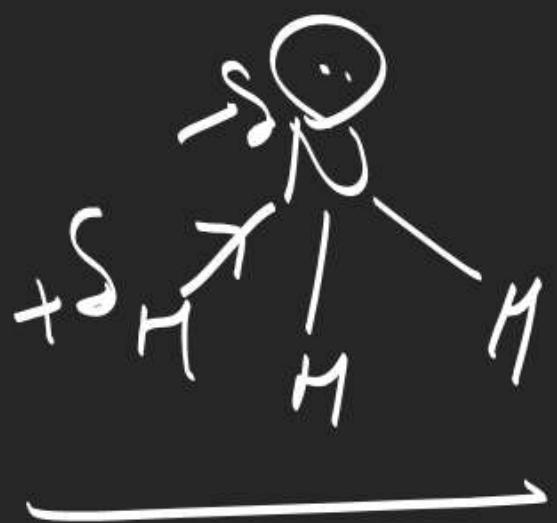


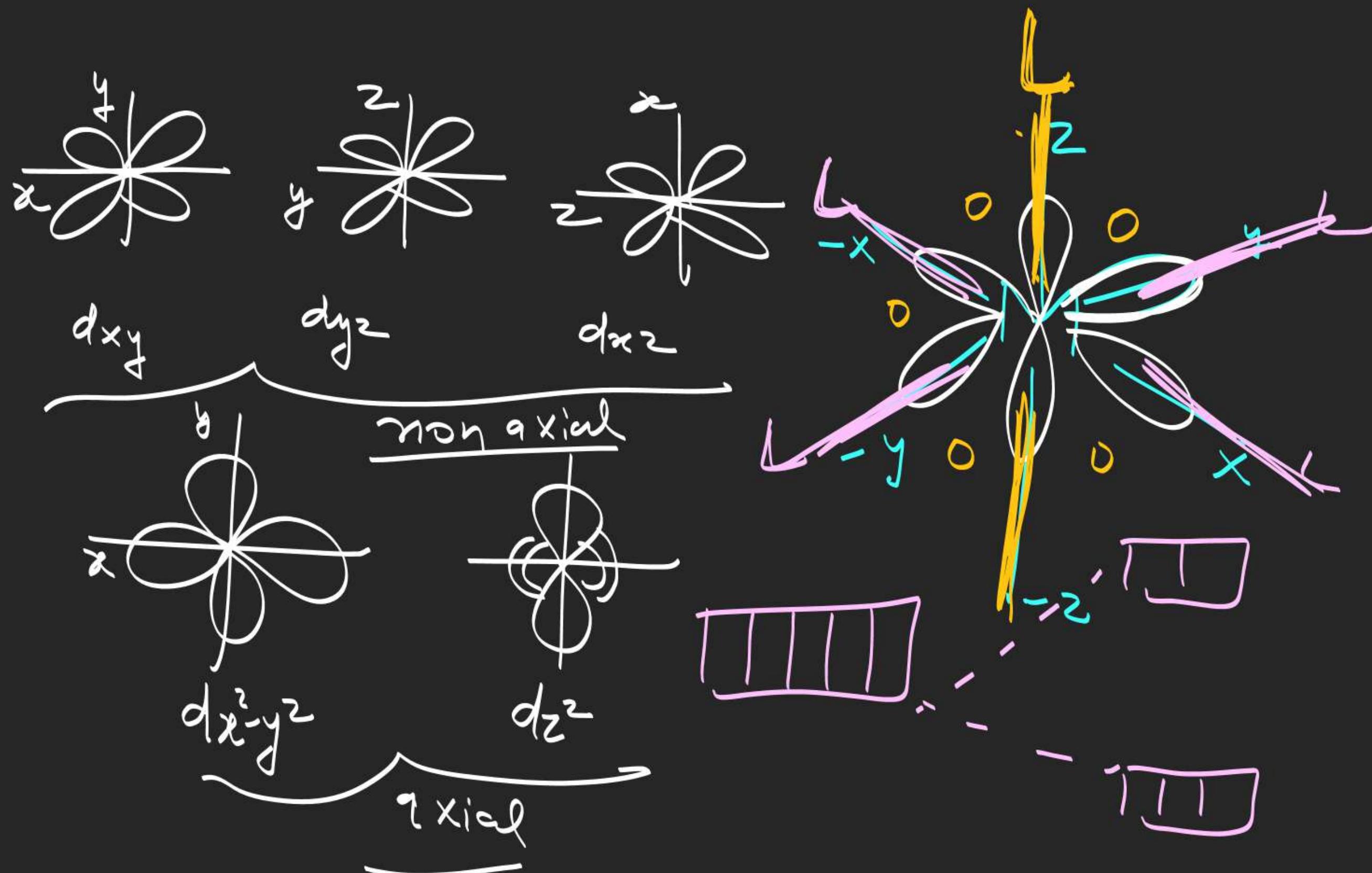
# COORDINATION CHEMISTRY



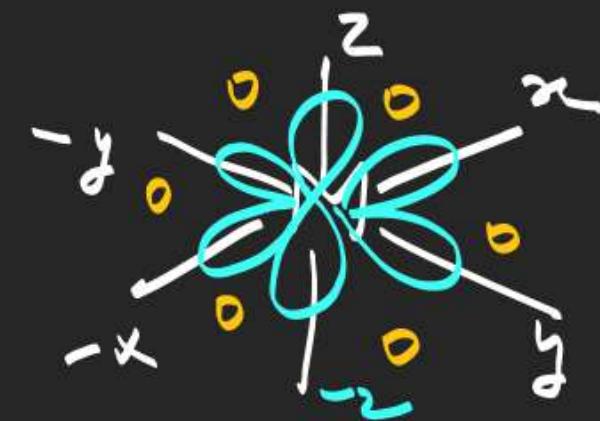
C·F·T

- ① Van Vleck and Bethe
- ② -ive ligand  $\rightarrow$  a C<sub>tp</sub> as point charge  
neutral ligand acts as dipole
- ③ acc. to C·F·T pure electrostatic attraction present between metal cation and ligand. but it is not true due to synergic bonding

