# Stereochemistry 2-R/S - Configurations

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Naming Enantiomers- The *R,S* System

- Also called the Cahn-Ingold-Prelog system
- The four groups attached to the stereogenic/chiral carbon are assigned priorities from highest (a) to lowest (d)
- Priorities are assigned as follows
    - Atoms directly attached to the chiral center are compared
    - Atoms with higher atomic number are given higher priority
  - If priority cannot be assigned based on directly attached atoms, the next layer of atoms is examined
 - Example
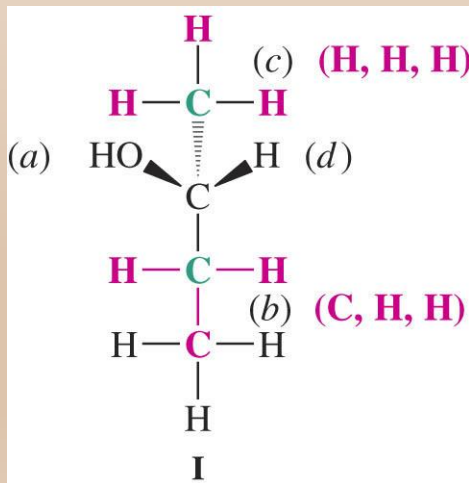
Naming Enantiomers- The *R,S* System, contd..

- The molecule is rotated to **put the lowest priority group back**
  - If the groups descend in priority (a,b then c) in clockwise direction the enantiomer is *R*
  - If the groups descend in priority in counterclockwise direction the enantiomer is *S*


(*R*)-2-Butanol
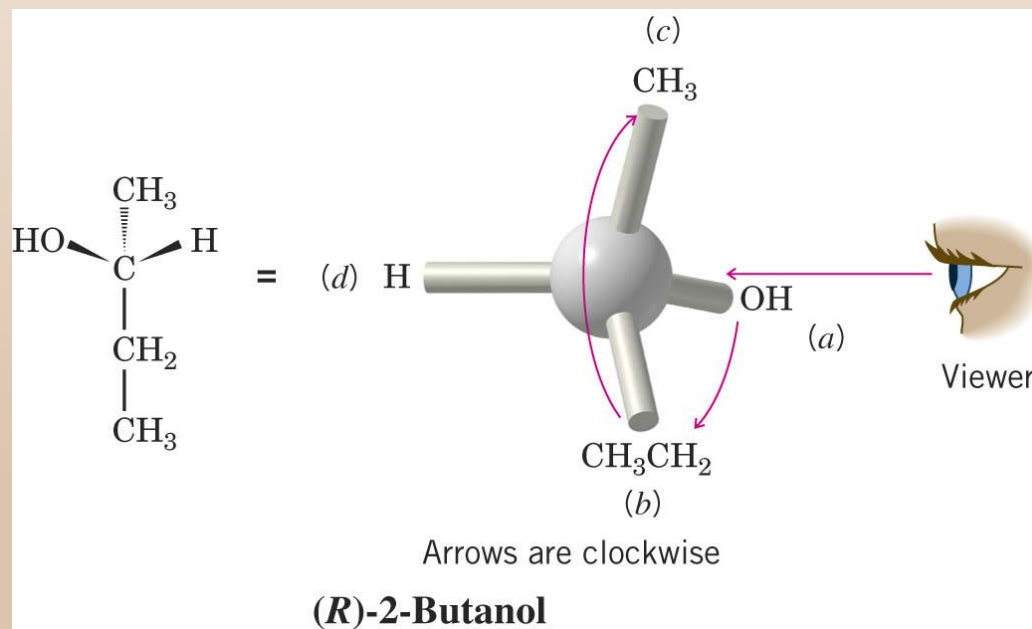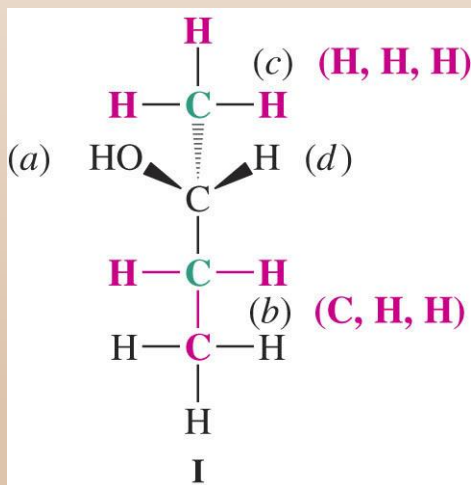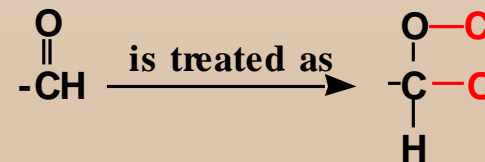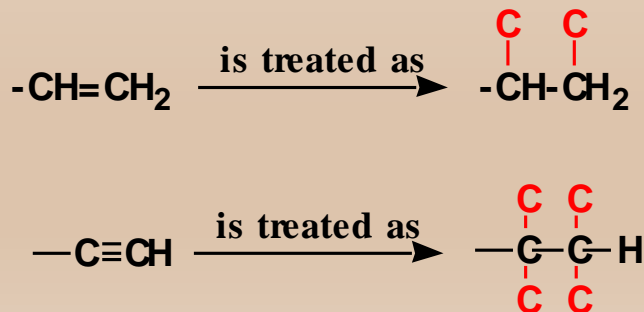
Assigning Priority

