

Hamiltonian for the hydrogen atom

Classical Hamiltonian

$$E = T + V = -\frac{e^2}{r} + \frac{1}{2}mv^2$$

Quantum Mechanical Hamiltonian

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

$$\hat{H} = -\frac{\hbar^2}{2m}\nabla^2 - \frac{e^2}{r}$$

$$\psi(r, \theta, \phi) = R(r) \cdot \Theta(\theta) \cdot \Phi(\phi)$$

Spherical coordinates

