$

- For region - II

$$d^2\psi/dx^2 + 2m/\hbar^2 (V-E)\psi_2 = 0 \rightarrow (3)$$

$\Rightarrow$ Solution

$$\psi_2 = Fe^{i\beta x} + Ge^{i\beta x} \rightarrow (4)$$

- For region - III

$$d^2\psi/dx^2 + 2m/\hbar^2 (E-0)\psi_3 = 0 \rightarrow (5)$$

$\Rightarrow$ Solution

$$\psi_3 = Ce^{i\alpha x} + De^{-i\alpha x}$$

- Ψ_1 (incident) $= Ae^{\alpha x}$
- Ψ_2 (PPW) $= Fe^{i\beta x}$
- Ψ_3 (Tramitted) $= Ce^{i\alpha x}$

Transmission coefficient

$$T = \frac{|C|^2}{|A|^2}$$

Ratio between the square of the amplitude of the transmitted wave $|C|^2$ and the square of the amplitude of the incident wae $\equiv T$

Reflected coefficient

Ratio Between the square of the amplitude of the Reflected wave $|B|^2$ and the square of the amplitude of the incident wave.

$|A|^2 \equiv R$

$$R = \frac{|B|^2}{|A|^2}$$