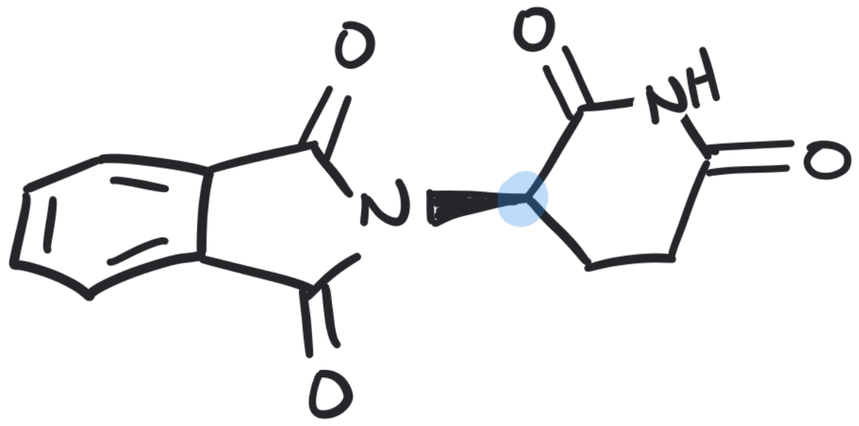
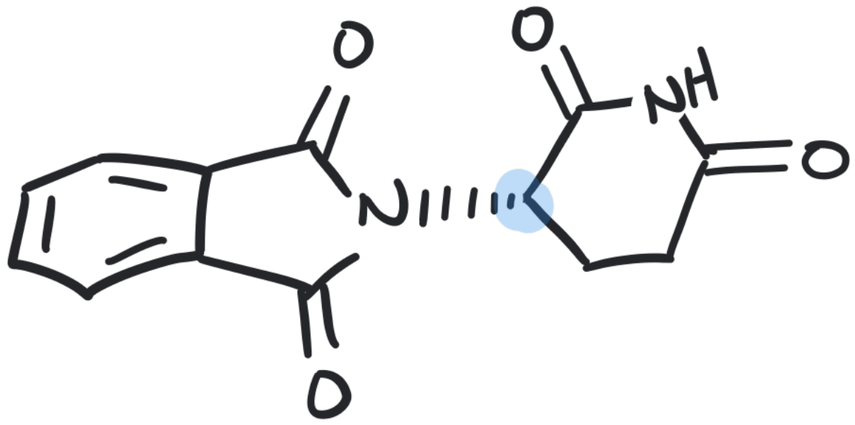
Stereochemistry

Consider:



R-thalidomide
↳ harmless

Stereoisomers and

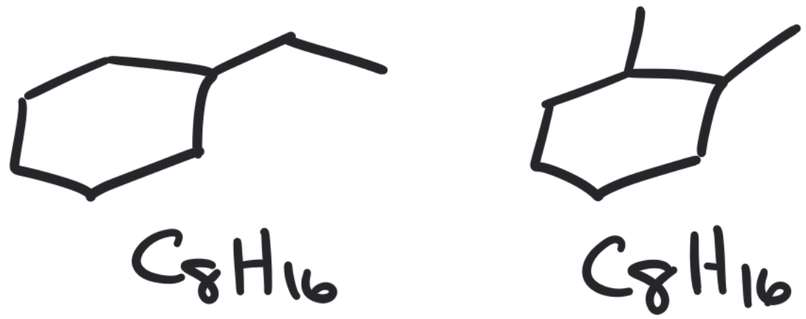


S-thalidomide
↳ tetratogen
(birth defects)

Isomers = different molecules with the same molecular formula.

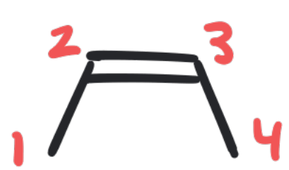
- Constitutional = different atom connectivity
- Stereoisomers = different spatial / 3D arrangement of atoms

