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PATNA REGION
MINIMUM LEVEL FOR SLOW LEARNERS
CO-ORDINATION COMPOUND NOMENCLATURE(IUPAC)

(1)$[Co(NH_3)_6]cl_3$

Hexaammine cobalt (3) chloride

(2)$[Co(NH_3)_5cl]cl_2$

Pentaammine chloride cobalt (3) chloride

(3)$K_3[Fe(CN)_6]$

Potassium Hexacynoferrate(3)

(4)$K_3[Fe(C_2O_4)_3]$

Potassium trioxalatoferrate(3)

(5)$K_2[PtCl_4]$

Potassium tetrachloridopalladate(2)

(6)$[Pt(NH_3)_2Cl(NH_2CH_3)]cl$

Diamminechlorido(methylamine)platinum(2)chloride

Nomenclature to formulae

(1)Tetraamminediaqua cobalt(3) chloride

$[Co(NH_3)_4(H_2O)_2]cl_3$

(2)Potassium tetracyanonickelate(2)

$K_2[Ni(CN)_4]$

(3)Tris(ethane 1,2 diamine)chromium(3)chloride

$[Cr(en)_3]cl_3$

(4)Amminebromidochloridonitrite N-platinate(3)

$[Pt(NH_3)Brcl(NO_2)]$-

(5)Dichloridobis(ethane 1,2 diamine)platinum(4)nitrate

$[PtCl_2(en)_2]\ (NO_3)_2$

(6)Iron(3) hexacyanoferrate(2)

$Fe_4[Fe(CN)_6]_3$

ISOMERISM

There are two types of isomerism

(1)structural isomerism **(2)stereo isomerism**

There are four types of structural isomerism

(a)Ionisation isomerism

(b)Hydrate isomerism

(c)Linkage isomerism

(d)Co-ordination isomerism

There are two types of stereo isomerism.

(a)Geometrical isomerism (cis-trans isomerism

(b)Optical isomerism

(a)Ionisation isomerism:- due to exchange of ligand inside and outside the co-ordination sphere.

$[Co(NH_3)_4Cl_2]NO_2$ and $[Co(NH_3)_4(NO_2)Cl]Cl$

(b)Hydrate isomerism:-It is shown by the complex having different in water of crystallization.

$[Cr(H_2O)_6]Cl_3$ and $[Cr(H_2O)_5Cl]Cl_2.H_2O$

(3)Linkage isomerism:-When the ligand is ambidevtate and can combine with two or more diferrent atoms.

$[Co(NH_3)_5(NO_2)]$ and $[CO_2(NH_3)_5(ONO)]cl_2$

(4)Co-ordination isomerism:-when both cations and anions are complex and metal ions are interchanged between them.

$[CO(NH_3)_6][Cr(CN)_6]$

$[Cr(NH_3)_6][CO(CN)_6]$

Geometrical isomerism or cis-trans isomerism.

Cis-when two identical group of adjacent position.

Trans-when two ligands are arranged opposite to one another.

* Tetrahedral complex do not show cis-trans isomerism.

*square planer complex of this type$[Ma_4][Ma_3b][Mab_3]$. Do not show this isomerism.

*$[Ma_2b_2]$[Mabed] and $[M(ab)_2]$

Show cis-trans isomerism.

$[Ma_6]_2[Ma_5b]$ Do not show this isomerism.

Octahedral complex

$[Ma_4b_2][Ma_3b_3]$

$[M(AA)a_2b_2]$ $[M(AA)_2ab]$ Show geometrical isomerism.

Optical isomerism

*It rotate the plane of polarized light to the right-dextrorotatory.

*It rotate the plane of polarized light to the left-laevorotatory.

*Optical isomers are called enantiomers.

