Crystal Field Splitting of d-Orbitals →

It is all ready mentioned that d orbitals may be devided in to two sets. First set consist of d_{xy}, d_{yz} and d_{xz} orbitals An orbital belonging to this set is oriented in the region between two co-ordinate axes. This orbital is collectively called d_ϵ orbitals.

The second set consist of $d_{x^2-y^2}$ and d_{z^2} orbitals and these orbitals has tendency to oriented along co-ordinate axes. These are called d_γ orbitals.

In the case of free central ion (in the absence of ligand field). All the five d-orbitals have the same energy i.e they are degenarate meaning energetically same.

However on the approach of ligands. The d-electron will be repelled by the lone pair of the ligand this repulsion will rised the energy level of d-orbitals.

If all the ligands approches towards central metal ion are at an equal distance from each of the d-orbitals. The energy of each orbital will increase by the same amount. ie. they will have now higher energy than before. This is however an hypothetical situation.

As all ready mentioned that d-orbitals differ in their orientations. The energy of d-orbitals laying in the direction of the approaching liganas becomes greater than the energy of d-orbitals lying in between the ligand.

The Conversion of five degenarate d-orbitals of the metal ion in to two sets of d-orbital having different energy is called Crystal field Splitting or Energy level Splitting.

The energy difference between $d\epsilon$ (d_{xy}, d_{yz}, & d_{xz}) and $d\gamma$ ($d_{x^2-y^2}$, & d_{z^2}) level is represented by Δ and, it is termed as Crystal field Spliting.

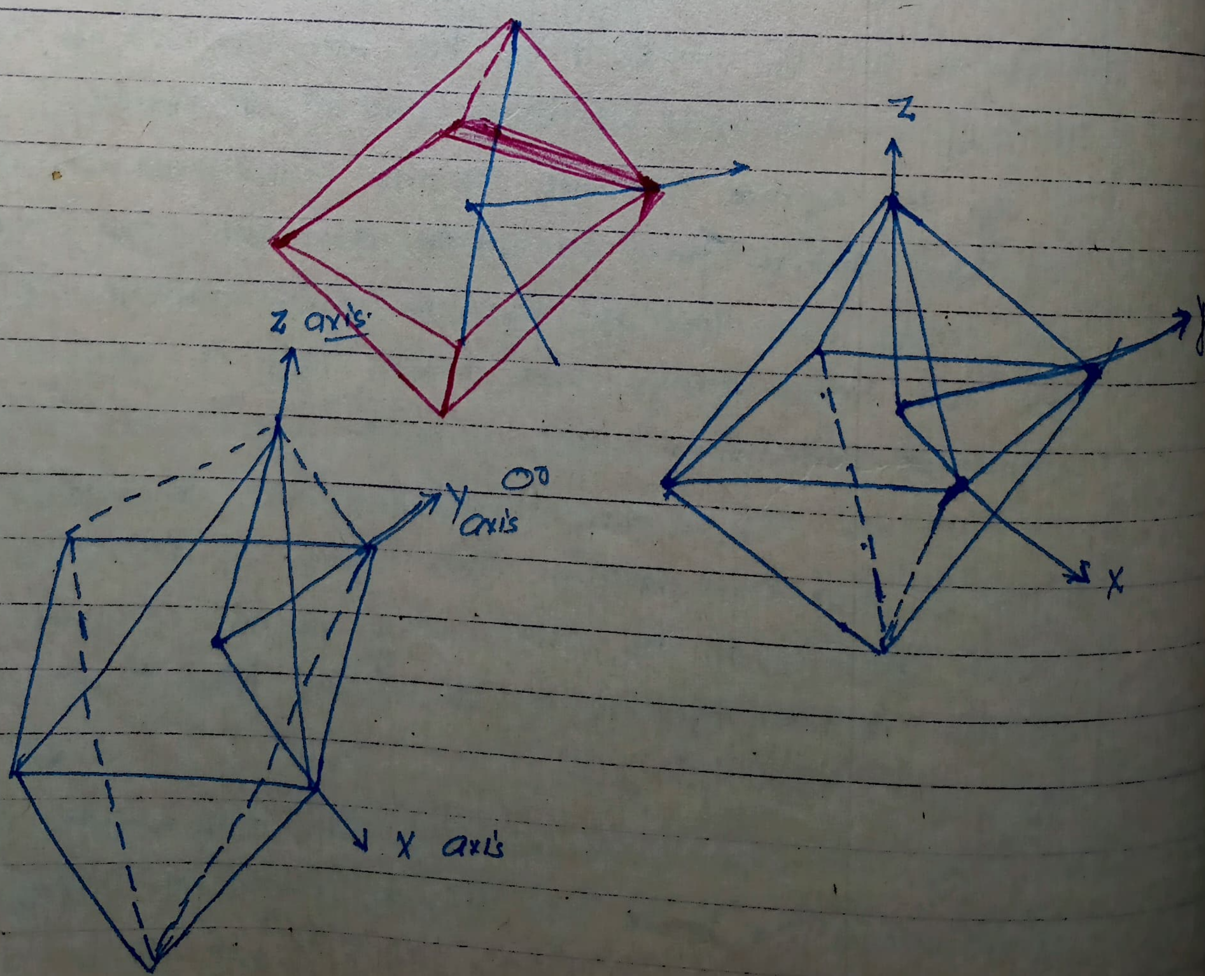
The Crystal field Spliting energy 'Δ' is frequently measured in terms of a parametere Dq. It (the magnitude of splitting) is arbitrarily set at 10Dq.

