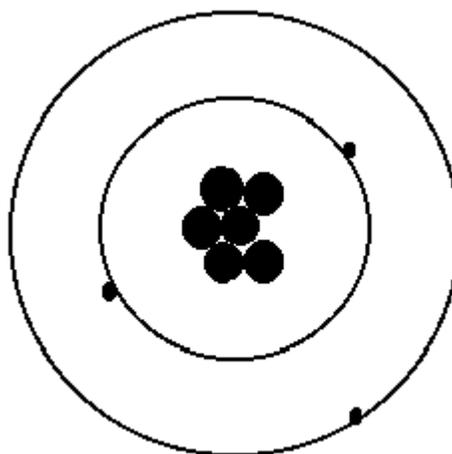


## CHEMISTRY CHAPTER 4

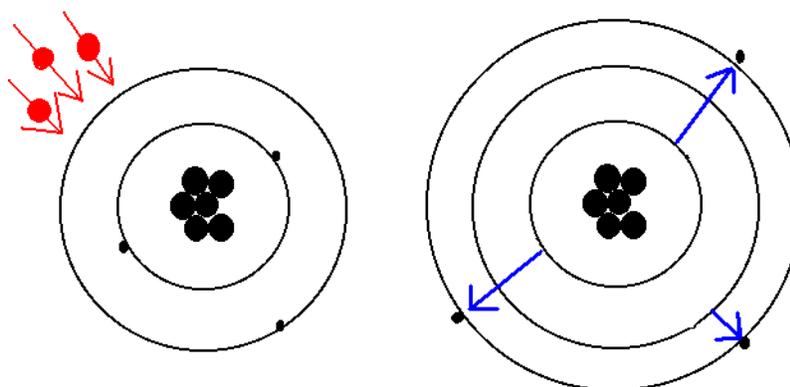
### (Arrangement of Electrons)

The lowest energy state of an atom is its ground state.  
(usually it's the lowest levels)

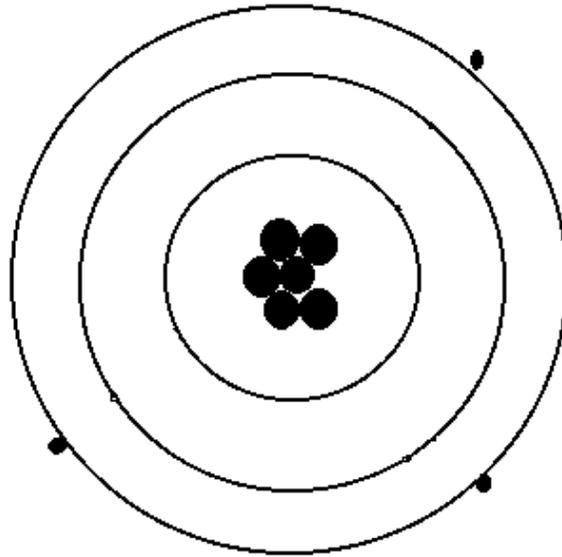


A photon is a particle of electromagnetic radiation having zero mass and carrying a quantum of energy.

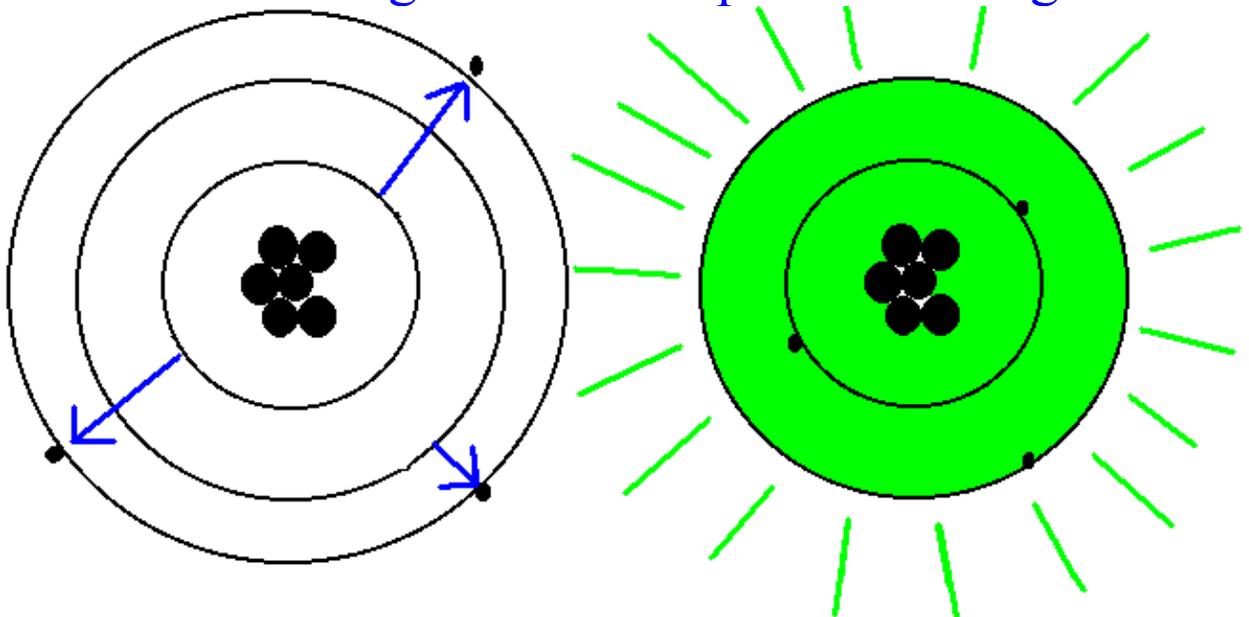
When a photon strikes an atom it gives the atom more energy. If enough photons strike an atom it may cause electrons to jump levels.



