

# Ch 5 Stereochemistry

Note Title

9/27/2005

## Stereochemistry - 3D structure of molecules

### Isomers (same molec. formula)

#### Constitutional (Structural)

isomers

different

bonding sequence

ex.



#### stereoisomers

same bonding sequence

but different orientations

of some atoms in

3-D space

- different compounds

(bonds must break  
to convert between  
stereoisomers)

ex. cis/trans

#### Conformers

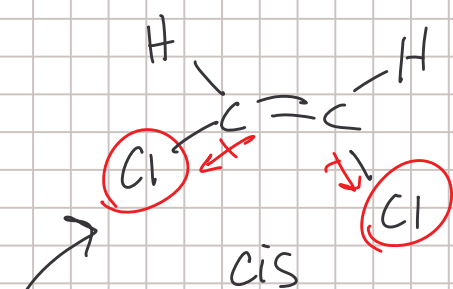
differ by

$\sigma$  bond rotations  
of same molecule

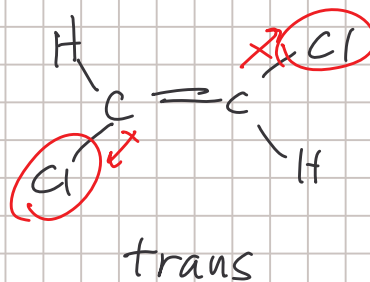
ex (rotations,

Chair flips, etc)

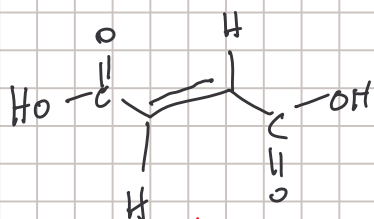
(no bonds broken  
to go between  
conformers)



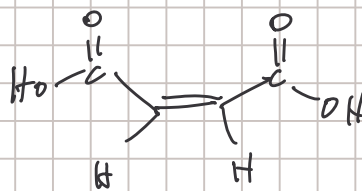
vs



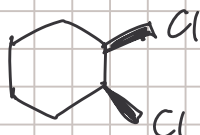
different properties (boiling points, etc)



fumaric acid  
mp. 287°C



maleic acid  
mp. 138°C



cis



trans

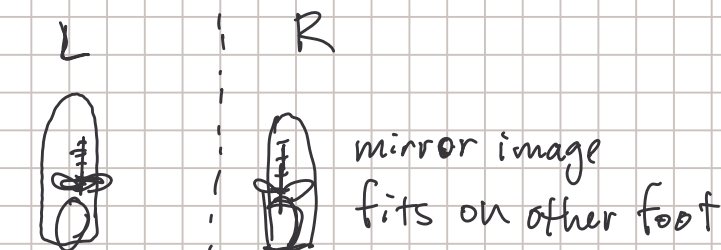
stereoisomers

Chirality - handedness

a pair of gloves look similar  
but only fit on one hand

Shoes look similar, only fit on one foot

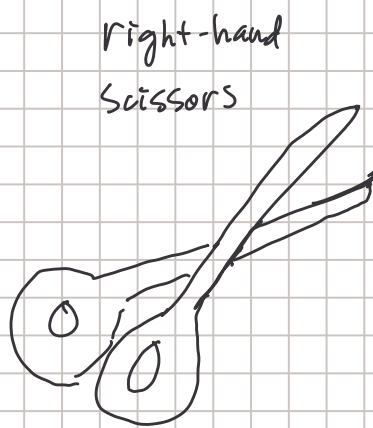
Chiral objects → look at mirror image



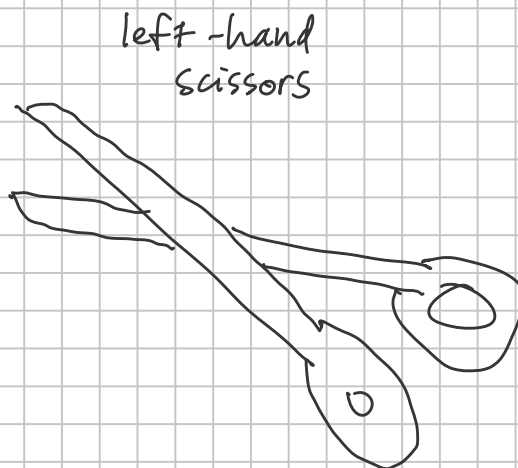
a shoe

a mirror

the mirror image is not identical  
to L shoe



a scissors



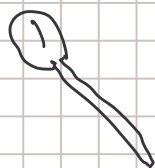
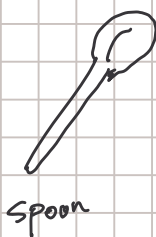
mirror image

a scissors is chiral!



Mirror images  
are identical!

a chair is ACHIRAL  
"not chiral"

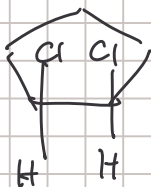
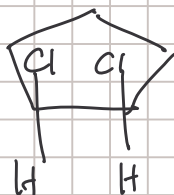


identical mirror image

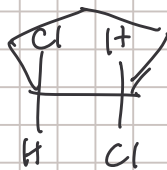
achiral

Same with molecules! is mirror image superimposable?

cis-1,2-dichlorocyclopentane



# trans-1,2-dichlorocyclopentane

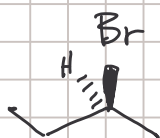
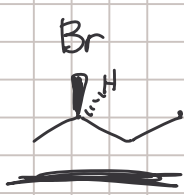


Chiral

mirror images  
non-superimposable

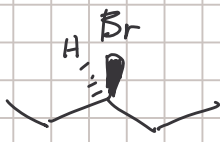
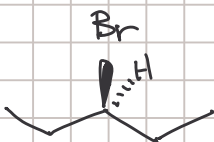
## Enantiomers

a pair of non-superimposable  
mirror-image compounds

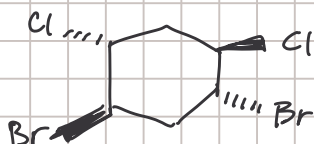


enantiomers

both are chiral



same compound  
both are achiral



enantiomers

both are chiral

## Asymmetric carbon C bonded to 4 different groups