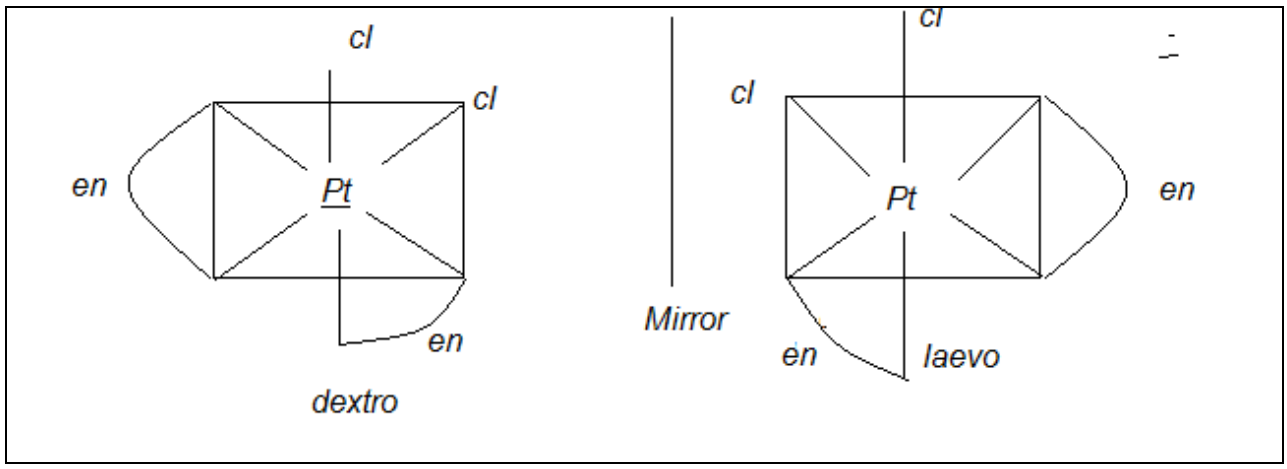
*Square planer complexes do not show optical isomerism.

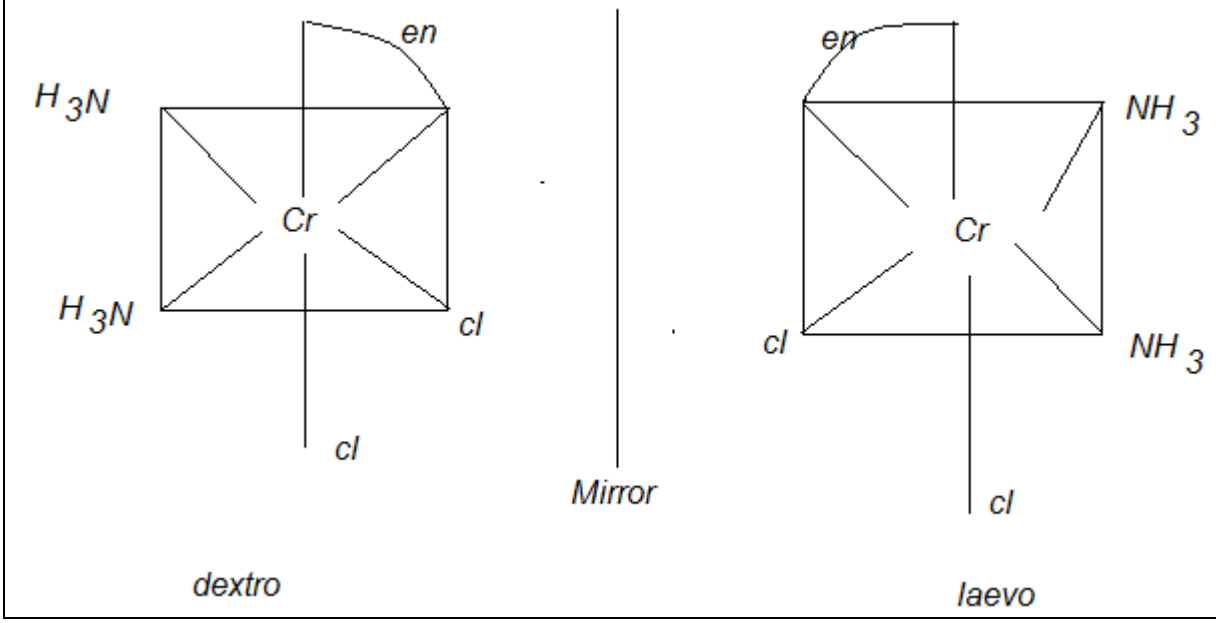
*octahedral complexes show optical isomerism.