The excited state occurs when an atom has a higher potential energy than it has at its ground state.



When an excited atom falls back to its ground state the substance will give off a unique color of light.



These light emissions are used to identify substances in such cases.

C

h

A

M

i

S

t

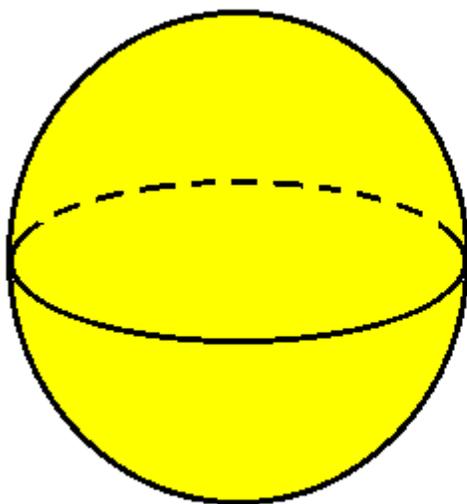
r

y

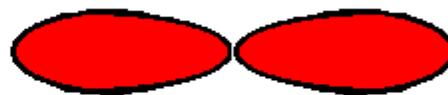
The Heisenberg uncertainty principle states that it is impossible to determine simultaneously both the position and velocity of an electron or any other particle

An orbital is a highly probable location about a nucleus where an electron may be found

Orbitals come in many different shapes. The simplest two shapes are spherical (round) and dumbbell.



Spherical (s)



Dumbbell (p)

The p orbital can exist in any of three directions, left-right, up-down, and/or forward-backward.

These are the paths electrons take around the nucleus of the atom.

