

# COORDINATION CHEMISTRY

1 Structural isomers

(a) Ionisation isomerism

② Hydrate / solvate isomerism

③ Linkage isomerism

④ Co-ordination isomerism

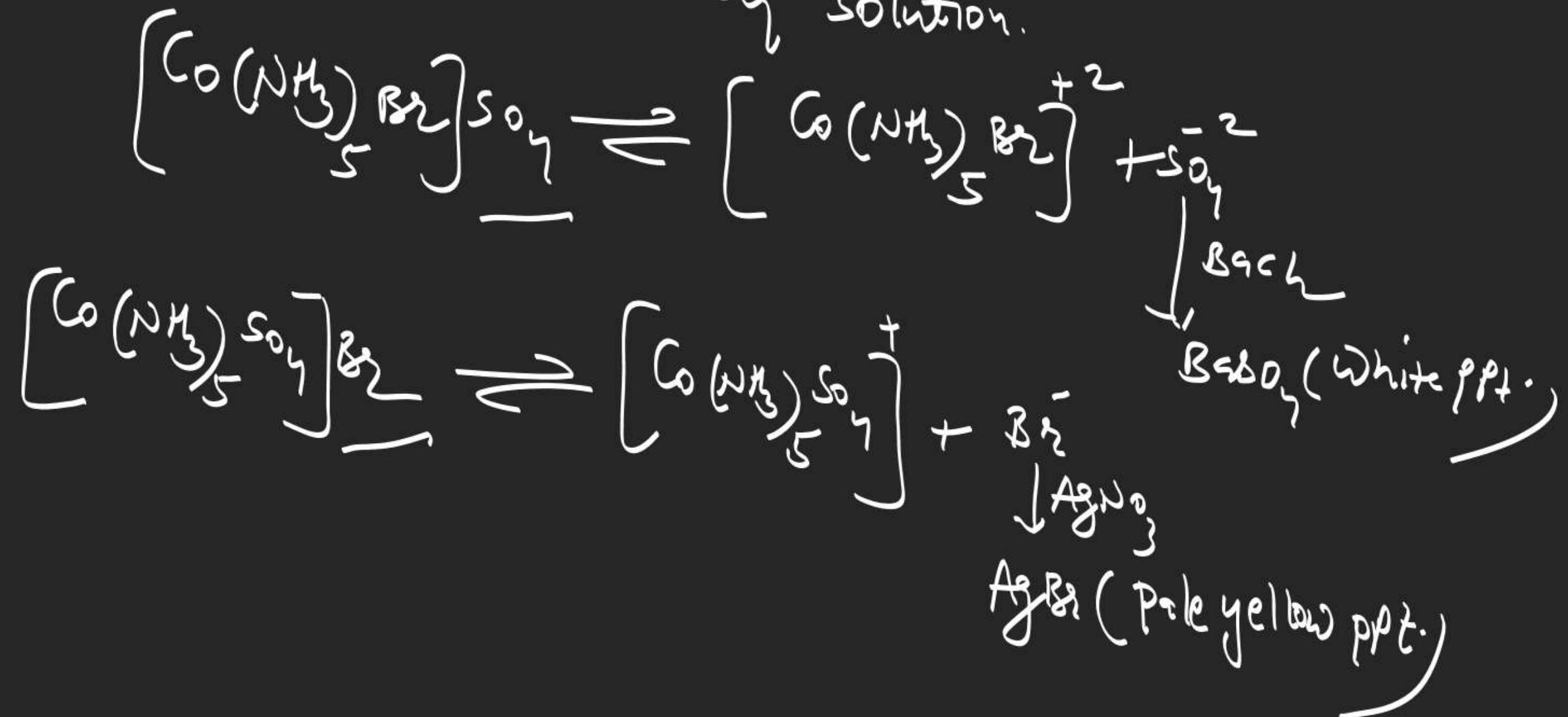
⑤ Co-ordination position isomerism

⑥ Ligand isomerism

## Structural isomerism

When complex compound have same molecular formula but have diff. structural and spatial arrangement of ligand around the metal cation or atom then they called isomer and process is known as isomerism.

Ionisation → When complex compound have same molecular formula but give diff ions in their aq. solution.

