

Stereochemistry

Key Stereochemistry Terms

Stereochemistry: the 3D spatial aspects of chemistry

Stereoisomers: molecules that differ only in the arrangement of bonds in 3D. Stereoisomers have identical constitution but differ in arrangement in space.

Enantiomers: Molecules that are non-superimposable mirror images of each other. They have the same physical properties and can be distinguished by their **optical activity**.

Superimposable: A molecule that is indistinguishable from its mirror image.

Non-superimposable: A molecule that is different from its mirror image.

Chiral: An object (molecule) that is non-superimposable on its mirror image. Chiral objects have no plane of symmetry.

Achiral: Object that is superimposable on its mirror image. Achiral objects contain at least one plane of symmetry.

Diastereomers: Stereoisomers that are not enantiomers. Diastereomers are not mirror images. They differ in physical properties.

Chiral Center: An sp³ hybridized carbon with 4 different groups attached to it. Also called a **stereocenter**, **stereogenic center**, or **chirality center**.

Optical Activity: Molecules that can rotate plane polarized light. Enantiomers rotate the light in opposite ways.

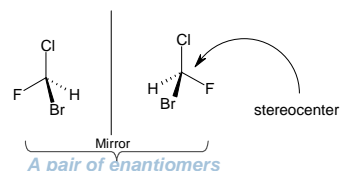
Configuration: Arrangements of groups on a chiral carbon that distinguishes stereoisomers.

R, S: The designations of a chiral center used to distinguish enantiomers. If the rank-ordered, oriented groups on carbon trace a clockwise path, R; if counterclockwise, S.

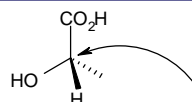
Fischer Projection: Depiction of chiral molecules where vertical lines are behind the plane of the paper and horizontal lines are above the plane.

Meso: An achiral compound with chirality centers. Meso compounds have a plane of symmetry.

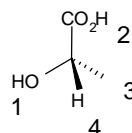
A chiral molecule and its mirror image are called **enantiomers**



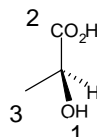
Assigning Configuration of a Chiral Center



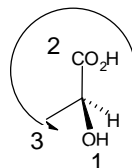
1. Find the chiral center
4 different groups on carbon



2. Assign priority to the groups
 $\text{OH} > \text{CO}_2\text{H} > \text{CH}_3 > \text{H}$

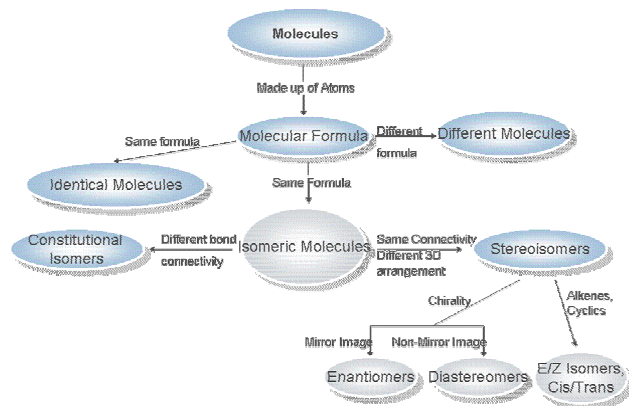


3. Orient lowest priority in back
H in this case



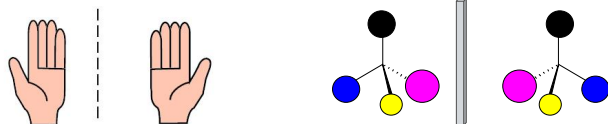
4. Trace from high to low
Clockwise, assign **R**
Counterclockwise, **S**

Role of Stereochemistry



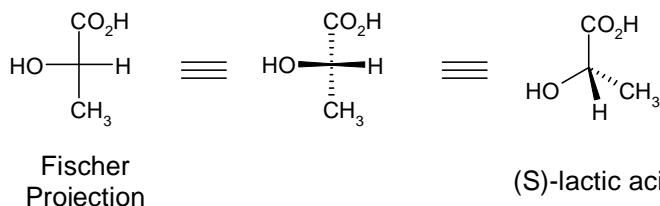
Chirality

An object that is not superimposable with its mirror image.

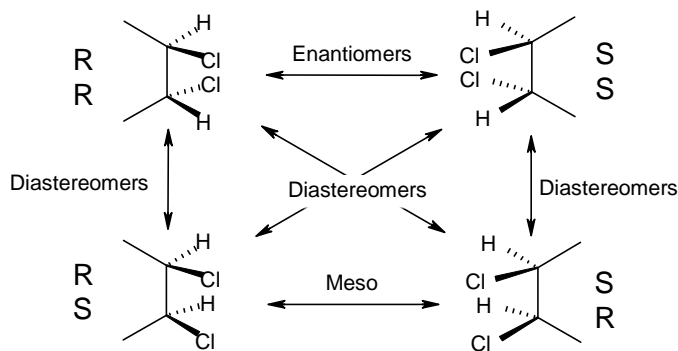


Your left and right hands are chiral. They are not superimposable on each other. A carbon with 4 different groups attached is also chiral.

Fischer Projections



Diastereomers, Enantiomers, Meso Isomers



How to Use This Cheat Sheet: These are the keys related this topic. Try to read through it carefully twice then recite it out on a blank sheet of paper. Review it again before the exams.