

→ When Metal react with Ligand to form stable co-ordination Compound or Complex Compound or Semipolar Compound or dative Compound or Acid base Compound.

* Ligand or Nucleophile or Base :→ Those species

which having excess e^- in form of $-q$. [Cl^- , H^- , Br^- , OH^- , CN^- , etc]. Lone pair e^- ($H_2\ddot{O}$, $\ddot{N}H_3$, $H_2\ddot{S}$, $\ddot{P}H_3$)

having π -bond (Benzene, O_2 , N_2 , EDTA, oxalate etc)

* Types of Ligand :→

(i) Strong ligand

(ii) Weak ligand

(iii) Neutral ligand

(iv) Monodentate ligand

(v) Bidentate ligand

(vi) Ambidentat ligand.

(vii) Hexadentat ligand.

(i) Strong Ligand :→ Those ligand which doesn't obey Hund's rule hence pairing of e^- occurs

from initial. (Not filling $\bar{e}$ singly), it use inner hybrid orbital. (dsp), Make low spin complex compound because less no. of unpaired $\bar{e}$ present hence it's diamagnetic character and it's paramagnetic character as well as magnetic moment.

eg $\rightarrow$ CN, Co, NO₂ but H₂O and NH₃ acts as strong ligand with cobalt and copper. All ligand (strong & weak) acts as strong ligand with 5th, 6th, 7th period element (Pd, Pt, etc).

(II) weak ligand $\rightarrow$ Those ligand which obey Hund's rule hence firstly fill single $\bar{e}$ then do pairing. it use outer hybrid orbital (s, p, d, f). and Make ~~low~~ High spin complex compound because more no. of unpaired $\bar{e}$ s are present hence it's paramagnetic character and magnetic moment and it's diamagnetic character.

eg $\rightarrow$ All ligand other than strong ligand.

OH, en, oxalate, EDTA, Cl, Br, I, F etc.

(III) Neutral ligand $\rightarrow$ Those ligand which have zero oxidation no.

eg $\rightarrow$ NH₃, H₂O, en, pyridine, alkyl group, benzene.

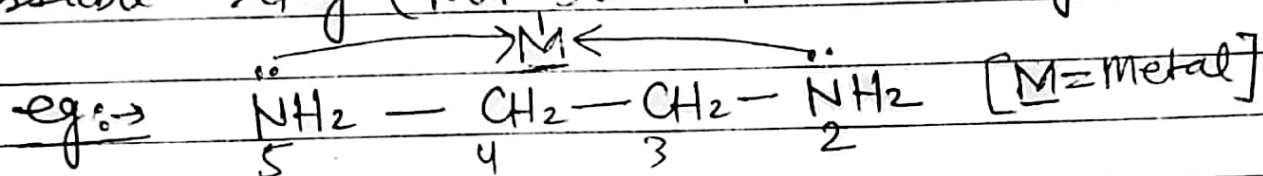
(iv) Monodentate Ligand $\rightarrow$

1 Teeth or Donor

Those ligand which donate $1-e^-$ pair.
eg $\rightarrow$ H_2O , NH_3 , OH^- , CN , CO , H_2O , NH_3 etc.

(V) Bidentate Ligand $\rightarrow$ Those ligand which donate

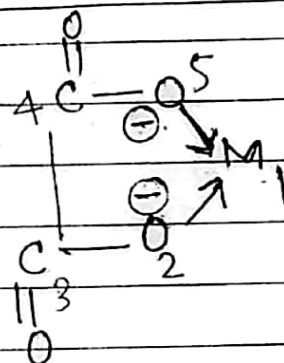
2- $\bar{e}$ pair at a time. and make 5 or 6-member stable ring. (Not 3 and 4 member ring).



ethylene diamine (en)

eg: en DMG
Acetyl acetone
cyclohexanone

oxalate $C_2O_4^{2-}$
(ox)



(VI) Ambidentat ligand : $\rightarrow$ Those Ligand in which

2 donor site present but only 1 donor site donate e pair at a time.

eg $\rightarrow$ $\text{CN} \rightarrow \text{NC}_1 \rightarrow$ (Isocyanide)
 $\text{ONO} \rightarrow \text{NO}_2$

$$\text{ONO} \rightarrow \text{NO}_2$$

cyano o-nitrito $\rightarrow$ N-Nitro
solino chl $\rightarrow$ solino

Selinium CN $\rightarrow$ selenium NC

SCN $\rightarrow$ SNC