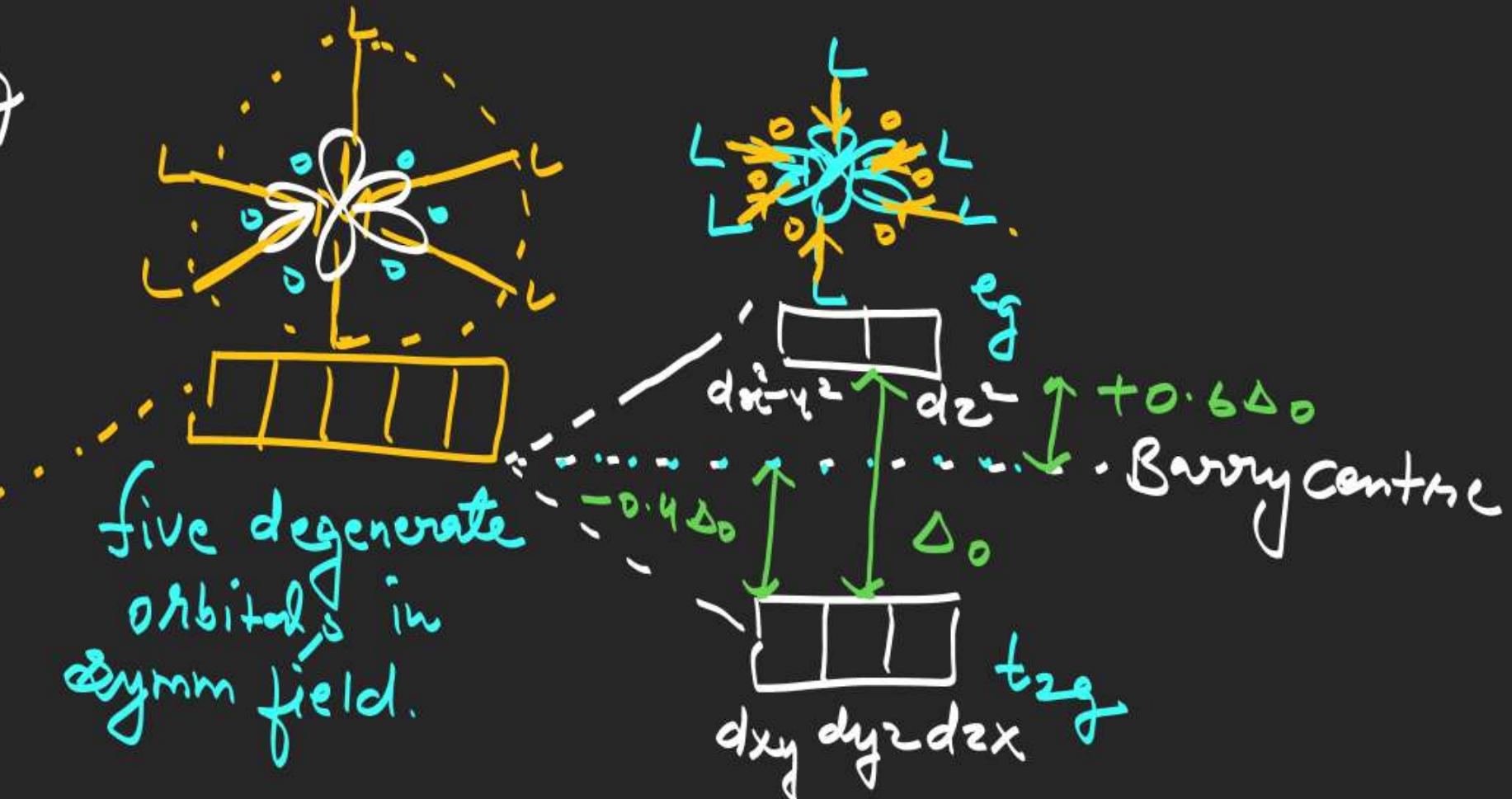




# Octahedral splitting



five degenerate orbital  
of free metal cation



$$\text{C.F.S.E} = \text{Crystal field splitting energy}$$

$$\Delta_0 = C \cdot F \cdot S \cdot E \text{ for octahedral}$$

S.F.-L

$$\underline{\Delta_0} > P$$

1L	1L
----	----

W.F.-L

$$\underline{\Delta_0} < P$$

1L	1L
----	----

$d^1 \text{ to } d^{10}$

1L	1L	1L
----	----	----

1L	1L	1L
----	----	----

$P$  = Pairing energy  
 req-energy for pairing

for octahedral

high spin  $\Rightarrow$  number of u.p.e.  $\uparrow$

low spin  $\Rightarrow$  number of u.p.e.  $\downarrow$

$d^1 \text{ to } d^3 \Rightarrow$  no low spin / no high spin

$d^8 \text{ to } d^{10} \Rightarrow$  low spin

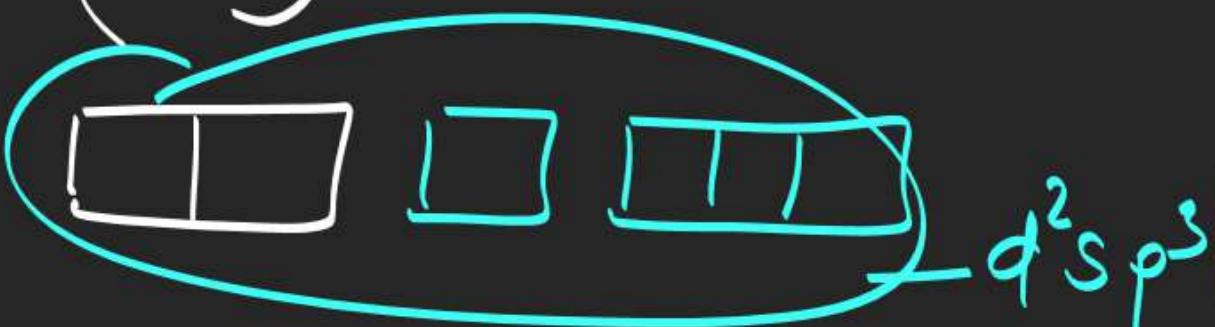
$d^4 \text{ to } d^7 \xrightarrow{\text{S.F.-L}} \text{ low spin}$

