Schrodinger's Wave Equation for Hydrogen atom.

We know that the Potential Energy of H atom $= -\frac{e^2}{r}$

and General form of Schrodinger's wave equation is given as

$$\nabla^2\psi + \frac{8\pi^2 m}{h^2}(E-U)\psi = 0$$

where E is total energy and U is Potential energy

or, $$\nabla^2\psi + \frac{8\pi^2 m}{h^2}\left\{[E] - \left(-\frac{e^2}{r}\right)\right\}\psi = 0$$

or, $$-\frac{h^2}{8\pi^2 m}\nabla^2\psi = E\psi + \frac{e^2}{r}\psi$$

or $$E\psi = \left[-\frac{h^2}{8\pi^2 m}\left(\nabla^2\psi + \frac{e^2}{r}\right)\psi\right]$$

$$E\psi = \left[-\frac{h^2}{8\pi^2 m}\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2} + \frac{\partial^2}{\partial z^2}\right) - \frac{e^2}{r}\right]\psi$$

The above eqⁿ is the Schrodinger's wave equation for Hydrogen atom.

— x —