

Introduction to Stereoisomers

UCI Chem 51A
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Goals

- * After this lesson you should be able to:
 - * Distinguish between constitutional isomers and stereoisomers
 - * Identify stereocenters in a molecule
 - * Determine whether a molecule is chiral (except multiple stereocenters)
 - * Recognize pairs of enantiomers
 - * Draw the enantiomer of a chiral molecule

Types of Isomers

- * **Constitutional Isomers**: Molecules with the same molecular formula whose structures vary by arrangement of atoms & bonds (different connections)

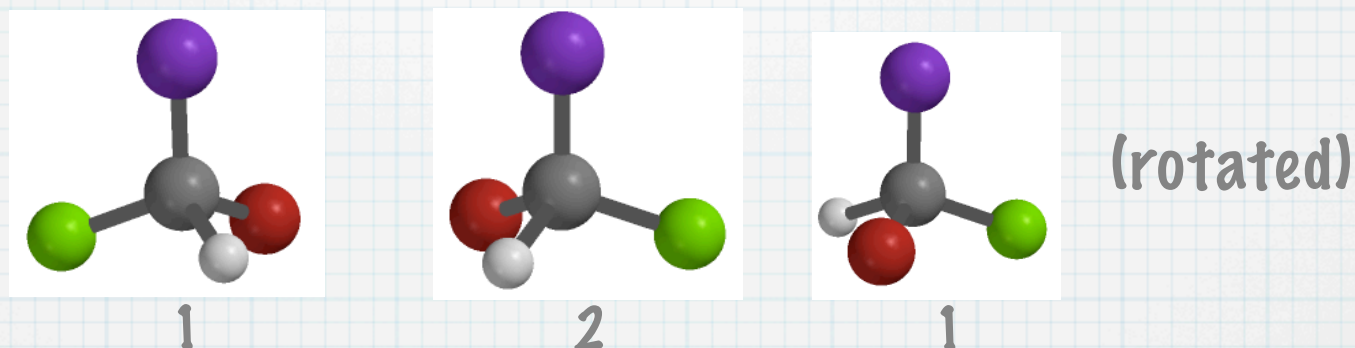
- * **Stereoisomers**: Molecules that have the same molecular formula and same connections but vary by spatial arrangement

Types of Stereoisomers

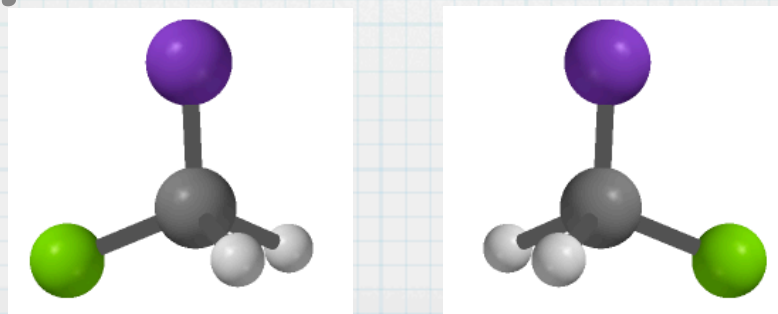
- * Enantiomers: Isomers that are mirror images of each other but are not superimposable on each other
- * Diastereomers: Not quite enantiomers, contain multiple stereocenters (we'll get to these in another lesson)
- * Cis/trans isomers: Isomers that are not enantiomers or diastereomers but differ in cis/trans (most common with alkenes)

Chirality

- * A molecule is **chiral** if it IS NOT superimposable on its mirror image.

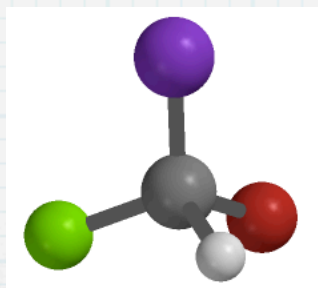


- * A molecule is **achiral** if it IS superimposable on its mirror image.

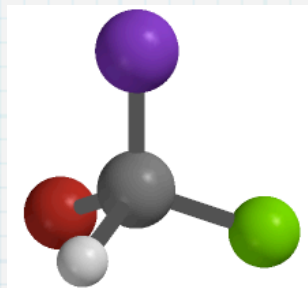


Enantiomers

- * Enantiomers are a pair of isomers that are mirror images of each other and are NOT superimposable on each other.



1

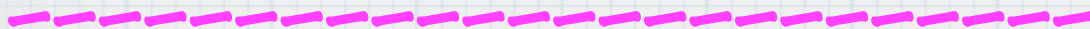


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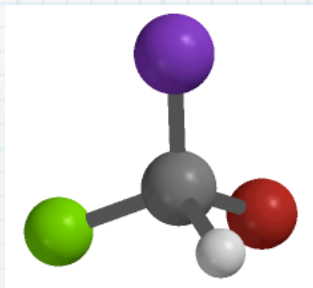


