

M. H. Khan ~~1154-20~~ 1154-20 D2 (Passmate)  
Inorganic topic ligand Co-ordination Compound Date \_\_\_\_\_  
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→ 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  $\Rightarrow$  Those species

Which having excess  $e^-$  in form of  $-q$ . [ $\underline{\text{Cl}^-}$ ,  $\underline{\text{H}^-}$ ,  $\underline{\text{Br}^-}$ ,  $\underline{\text{OH}^-}$ ,  $\underline{\text{CN}^-}$ , etc]. Lone pair  $e^-$  ( $\underline{\text{H}_2\ddot{\text{O}}}$ ,  $\underline{\text{NH}_3}$ ,  $\underline{\text{H}_2\ddot{\text{S}}}$ ).

$\text{PH}_3$ ) having  $\pi$ -bond (Benzene,  $\text{O}_2$ ,  $\text{N}_2$ , EDTA, oxalate etc)

### \* Types of Ligand :->

✓ (1) Strong ligand

(11) weak ligand

✓ (iii) Neutral ligand

(iv) Monodentate Ligand

(v) Bidentate Ligand

(V) Ambidentate Ligand.

(vii) Hexadentat ligand.

(1) Strong Ligand  $\rightarrow$  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  $\uparrow$  diamagnetic character and  $\downarrow$  paramagnetic character as well as magnetic moment.

eg  $\rightarrow$  CN, Co, NO<sub>2</sub> but H<sub>2</sub>O and NH<sub>3</sub> 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  $\uparrow$  paramagnetic character and  $\uparrow$  moment and  $\downarrow$  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 oxid<sup>n</sup> no.

eg  $\rightarrow$  NH<sub>3</sub>, H<sub>2</sub>O, en, pyridine, alkyl group, benzene.

Topic  $\rightarrow$  4<sup>th</sup> grade.

Those ligand which donate  $\text{I-e}^-$  pair.

eg  $\rightarrow$   $H_2O$ ,  $NH_3$ ,  $OH^-$ ,  $CN$ ,  $CO$ ,  $H_2O$ ,  $NH_3$  etc.

(V) Bidentate Ligand: → 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).

eg:  $\text{NH}_2 - \text{CH}_2 - \text{CH}_2 - \text{NH}_2$  [M = metal]

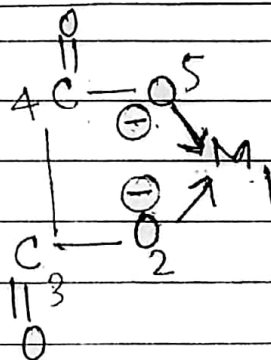
ethylene diamine (en)

geg. en

DMg

Acetyl acetate (ac ac)  
dipyrical

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  $\rightarrow$   $\text{CN} \rightarrow \text{NC}_1 \rightarrow \text{Isoyano}$   
 $\text{ONO} \rightarrow \text{NO}_2$

cyano o-nitro  $\rightarrow$  N-Nitro

Selenium  $CN \rightarrow$  selenium  $NC$

SCN  $\rightarrow$  SNC