



## QUANTUM NUMBERS

Pauli Exclusion Principle: no two electrons can have the same set of quantum numbers

1 <sup>st</sup> Quantum Number – Principle	2 <sup>nd</sup> Quantum Number – Sublevel	3 <sup>rd</sup> Quantum Number – Orientation	4 <sup>th</sup> Quantum Number – Spin
<b>n</b>	<b>l</b>	<b>m<sub>l</sub></b>	<b>m<sub>s</sub></b>
n = 1, 2, 3, 4, 5, 6, 7	l goes from 0 to n-1 <b>within</b> an energy level  l values = 0 (for s), 1 (for p), 2 (for d), and 3 (for f) sublevels	Values m <sub>l</sub> go from + l to - l, which gives 2l + 1 number of values	Has 2 values: +1/2 (spin up) and -1/2 (spin down)
1. measures the <b>average distance</b> of the electron from the nucleus	1. indicates the shape of the orbital (90% probability of finding the electron in the shape)	1. identifies the direction the electron's orbital has around the nucleus – how it is positioned on the Cartesian axis	1. identifies the “spin” or <b>rotation</b> of the electron about its own axis
2. different values of <b>n</b> mean different energy levels	2. different values of l mean different sublevels. In a sublevel all the electrons have nearly the same energy	2. specifies the electron's orbital in which the electron is located within a sublevel	2. shows that <b>orbital</b> can contain only 2 electron
3. different values of <b>n</b> mean relatively large differences in the energies of the electrons	3. different sublevels <b>within</b> the same level may have moderately large differences in energy	3. different values of m <sub>l</sub> mean little difference in energies of the electron	3. the direction of spin is either in one direction or the other
4. the smallest average distance and the lowest energy occurs when n=1; each increase in <b>n</b> increases those quantities	4. within any level, the lowest energy sublevel is s, then p, then d, then f	4. the number of possible values m <sub>l</sub> within a sublevel identifies how many electron pairs that the sublevel can hold	4. when 2 electrons (in an atom) have the same set o fquantum numbers except for m <sub>s</sub> then these electrons are called an electron pair
5. the number of electrons possible in a level is 2n <sup>2</sup>	5. the number of possible values of l for a level is equal to the value of <b>n</b>		5. these electrons within an electron pair have essentially the same energy