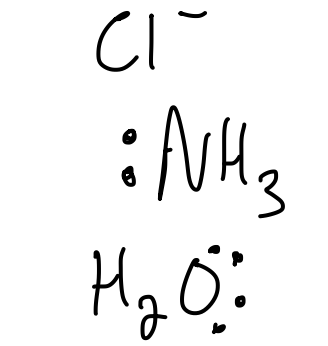
This Class

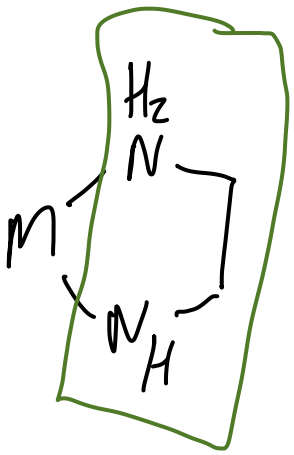
Coordination Chemistry

Next Class

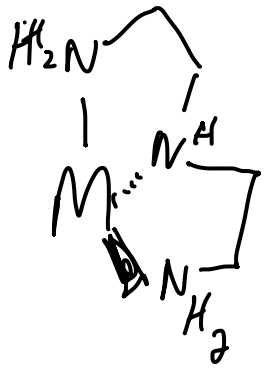
Coordination Chemistry

ligands can be monodentate, bidentate, tridenatate…





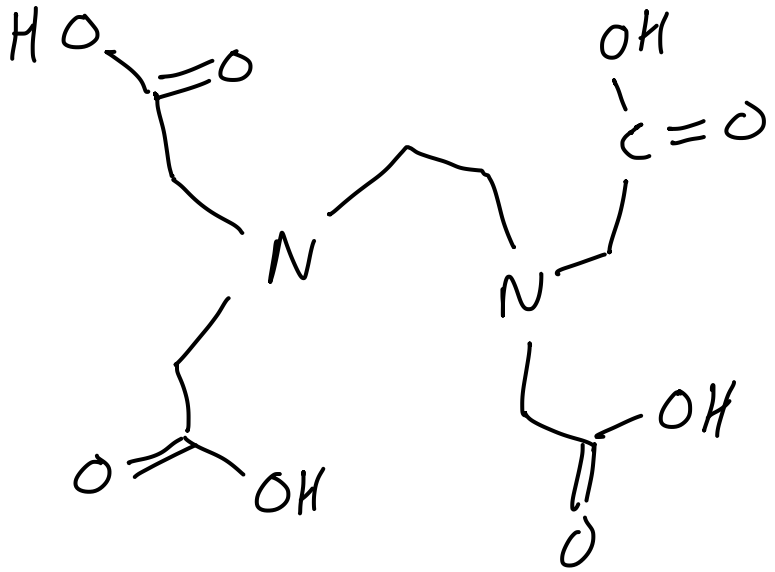
bidentate ligand

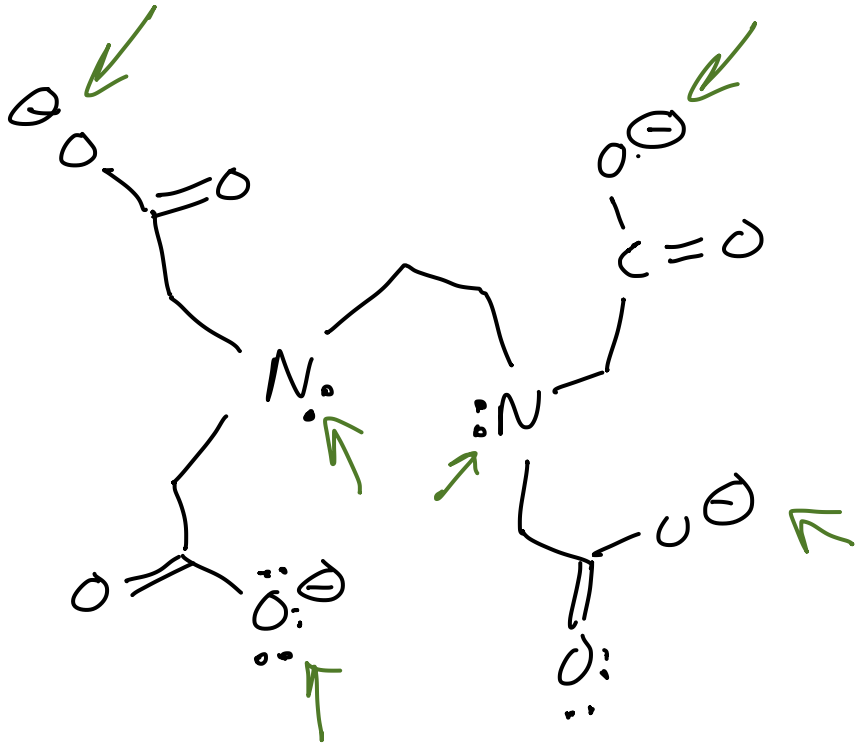


a ligand is the molecule or atom being bound to the metal

EDTA or sodium EDTA

ethylene diamine tetra acecitic acid





hexa dentate

these a chelating ligands bind more strongly than monodentate ligands because they make more bonds

Hydrate/Solvate – compounds can be isolated with different numbers of solvent molecules in the coordination sphere

