Magnetic Nature (μ) → Dimagnetic Nature $\Rightarrow \mu = 0$ / all $\bar{e}$s inPaired.

→ Paramagnetic Nature $\Rightarrow \mu \neq 0$ / UnPaired e^-

$$\mu = \sqrt{n(n+2)}$$

Here ÷ n = no. of UnPaired e^-.

To determine in V.B.T following. Hybridisation, geometory, magnetic moment moment, Spin, magnetic nature.

(2) $[Fe(CN)_6]^{4-}$ CN ⇒ S.F.L.

C.No. ⇒ 6

$X + 6(-1) = -4 \Rightarrow \boxed{X = +2}$

$Fe^{2+} = [Ar]\ 3d^6\ 4s^0\ 4p^0$

Hybridisation = d^2sp^3

Octahedral.

Low magnetic moment & low Spin.

$\mu = 0 \Rightarrow$ diamagnetic.

(3) $[Ni(Cl)_4]^{2-}$ W.F.L. ⇒ Cl

C.No. = 4

$X = +2$

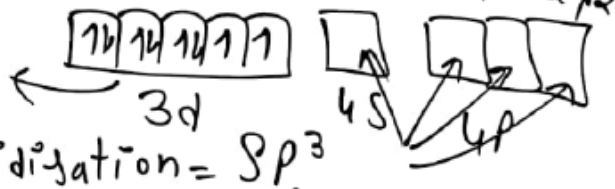
$Ni^{2+} = [Ar]\ 3d^8\ 4s^0\ 4p^0$

Paramagnetic

$\mu = \sqrt{2(2+2)}$

$\mu = 2\sqrt{2}$.

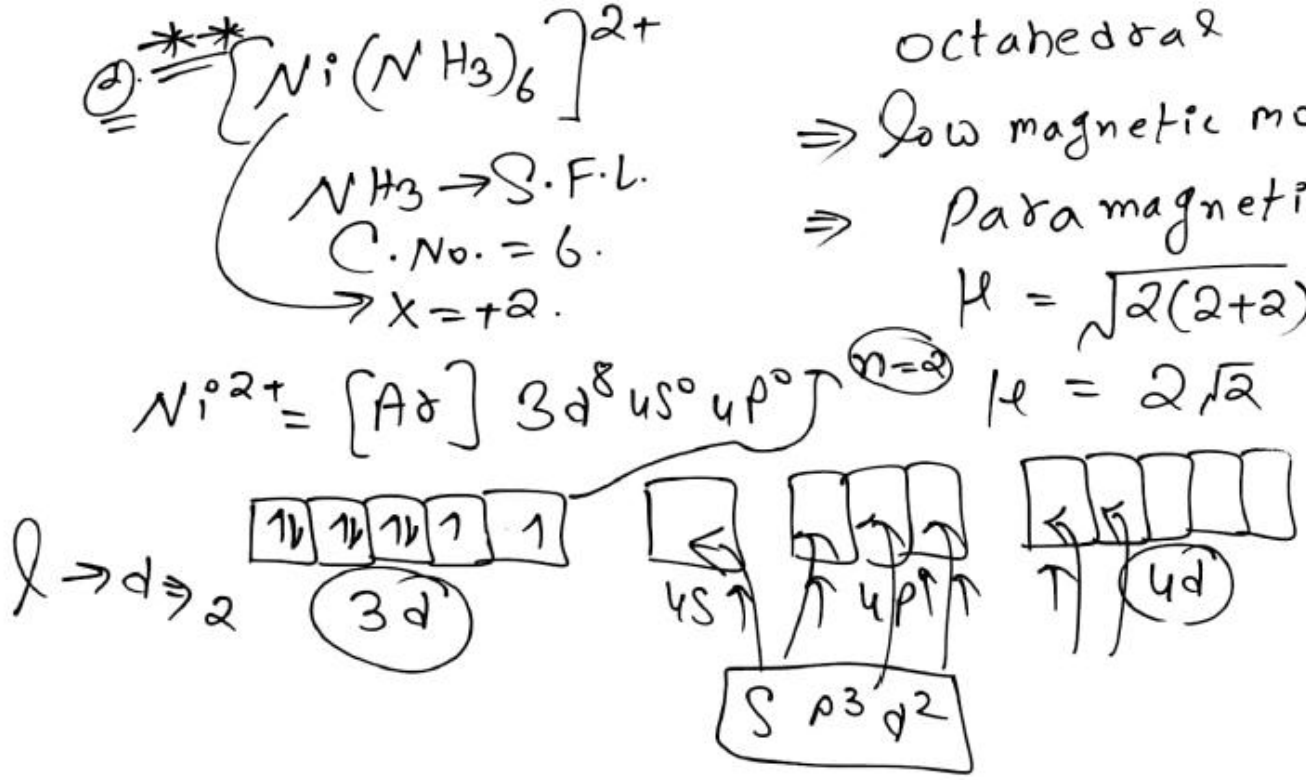
$n = 2$



Hybridisation = sp^3

Tetrahedral.

High mgnetic moment & High Spin.


