



Pre-Health Post-Baccalaureate Program  
CHM2210 Study Guide & Practice Problems

Topics Covered:

*R/S* System

Molecules with 2+ Stereocenters

*E/Z* System

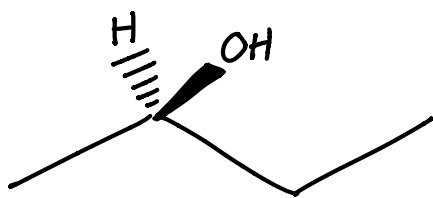
Created by Isaac Loy

# R/S System

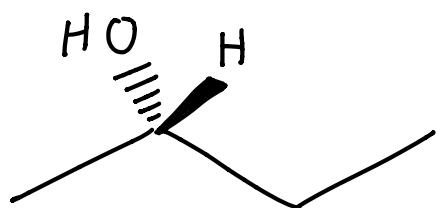
→ The R/S system is a way to determine the configuration of a stereocenter

→ The R/S designation of a stereocenter is included in the molecule's name because each unique molecule has its own name

Ex:

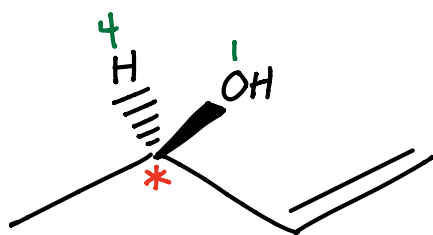


... is not the same as...



→ Steps to determine the configuration of a stereocenter

→ Rank the priority of the atoms bonded to the chiral atom based on atomic number (higher atomic number = higher priority)



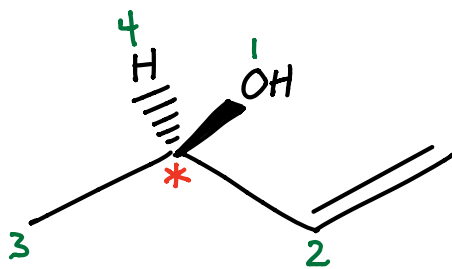
atom	#	priority
H	1	4
C <sub>4</sub>	6	?
C <sub>2</sub>	6	?
O	8	1

→ If two of the same atoms are bonded to the chiral atom, then we need to look at those atoms' other bonds and

determine the first point of difference

$C_4$	$C_2$
H	C
H	C
H	H

← first point of difference



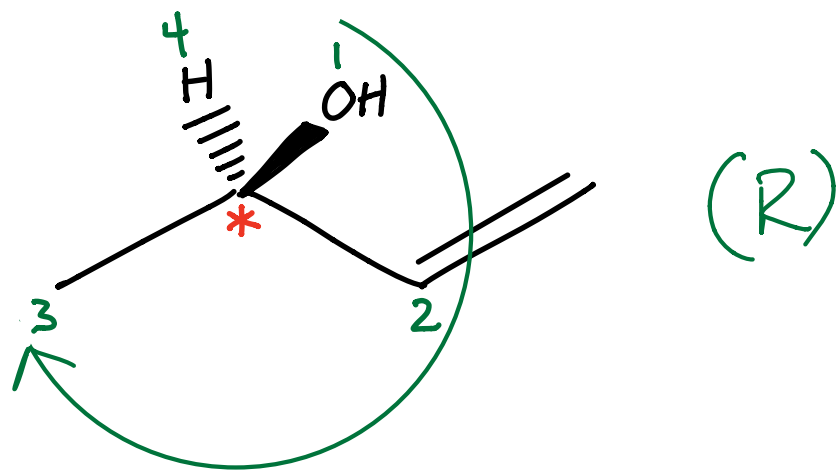
atom	#	priority
H	1	4
$C_4$	6	3
$C_2$	6	2
O	8	1

Note 1: We treat double bonds as two individual bonds

Note 2: DO NOT add numbers. We are comparing the atomic number of C vs. the atomic number of H, NOT  $C + C + H$  vs.  $H + H + H$

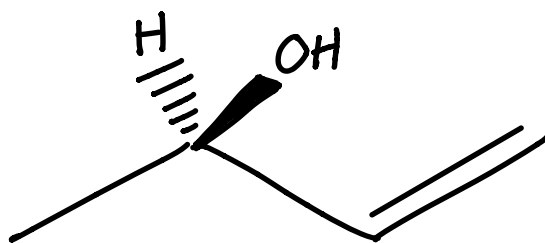
→ Starting with our first priority group, we draw a circle from 1 → 2 → 3.