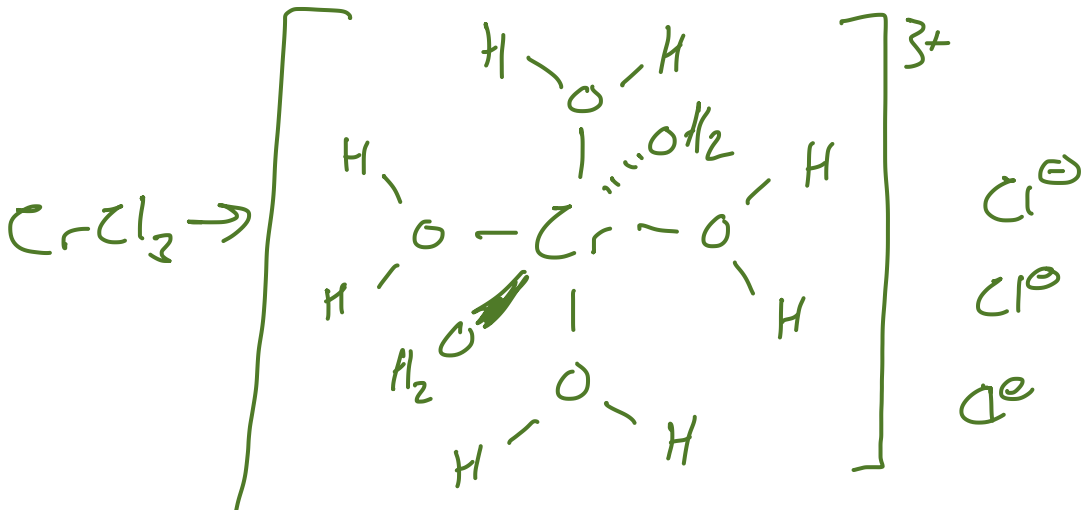
$[Cr(H_2O)_6]Cl_3$ violet

$CrCl_3$

$[CrCl(H_2O)_5]Cl_2 \cdot H_2O$ blue-green

$[CrCl_2(H_2O)_4]Cl \cdot 2\ H_2O$ dark green

$[CrCl_3(H_2O)_3]$ yellow-green



Isomerism: Constitutional isomers

Ionization Isomerism

SO_4^{2-} NO_3^- NO_3^- SO_4^{2-}

$[Co(NH_3)_5SO_4]NO_3$ vs $[Co(NH_3)_5NO_3]SO_4$

\+ - +2 -2

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

Cl^- NO_2^-

When different compounds result from ions exchanging places in the compound ... from inside the coordination sphere to outside.

Coordination isomerism

Total ratio of ligands to metal remains the same, but the actual arrangement changes

