Spectroscopic Symbol, Term and State

Spin-Orbit (L-S) or Russel-Saunders (R-S) Coupling

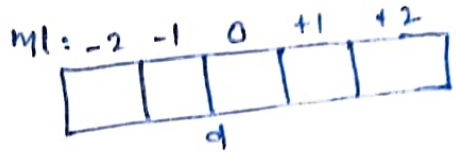
The magnetic quantum number is shown by m_l.

The m_l values for orbitals are shown as

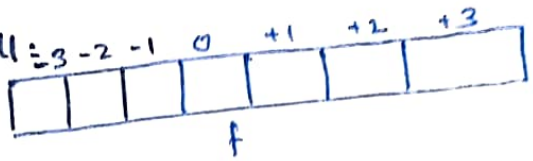
For S orbital

For P orbital

For d orbital



For f orbital



The summation of all m_l values of a subshell is c
total orbital angular momentum or simply Total Orbit

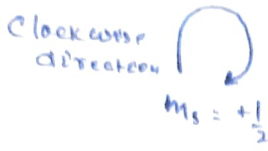
$$\text{ie} \quad L = \Sigma m_l$$

If L values is 0, 1, 2, 3, 4, 5 ... then
the spectroscopic symbols is S, P, D, F, G, H .....

Total Orbital angular momentum $L = \Sigma m_l$ or L value	0	1	2	3	4	5	.....
Symbol	S	P	D	F	G	H	.....

Now we know the spin Quantum Number is shown by m_s

If electrons spins in clock wise direction ie '↑', then m_s value is '$+\frac{1}{2}$'. but if spins in anti clock wise direction i.e '↓' then m_s value is '$-\frac{1}{2}$'



Anti clock wise direction

So, the m_s can have either $+\frac{1}{2}$ for ↑ direction of electron spin value

or $-\frac{1}{2}$ for ↓ direction of electron spin value

The summation of all m_s values of a subshell is called Total spin angular momentum or simply

Total spin (S)

The total spin or $S = \sum m_s$

And $(2S+1)$ is called spin multiplicity

ie Spin multiplicity $= 2S+1$

If n be the number of Unpaired electrons then Spin multiplicity

$[\because 2S = n]$

$\therefore 2S+1 = n+1$

If Spin multiplicity value $(2S+1)$ is 1, 2, 3 ... then we call it as Singlet, Doublet, Tripplet ... etc.

$2S+1$ (Spin Multiplicity) value	1	2	3	4	5	6
Name	Singlet	Doublet	Tripler	Quarter	Pentet	Sixer