5.61 Lecture #3S: Postulates

Postulate 1

The state of a quantum–mechanical system is completely specified by a function $\Psi(\mathbf{r}, t)$ that depends on the coordinates of the particle and on time. This function, called the wave function or state function, has the important property that $\Psi^\star(\mathbf{r}, t)\Psi(\mathbf{r}, t)dxdydz$ is the probability that the particle lies in the volume element $dxdydz$ located at $\mathbf{r}$ at time t.

Postulate 2

To every observable in classical mechanics there corresponds a linear, Hermitian operator in quantum mechanics.

Postulate 3

In any measurement of the observable associated with the operator $\widehat{A}$, the only values that will ever be observed are the eigenvalues a_n, which satisfy the eigenvalue equation

$$\widehat{A}\Psi_a = a\Psi_a$$

Postulate 4

If a system is in a state described by a normalized wave function Ψ, then the average value of the observable corresponding to $\widehat{A}$ is given by

$$\langle a \rangle = \int_{-\infty}^{\infty} \Psi^\star \widehat{A} \Psi d\tau$$

Postulate 5

The wave function or state function of a system evolves in time according to the time-dependent Schrödinger equation

$$\widehat{H}\Psi(x, t) = i\hbar \frac{\partial \Psi}{\partial t}$$

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