$[Pt(NH_3)_2Cl_2]$ vs $[Pt(NH_3)_3Cl][Pt(NH_3)Cl_3]$ vs $[Pt(NH_3)_4][PtCl_4]$

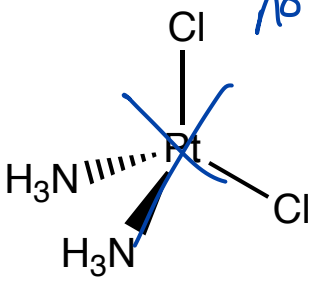
Isomerism: Stereochemistry

stereoisomers

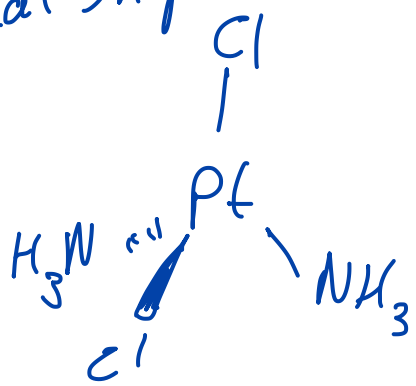
not chiral

not actual shape

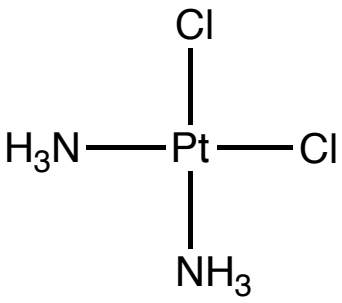
lacks a mirror plane or an improper axis of rotation - chiral



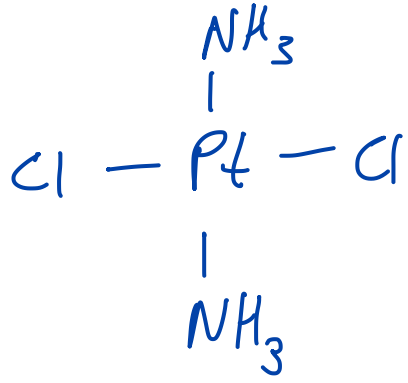
NO



do these structures predict stereoisomers for the complex? (Different 3D arrangements)



vs



planar 4 coordinate complexes that have 2 different ligands can have 2 geometries