~~i.e. 2 Dq for each unpaired d Electron.~~

CRYSTAL FIELD Spliting IN Octahedral Complexes:

i.e. IN Co-ordination No-6

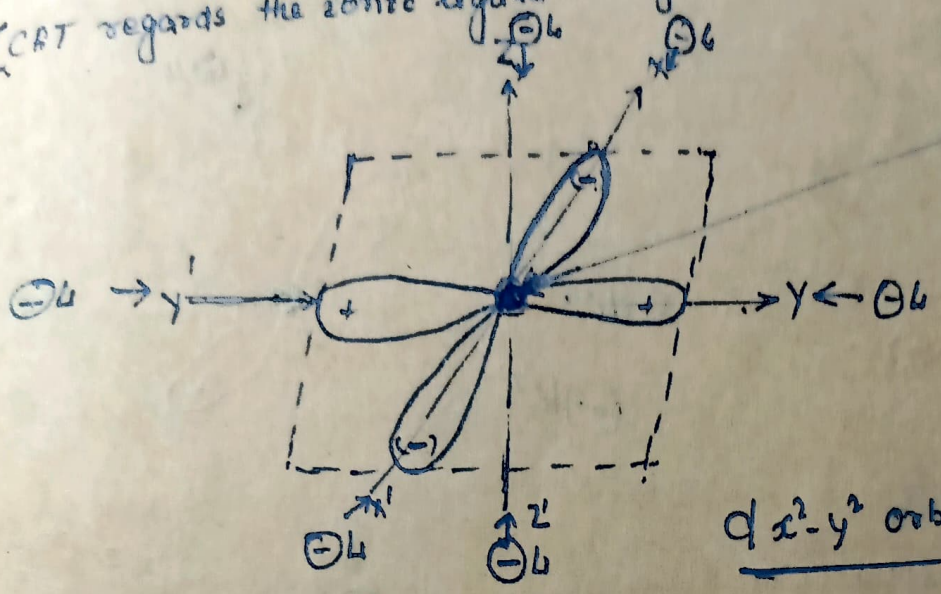
IN an octahedral Complex, The Central metal ion is placed at the Centre and the ligand occupy the (6) Six Corners of a Octahedron as shown below:—



