

Quantum Numbers



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The General Quantum Numbers

Quantum Number of Electrons

- ☉ Principle Quantum Number (n)
- ☉ Angular Quantum Number (l)
- ☉ Magnetic Quantum Number (m)
- ☉ Spin Quantum Number (s)



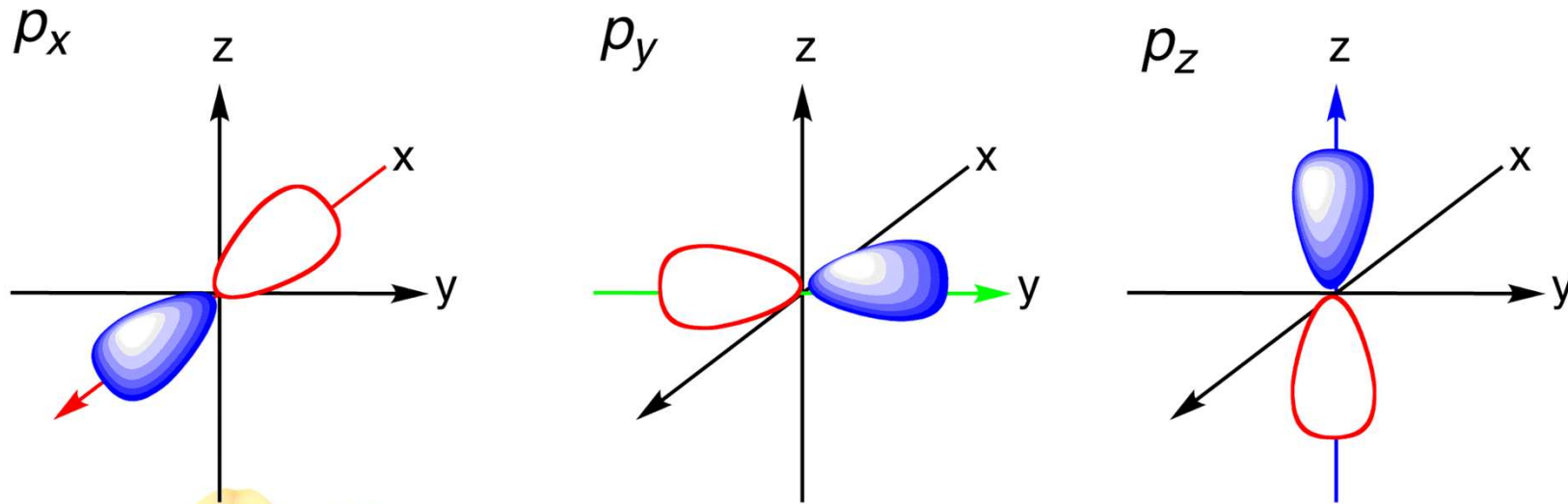
Principle Quantum Number

- ☞ Describes the Size of the Orbital.
- ☞ Distance from electron to the nucleus is directly proportional to the energy of the electron.



Angular Quantum Number (l)

↻ describes the Shape of the orbital.



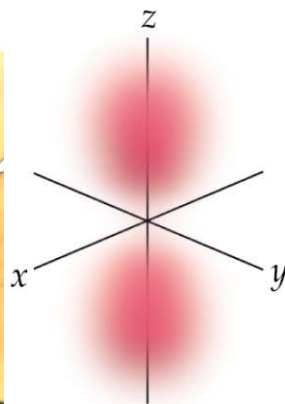
The three p orbitals are aligned along perpendicular axes



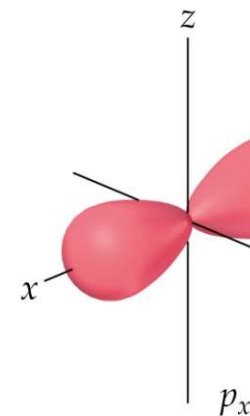
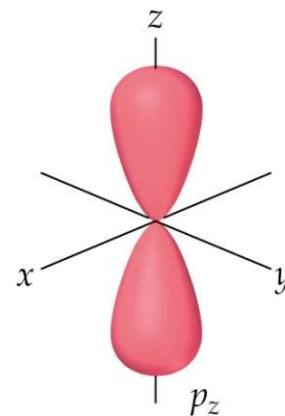
Magnetic Quantum Number (m)

☞ describes the orientation of the orbital.

