1. The state of a single particle is described as fully as possible by an appropriate function, $\Psi(x,y,z,t)$, which may be expressed for stationary energy states as the product of a time-independent amplitude function, $\psi(x,y,z)$, and a time-dependent function, $f(t)$. Both functions, Ψ and ψ, must be single valued, continuous, finite and square integrable for all values of the coordinates.

2.a. The possible state functions $\Psi(x,y,z,t)$ for a single particle are given by solutions to the time-dependent Schrödinger equation:

$$\frac{\hbar}{i}\frac{\partial}{\partial t}\Psi = \hat{\mathbf{H}}\Psi = \left[-\frac{\hbar^2}{2m}\nabla^2 + V(x,y,z,t)\right]\Psi$$

2.b. In the special case of a conservative system, where V is not a function of time, and $\Psi(x,y,z,t) = \psi(x,y,z)\ e^{-i\,Et/\hbar}$, the possible time-independent amplitude functions $\psi(x,y,z)$ for a single particle are given by solutions to the time independent Schrödinger equation:

$$\hat{\mathbf{H}}\psi = \left[-\frac{\hbar^2}{2m}\nabla^2 + V(x,y,z)\right]\psi = E\psi$$

3.a. For every physically observable dynamical variable, **A**, there is a corresponding linear Hermitian operator, $\hat{\mathbf{A}}$. If the variable is capable of exact experimental determination, its only possible exact values, a, are those given by the eigenvalues of the equation:

$$\hat{\mathbf{A}}\Psi = a\Psi$$

3.b. In conservative systems and time-independent operators, the only possible exact values of the variable are given by:

$$\hat{\mathbf{A}}\psi = a\psi$$

4.a. The term $|\Psi|^2 d\tau = \Psi^*\Psi d\tau$ is the time-dependent probability that a single particle exists at a given time t in the space element $d\tau$, i.e. between (x,y,z) and $(x+dx,y+dy,z+dz)$.

4.b. In conservative systems (in which the single particle is restricted to an energy eigenstate), the time independent probability that the particle exists in the space element $d\tau$ is $|\psi|^2 d\tau = \psi^*\psi d\tau$.

5.a. The expected mean value, <*a*>, of a series of measurements of variable **A** made over a large number of particles each in the state **Ψ** is:

$$\langle a \rangle = \frac{\int_{-\infty}^{+\infty} \Psi^* \hat{\mathbf{A}} \Psi \, d\tau}{\int_{-\infty}^{+\infty} |\Psi|^2 \, d\tau}$$

where $\hat{\mathbf{A}}$ is the quantum mechanical operator for the variable.

5.b. For conservative systems, this equation becomes:

$$\langle a \rangle = \frac{\int_{-\infty}^{+\infty} \psi^* \hat{\mathbf{A}} \psi \, d\tau}{\int_{-\infty}^{+\infty} |\psi|^2 \, d\tau}$$

and, when the time-independent functions are normalized, this further reduces to:

$$\langle a \rangle = \int_{-\infty}^{+\infty} \psi^* \hat{\mathbf{A}} \psi \, d\tau$$

6. The operators corresponding to the position and the linear momentum are:

$$\hat{\mathbf{x}} = x \cdot \text{ and } \hat{\mathbf{p}}_x = \frac{\hbar}{i} \frac{d}{dx}$$

respectively.