[Ni(NH3)6]2+
NH3 → S.F.L.
C.No. = 6.
→ X = +2.
octahedral
⇒ low magnetic moment & low spin.
⇒ paramagnetic nature.
μ = √2(2+2)
μ = 2√2
Ni°2+ = [Ar] 3d8 4s° 4p°
n=2
l → d ⇒ 2
3d
4s
4p
4d
S p3 d2

Some Special Cases :-

(1) Transfer rule :-

{# It behaves as a reducing agent}

When required, one electron can be tranfered to a high energy orbital in presence of S.F.L.

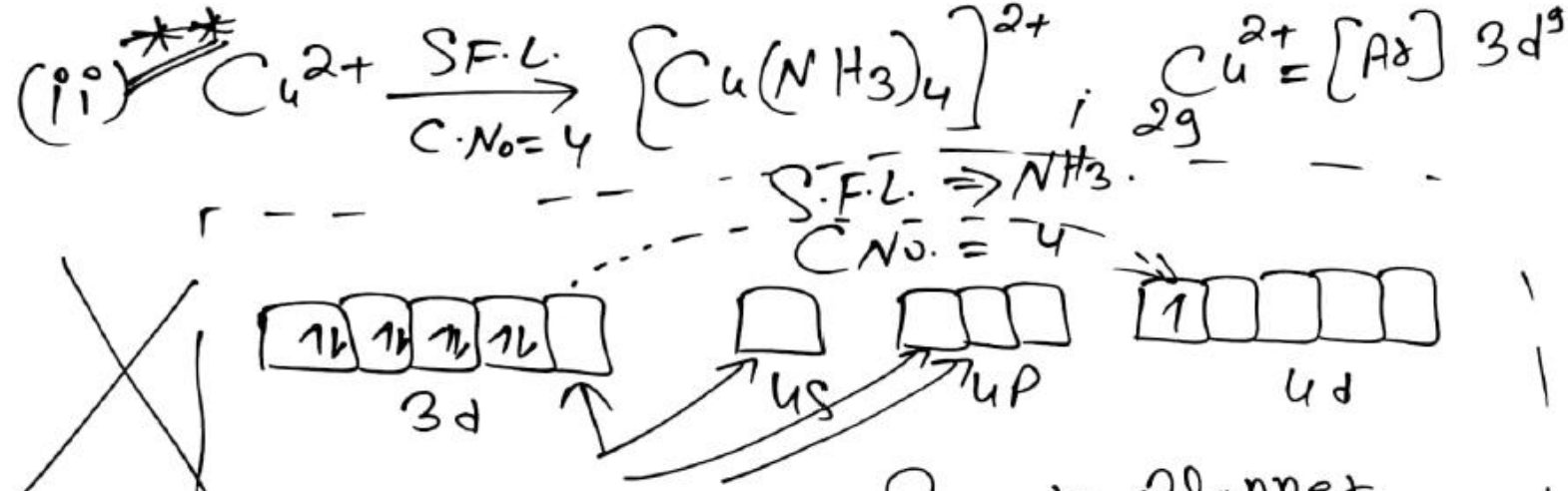
(i) $Co^{2+} \xrightarrow{S.F.L.} [Co(CN)_6]^{4-}$; $Co^{2+} = [Ar]\ 3d^7\ 4s^0\ 4p^0$

$x = +2$

S.F.L. ⇒ CN ⇒ low spin, slow magnetic moment.

C.no. ⇒ 6 ⇒ d^2sp^3 ⇒ Octahedral ⇒ Paramagnetic

(ii) $Cu^{2+} \xrightarrow[C.No=4]{S.F.L.} [Cu(NH_3)_4]^{2+}$; $Cu^{2+} = [Ar]\ 3d^9\ 4s^0$



→ dsp² ⇒ Square planner.

→ low spin & low magnetic moment

→ Paramagnetic nature.

A/C to Huggins

Hybridisation → sp^2d ⇒ Square Planner

(2) Strength Rule :-

(a) Co^{3+} → 'O based Ligand" → S.F.L.

(b) Ni^{+4} → O-based, halogen → S.F.L.

(c) 4d/5d → O-based, halogen → S.F.L.

($Pb^{2+}/Pb^{+4}/Pt^{+2}/Pt^{+4}/Rh^{+3}/Ir^{+3}$)

(d) $Mn^{2+}(d^5)$ → NH_3 → W.F.L.

Ques. Find out hybridisation, geometory, magnetic nature. In following.

(1) $[Cr(en)_2Cl_2]Cl$

(2) $K_2[NiF_6]$

(3) $[Ni(en)_3]Cl_2$

(4) $[Co(H_2O)_6]Cl_3$

(5) $K_4[Co(CN)_6]$

(6) $[RhF_6]^{3-}$

(7) $[Cu(NH_3)_4]SO_4$

(8) $[NiCl_4]^{2-}$

(9) $[PtCl_4]^{2-}$

(11) $K_2[PtCl_6]$

(12) $[PdCl_4]^{2-}$

(13) $K_3[Co(ox)_3]$

(14) $[Fe(H_2O)_5NO]SO_4$

(15) $[Cu(en)_3]Cl_2$.