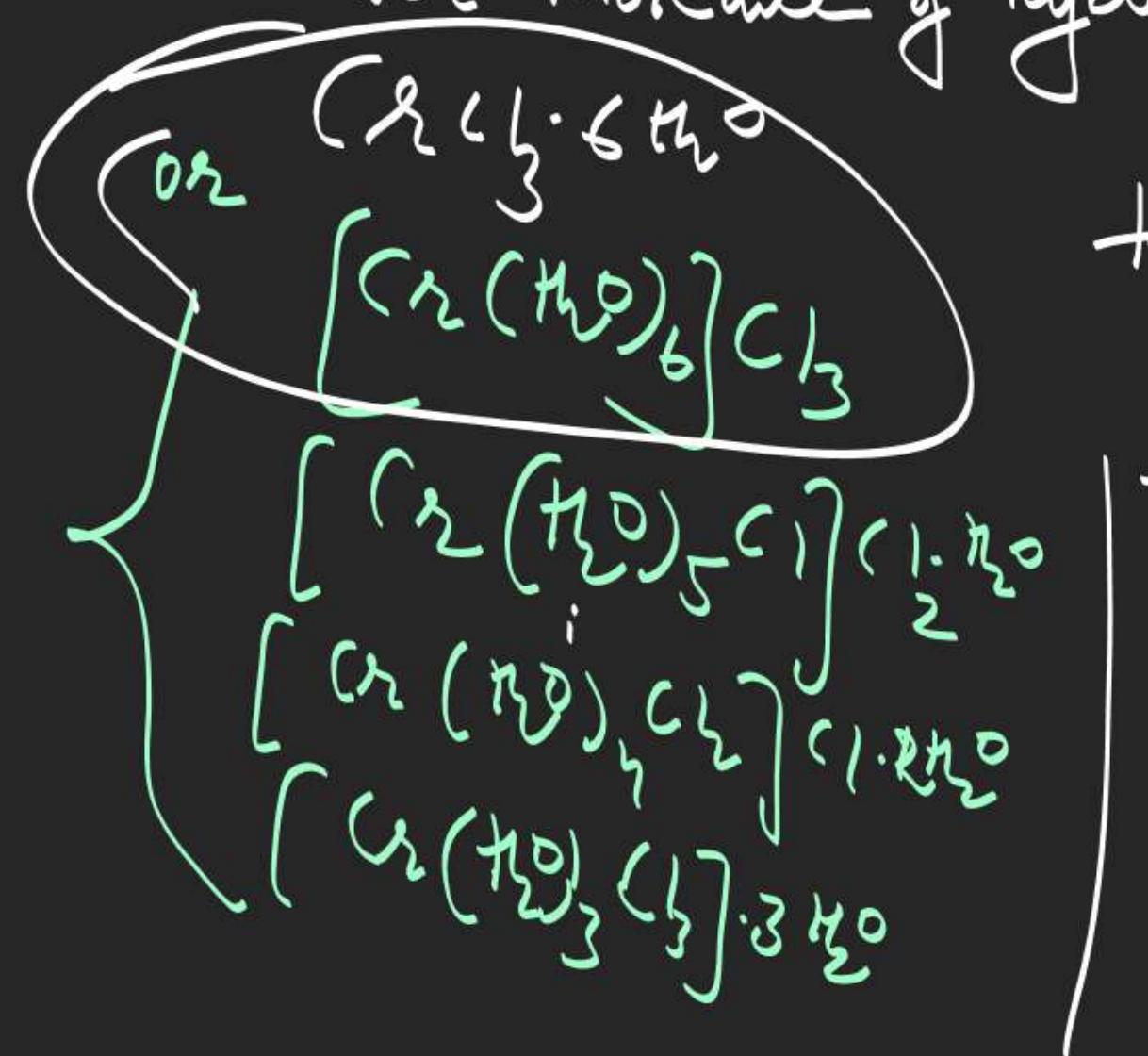


$$\left[ \begin{matrix} \text{Co}(NH_3)_{5\text{I}} \\ \text{Co}(NH_3)_5Cl \end{matrix} \right] \xrightarrow{\quad} \times$$

$$\left[ \begin{matrix} \text{Co}(NH_3)_{5NO_3} \\ \text{Co}(NH_3)_5Cl \end{matrix} \right] \xrightarrow{\quad} \checkmark$$

## Hydrate / solvate

it occurs in those complex compound in which few co-ordinated water molecules becomes water molecule of hydration.

