Problem 18 – Clarification

Here is my best effort to clear up the question.

1. Draw an energy level diagram showing the Bohr energies for the n = 3 and n =2 states. Save room to draw the fine structure levels to the right.

2. Build a table listing each of the allowed fine structure states such as the one below.

n	j	allowed ℓ's	$\left(3-\frac{4n}{j+\frac{1}{2}}\right)$	$E_{fs}^{(1)}(eV)$
3	$\frac{5}{2}$	2	-1	-0.22x10^{-5}

3. Now go back to the energy level diagram and draw the fine structure levels labeled with their j's and ℓ's. The fine structure levels should be draw to scale with themselves but greatly enlarged with respect to the Bohr energies. You can get some help by looking at figure 6.9.

4. Draw the transition from the n = 3 level to the n = 2 level in the Bohr energy diagram. Now, use the selection rules to sketch the allowed transitions for the fine structure states. Draw them from lowest energy to highest energy and label them 1, 2, 3, …

5. Build a table to find the energy difference of these transitions from the Bohr value.

Transition Number	Energy Shift n=3 (eV)	Energy Shift n=2 (eV)	Total Energy Shift (eV)
1	-2.01x10^{-5}	+1.13x10^{-5}	-0.88x10^{-5}
2			
3			