PHY 3107, Spring 2016, Homework #6

due Friday, March 4, at 12:00 pm (noon)

1.) For singly-ionized He^+, what are the most probable radius of the electron and what is the ionization energy of that electron? [Hint: you are preparing for the test next week: be sure you are comfortable with the difference between the most probable value of the radius and the expectation value for the radius. Also see eqn. 8.42 and 8.44]

2.) Give all the possible value of j and m_j for a d electron.

3.) Eight identical, noninteracting particles are placed in a cubical box of sides L=0.200 nm. Find the lowest energy of the system (in electron volts) and list the quantum numbers if a) the particles are electrons (e.g., fermions), or b) the particles have the same mass as the electron but do not obey the exclusion principle (e.g., bosons).

4.) The "omega minus" or Ω^- is an odd, 3-quark particle that we will be looking at shortly in Chapter 15. However is has spin $\frac{3}{2}$, which is what I want you to think about here. Find: a) the magnitude of the spin angular momentum for this particle and b) the possible angles which the spin angular momentum vector makes with respect to the z-axis. c) Does the Ω^- obey the Pauli exclusion principle? [Why or why not?]