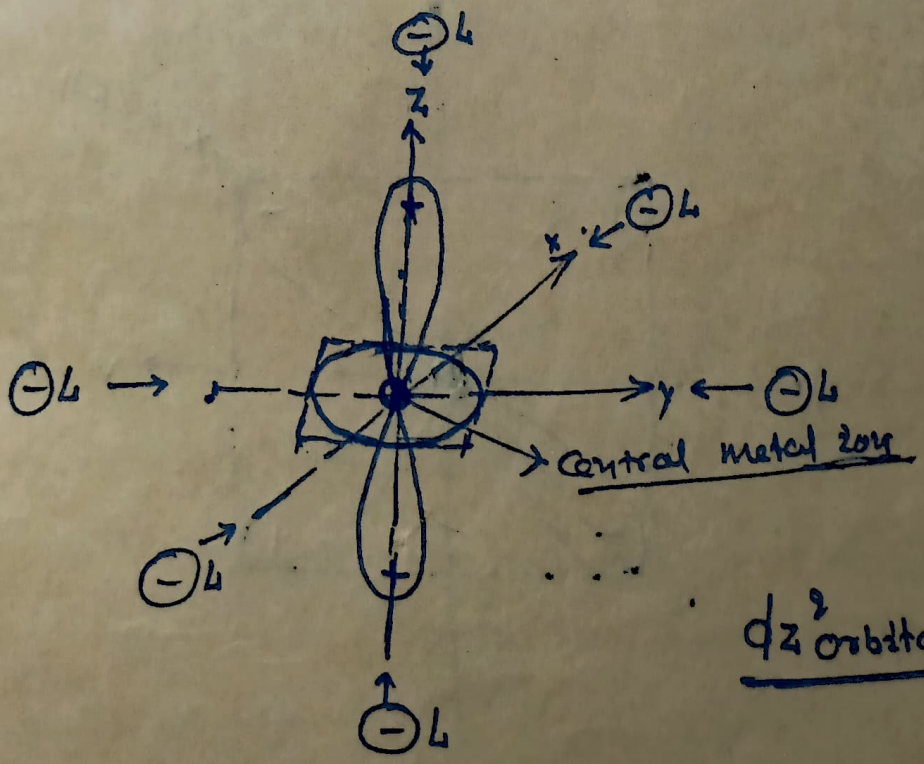
C.F. Splitting of d-Orbitals:

d-orbitals laying on the direction of the approaching ligand.

[CFT regards the centre ligand as negative Point charge & Neutral Ligand as dipole.

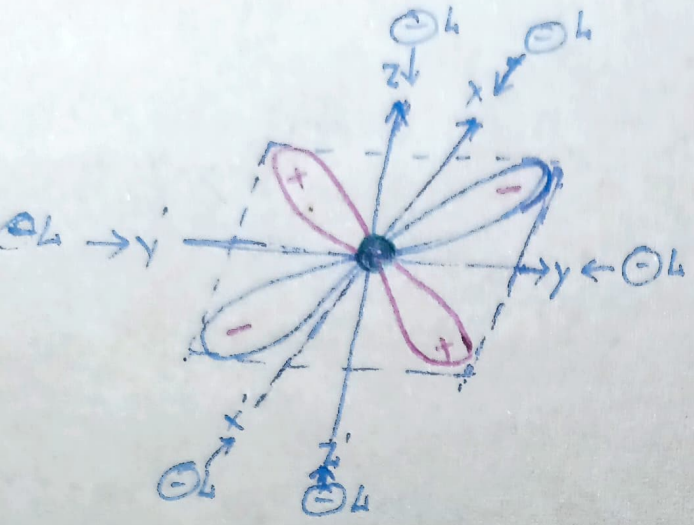


$d_{x^2-y^2}$ orbital.

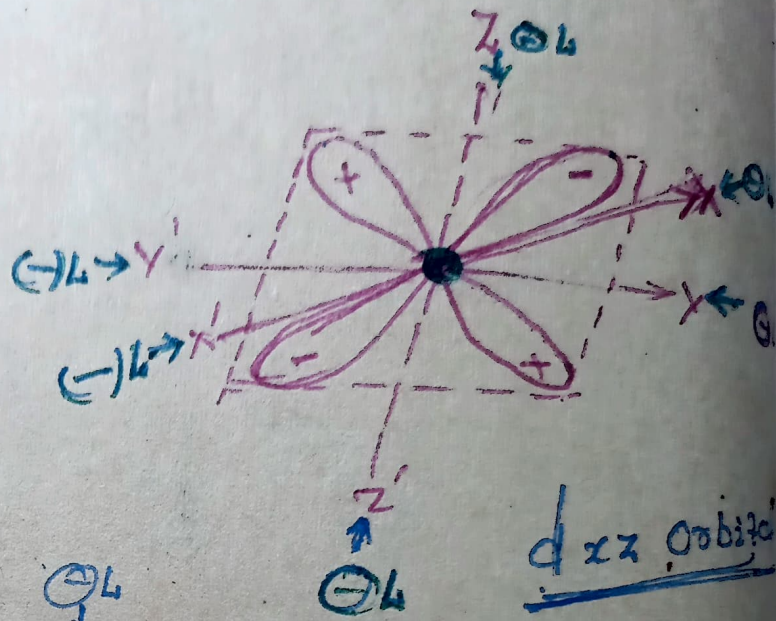


d_{z^2} orbital.

'⊕' this sign stands for Central metal ion.



dxy Orbital



dxz Orbital