

Physics 829: Problem Set 7

Due Wednesday, May 27, 2009 at 11:59 P. M.

- (25pts.)
 - Write down the angular wave functions in the 1D_2 , 3P_0 , $3P_1$, $3P_2$, and 1S_0 levels of the ground state configuration of carbon.
 - Write down the fully antisymmetrized 1D_2 wave function as a linear combination of Slater determinants.
- (15pts.) As mentioned in class, the $(1s)(2s)$ configuration of He represents an excited state of this atom. There are two possible states, known as ortho and para helium, corresponding to spin 0 and spin 1. Calculate the energy difference between these states by first order perturbation theory (that is, obtain this energy difference in the form of a specific integral).
- (10 pts.) Fill in the missing steps in the variational calculation described in class for the Hartree approximation. Thus, explicitly obtain the coupled Hartree equations for the single particle wave functions of N electrons in an external potential $V(\mathbf{r})$.