General Chemistry I - CHEM 2101
Fall 2008

Quantum Numbers

Three quantum numbers describe the distribution of electrons in atoms

1. **Principal quantum number (*n*)**
    a. It can have **values 1, 2, 3, 4, 5, etc**.
    b. It corresponds to the distance of an electron from the nucleus.
    c. In **hydrogen** the value of (**n) corresponds to** the **energy** of the orbital. In **a many electron atom (n) does not correspond to** the **energy** of the orbital.
    d. The **principal quantum number** or **principal quantum level (n)** is the **shell**.

2. **Angular momentum quantum number (*l*)**
    a. It can have **values from zero to (n-1)**, but only integral values.
    b. It tells us the shape of the orbitals.
    c. The **angular momentum quantum number (*l*)** is the **subshell.**

Angular momentum quantum number (*l*)	0	1	2	3	4	5
Subshell	s	p	d	f	g	h

3. **Magnetic quantum number (m_l)**
    a. It can have integral values form – l to + l (**do not forget zero**).
    b. It describes the orientation of the orbitals in space.
    c. The **number of magnetic quantum number (m_l) values** represents the **number of orbitals** in a subshell.

Example: If n = 3, and l = 2, how many orbitals are in the subshell?

There is one more quantum number. It describes how an electron spins.

4. Electron spin quantum number (m_s)

a. It has **values** of **+½ and –½.**

b. Half the electrons will have m_s = ½ the others m_s = –½

Therefore, <u>four</u> quantum numbers are needed to <u>describe an electron in an atom.</u>

Example: For n values of 1 – 3, fill in the following table:

n	l	m_l	Number of orbitals per subshell	Orbital names	Max. e^- per subshell	Max e^- per shell
1						
2						
3						