Constitutional isomers



C_8H_{16} C_8H_{16}

Stereoisomers

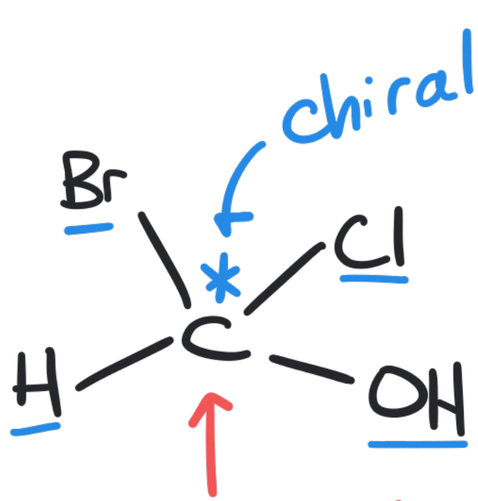


Stereoisomers

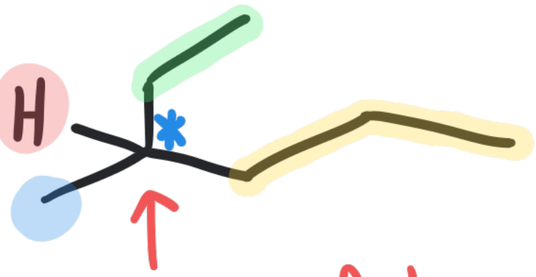
1,2-dimethylcyclohexane

Chirality and Asymmetric Centers

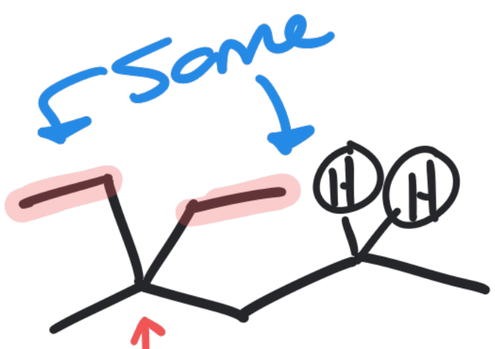
↳ aka chiral centers = atom bonded to four different groups



bonded to 4 different groups



bonded to 4 different groups

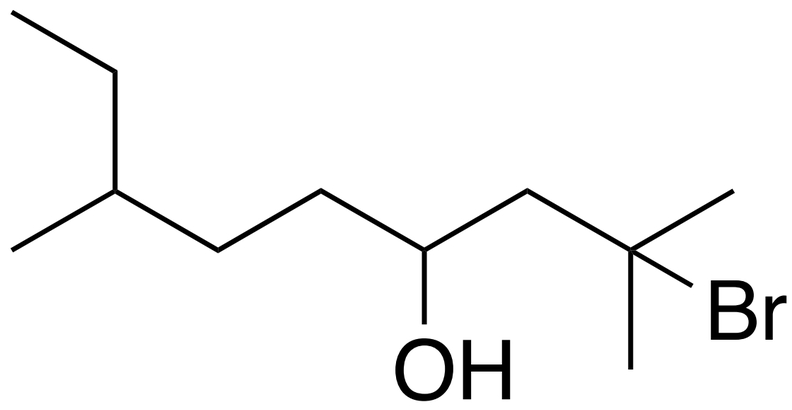


not a chiral center

A molecule with one chiral center is a chiral molecule

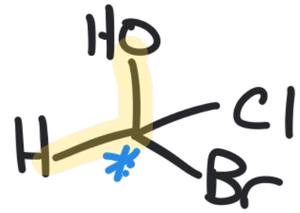
You Try

How many chiral centers are present in the molecule shown?

