(H.W. Question)

1. Write all possible G.I., optically active isomer, optically inactive isomer and stereoisomer of following :

(i) $[M(en)_2Cl_2]$ (ii) $[Ma_2b_2c_2]$ (iii) $[M(en)(C_2O_4)_2]$ (iv) $[M(en)_3]$

(v) $[M(en)(C_2O_4)(bipy)]$ (vi) $[Pt(NH_3)_2(H_2O)_2]Cl_2$

2. Select **CORRECT** about $[CoCl_3Br_3]^{3-}$

(A) It has 3 stereoisomer (B) All sterioisomers are optically active

(C) Two optically active isomer (D) All sterioisomers are optically inactive

(E) Only 1 sterioisomer have P.O.S.

3. Find total number of P.O.S. in $[PtCl_6]^{2-}$ 9

4. How many sterioisomers possible for $[M(en)(NH_3)_2(NO_2)_2]$ 4

5. Total possible compound with molecular formula $[Pt(NH_3)_2(NO_2)Cl]$

(A) 2 (B) 3 (C) 4 (D) 5 (E) 6

6. $[Ma_3b_2c]$ have :-

G.I. = 3 O.Ac. = 0 O.InAc. = 3 S.I. = 3 E.P. = 0

7. Type of isomerism possible in $[Co(en)_3][Co(C_2O_4)_2(NO_2)_2]$

(A) Linkage isomerism (B) Coordination isomerism

(C) Optical isomerism (D) Geometrical isomerism

8. Select correct for $[ML_6]$ type octahedral complex :-

(A) It has C_4 – axis of symmetry (B) It has C_2 – axis of symmetry

(C) It has C_3 – axis of symmetry (D) It has C_6 – axis of symmetry

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9. $[M(bipy)_3]$ show G.I. and O.I. (T/F)

10. $[M(Gly)_3]$ show G.I. and O.I. (T/F)

11. Select which is/are optically active complex

(A) pentaamminechloridocobalt(III) sulphate

(B) cis-diamminedichloridoplatinum(II)

(C) trans-dicyanidobis(ethylendiamine)cobalt(III) bromide

(D) sodium tris(oxalato)ferrate(III)

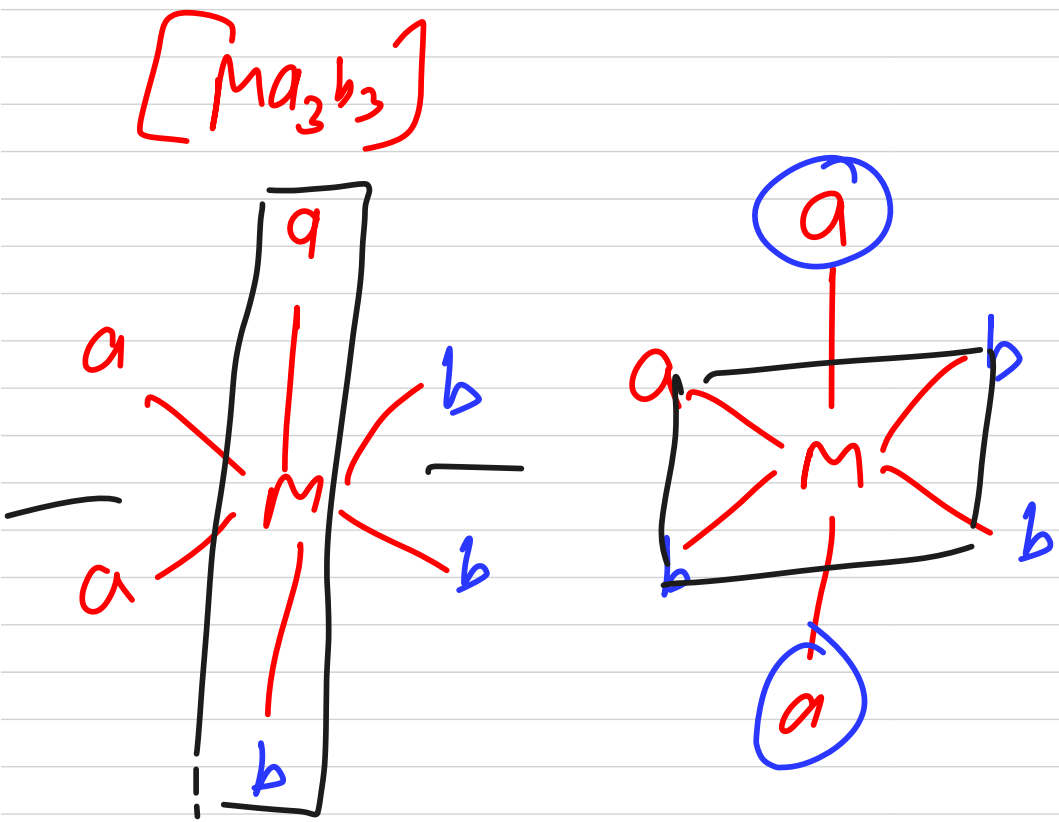
12. [Mabcdef] type octahedral complex have 30 stereoisomer (T/F)

