1. The Wave Function

1.1 The Schrödinger Equation

$i\hbar\frac{\partial\Psi}{\partial t} = -\frac{\hbar^2}{2m}\frac{\partial^2\Psi}{\partial x^2} + V\Psi$

Solve for the particle's wave function $\Psi(x,t)$

$\hbar = \frac{h}{2\pi} = 1.054572 \times 10^{-34}$ Js

1.2 The Statistical Interpretation

$\int_a^b |\Psi(x,t)|^2 dx = \{\text{P of finding the particle btwn } a \text{ and } b, \text{ at } t\}$

1.3 Probability

Standard deviation: $\sigma = \sqrt{\langle j^2\rangle - \langle j\rangle^2}$

Expectation value of x given Ψ: $\langle x\rangle = \int x|\Psi|^2 dx$

1.4 Normalization

$\int_{-\infty}^{+\infty} |\Psi(x,t)|^2 dx = 1$

1.5 Momentum

For a particle in state Φ, the expectation value of x is

Other: Blackbody Spectrum

$E = hv = \hbar\omega$

The wave number k is $k = 2\pi/\lambda = \omega/c$

Only two spin states occur (quantum number m is $+1$ or -1).

$\rho(\omega) = \frac{\hbar\omega^3}{\pi^2 c^3 (e^{\hbar\omega/k_b T} - 1)}$

Wien displacement law: $\lambda_{\text{max}} = \frac{2.90\times 10^{-3}\text{mK}}{T}$