A clockwise circle means that the chiral center has an (R) configuration while a counterclockwise circle means that it has an (S) configuration



Note: This only works if the fourth priority group is on a dash (into the paper)!

→ Name the molecule



Configuration: (3R)

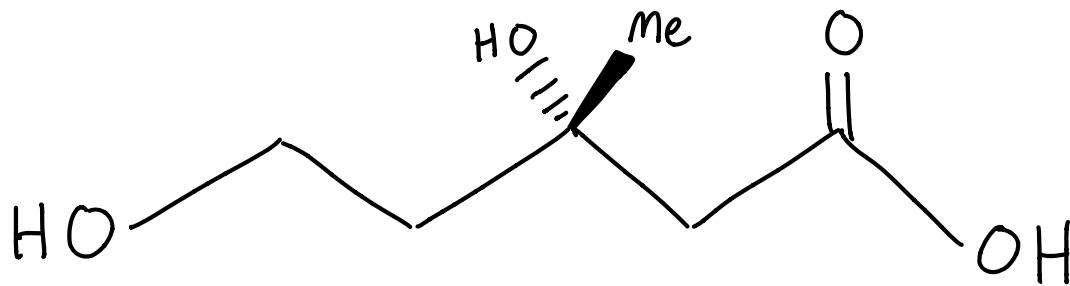
Substituent(s): 3-Hydroxy

Prefix: but-

FG ending: -1-ene

(3R)-3-Hydroxybut-1-ene

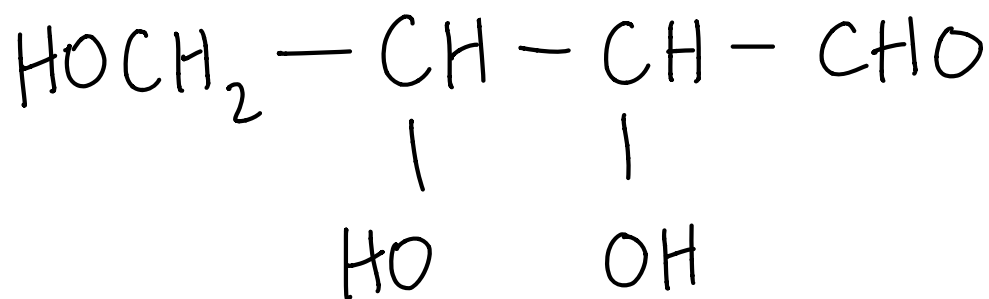
① Determine the configuration (R or S) of the following molecule:



# Molecules with Multiple Stereocenters

→ Maximum number of stereoisomers possible for a molecule with multiple stereocenters is  $2^n$ , where  $n$  = number of stereocenters

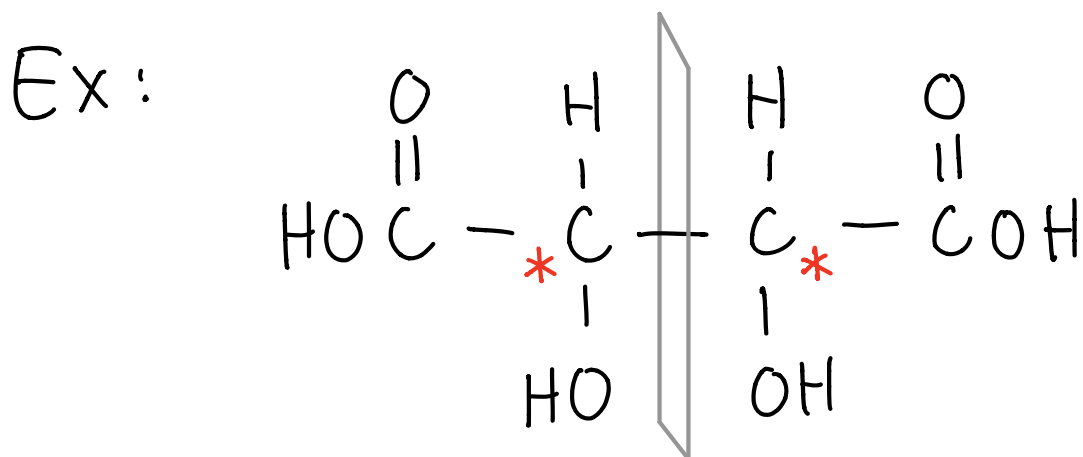
② Draw all possible stereoisomers for the following molecule:





