Recitation #12
Quantum 521

Recall that we found the radial momentum operator,

$$\hat{p}_r = \frac{\hbar}{i}\frac{1}{r}\frac{\partial}{\partial r}r$$

. The Hamiltonian for a particle of mass m in a spherically symmetric potential is then

$$\frac{\hat{p}_r^2}{2m} + \frac{\hat{L}^2}{2mr^2} + V(r)$$

Consider a particle in the state

$$\psi = Ae^{-r/a_0}$$

.

1. What is the angular momentum of the state?
2. Assuming ψ is an energy eigenstate in a spherically symmetric potential that vanishes as $r \to \infty$ find E. (Match leading terms in the Schrodinger equation.)
3. Find V(r) taking $a_0 = \hbar/mc\alpha$