First Postulate of Quantum Mechanics

Every physically-realizable state of a system is described in quantum mechanics by a state function $\Psi(\vec{r},t)$ that contains all accessible physical information about the system in that state.

1. $\Psi(\vec{r},t)$ must be continuous and spatially localized (normalizable);
2. $\Psi(\vec{r},t)$ must be a complex function of position and time;
3. $\Psi(\vec{r},t)$ must not violate the homogeneity of free space

Second Postulate of Quantum Mechanics

If a system is in a quantum state represented by a state function $\Psi(\vec{r},t)$, then $Pdv = \left|\Psi(\vec{r},t)\right|^2 dv$ is the probability that in a position measurement at time t the particle will be detected in the infinitesimal volume element dv.

Third Postulate of Quantum Mechanics

In quantum mechanics, every observable is represented by an operator that is used to obtain physical information about the observable from state functions. For an observable that is represented in classical physics by the function $Q(x,p)$, the corresponding operator is $\hat{Q}(\hat{x},\hat{p})$.

Fourth Postulate of Quantum Mechanics

If a measurement of position (or any observable property such as momentum or energy) is made on a system, and a particular result x (or p or E) is found, then the state function changes instantly, discontinuously, to be a state function describing a particle with that definite value of x (or p or E).

Fifth Postulate of Quantum Mechanics

The time development of the state functions of an isolated quantum system is governed by the time-dependent Schrödinger Equation $\hat{\mathrm{H}}\Psi\left(x,t\right)=i\hbar\frac{\partial}{\partial t}\Psi\left(x,t\right)$, where $\hat{\mathrm{H}}=\hat{T}+\hat{V}$ is the Hamiltonian of the system.