1. Look at the atom (not the group) directly attached to the carbon and arrange according to atomic weight

(1)	(6)	(7)	(8)	(16)	(17)	(35)	(53)
-H	-CH$_3$	-NH$_2$	-OH	-SH	-Cl	-Br	-I

Increasing priority →
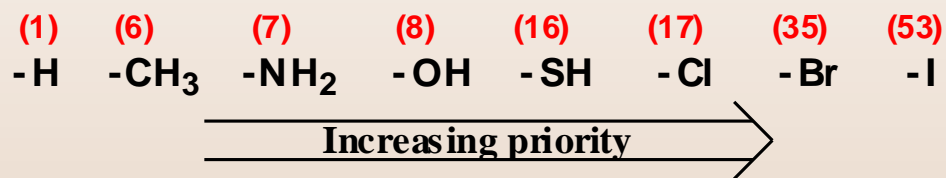
2. If priority cannot be assigned per the atoms bonded to the chiral center, look to the next set of atoms; priority is assigned at the first point of difference
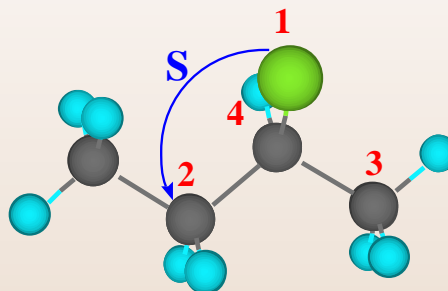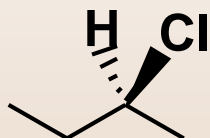
	(1)		(6)		(7)		(8)
-CH$_2$-H		-CH$_2$-CH$_3$		-CH$_2$-NH$_2$		-CH$_2$-OH	

Increasing priority →
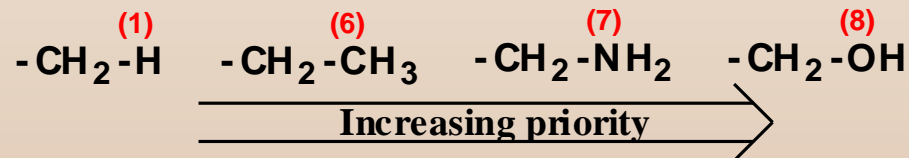
3. Groups with double or triple bonds are assigned priorities as if their atoms were duplicated or triplicated

$-CH=CH_2$ **is treated as** → $-CH-CH_2$ (with C, C duplicated)