13. [M(EDTA)] type octahedral complex show optical isomerism (T/F)

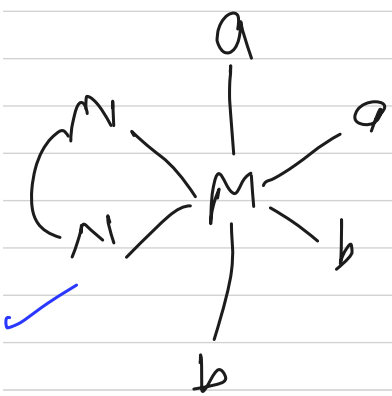
Q. 14, Q 15 on Next Page

14. Drow all possible sterioisomers of $[Cl(PPh_3)PtCl_2Pt(PPh_3)Cl]$

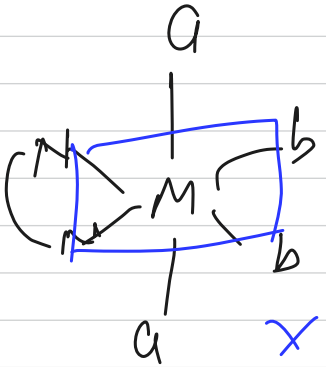
15. Draw all possible G.I. of $[Co^{III}(Gly)_2Cl_2]^-$



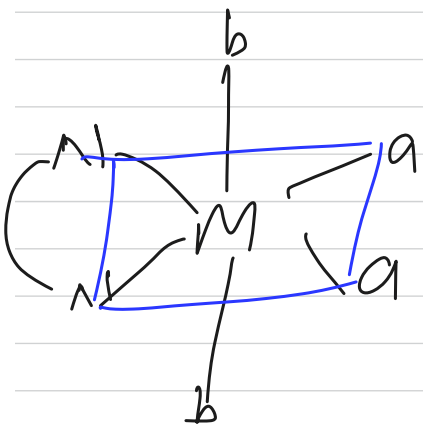
[M(en) $a_2 b_2$]



✓



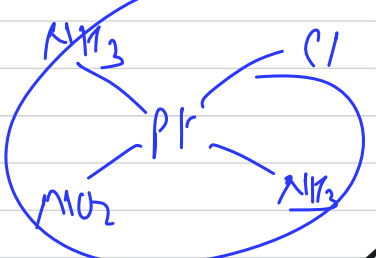
✗



✗

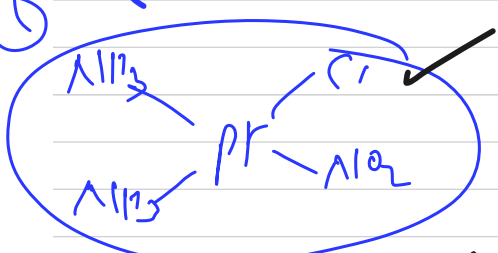
[Pt(NH_3)$_2$(NO_2) Cl]