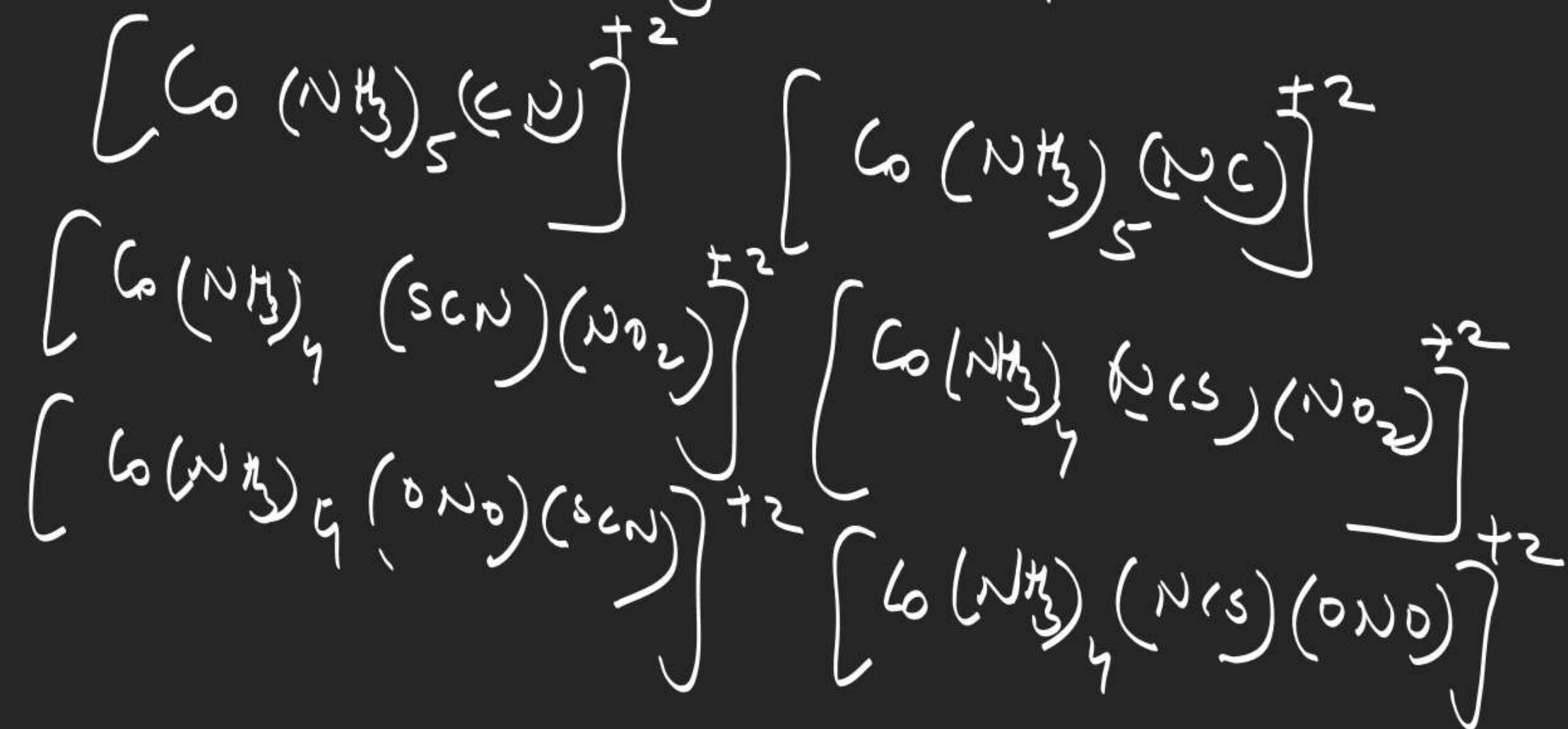


total hydrate  
isomer = 4

Note  $\Rightarrow$  conc-H<sub>2</sub>SO<sub>4</sub>  $\rightarrow$  dehydrating agent  
and it can absorb only  
Hydrated water molecule in  
Complex.

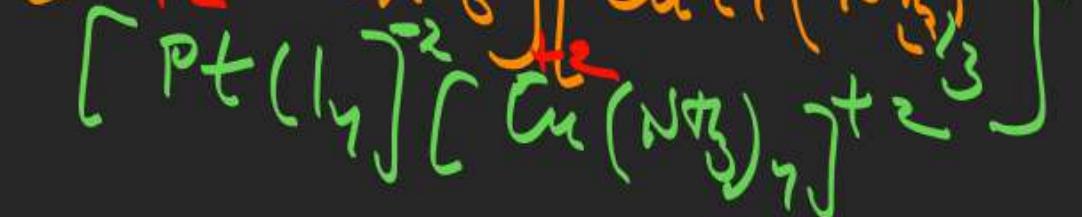
## Linkage isomerism

it occurs in those complex compound in which ambidentate ligands are present.



## Co-ordination isomerism

it occurs in those complex compound in which both **cation** and **anion** are complex, and ligands are interchange