G

h

a

M

i

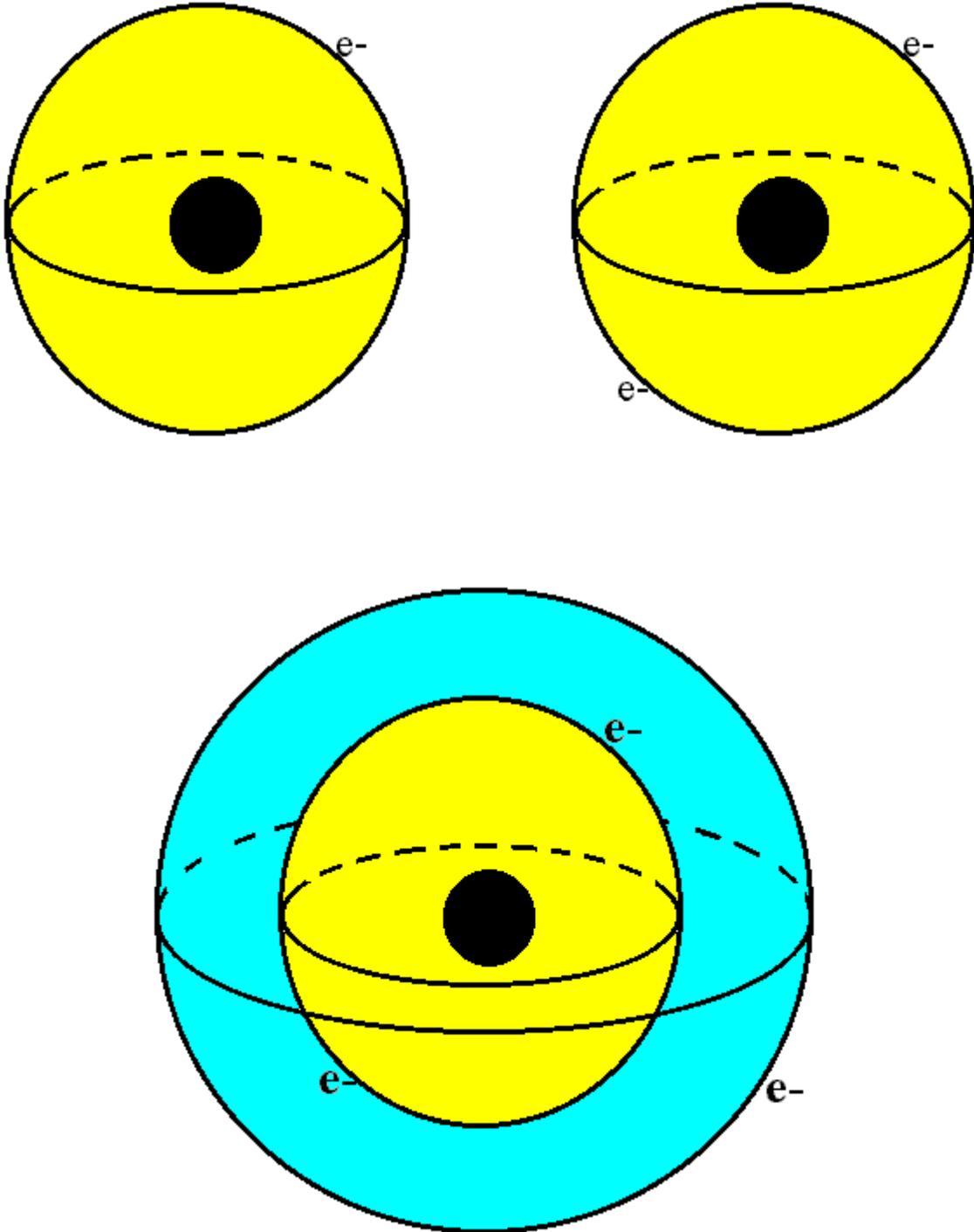
S

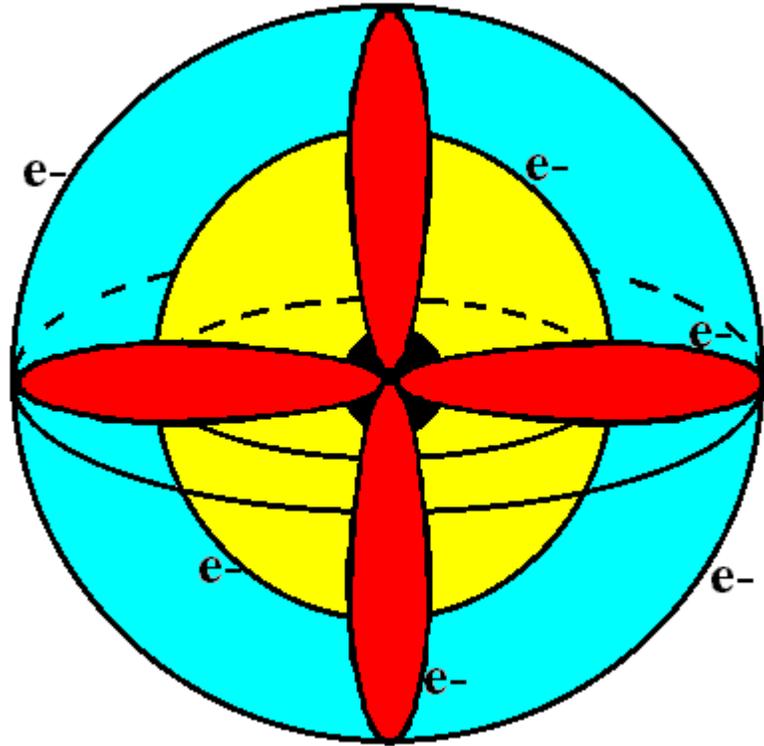