*optical isomerism is shown by chiral molecule.

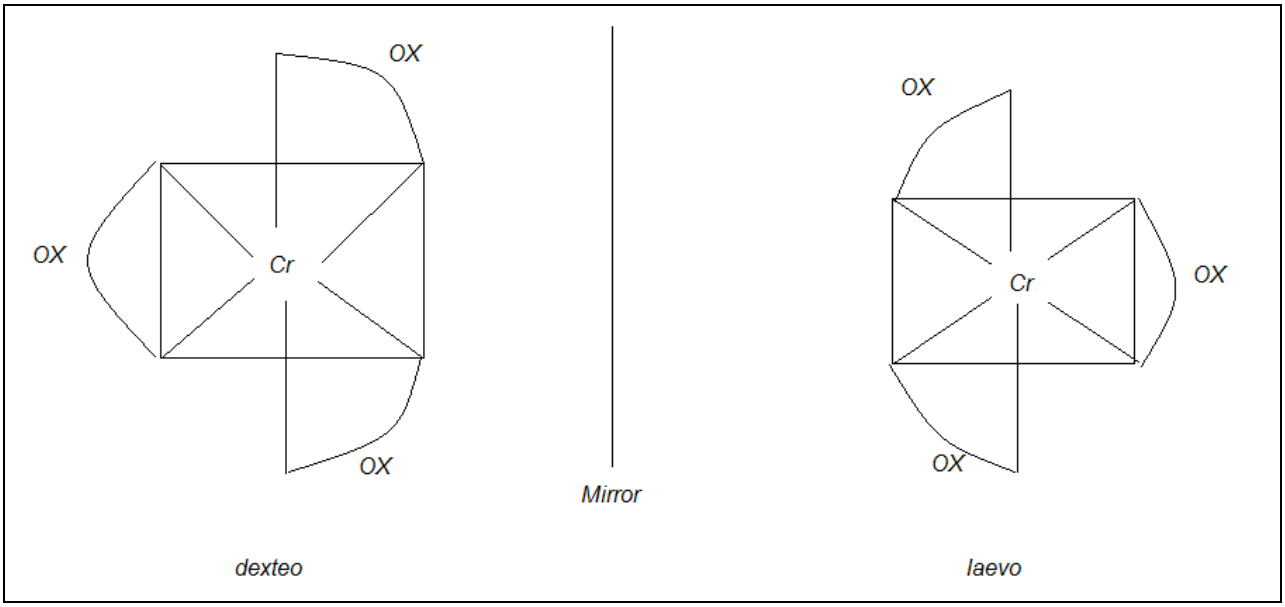
Q. Draw the structure of Optical Isomerse of