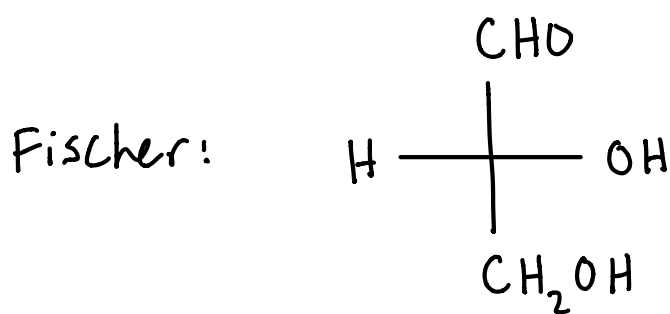
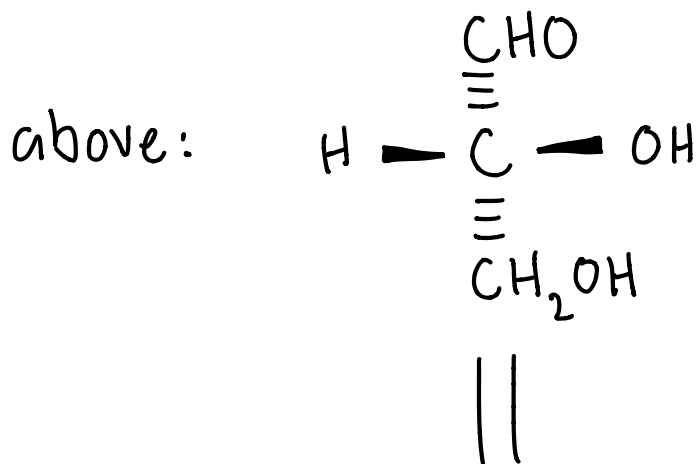
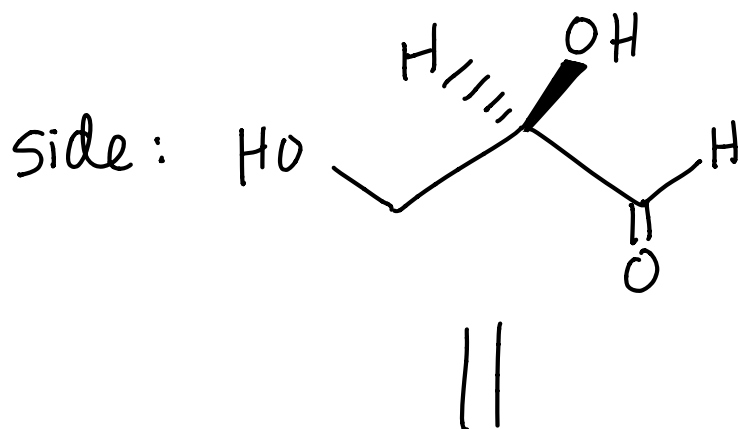
③ Of the possible stereoisomers, which pairs are enantiomers and which pairs are diastereomers?

