Schrodinger's Equation in Operator form.

Schrodinger's wave equation is an eigen value equation for the total energy of the system.

It may be written in operator form as –

$$\hat{H}\psi = E\psi$$

where $\hat{H}$ is a operator known as Hamiltonian Operator. This Hamiltonian Operator $\hat{H}$ defines the total energy of the system. It is used as operator for energy E.

ψ is a wave function describing the given state of the system.

Hamiltonian operator is expressed as

$$\hat{H} = -\frac{h^2}{8\pi^2 m}\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2} + \frac{\partial^2}{\partial z^2}\right) + \hat{V}(x,y,z)$$

$$= -\frac{h^2}{8\pi^2 m}\nabla^2 + \hat{V}(x,y,z)$$

Now, schrodinger's eqⁿ can be written as

$$\left[-\frac{h^2}{8\pi^2 m}\nabla^2 + \hat{V}(x,y,z)\right] = E\psi$$

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

$\left[\text{where } \frac{h}{2\pi} = \hbar\right]$

Here ∇^2 (Del squared) $= \frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2} + \frac{\partial^2}{\partial z^2}$ is known as Laplacian Operator.