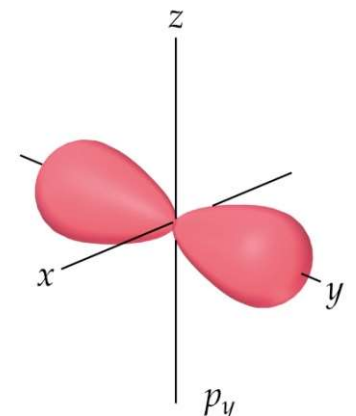
☞ for s orbital $l = 0$ and $m = 0$. and if $l = 1$ and $m = +1, 0, -1$ and if $l = 2$ and $m = -2, -1, 0, +1, +2$.



(a)



(b)



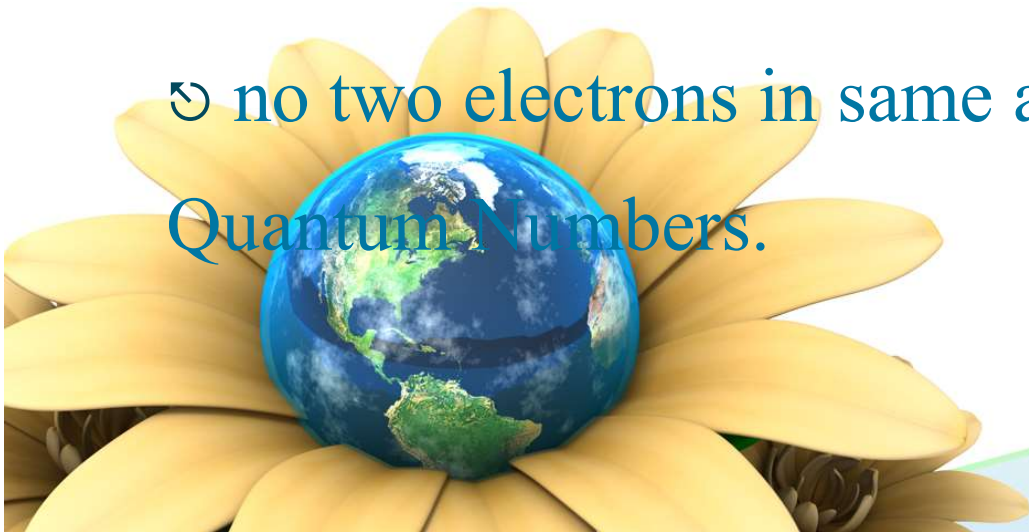
Spin Quantum Number (s)

- ☉ describes the spin or direction (clockwise or anticlockwise) in which an electron spin.
- ☉ the two possible spin values are $+1/2$ and $-1/2$.



Rules of Allowed Quantum Numbers

- ⊗ 3 quantum number (n, l, m) must be an integer.
- ⊗ 'n' cannot be zero.
- ⊗ 'l' can be an integer b/w $0 > l > (n-1)$.
- ⊗ 'm' can be an integer b/w $-l > m > +l$.
- ⊗ 's' can take only
- ⊗ no two electrons in same atom can have the same 4 Quantum Numbers.



Tabular Representation

Shell n	Sub Shell l	Sub-shell notation	Orientation m	No. of Orbitals
1	0	1s	0	1
2	0	2s	0	1
	1	2p	-1, 0, +1	3
3	0	3s	0	1
	1	3p	-1, 0, +1	3
	2	3d	-2, -1, 0, +1, +2	5
4	0	4s	0	1
	1	4p	-1, 0, +1	3
	2	4d	-2, -1, 0, +1, +2	5
	3	4f	-3, -2, -1, 0, +1, +2, +3	7