① ✓



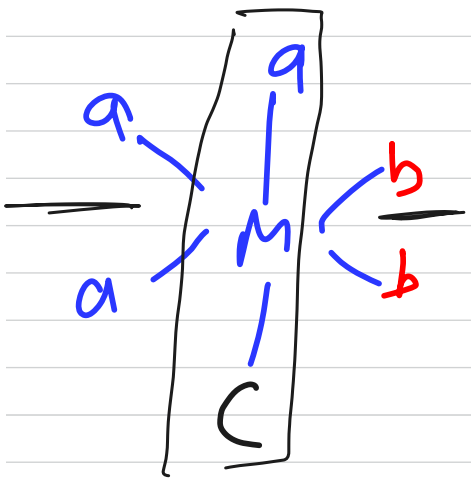
④ ✓

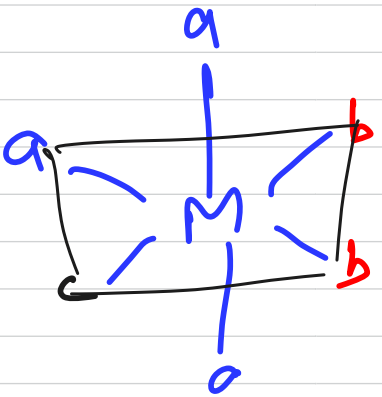
① ✓

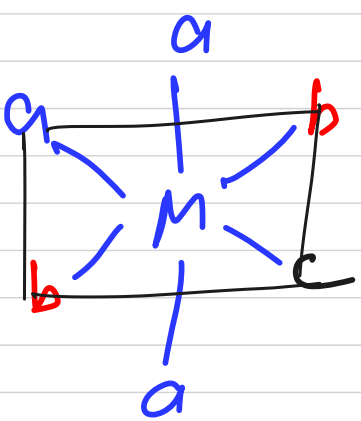


③ ✓

$[Ma_3b_2c]$



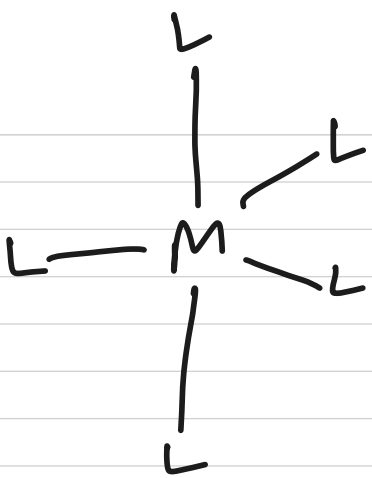




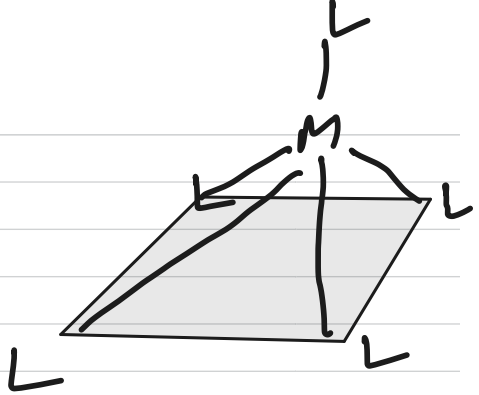
Modern Approach to Explain Co-ordination comp. :-

[V.B.T.]

ML_2	sp	linear
ML_3	sp^2	T. Plan
ML_4 *	sp^3	Td.
	dsp^2	SQ. Plan
ML_5	$\underset{(n-1)}{d}\underset{n}{sp^3}/\underset{n}{sp^3}\underset{n}{d}$ $(d=d_{z^2})$	T.B.P. ✓
	$\underset{(n-1)}{d}\underset{n}{sp^3}/\underset{n}{sp^3}\underset{n}{d}$ $(d=d_{x^2-y^2})$	SQ Pyramidal



T.B.P.

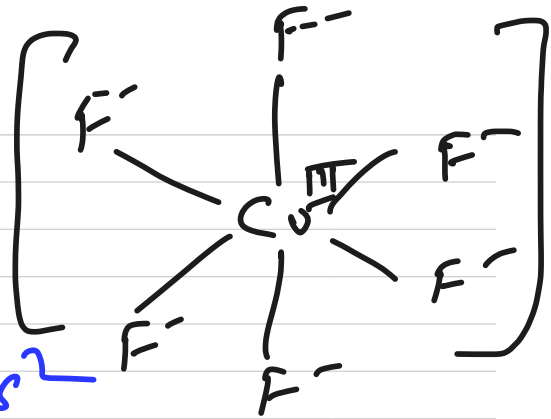


Sq. Pyramidal

* ML_6 $\frac{sp^3}{n}\frac{d^2}{n}$ (outer orbital) Octahedral

$\frac{d^2sp^3}{(n-1)\ \ n}$ (Inner orbital)

① $Na_3[\overset{III}{Co}F_6]$



(1)

$Co = [Ar]\,3d^7\,4s^2$

$Co^{+3} = [Ar]$ — 3d⁶

(Low spin)

