

## Chirality

Chiral            Not superimposable onto its mirror image

Chiral Molecules    Rotation does not lead to superimposability

Contains a Chiral Center (atom)

Does not contain an axis of symmetry

Chiral Atoms        C bonded to 4 different groups

For rings, if chain order of constituents is different when moving clockwise vs counterclockwise then atom at junction is chiral

Identified with an asterisk

Enantiomers        Stereo Isomers, mirror image of each other, contain a chiral center

## Enantiomer Nomenclature

Cahn Ingold Prelog System

Step 1            Identify chiral center

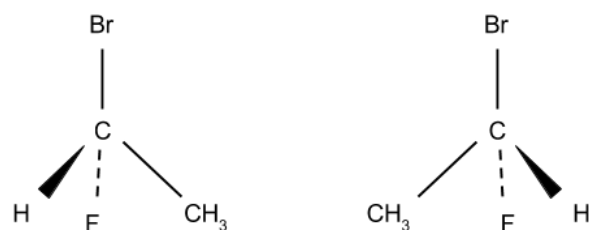
Step 2            Rank groups by atomic number (largest gets 1, smallest gets 4)

Step 3            Rotate molecule so that 4 is in the back

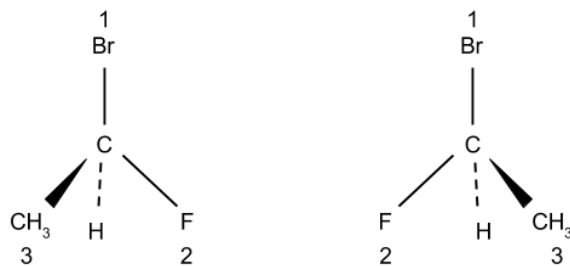
Step 4            If remaining ordering is clockwise, then use R prefix

Step 5            If remaining ordering is counterclockwise, then use S prefix

1-Bromo 1-Fluoro ethane



After assigning numbering based on atomic number and rotation of molecule

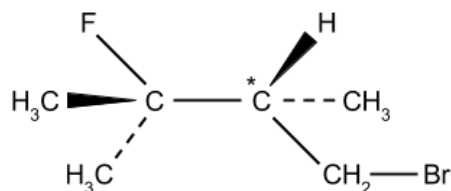


(R) 1-Bromo 1-Fluoro ethane

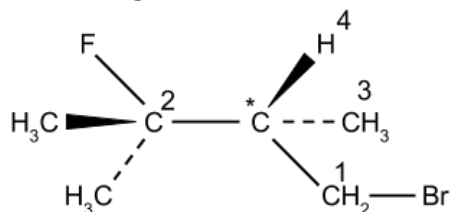
(S) 1-Bromo 1-Fluoro ethane

This nomenclature distinguishes between the left and right configurations of enantiomers.

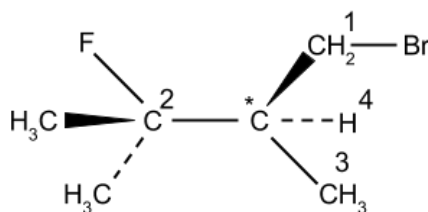
### 1-Bromo 3-Fluoro 2,3-DiMethyl butane



Numbering around chiral center



Move molecule so that 4 is back



Rotation is counter clockwise

(S) 1-Bromo 3-Fluoro 2,3-DiMethyl butane

## Isomers

Isomers      Molecules with same molecular formula (identical constituents)

Constitutional Isomers      Molecules with same constituents  
Attachment of constituents is different between molecules

Stereo Isomers      Molecules with same constituents  
Attachment of constituents is identical  
3D representation is different between molecules

Enantiomers      Molecules with same constituents  
Attachment of constituents is identical  
3D representation is different between molecules  
Mirror image of each other

Diastereomers      Molecules with same constituents  
Attachment of constituents is identical  
3D representation is different between molecules  
Not mirror image of each other

Meso Compound      Molecules with same constituents  
Attachment of constituents is identical  
3D representation is different between molecules  
Mirror image of each other  
Superimposable on mirror image  
(therefore same molecule)  
(even if it contains chiral centers, it is not a chiral molecule)

## Cis Trans / E Z

Used to distinguish molecules when they differ in the placement of functional groups

Cis / Z      When functional groups appear on same side

Trans / E      When functional groups appear on opposite sides