$\xrightarrow{\text{W.F.-L}} \text{ high spin}$



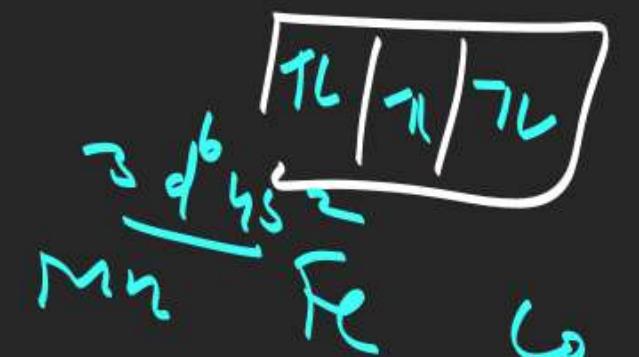
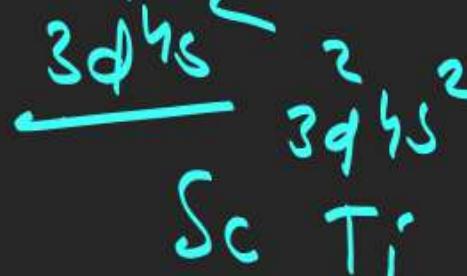
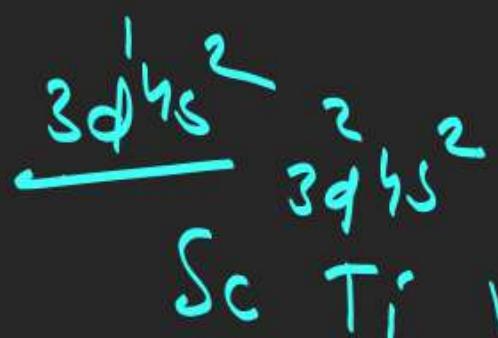
$$\text{Fe}^{+2} = \underline{3d^6}$$