Ans = total Co-ordination  
isomer = 4

Keypoint

if  $\text{C} \cdot \text{N} = 4$

then Co-ordination

isomer = 4 anti

metal is diff and

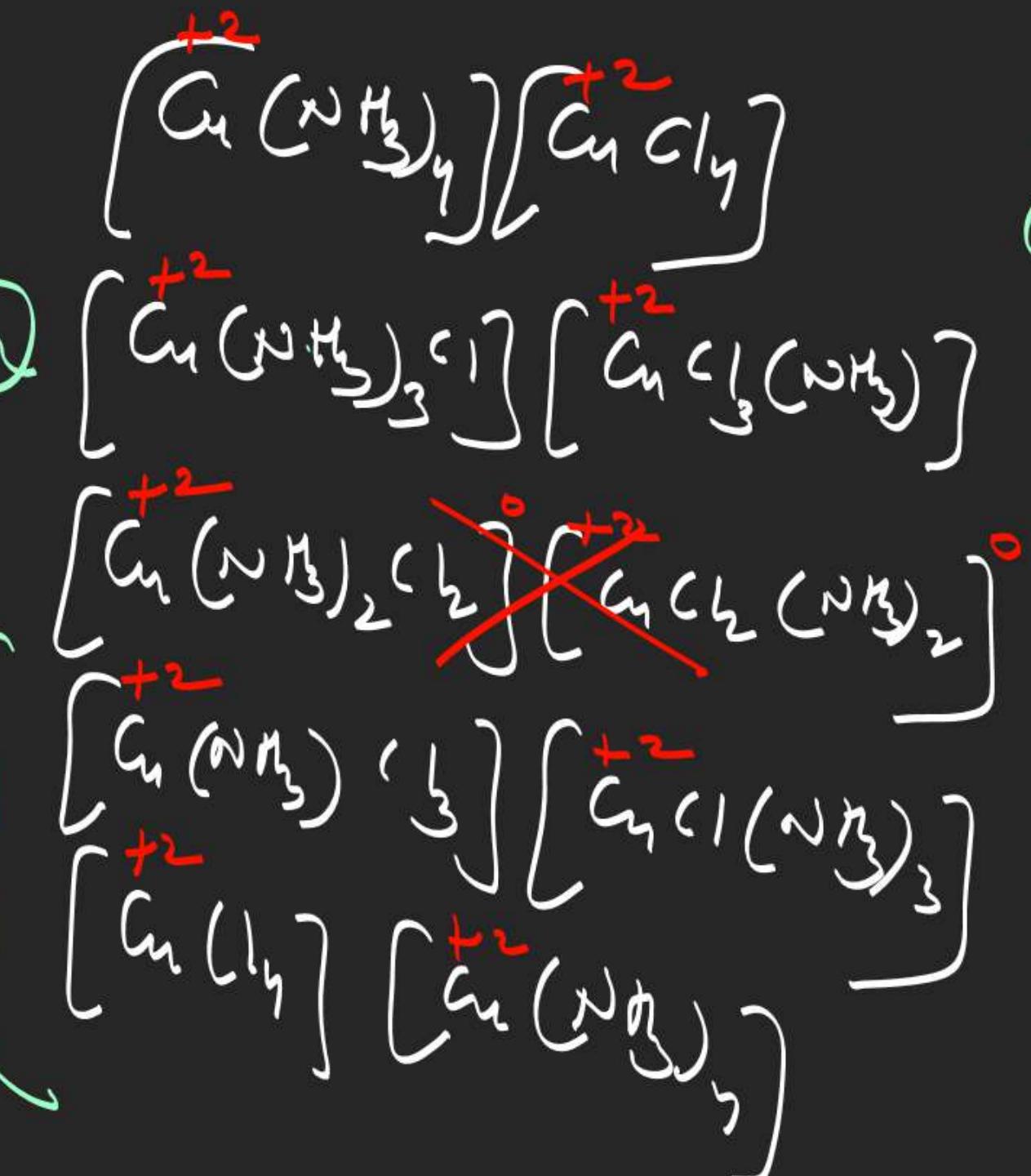
Mono dentate

Ligands

are present

Repet

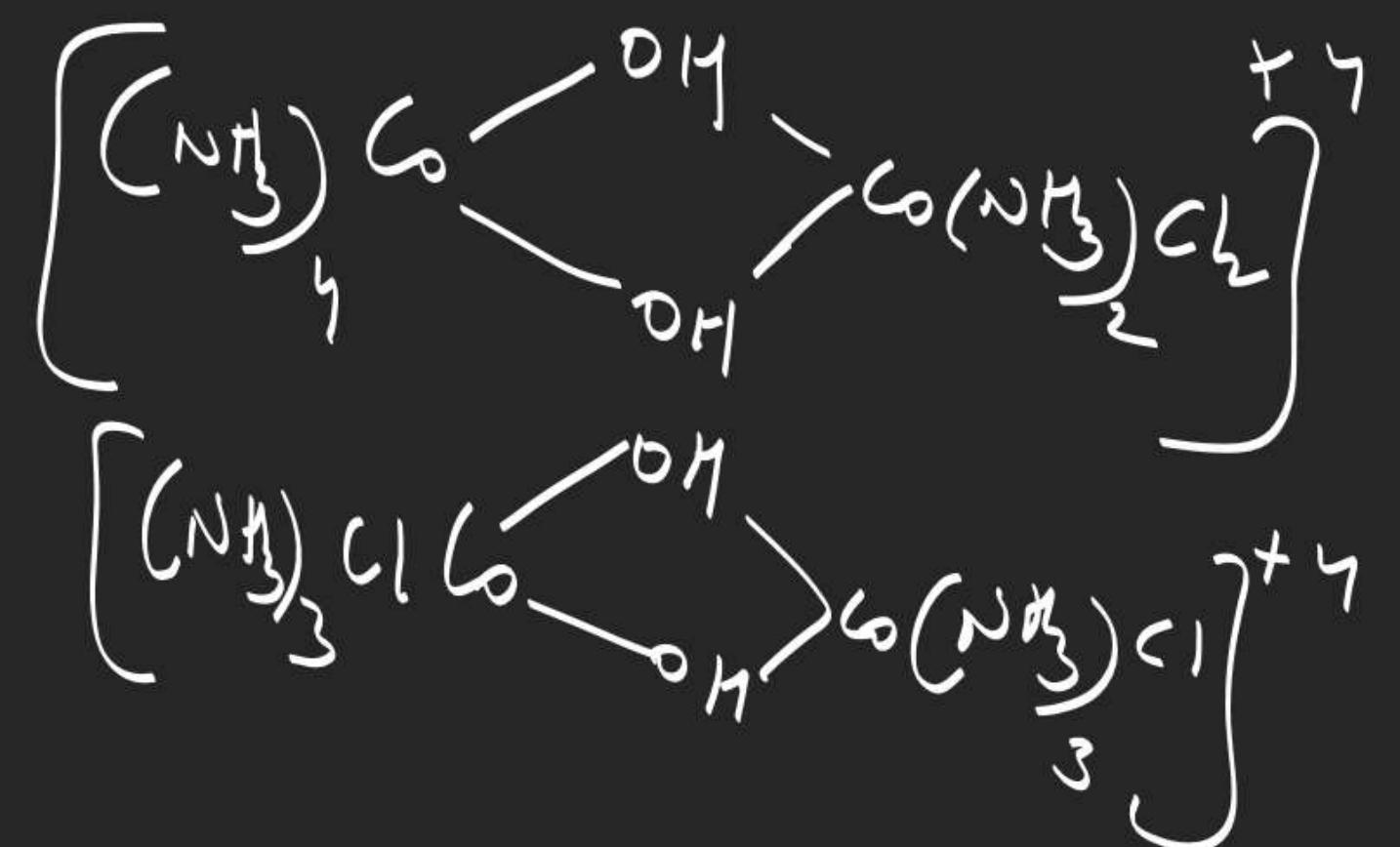
X



total  
Co-ordination  
isomer = 4

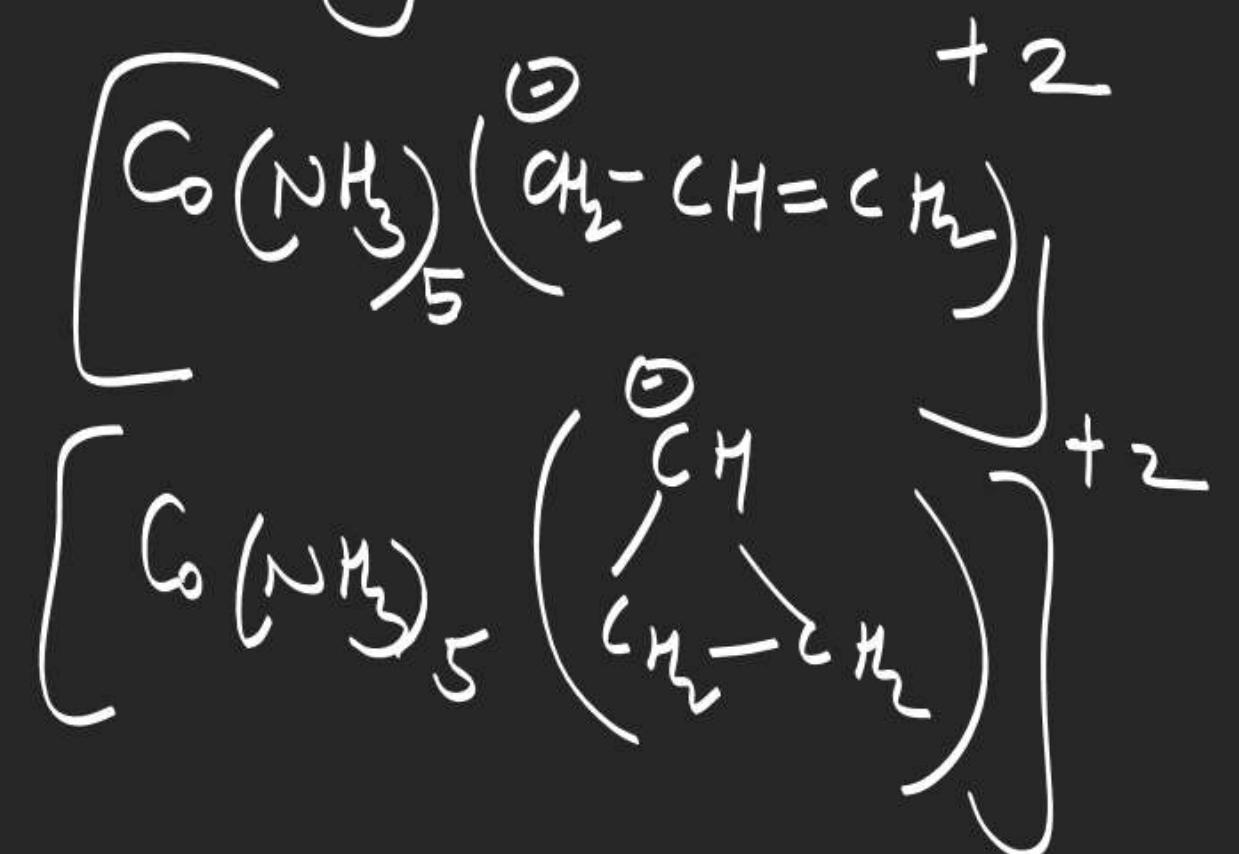
Co-ordination position

it occurs in polynuclear or bridging complex Compound.



## Ligand isomerism

If complex have isomers of ligand  