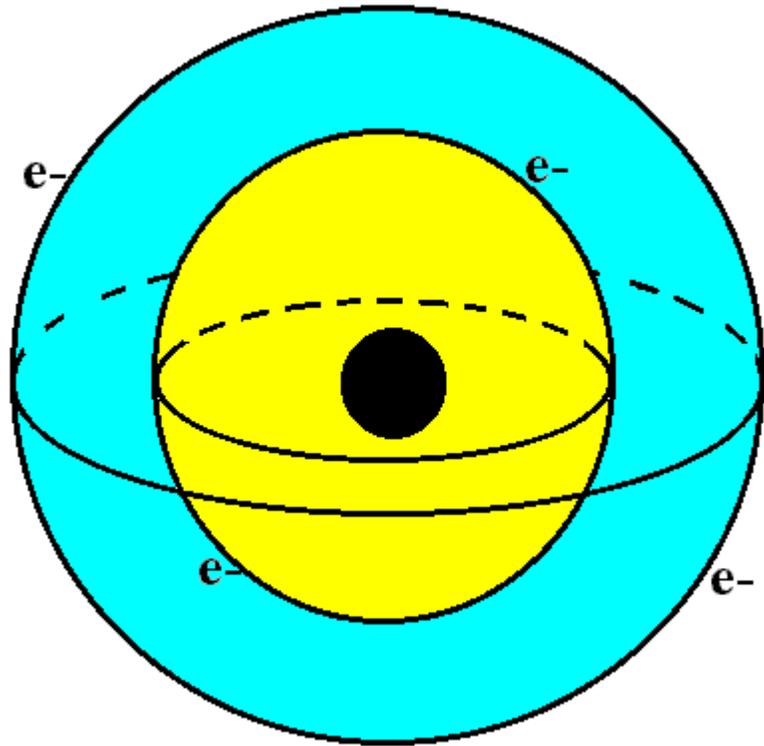
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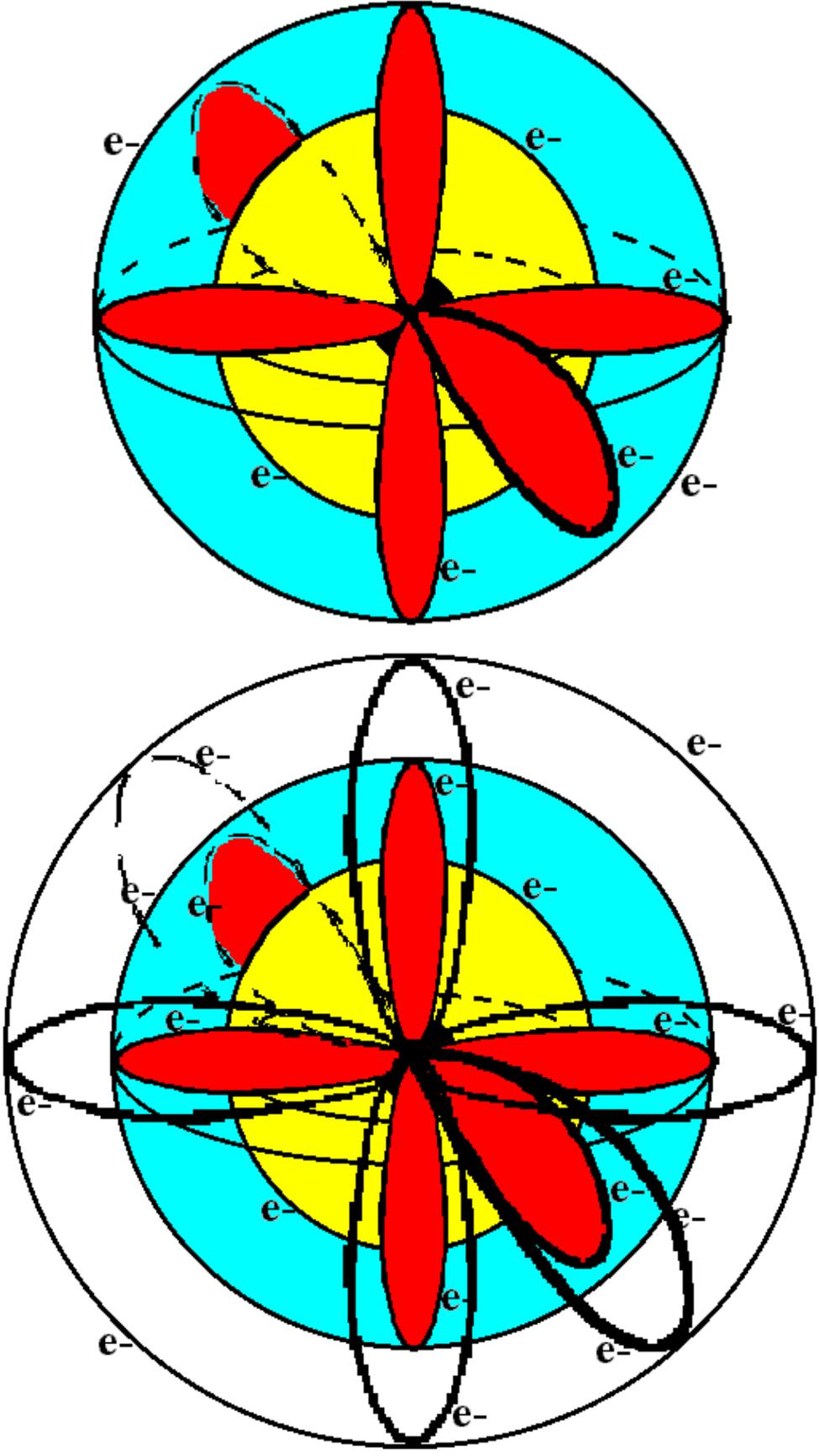
r