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Stereocenters

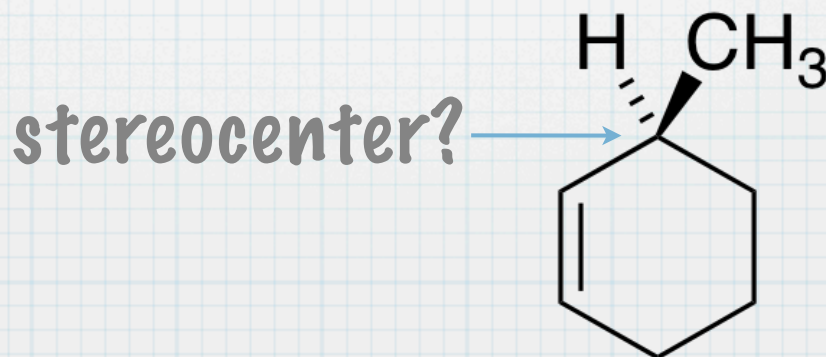
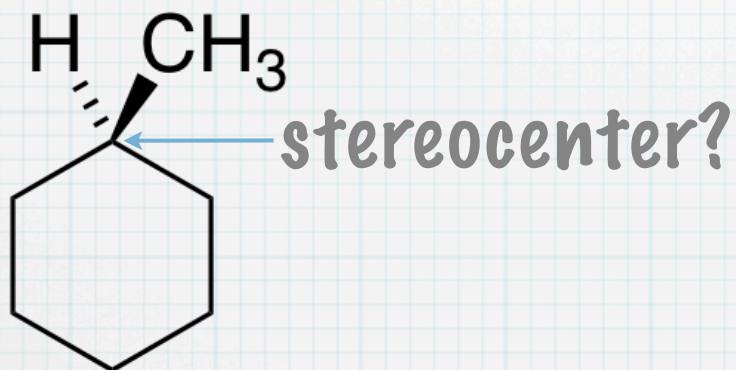
- * Most (but not all) chiral molecules have at least one stereocenter.



- * Stereocenter:

Cyclic Molecules & Stereocenters

* Watch out for symmetry!



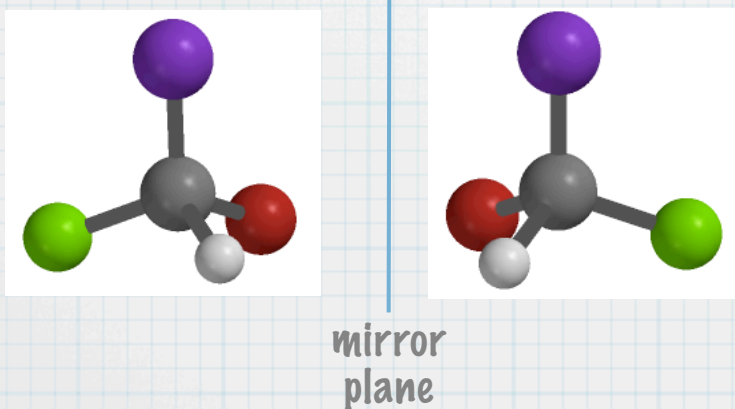
How to Tell If It's Chiral or Achiral

- * 1. Look for stereocenters.
 - * If one stereocenter, chiral.
 - * Multiple stereocenters? Maybe chiral.
- * 2. Look for planes of symmetry.
 - * Plane of symmetry = achiral

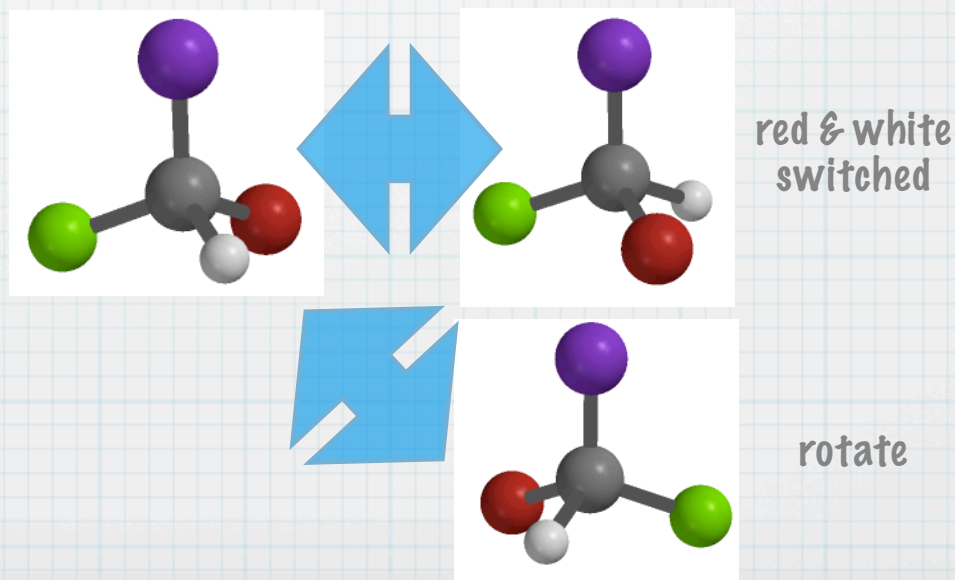
How to Draw the Enantiomer

- * Option 1. Literally draw the mirror image.
- * Option 2. Switch any two groups.

Option 1



Option 2

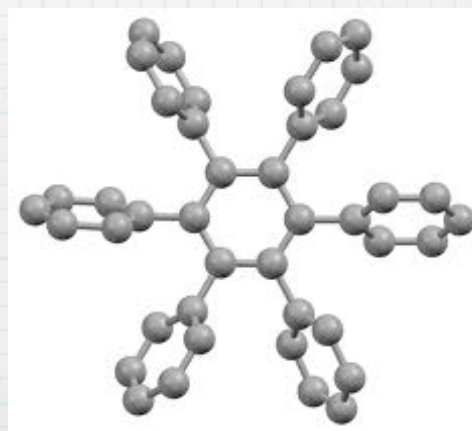


Chiral Without A Stereocenter?!

- * DNA is chiral!
 - * Helices have a “handedness”



- * Hexaphenylbenzene
 - * Also a helix



Wrapping Up

- * Practice recognizing types of isomers
- * Practice identifying stereocenters
- * Practice drawing and identifying enantiomers
- * Practice looking for planes of symmetry in molecules
- * Practice determining whether a molecule is chiral or achiral