Quantum Mechanics:

the sequel

Quantum Numbers

- Read on pg. 200 from "The theory of quantum…" (about third paragraph) to "The Magnetic Quantum Number, m_l" on pg. 201. Do PE 3

m_l : the magnetic quantum number

- Recall: we are looking at the first three of four quantum numbers: <u>n, l, m_l</u>, m_s
- The magnetic quantum number is m_l, it further divides subshells into "orbitals"
- Recall that even though you can visualize these divisions as spherical regions around the nucleus, they really refer to different waveforms
- m_l ranges from - l to + l, in intervals of one
- when l = 1, the values of m_l are -1, 0, 1

m_l : the magnetic quantum number

Read the remainder of 201.

- What is m_l when l = 3 (f)? When l = 0 (s)?

- PE 4: How many orbitals are in a g subshell?

More practice with quantum #s

- Complete the chart on the study sheet
- Look at the last two columns of the chart.
- A maximum of two electrons can fit in each orbital.
- For n = 3, a maximum of 18 electrons can fit in this shell (2 + 6 + 10)
- This is equivalent to $2n^2$: $2(3)^2$ = 18.
- From now on, you can determine the # of electrons in a shell by using this "$2n^2$" rule.

Summary

- Read pg. 202
- Figure 6.19 indicates the energies of subshells and the number of orbitals in each. We will see that each of these orbitals can hold exactly 2 electrons
- Note that some shells overlap with respect to energy.
- If we extend a Bohr-like model to represent this we would see shells being split into subshells causing some shells to overlap…

The overlapping of subshells

To visualize what is happening we are equating energy of a subshell to size

Note: not exactly to scale (see fig. 6.19)

n = 1
n = 2
n = 3
n = 4
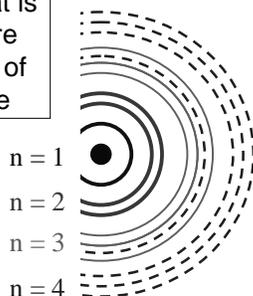
m_s : the final quantum number!

- Recall: the quantum numbers: n, l, m_l, m_s
- The spin quantum number is m_s, it can be thought of as the clockwise vs. counterclockwise spin of an electron (as on pg. 203, or as a waveform)…
- The value of m_s is + 1/2 or - 1/2
- Don't worry about why they are fractions
- The important point is that there are two values. It's important because …