y

Some orbital sketches of simple atoms:







Due to the difficulty of sketching electron orbits it is necessary to derive a way to describe the behavior of electrons other than sketching them.

7th	s	$p_x$	$p_y$	$p_z$	$d_a$	$d_b$	$d_c$	$d_d$	$d_e$	$f_1$	$f_2$	$f_3$	$f_4$	$f_5$	$f_6$	$f_7$
6th	s	$p_x$	$p_y$	$p_z$	$d_a$	$d_b$	$d_c$	$d_d$	$d_e$	$f_1$	$f_2$	$f_3$	$f_4$	$f_5$	$f_6$	$f_7$
5th	s	$p_x$	$p_y$	$p_z$	$d_a$	$d_b$	$d_c$	$d_d$	$d_e$	$f_1$	$f_2$	$f_3$	$f_4$	$f_5$	$f_6$	$f_7$
4th	s	$p_x$	$p_y$	$p_z$	$d_a$	$d_b$	$d_c$	$d_d$	$d_e$	$f_1$	$f_2$	$f_3$	$f_4$	$f_5$	$f_6$	$f_7$
3rd	s	$p_x$	$p_y$	$p_z$	$d_a$	$d_b$	$d_c$	$d_d$	$d_e$							
2nd	s	$p_x$	$p_y$	$p_z$												
1st	s															

Rules for assigning students to dorm rooms:

1. Maximum of two students in any one room
2. There are no elevators->students must be as close to the 1<sup>st</sup> floor as possible
3. When filling a type of room, all rooms must be full before going onto a different type of room.
4. When filling rooms on a floor, you must place one student in each type of room before pairing them.

New rule:

A student will be placed one floor higher if and only if there is an available room, which is two grades better.

The following chart will take care of all rules for your.

1s  
2s 2p  
3s 3p 3d  
4s 4p 4d 4f  
5s 5p 5d 5f  
6s 6p 6d 6f  
7s 7p 7d 7f

~~1s~~  
~~2s 2p~~  
~~3s 3p 3d~~  
~~4s 4p 4d 4f~~  
~~5s 5p 5d 5f~~  
~~6s 6p 6d 6f~~  
~~7s 7p 7d 7f~~

G

h

a

M

i

S

t

r

y

Quantum numbers specify the properties of atomic orbital and the properties of electrons in orbitals.

