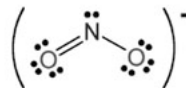
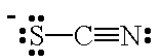
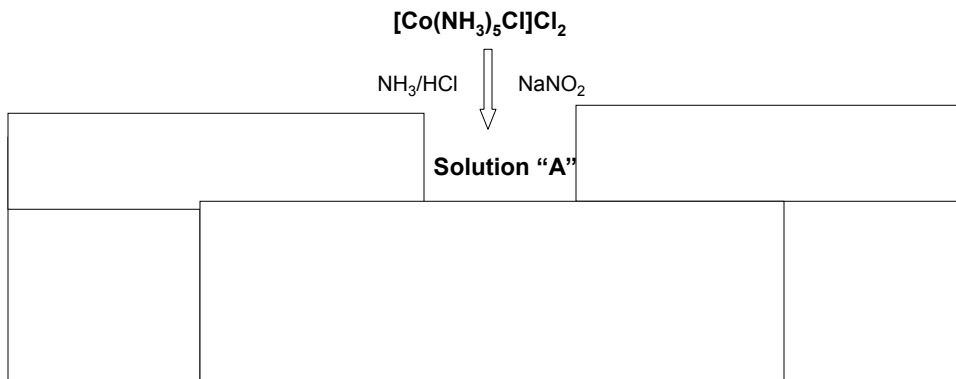


Linkage Isomers

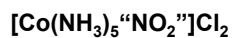
Linkage isomers can exist when one or more ambidentate ligands is bonded to a metal ion.



This type of isomerization was discovered by Jorgensen in 1894.



What's going on?



The nitrite ion can bind in two different ways. Through the O or through the N.

What do the structures look like?

Jorgensen figured this out in 1894.....BUT HOW?
He did not have IR-spectroscopy, X-ray crystallography, etc...

Was he correct?

How can you tell?

Isomerization Summary

Ionization Isomers. 2 different ions are obtained when dissolved in solution. (Same formula.....different solution species.)

This is similar to the Hydration Isomers noted on page 424 of R-C, although in the case of HI isomers differ in the number of coordinated water molecules.

Coordination Isomers. When both the anion and cation contain metal ions different distributions of ligands between metal centers result.

Linkage Isomerism. Bonding of ligands through different modes. A good example of this involves the binding of NO_2 .

Structure of Simple Coordination Compounds

A review of conventions for drawing 3-D structures on paper.



M-L bond in the plane of the page.

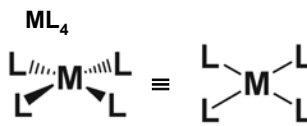
M-L bond out of the plane of the page.

M-L bond into the plane of the page.

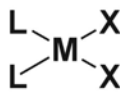
Four Coordinate Complexes



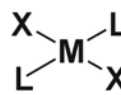
tetrahedral



square planar

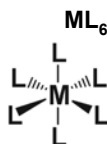


cis



trans

Six Coordinate Complexes



octahedral



trans-



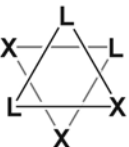
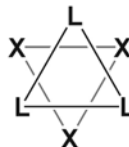
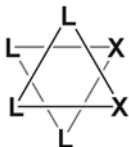
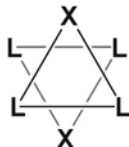
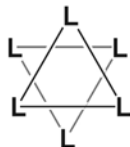
cis-



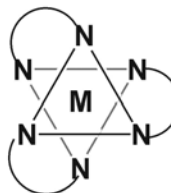
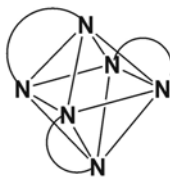
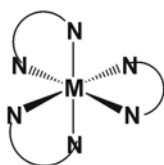
facial (fac)



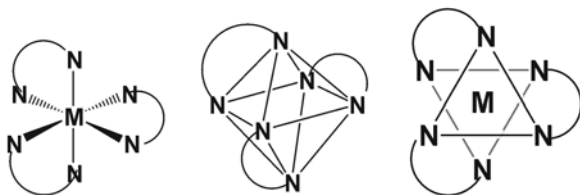
meridional (mer)



These are the same complexes viewed down a face of the octahedron.



Tris-ethylenediamine Chelates



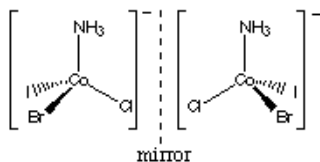
These are the structural representations of ONE optical isomer.

Understanding these structural formulae is crucial to you deciding on chirality.

Optical Isomerization

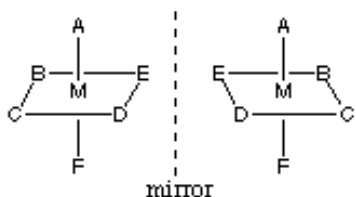
Tetrahedral Geometry

The $[\text{Co}(\text{NH}_3)\text{ClBrI}]^-$ ion is tetrahedral, with four different groups bonded to the cobalt. It has two nonsuperimposable mirror images:



This is the same as you see for organic chemistry.

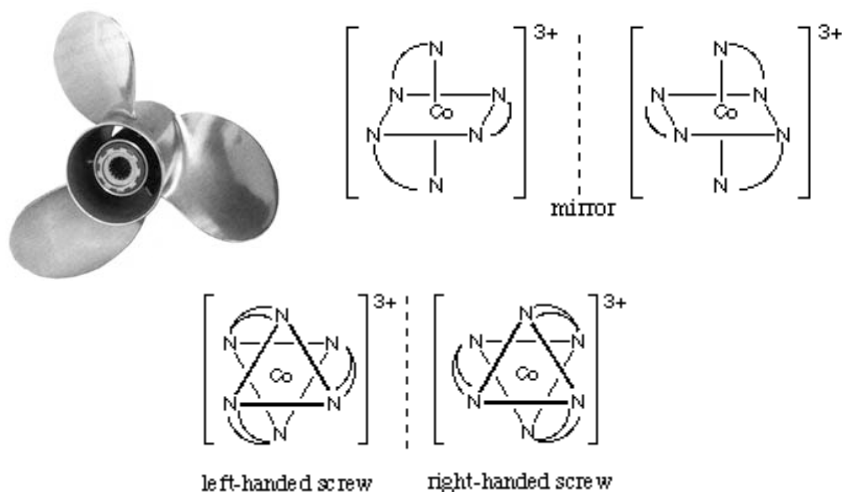
Octahedral Geometry



Similarly, an octahedral metal ion bonded to 6 different ligands would be chiral.

Optical Isomerization Con't

Chirality and optical isomerism that do not depend on having four different groups attached to a tetrahedral central atom. Tris(ethylenediamine)cobalt(III) ion is chiral, in spite of the fact that the three ethylenediamine ligands are all the same and are themselves symmetrical:



cisplatin