then they are known as ligand isomer



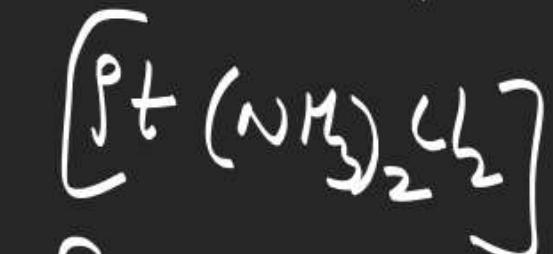
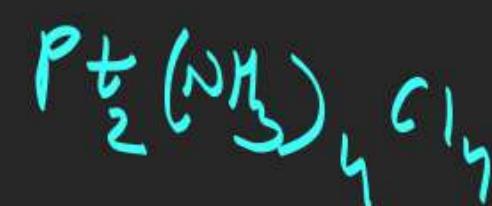
$$\frac{[\omega_{(NH_3)_y}(t_n)]^{+3}}{[\omega_{(NH_3)_y}(\rho_n)]^{+3}}$$

$$P_n = \underbrace{CH_3 - CH}_N - \underbrace{CH_2}_N$$

$$t_n = \underbrace{CH_2 - CH}_N - \underbrace{CH}_N$$

## Polymerisation

it is not a true isomerism  
because in this type of isomerism  
molecular formula is diff



but E.F of Complex is same.

## V.B.T

A cc. to V.B.T complex compound is formed when ligand donates its e.p. into vac. orbital of metal cation or atom but before this these orbitals undergoes hybridization.

Type of hyb., magnetic nature and geometry of the molecule is depends on nature of ligand.

① S.F.L can change conf. of metal cation or atom  
and form possible pair of u.p.e

② W.F.L does not change conf. of metal cation

③ if complex have u.p.e then it is paramagnetic  
and if u.p.e absent then it is diamagnetic