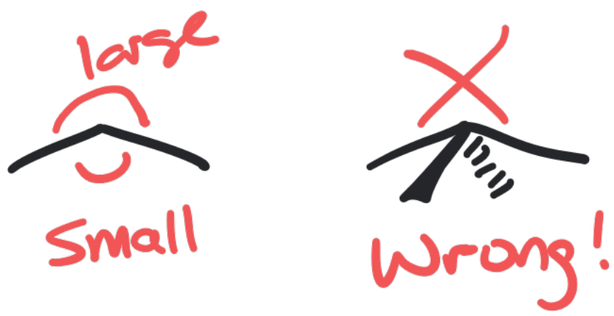


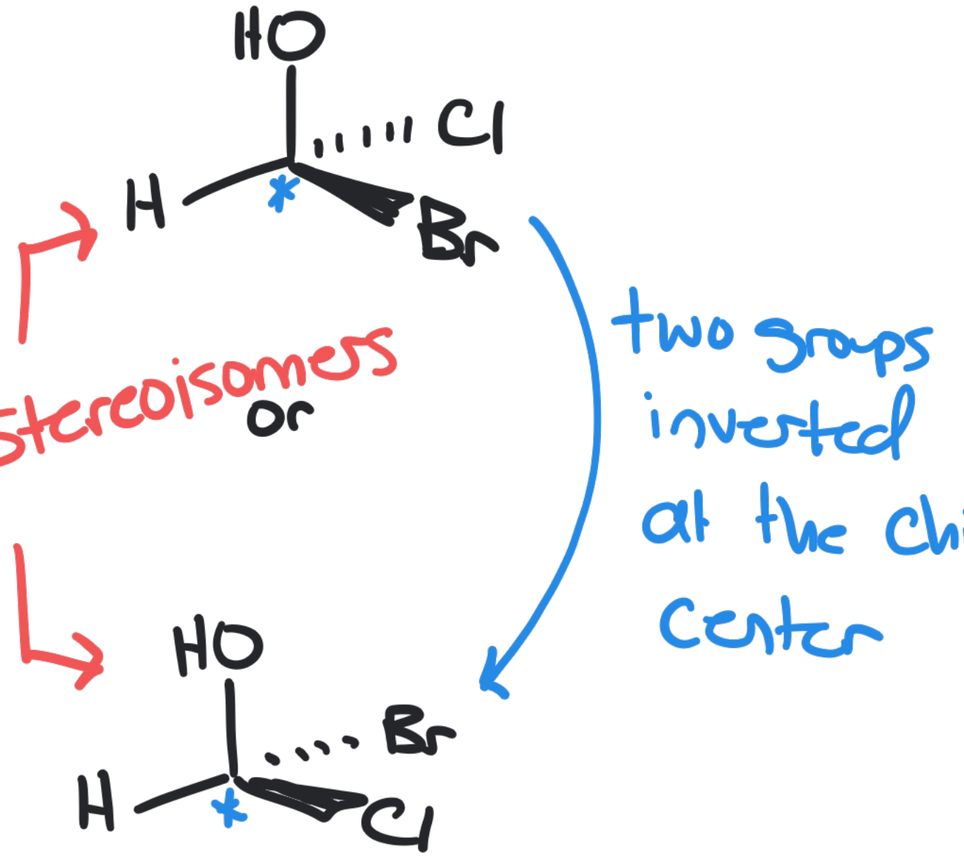
Viewing a Chiral Centa in 3D

- 2 bonds in plane — ^
- 1 bond out ◀ wedge
- 1 bond back ||||| dash



*always draw ◀ and ||||| coming off large angle of bond



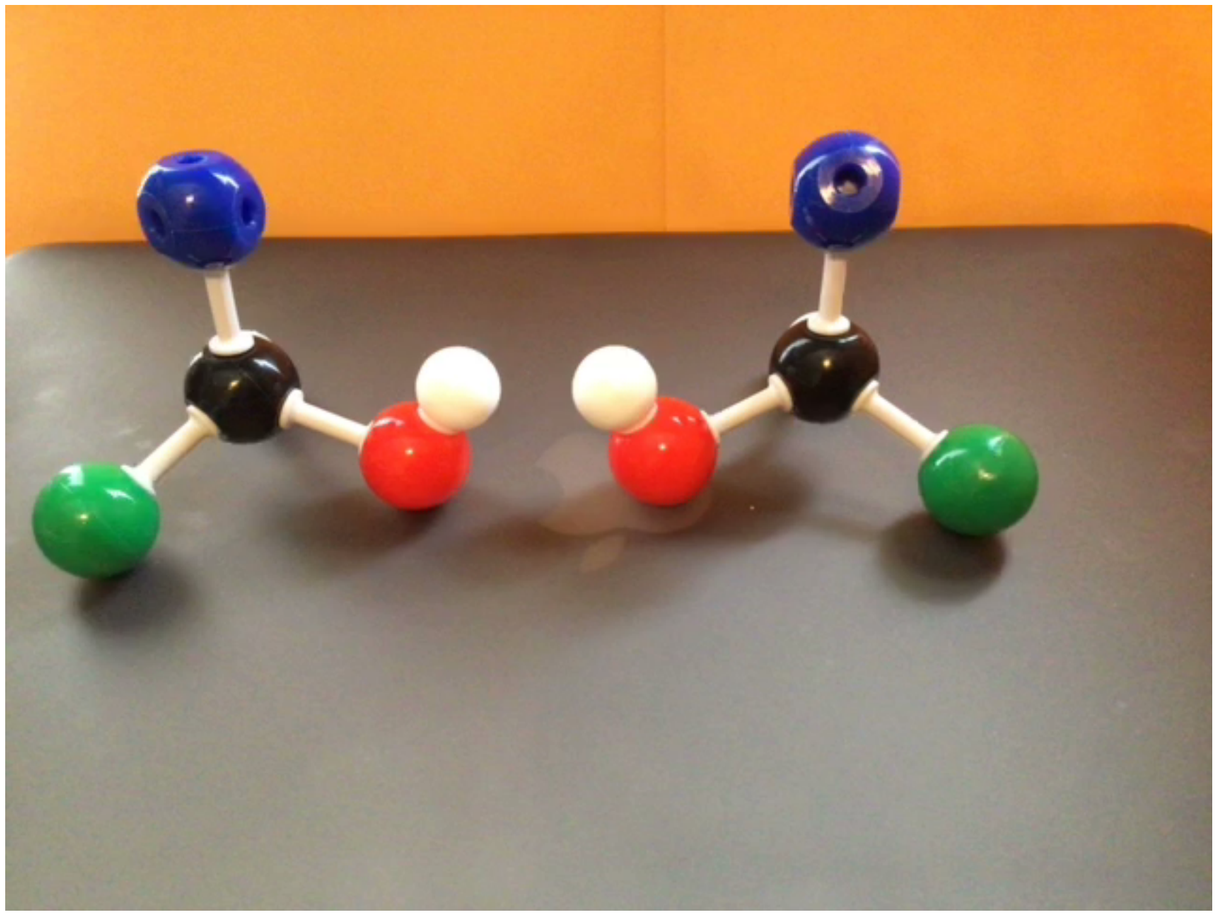


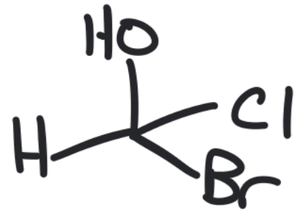
Max # Stereoisomers = 2^n

$2^1 = 2$ Stereoisomers

n = # Chiral Centers or Stereocentas

Viewing a Chiral Centre in 3D



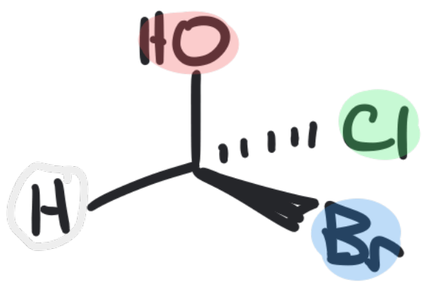