→ Meso compounds are molecules with an internal mirror plane and are achiral (even if they have chiral centers)



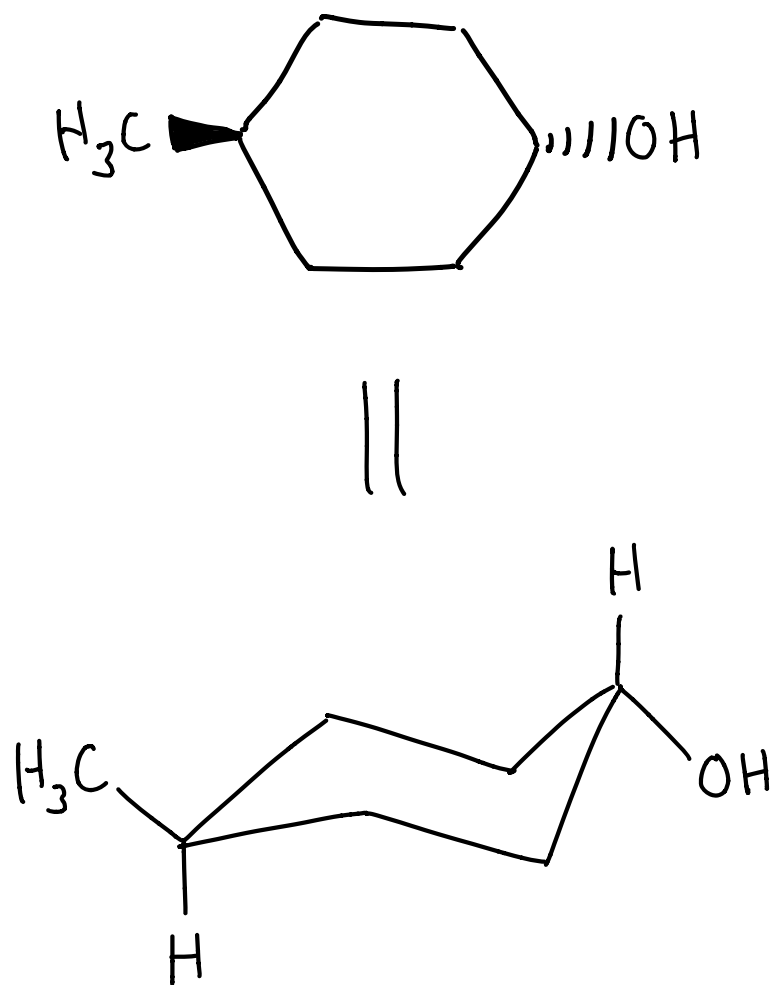
→ Fischer Projections are a way of representing 3-D molecules in 2-D

Ex:



→ In cyclic molecules, think about the position of the groups relative to the plane of the ring