$\text{CN}^- (\text{S}\cdot\text{F}\cdot\text{L})$

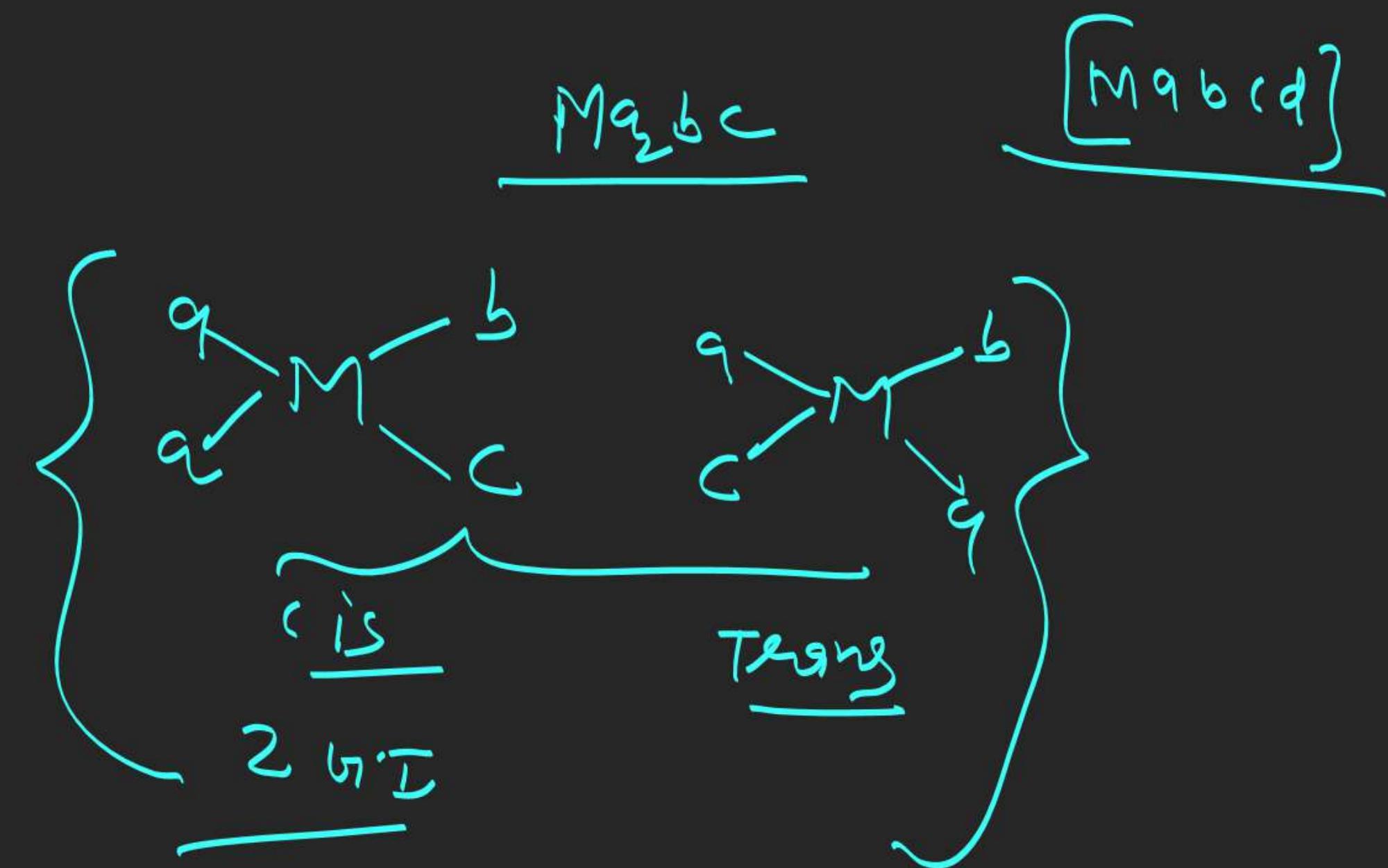


$$4t - \alpha + 6(-1) = 0$$

$$\chi = +2$$

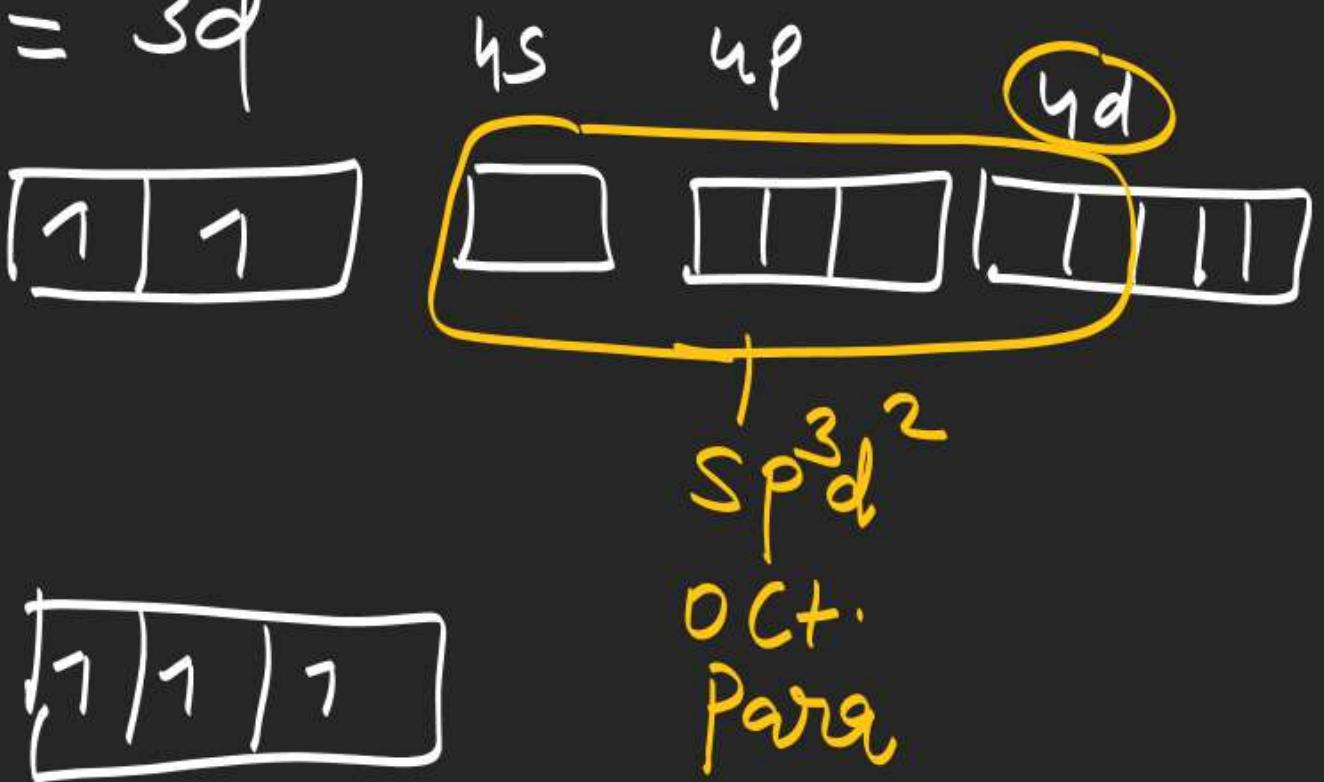


$\Delta_{\text{iq}}$   
 $M=0$   
 low spin  
 inner orbital



$$\left[ \text{Fe}^+ \right]^{-3}$$

$$\text{Fe}^{+3} = 3d^5$$



$M = S - 92$   
Outer orbital  
high spin

for C:N = 6 (Octahedron)

Keypoint

$d^1 \rightarrow d^3$  — always  $d^2sp^3$  inner