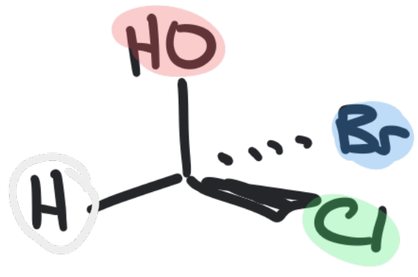
Non Superimposable
(non identical)

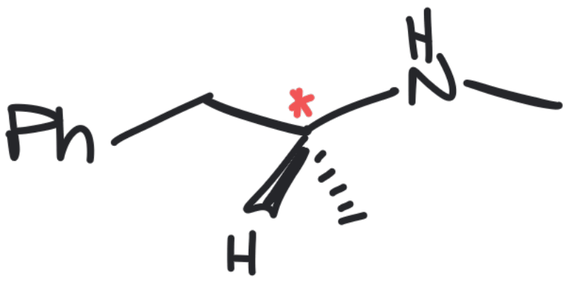
Mirror images

Enantiomers

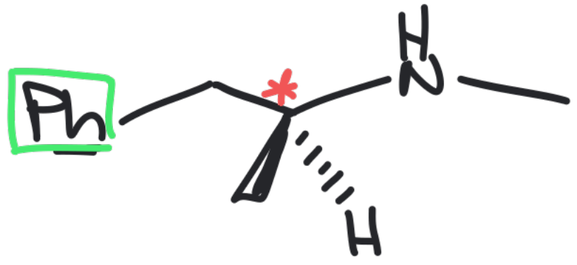
:







and



Ph = phenyl

levomethamphetamine
(vicks vapor inhaler)

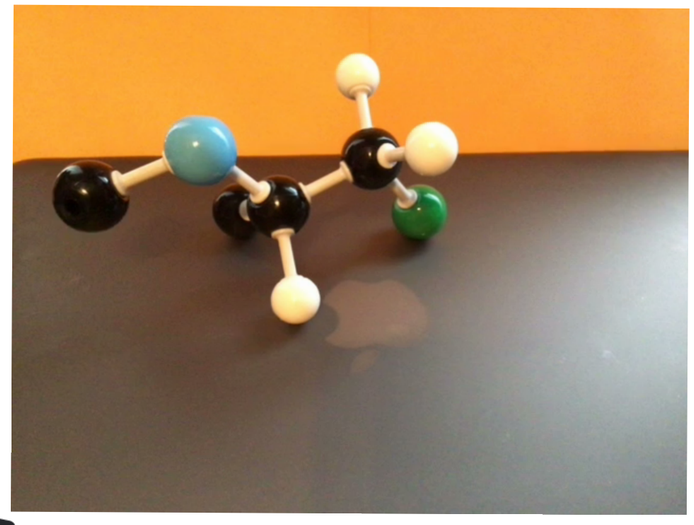
methamphetamine
(psychostimulent)

flip horizontally

Many biomolecules are chiral, thus different stereoisomers interact differently in the body.

Relationship:

Mirror



Non superimposable mirror images : enantiomers