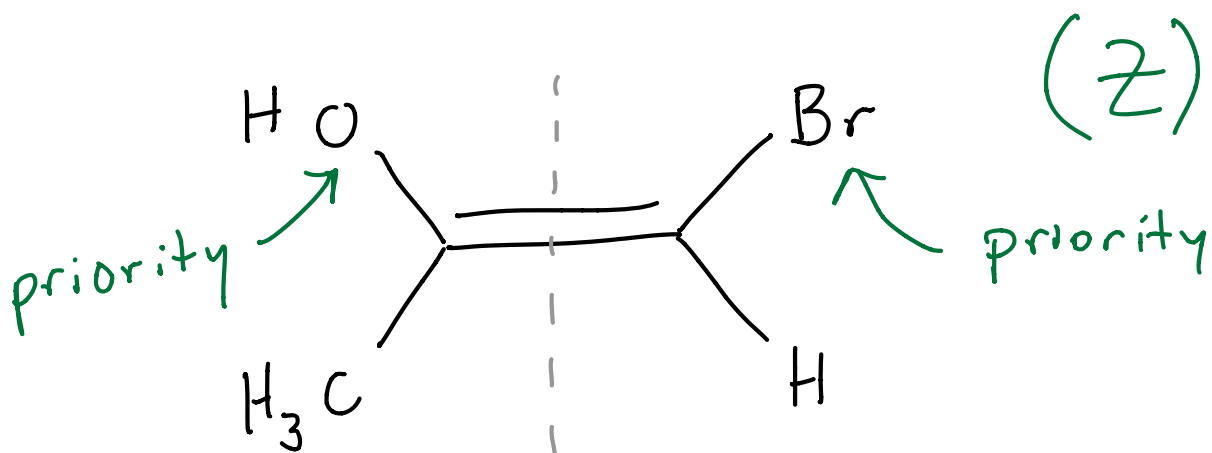
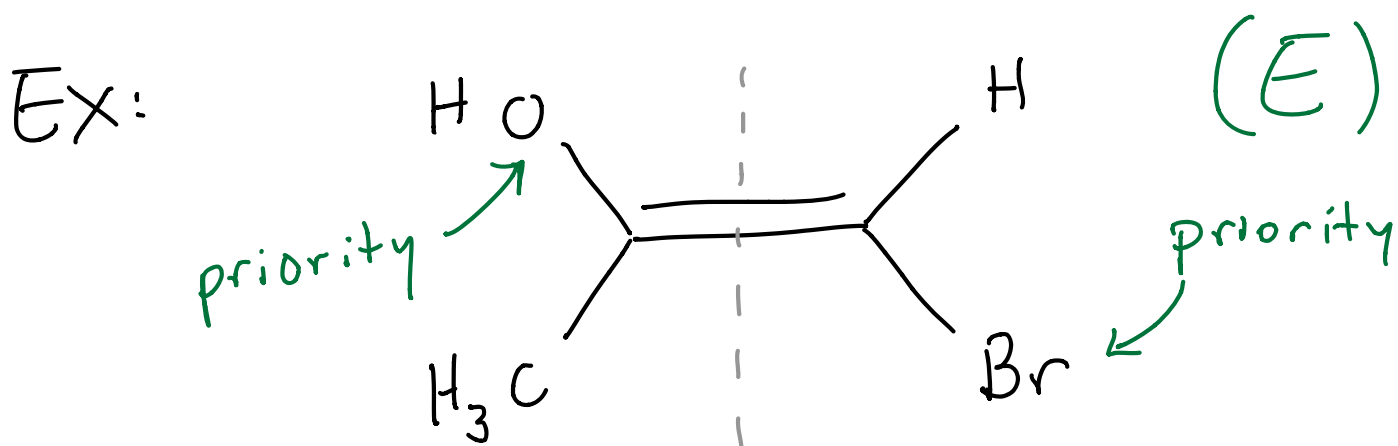
Ex:



# The E/Z System

- This system allows us to describe the location of groups around a double bond
- Cis/trans system only works if there are multiple of the same type of groups around a double bond or on a ring
- Draw a line through the double bond and determine the priority of the atoms/groups bonded to each side (priority is determined by atomic number, just like in the R/S system)

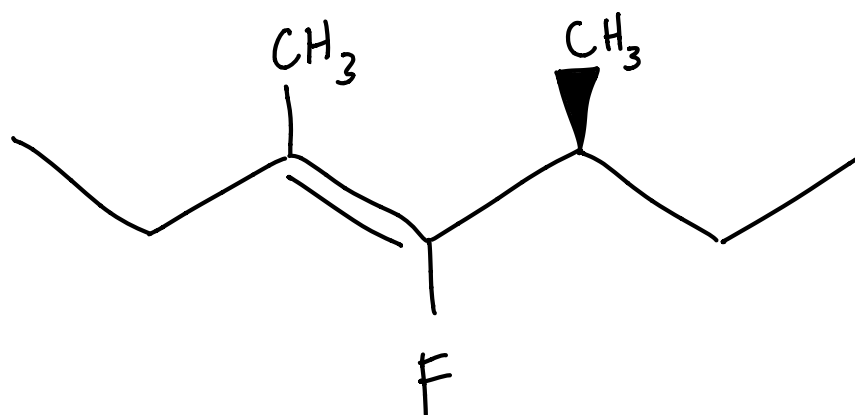
→ If the priority groups are on opposite sides of the double bond, it is (E), and if they are on the same side, it is (Z)



→ Just like the R/S designation, the E/Z designation is included in the molecule's name

