$K = \frac{2\pi}{\lambda}$

$K = \frac{P}{\hbar}$

$L = \frac{n\lambda}{2}$

$E = \hbar w$

$$\frac{-\hbar^2}{2m} \frac{\partial^2 \Psi(x,t)}{\partial x^2} + U(x)\,\Psi(x,t) = i\hbar \frac{\partial \Psi(x,t)}{\partial t}$$

$$-\frac{\hbar^2}{2m} \frac{d^2 \Psi}{d x^2} + U(x)\,\Psi(x) = E\,\Psi(x)$$

$E = \frac{P^2}{2m} = KE$

$E = \frac{\hbar^2 K^2}{2m}$

$w = \frac{\hbar K^2}{2m}$

$V_p = \frac{w}{K} = \frac{\hbar K}{2m}$

$V = \frac{dw}{dK} = X \longrightarrow$ one Particle

Free Particle:

$$E = \frac{\hbar^2 K^2}{2m}$$

$$P = \hbar K$$

Particle in a Box

$\Psi = A \sin Kx + B \cos Kx$

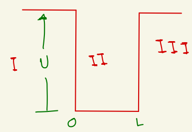
$$E_n = \frac{n^2 \pi^2 \hbar^2}{2 m L^2}$$

$\Psi_n(x) = \sqrt{\frac{2}{L}} \sin \frac{n\pi x}{L}$

the finite squeare Well case

$$U(x) = \begin{cases} U & \boxed{x < 0} \\ 0 & \boxed{0 < x < L} \\ U & \boxed{x > L} \end{cases}$$

by the Particle in a Box



$$\alpha^2 = \frac{2m}{\hbar^2}(U - E)$$

$E < U$

$\Psi_I(x) = A\,e^{\alpha x} \qquad x < 0$

$\Psi_{III}(x) = B\,e^{-\alpha x} \qquad x > L$

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$$E_n = \frac{n^2 \pi^2 \hbar^2}{2m(L + 2\delta)^2}$$

$$\delta = \frac{1}{\alpha}$$

the quantem ocsillator

$U = \frac{1}{2} m w^2 x^2$

$\Psi = C_0\, e^{-\alpha x^2} \longleftarrow$ solution

$\alpha = \frac{m w}{2\hbar}$

$E = \frac{1}{2} \hbar w$

$\Psi_2 = C_2(1 - 2x^2)e^{-\alpha x^2}$

$E_n = (n + \frac{1}{2})\hbar w$

$$C_0 = \left(\frac{m w}{\pi \hbar}\right)^{1/4}$$

$$\int_{-\infty}^{\infty} e^{-a x^2} = \sqrt{\frac{\pi}{a}}$$