$$\mu = \sqrt{g(\gamma + 2)} \text{ B.M}$$

$$\gamma = \frac{\text{no. of u.p.e}}{\text{no. of d electrons}}$$

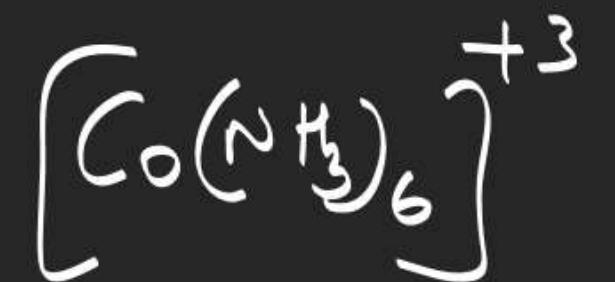

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u.p.e

1	
2	
3	
4	
5	

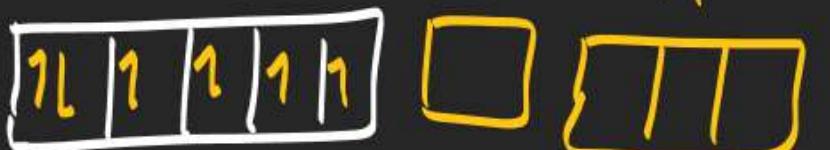
μ

1.73
2.83
3.87
4.90
5.92

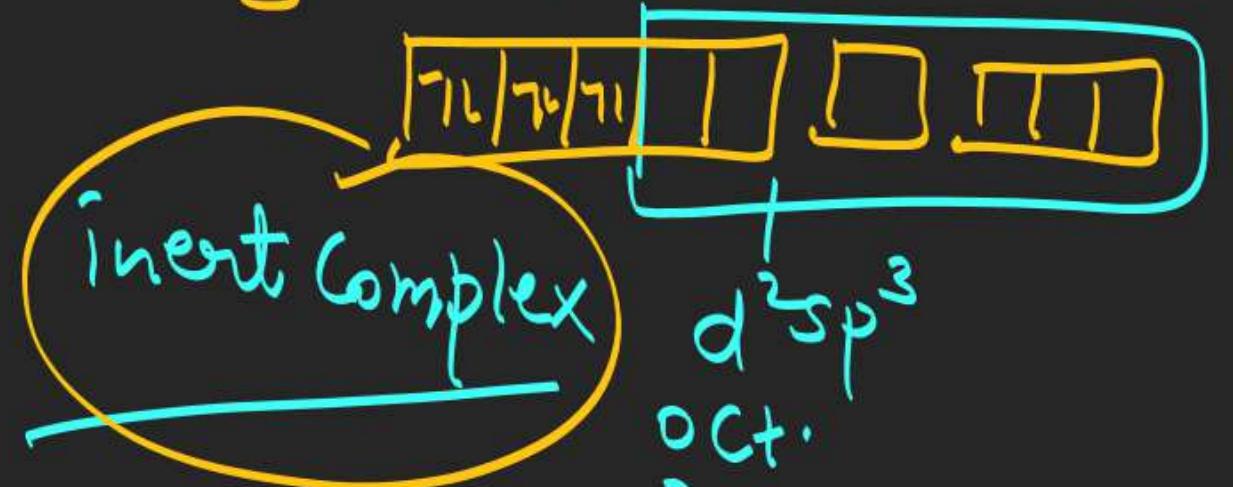
S.F.L

$$\text{Co}^{+3} = 3d^6$$

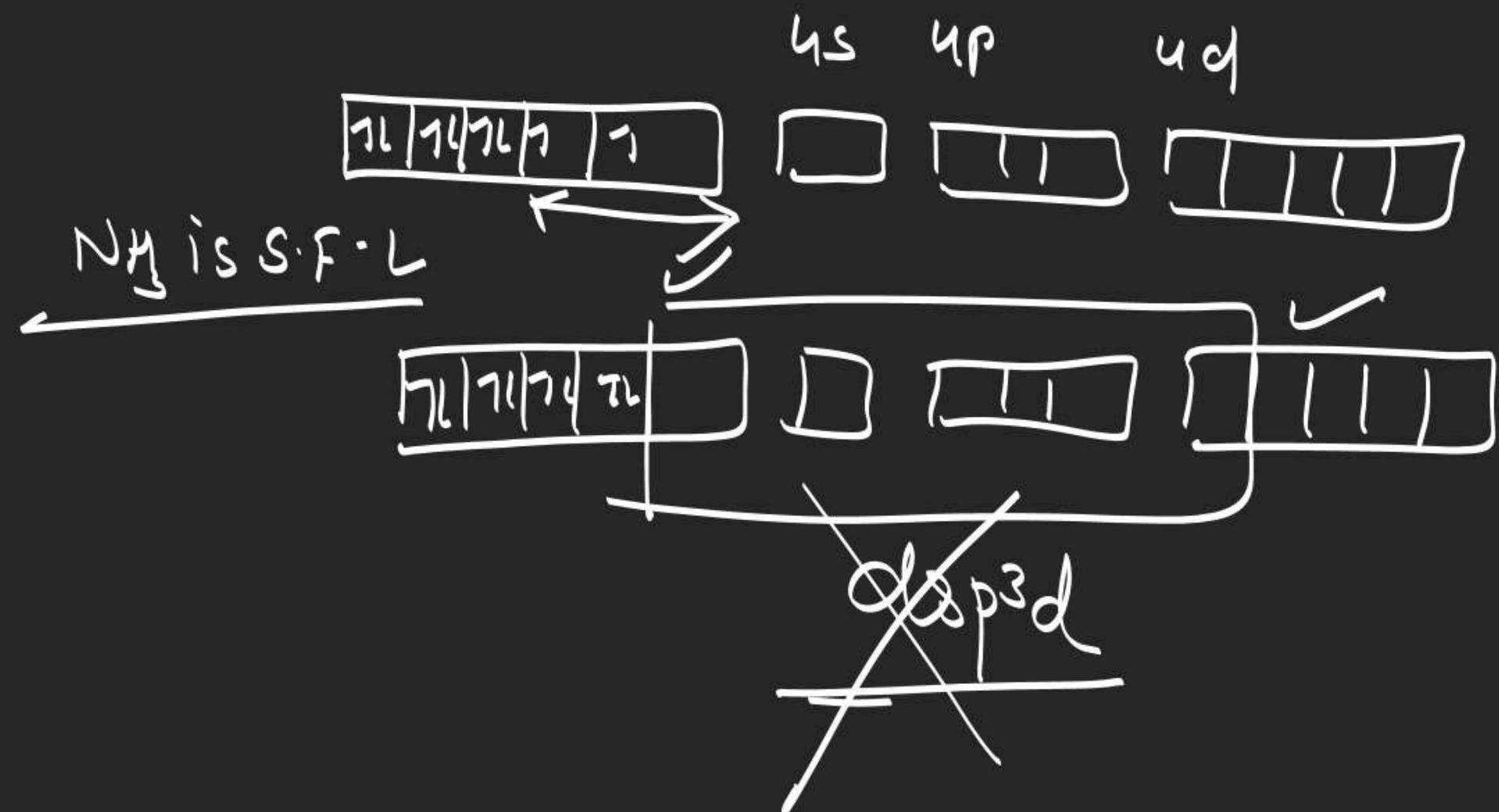
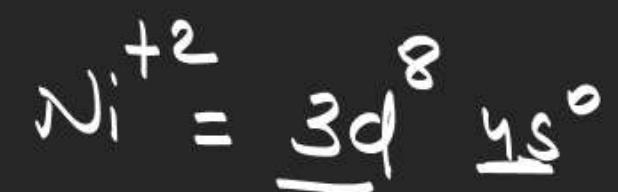
4s 4p