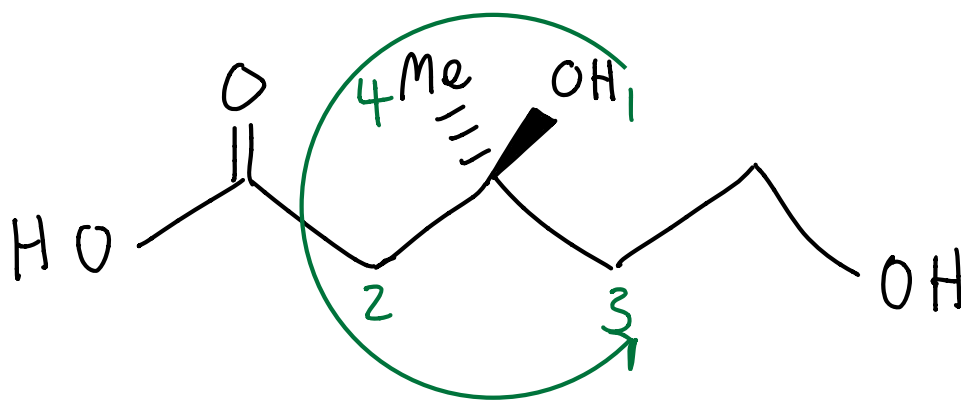
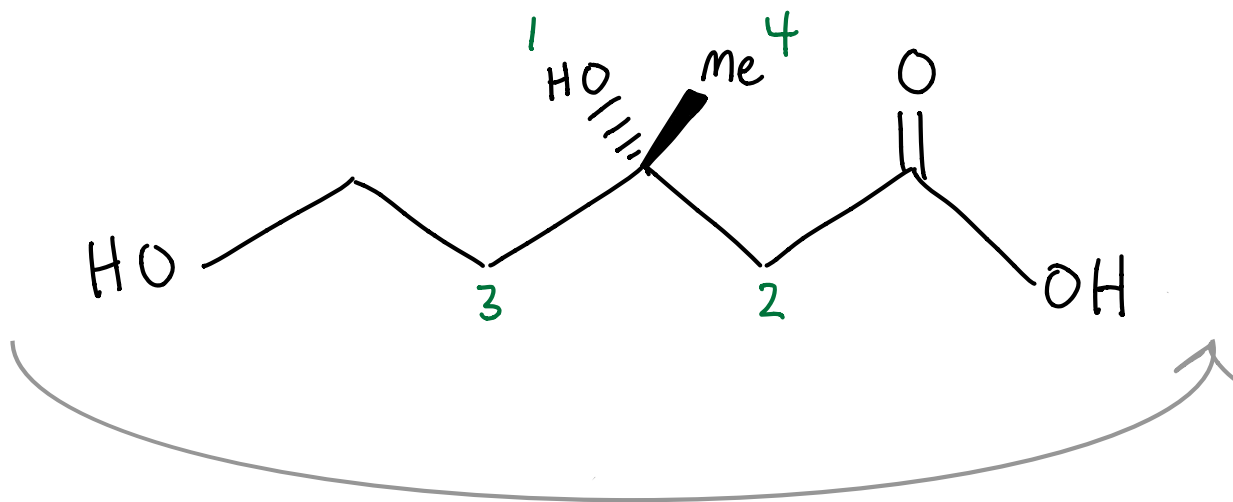
④

What is the IUPAC name of the following molecule?



