Chemistry 542
Fall, 2002
Problem Set 11

Finish Chapter 8.

1. Use the variation method to estimate the ground state energy of the hydrogen atom. Use as your trial function $\psi = e^{-\lambda r}$. Do all of your work in atomic units.

2. Use the variation method to estimate the ground state energy of the hydrogen atom in an electric field of strength F. Use as your trial function $\psi = c_1\psi_{1s} + c_2\psi_{2p_z}$. Do all of your work in atomic units.

3. In the previous problem, calculate the fraction of p character in the ground state wave function for F = 0.1. Use may use the weak field approximation to simplify the calculation.

4. Use the variation method to estimate the ground state energy of a particle of mass in a 1D box of length L. Use as your trial function $\psi = x(L - x)$.