$\text{NH}_3$  is S.F.L hence it will pair up 4.p.e



inner orbital complex



Draw back

- ① V.B.T can't explain mag. nature prop.
- ② V.B.T can't explain colour in complex compound.
- ③ V.B.T can't <sup>explain</sup> formation of high spin and low spin complex compound.

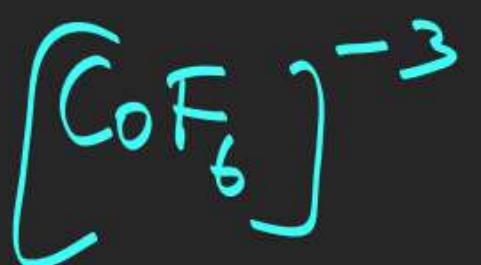
$sp^3d$

$dsp^3$

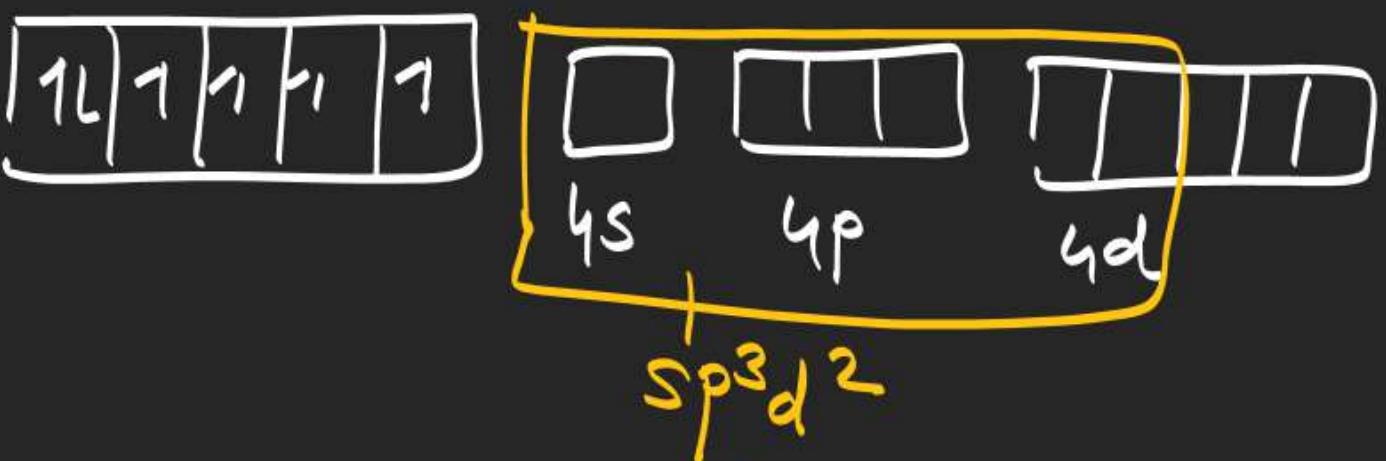
$dsp^2$

$sp^3d^2$

$d^2sp^3$



$\text{f}^0$  is  $\omega\cdot\text{f}\cdot\text{L}$  hence it will not pair up u.p.e



$s p^3 d^2$

OCT

pare

$M = 4.92$

Outer orbital  
Labile

Note  $\Rightarrow$  in isomers oxidation state and C.N of metal cation should be same.