(a) $[ptcl_2(en)_2^{+2}]$ (b) $[cr(NH_3)Cl_2(en)_2]^+$

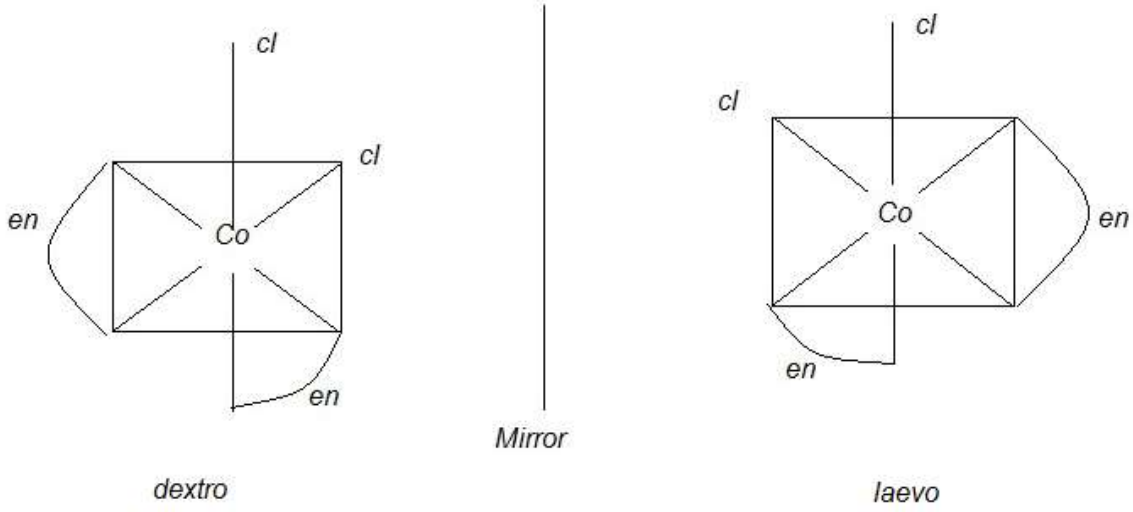




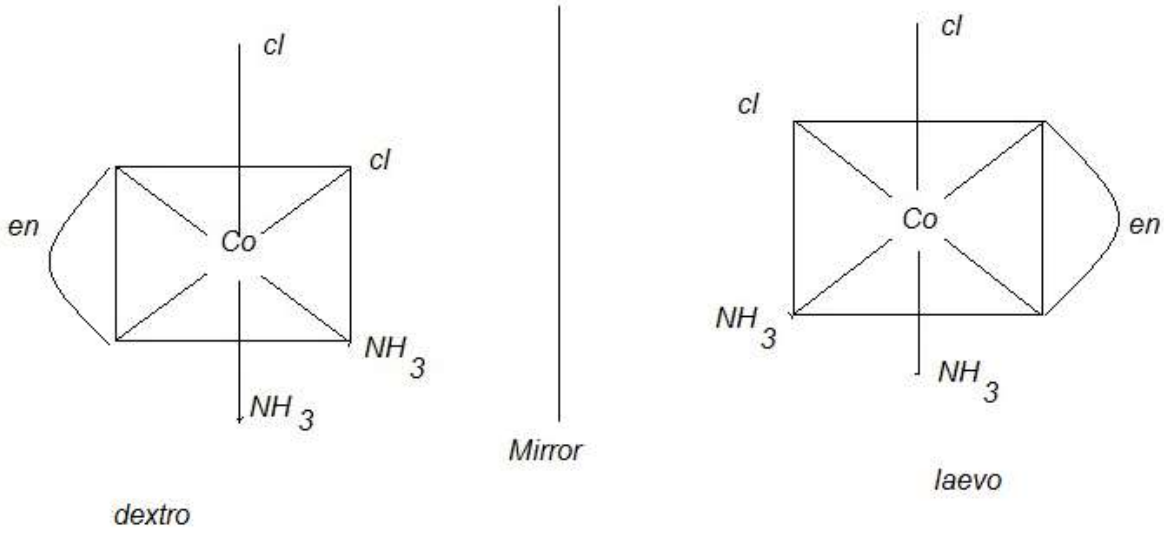
Type $[M(AA)_3$ Ex: $[Co(en)_3]^{3+}$, $[Cr(ox)_3]^{3-}$



Type $[M(AA)_2X_2]$ or $[M(AA)_2XY]$ e.g. $[Co(en)_2cl_2]^+$



Type $[M(AA)X_2Y_2]$ e.g. $[Co(en)(NH_3)_2cl_2]$

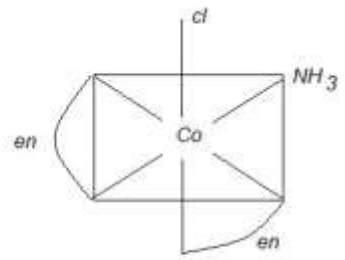


Draw all the isomers (geometrical and optical)

