Ques. (1) $CoCl_3 \cdot 4NH_3$

(2) $CoCl_3 \cdot 5NH_3$

(3) $CoCl_3 \cdot 6NH_3$

Find out the following

(a) Find 1° & 2° valency each

(b) Draw Werner's diagram of each

(c) What % of chloride ions is ionisable in each

(d) how many AgCl will percipitate from each compound when reacted with excess of $AgNO_3$.

Sol. $CoCl_3 \cdot 4NH_3$ $CoCl_3 \cdot 5NH_3$ $CoCl_3 \cdot 6NH_3$

$X+3(-1)+4(0)=0$ $X+3(-1)+5(0)=0$ $X+3(-1)+6(0)=0$

$X=+3$ $X=+3$ $X=+3$

when Co present in +3 oxidation state then its C.N. is 6.

$[Co(NH_3)_4Cl_2]Cl$; $[Co(NH_3)_5Cl]Cl_2$; $[Co(NH_3)_6]Cl_3$

(a) P.V.(1°) $=+3$ $=+3$ $=+3$

(b) S.V.(2°) $=6$ $=6$ $=6$

(c) $\%\,Cl^- = \frac{1}{3}\times 100$; $= \frac{2}{3}\times 100$; $= \frac{3}{3}\times 100$

$= 33.33\,\%$ $66.66\,\%$ $100\,\%$

(d) (a) $\left[Co(NH_3)_4Cl_2\right]Cl + AgNO_3 \longrightarrow AgCl$ (excess) → 1 mol

$+ \left[Co(NH_3)_4Cl_2\right]NO_3$

(b) $\left[Co(NH_3)_5Cl\right]Cl_2 \xrightarrow{AgNO_3}$ 2 mol AgCl

(c) → 3 mol AgCl.

VALECE BOND THEORY (V.B.T.).

(1) Central metal Atom/ion used (n-1)d, ns, np & nd orbitals are used for bonding (generally n=4)

(2) Ligand can donate lone pair to vacant orbital of Central metal atom/ion.

(3)

Coordination No. (C.N.)	Geometory	Hybridisation
2	Linear	sp
3	Trigonal planner	sp^2
4	Tetrahedral	sp^3 / d^3s
	Square planner	dsp^2
5	Trigonal bipyramidal	sp^3d / dsp^3
6	Octahedral (Square bipyramidal)	sp^3d^2 / d^2sp^3

Strong field ligand (S.F.L)	Weak field Ligand (W.F.L.)
(1) Capable of pairing up-d electron when required	Not capable of pairing up-d-electron.
(2) Generally form inner d-Complex.	Generally form outer d-Complex.
(3) Generally form low spin Complex	Generally form High spin complex.
(4) -11- Low magnetic moment	-11- High magnetic moment.

(X ⇒ halogen)

Ex:- $\ddot{N}H_3$

$H_2\ddot{O}$

Ques: Calc. Hybridisation in Following.

(1) $[Ni(CN)_4]^{2-}$

Sol. $X + 4(-1) = -2$

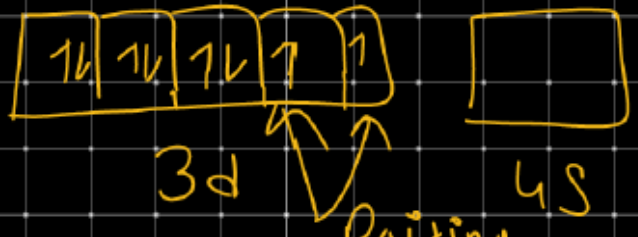
$X - 4 = -2$

$\boxed{X = +2}$

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

$_2He$
$_{10}Ne$
$_{18}Ar$
$_{36}Kr$

Valence shell



$[Ni(CN)_4]^{2-}$

C.N. = 4

CN → S.F.L.

Geometry ⇒ Sq. Planner

dsp^2