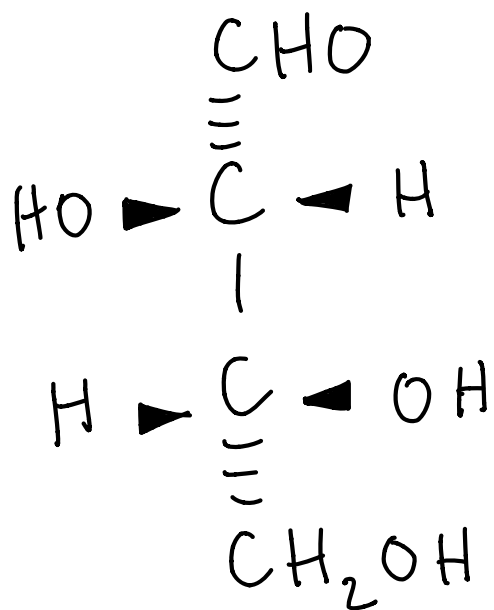
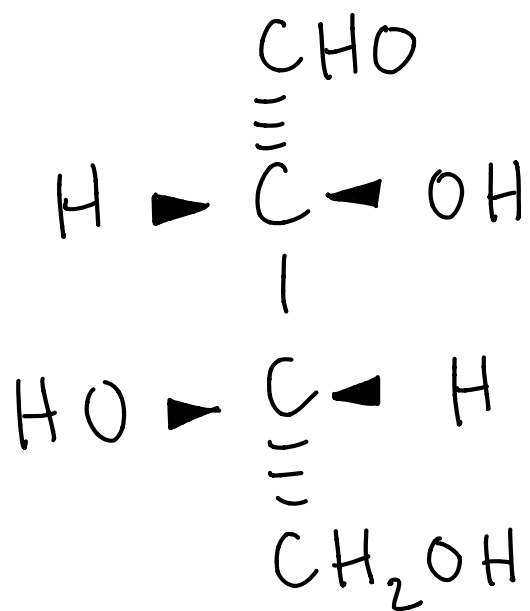
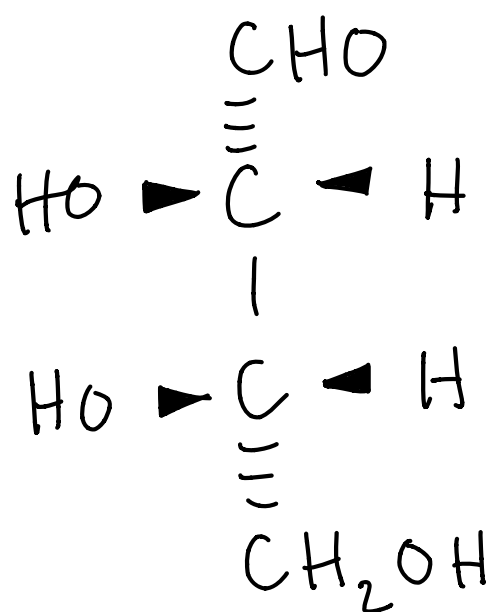
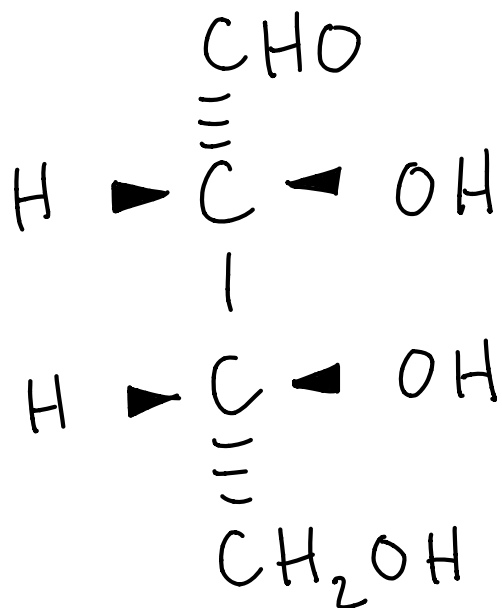
# Solutions