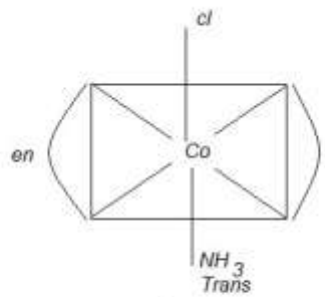
(a) $Co(NH_3)cl(en)_2]^+$

(b) $[Co(NH_3)_2cl(en)]^+$

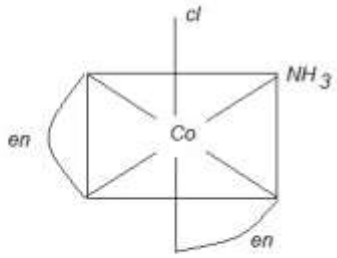
(a)



Cis

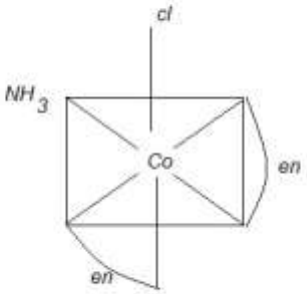


Trans



dextro

Mirror



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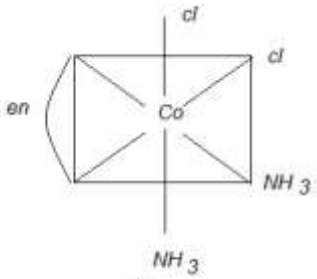
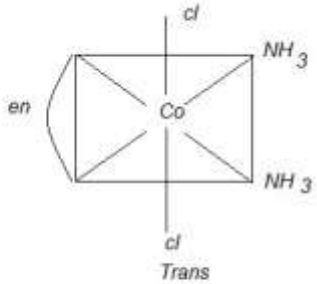
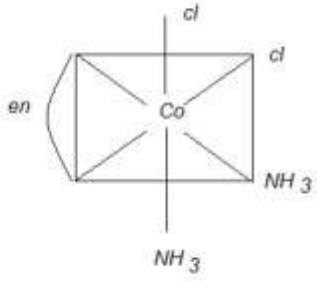
(b)



Cis

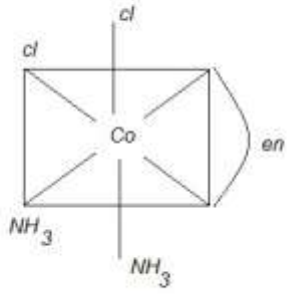


Trans



dextro

Mirror



laevo

(a)

Number of orbital and types of hybridization.

Co-ordination number	Types of hybridisation	Geometry
4	Sp_3	Tetrahedral
4	dsp_2	Square planer
5	Sp_3d	Trigonal bipyramidal
6	Sp_3d_2	Octahedral
6	d_2sp_3	Octahedral

*The inner orbital (low spin) or outer orbital (high spin) complexes are formed depending upon whether d-orbitals of inner shell or d-orbitals of outer shell are used in hybridisation. Unpaired electrons are present than the complex will be paramagnetic.

Q. Discuss the nature of bonding in the following by VBT.

1. $[Fe(CN)_6]^{4-}$

Oxidation state of Fe is +2

Electronic configuration of Fe $[Ar]3d_6\ 4S_2$

Electronic configuration of Fe+2 $[Ar]_3d_6$

Fe+2

3d 4s 4p

Hybridised orbital

d_2sp^3

Pairing take place due to strong ligand CN d_2sp^3.

No. of unpaired electron = zero(diamagnetic)

Inner orbital complex

Low spin complex

Spin paired complex

2. $[FeF_6]$-3

Oxidation state of iron is +3.

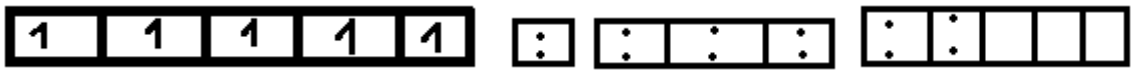
Electronic configuration of Fe –$[Ar]3d^6\ 4S^2$.

Electronic configuration of Fe – $[Ar]3d^5$

Fe^{+3}

3d 4s 4p 4d

Hybridised state



3d 4s 4p 4d

Sp^3d^2

F is weak ligand

Paramagnetic due to presence of unpaired electron.

Outer orbital complex.

Spin free complex.

High spin complex.

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PGT(Chemistry)

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