$Co^{+3} = [Ar]$ — 3d | 4s | 4p | 4d; sp^3d^2

$= [Ar]$ — F^- F^- F^- F^- F^- F^-

Hybr of Metal = sp^3d^2

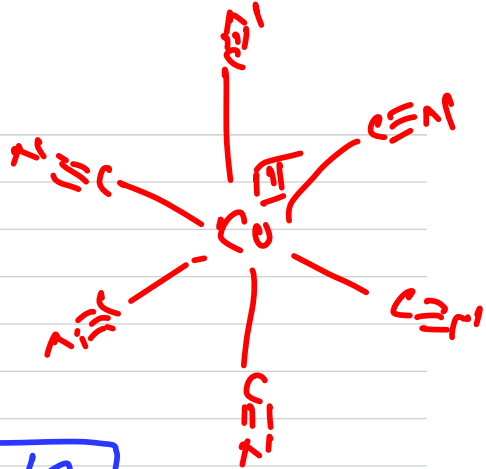
Geometry = Octahedral

Magnetic nature = Paramagnetic

Magnetic mom = $\sqrt{24}$ B.M

= Outer orbital complex

(2) $Na_3[Co(CN)_6]$



$Co = [Ar]\ 3d^7\ 4s^2$

Co^{+3} (g) $= [Ar]$ 3d | ↑↓ | ↑ | ↑ | ↑ | ↑

Co^{+3} (hybrid) $= [Ar]$ 3d | ↑↓ | ↑↓ | ↑↓ | | 4s | | ↑↓ | ↑↓ |

$\downarrow d^2sp^3$

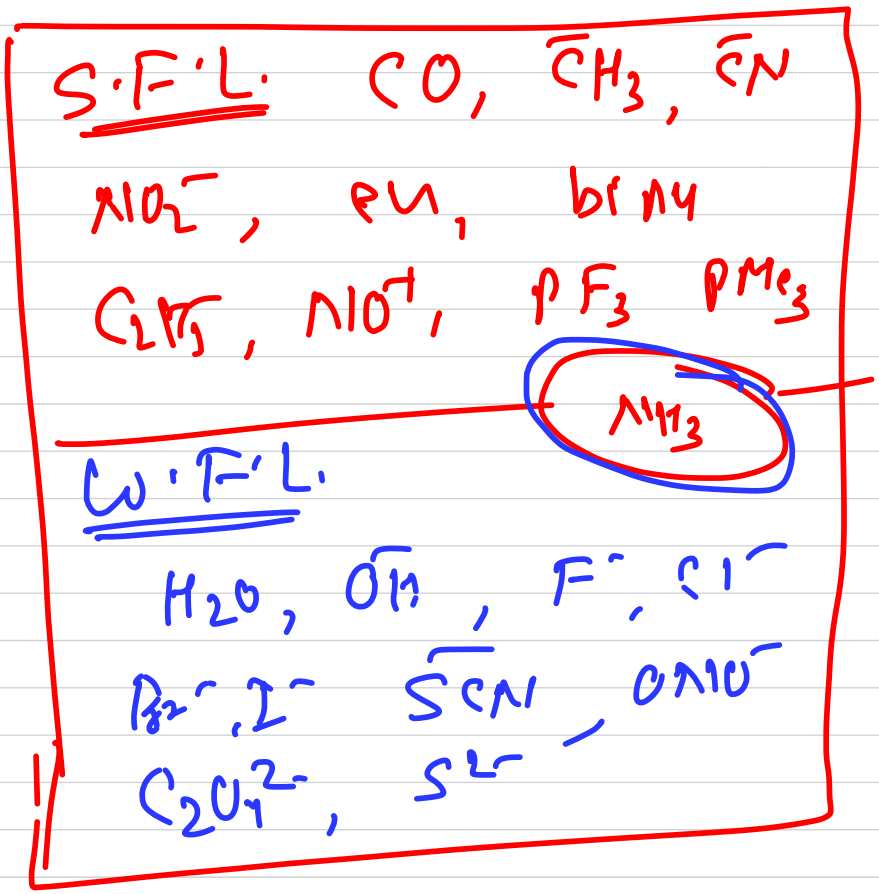
$Co^{+3} = [Ar]$ 3d | ↑↓ | ↑↓ | ↑↓ | sp^3d^2 | | | | | |

$\overline{CN}$ $\overline{CN}$ $\overline{CN}$ $\overline{CN}$ $\overline{CN}$ $\overline{CN}$

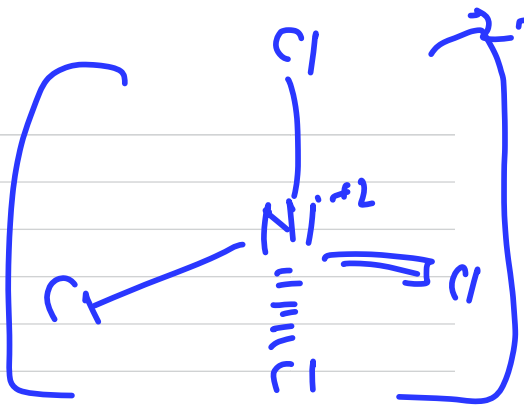
Hybrid Orbital : d^2sp^3, Octahedral

= Diamagnetic, Octahedral

= Inner orbital complex


S·F·L· CO, CH_3^-, CN^-
NO_2^-, en, bipy
$C_2H_3^-$, NO^+, PF_3 PMe_3
NH_3
W·F·L·
H_2O, OH^-, F^-, Cl^-
Br^-, I^- SCN^-, ONO^-
$C_2O_4^{2-}$, S^{2-}