①



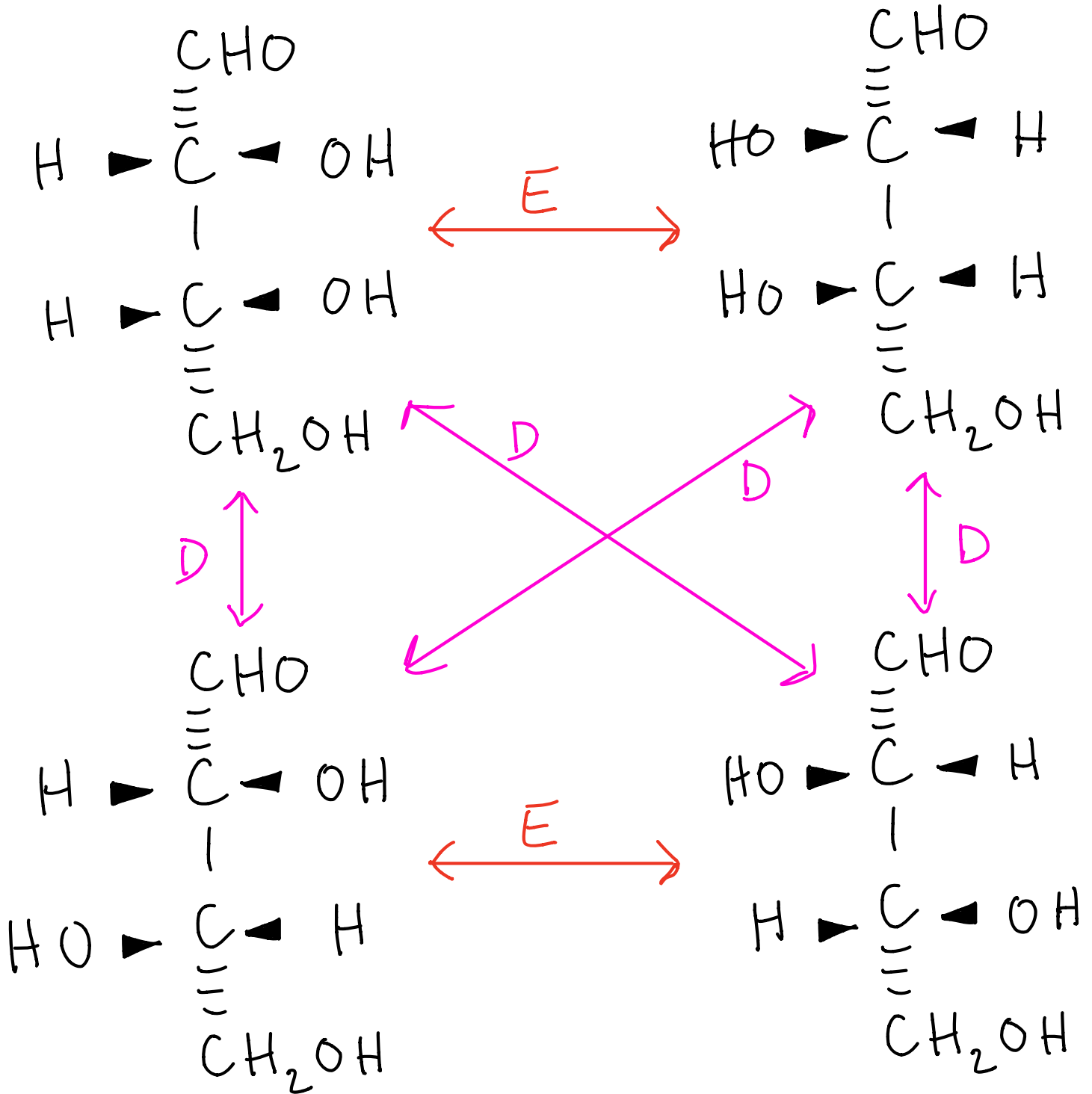
(S)

②

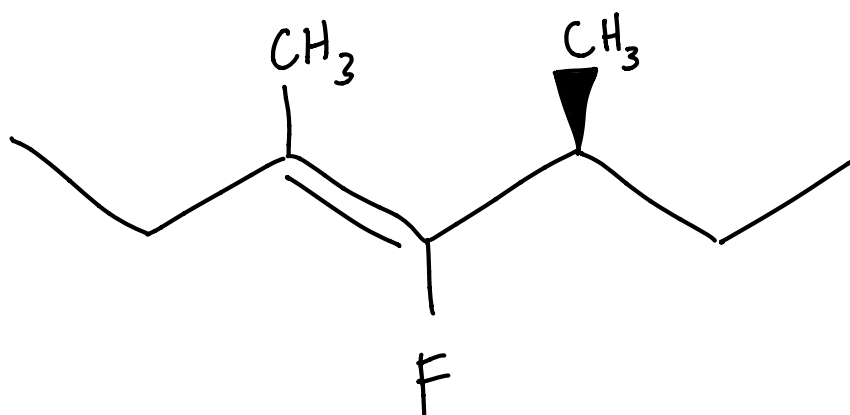




③



④



(3Z, 5S)-4-fluoro-3,5-dimethylhept-3-ene

or

(3Z, 5S)-4-fluoro-3,5-dimethyl-3-heptene