

Examination 1
Chemistry 262

October 10, 1997
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Name: _____

Please answer all 6 questions, showing all calculations - 25 points each, 150 total.

1. Which of the following wavefunctions are orthogonal to $\Psi_1 = A_1 \sin x$?

$$\Psi_2 = A_2 \exp(-x^2)$$

$$\Psi_3 = A_3 \cos 3x/2$$

2. What are the most probable locations to find an electron in a box from 0 to 1 Å in the $n = 5$ PIB state? What is the expectation value for the location of this electron?
3. What is the degeneracy of a $4p$ ($n = 4, l = 1$) electronic wavefunction for ^1H (ignoring electron spin)?
4. What are the possible term symbols for a Li atom in the $1s^1 2p^1 3d^1$ state?
5. Write the Slater determinant for a Be atom in the $1s^1 2s^2 2p^1$ state, using the wavefunctions $1s$, $1s$, $2s$, $2s$, $2p$, $2p$ as appropriate.
6. In your own words, describe what is involved in the Hartree-Fock method of calculating the ground state electronic energy of an atom.