PHYSICS 232 – CHAPTER 40: QUANTUM MECHANICS

Schrödinger equation: the wavefunction of a particle moving in the x-direction in the presence of a potential energy function $U(x)$ obeys

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

Normalization condition:

$$\int_{-\infty}^{\infty} |\psi(x)|^2 dx = 1$$

Infinitely deep square potential well of width L:

$$E_n = \frac{n^2h^2}{8mL^2} = \frac{n^2\pi^2\hbar^2}{2mL^2} \quad , \quad \psi_n = \sqrt{\frac{2}{L}}\sin\frac{n\pi x}{L} \quad (n = 1, 2, \dots)$$

Energy levels of harmonic oscillator of angular frequency ω:

$$E_n = \left(n + \frac{1}{2}\right)\hbar\omega \quad (n = 0, 1, 2, \dots)$$