$-C\equiv CH$ **is treated as** → $-C-C-H$ (with C, C triplicated)
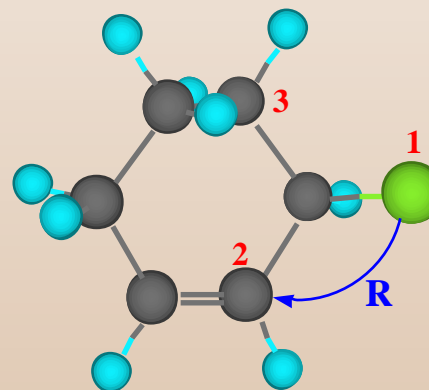
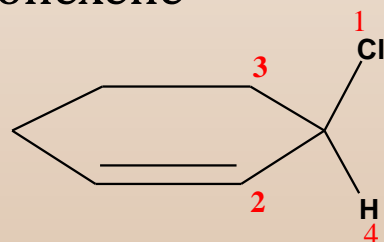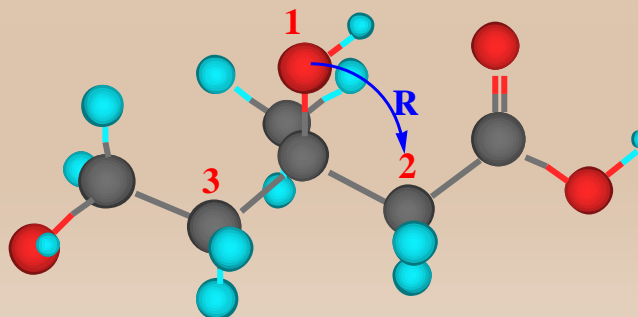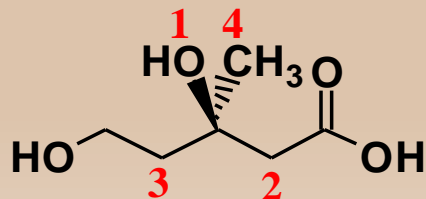$-CH$ (with O double bond) **is treated as** → $-C$ (with O—C, C—O, H)
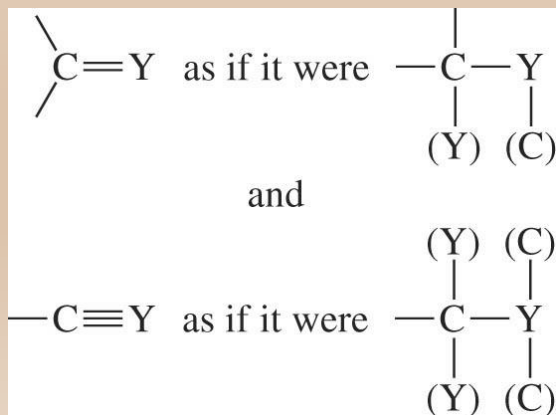
Examples

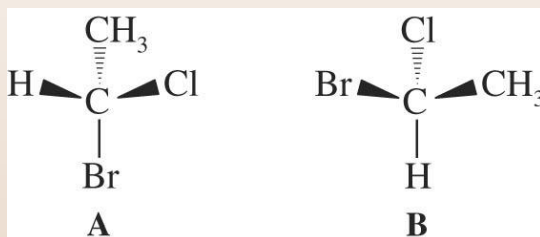- (*S*)-2-Chlorobutane

- (*R*)-3-Chlorocyclohexene
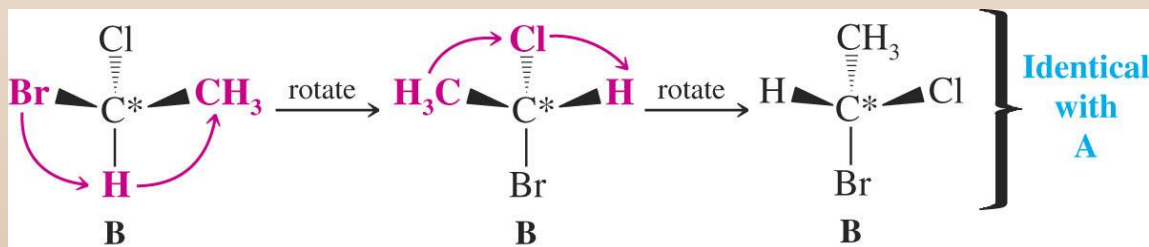
- (*R*)-Mevalonic acid
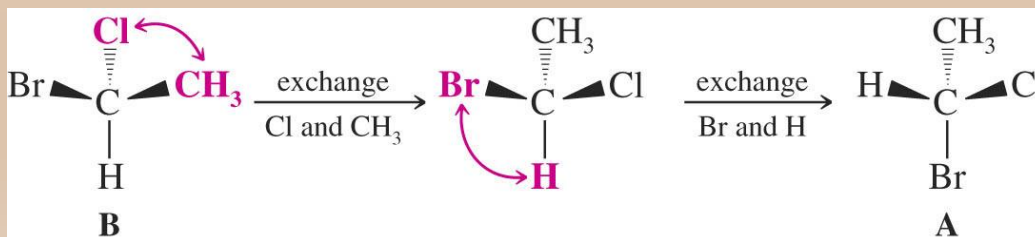
Identical or Not?

- Are A and B identical or enantiomers?

Manipulate B to see if it will become superimposable with A

Exchange 2 groups to try to convert B into A

Key Words/Concepts

- Be able to assign priorities to groups.
- Determine R and S configurations.
- Determine relationship between two molecules.