1. Prove that the radial wave function, given in Table 8.2, for an electron in the 3d state is a solution of the radial Schrodinger equation 8.72 and verify that the binding energy for this electron is given by equation 8.73. (25pts.)

2. What is the minimum angle between the orbital angular momentum vector and its z-component for an electron in the 5f orbital of an H-atom? (20pts.)

3. List all the different (n, l, $m_l$, $m_s$) combinations for an electron in the 4d state of a Hydrogen atom. (15pts.)

4. Consider a Hydrogen atom in the 6p state placed in a 1T magnetic field directed along the z-axis. Calculate the wavelengths of the lines (there are three of them) for electron downwards transitions between the 6p and 1s states. Neglect any spin effects. (20pts.)

5. An electron occupying the 4f state of a Hydrogen atom with $L_z = 3\hbar$ and $S_z = -\frac{1}{2}\hbar$. How much its energy changes if the atom is placed in a 2T magnetic field along the z-axis? (20pts.)

**Good Luck!!**