(3) $Na_2[NiCl_4]$



$Ni = (Ar)3d^8 4s^2$

Ni^{+2} (g) $= (Ar)$ ↑↓ ↑↓ ↑ ↑ ↑

Ni^{+2} (aq) $= (Ar)$ 3d: ↑↓ ↑ ↑ ↑ ↑ ; 4s: ↑↓ ; 4p: ↑ ↑ ↑

↳ sp3

$Ni^{+2} = (Ar)$ 3d: ↑↓ ↑↓ ↑↓ ↑ ↑

xx xx xx xx

Cl^- Cl^- Cl^- Cl^-

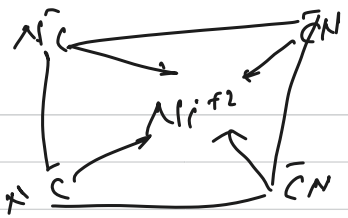
sp3

TD

Para

$\mu = \sqrt{8}$ B.M.

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



$Ni : [Ar]\,3d^8\,4s^2$

Ni^{+2} (3) : $[Ar]$ 3d | ↑↓ | ↑↓ | ↑↓ | ↑ ; 4s | ↑↓ | ; 4p | | | |

Ni^{+2} (hybrid) : $[Ar]$ 3d | ↑↓ | ↑↓ | ↑↓ | ↑↓ | ; 4s | ↑↓ | ; 4p | | | | ← dsp^2

$= [Ar]$ 3d | ↑↓ | ↑↓ | ↑↓ | ↑↓ | ; dsp^2 | ↑↓ | ↑↓ | ↑↓ | ↑↓ |

$\bar{C}N$ $\bar{C}N$ $\bar{C}N$ $\bar{C}N$

Hybrid of Ni^{+2} : dsp^2

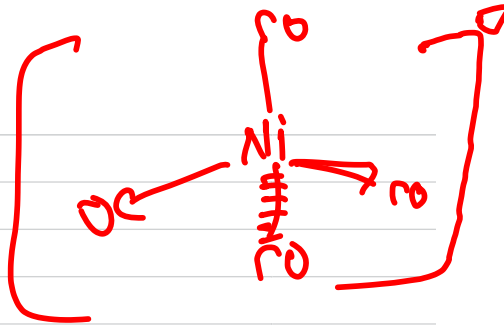
= SQ planar

= Dia

= 0 B.M

= Inner orbital complex

(5) $[Ni(CO)_4]$



$Ni = [Ar]\ 3d^8\ 4s^2$

$Ni = [Ar]$ | 3d: ↑↓ ↑↓ ↑ ↑ ↑ | 4s: ↑↓ | 4p: ↑ ↑ ↑

$Ni^{+2} = [Ar]$ | 3d: ↑↓ ↑↓ ↑ ↑ ↑ | 4s: ↑↓ | 4p: ↑ ↑ ↑

$Ni = (Ar)$ | 3d: ↑↓ ↑↓ ↑↓ ↑↓ ↑↓ | 4s: ↑↓ | 4p: ↑ ↑

$= (Ar)$ | ↑↓ ↑↓ ↑↓ ↑ ↑ |

↑↓	↑↓	↑↓	↑↓
CO	CO	CO	CO

sp^3

Td

Dia. $\mu = 0$

⑥ $K_4[Fe(CN)_6]$

d^2sp^3, Inner orbital

Dia, $\mu = 0$

⑦ $[MnCl_4]^{2-}$

sp^3, Td Para $\mu = \sqrt{35}$

⑧ $[Zn(CN)_4]^{2-}$

sp^3, Td, Dia, $\mu = 0$

⑨ $[Fe(H_2O)_6]SO_4$

sp^3d^2, Para, 0 lfg. $\sqrt{24}$ B.M

outer orbital

(10) $[Mn(H_2O)_6]Cl_2$

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

$Pt^{+2} = [Xe]4f^{14}5d^8$

H.W

(12) $[Co(en)_3]^{+3}$

(13) $[CoCl_4]^{2-}$

(14) $[Fe(NO_2)_6]^{3-}$