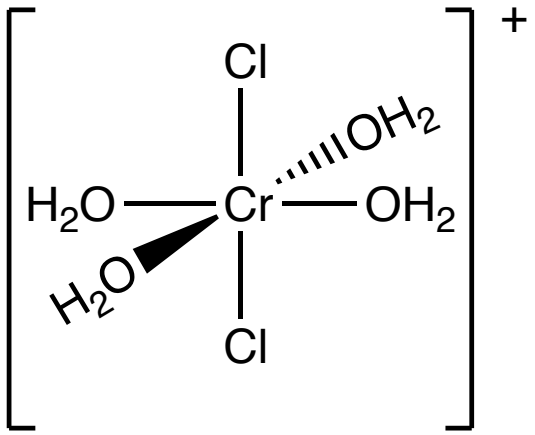
cis-platin

↑

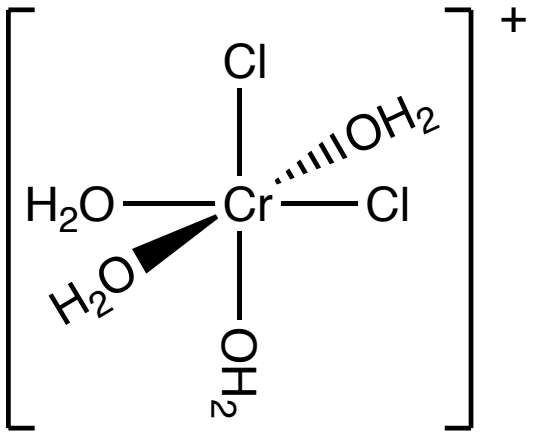
anti cancer agent

trans-platin

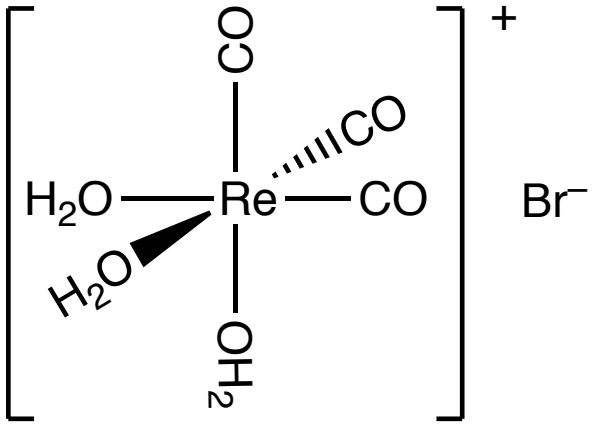
Isomerism: Stereoisomers



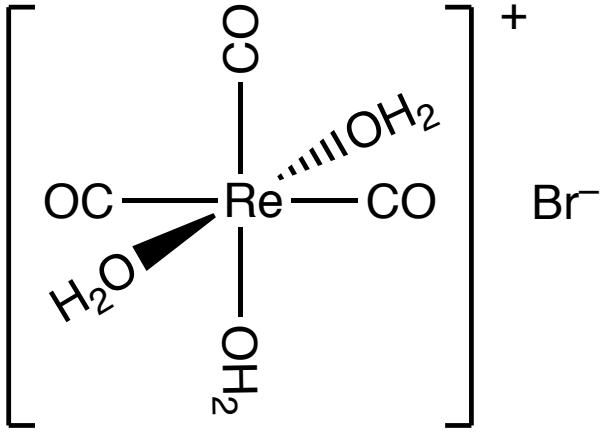
trans



cis

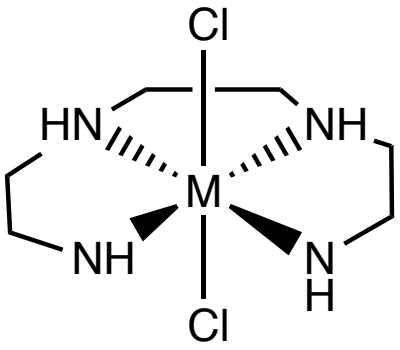


fac facial



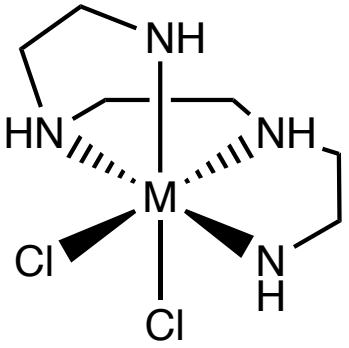
mer meridinal

Isomerism: Stereoisomers



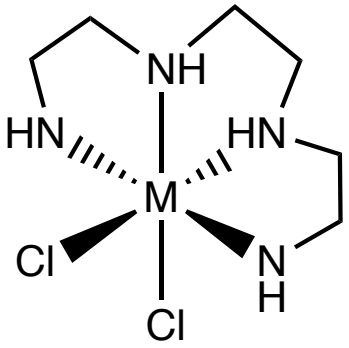
α

in the same plane



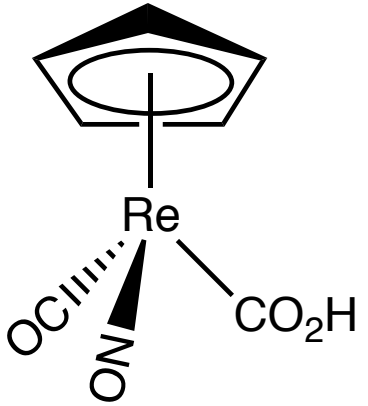
β

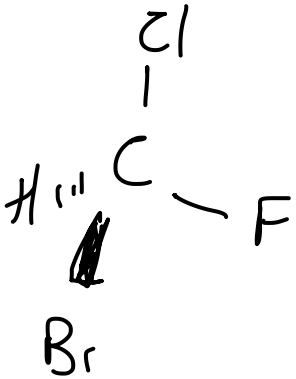
two rings in same plane



trans

none of the rings is in the same plane

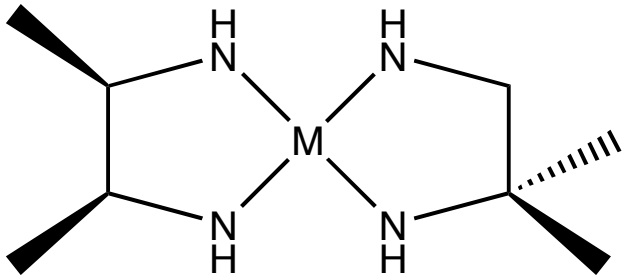




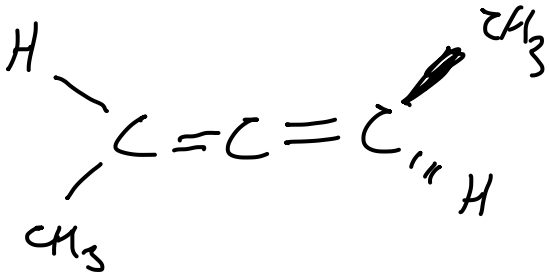
chiral because

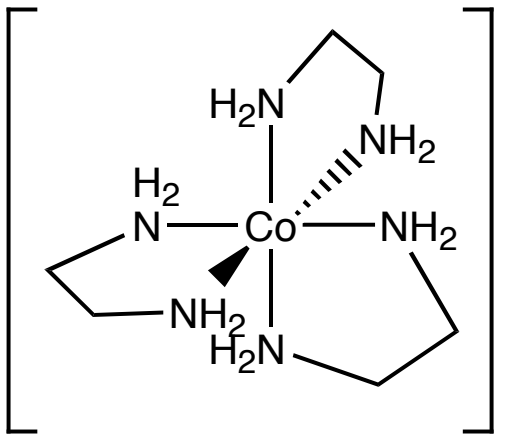
4 different groups arranged tetrahedrally around a center atom.