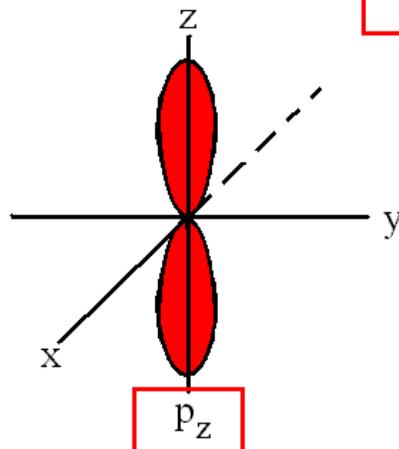
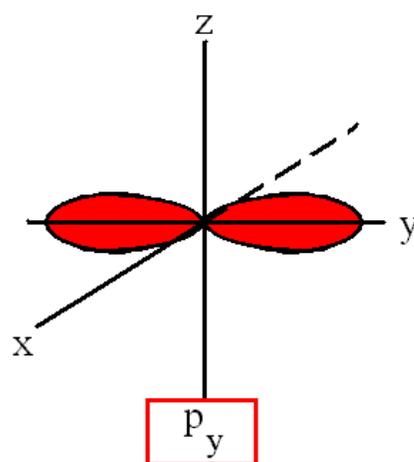
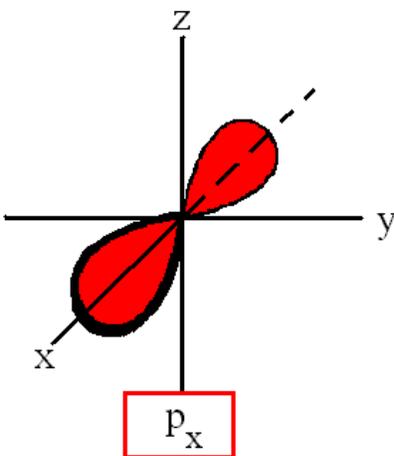
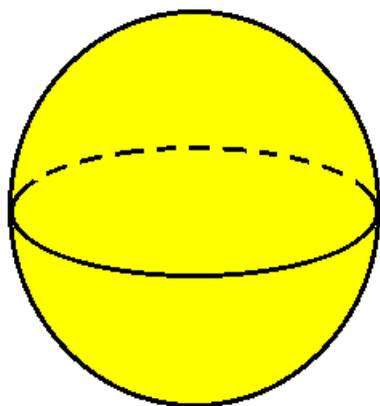
Ex: fluorine  $1s^2 2s^2 2p_x^2 p_y^2 p_z^1$

The principal quantum number (n) indicates the main energy level occupied by the electron

Ex:  $1s^2 2s^2 2p_x^2 p_y^2 p_z^1$

The angular momentum quantum number indicates the shape of the orbital

Ex: s, p, d, f  $1s^2 2s^2 2p_x^2 p_y^2 p_z^1$



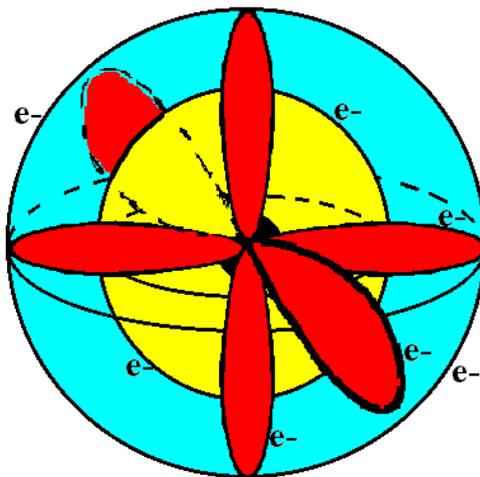
The magnetic quantum number indicates the position of the orbital about the three axes in space

Ex:  $1s^2 2s^2 2p_x^2 p_y^2 p_z^1$

<u>orbital</u>	<u># of shapes or positions</u>	<u># of electrons</u>
s	1	2
p	3	6
d	5	10
f	7	14

The electron configuration is short hand for the arrangement of electrons in an atom

Ex:  $1s^2 2s^2 2p_x^1 p_y^1 p_z^1$  is the notation for:



Orbital notation is an extension of electron configuration notation, which shows the spin of electrons in each orbital by making use of the spin quantum number.

The spin quantum number indicates the direction of the electron spin

Ex: fluorine

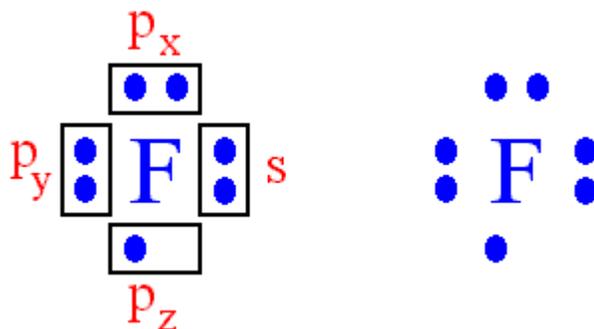
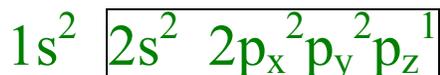


The electron pair is two electrons of opposite spin in the same orbital

An octet consists of 8 electrons in the outer energy level

Electron Dot notation is a representation of the highest occupied energy level

Ex: fluorine



Electron dot notation is the most useful of the notations.  
Why?