$d^8 \rightarrow d^{10}$  — always  $sp^3d^2$  outer

$d^4 \rightarrow d^7$   $\xrightarrow{S.F.L} d^2sp^3$

$\xrightarrow{W.F.L} sp^3d^2$



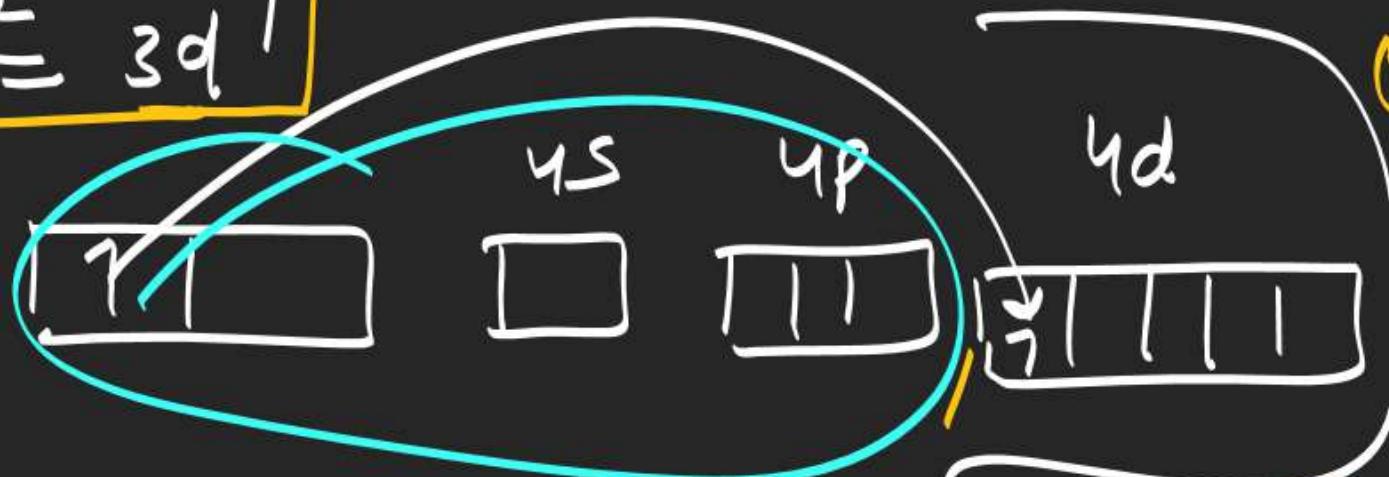
$$\chi + 6(-1) = -4 \left[ \text{Co}(\text{O}_2)_6 \right]^{-1}$$

$$\chi = +2$$

$$\text{Co} = 3d^7 \underline{1s^2}$$

$$\text{Co}^{+2} \equiv 3d^7$$

$$\text{Co}^{+2} \equiv 3d^7$$



$g^2 S^2 \rho^3$   
Oct.

$M = 1.73$   
inner  
low spin

### Condition of transference

- ① Complex should have only one  $4s$ ,  $p$ ,  $e$
- ② Complex should have only  $S \cdot F \cdot L$
- ③ Complex should have possibility of inner orbital complex compound.



When  $\text{Co}^{+2}$  surrounded by 6 S.F.L then

it always form  $d^2\text{sp}^3$  hybrid orbital  
and in such types of complex compound  
4-p.e present in 4d orbital (higher energy)  
rather than 3d orbital.

4-p.e present in 4d orbital (higher energy)  
so easily remove and they  $\text{9cty}$  R.A