CHEM 550 Problem Set #7
Due Friday Nov. 18 at 5pm in Prof. Ginger's mailbox.

Note: This may be shorter than usual, but don't wait till Thursday evening.

**Levine Exercises:**

**10.18** Spin functions

**11.30** Terms, levels, states of carbon

**Additional Problems**

***Spin***

1) a) Write out *all* of the allowed wave-functions for the first **excited** state of the He atom including electron spin. Which functions correspond to triplet states and which to singlet states.

b) List 5 particles that are Fermions. List 5 that are Bosons. (Google is fair game if you don't happen to know this many particles off the top of your head!). What do you notice as far as a trend goes for the 'fundamental' particles.

***Term symbol practice***

1) **Derive** (do not just state) the possible term symbols for the $1s^2 2s^2 2p^3$ configuration of a nitrogen atom.

***Qualitative Material***

2) a) Explain why the Hartree-Fock SCF method doesn't obtain the exact ground state energy even though it incorporates an interelectron repulsion term into the Hamiltonian.

b) Explain why the energy of an orbital depend on *l* for electrons in atoms other than hydrogen? Annotate your discussion with a ***plot*** of the radial wave functions for 3s, 3p and 3d.

c) Rationalize why, all other things being equal, parallel (unpaired) spins *generally* (not always) produce states of lower energy that states with antiparallel (paired) (*Hund's rule*)

***Freshman Chemistry Revisited***

3) When UV radiation of wavelength 58.4 nm from a He lamp is directed on to a sample of Krypton gas, electrons are ejected with a maximum speed of $1.59 \times 10^6$ m/s. What is the ionization energy of Krypton?