chiral due to the the structure of

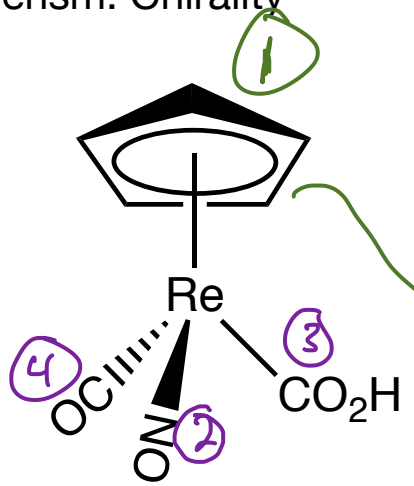


the ligands





chiral because there is a screw axis

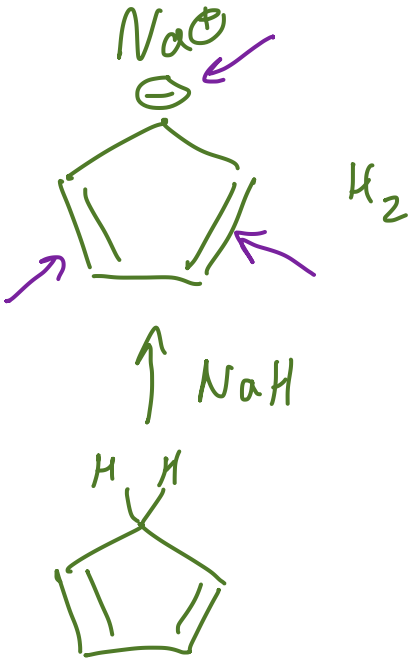


These compounds use the R/S system of nomenclature

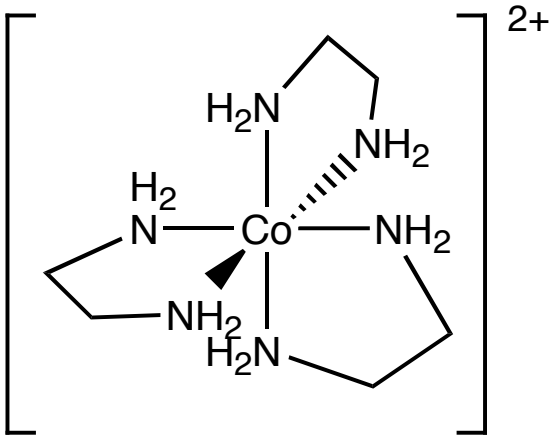
treat these as 5 + (atomic # 6)

cyclopentadiene ring 30

5



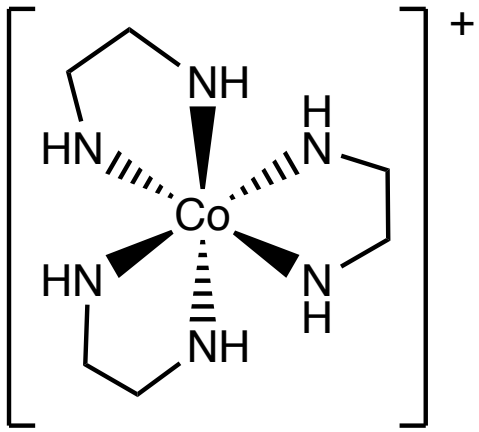
Isomerism: Chirality



left-handed propeller Λ propeller moves away from viewer when rotated counter-clockwise screw screws in when rotated counterclockwise screw screws out when rotated clockwise	right handed propeller Δ propeller moves away from viewer when rotated clockwise screw screws in when rotated clockwise

lamda delta

Isomerism: Chirality



1. rotate figure to place ring horizontally across the back at the top of one of the triangular faces

2. imagine the ring in the front triangular face as having originally been parallel to the back ring. Determine what rotation of the front face is required to obtain the actual configuration

3. if rotation is counterclockwise Λ. clockwise Δ.