(11) **Today**

Sections 5.1 – 5.5
Chirality and Determining the Configuration of Chiral Centers

Sections 5.6 – 5.12
Diastereomers, N,P, and S, and Prochirality

Next Class (12)

Sections 5.6 – 5.12
Diastereomers, N,P, and S, and Prochirality

Chap 6

(13) **Second Class from Today**

Chap 6

Third Class from Today (14)

Test 2

Please Hand in Reworked Test 1

Test 2 on Chap 2.8 - 2.12, Chap 3, Chap 4, and Chap 5 on Thursday, June 12.

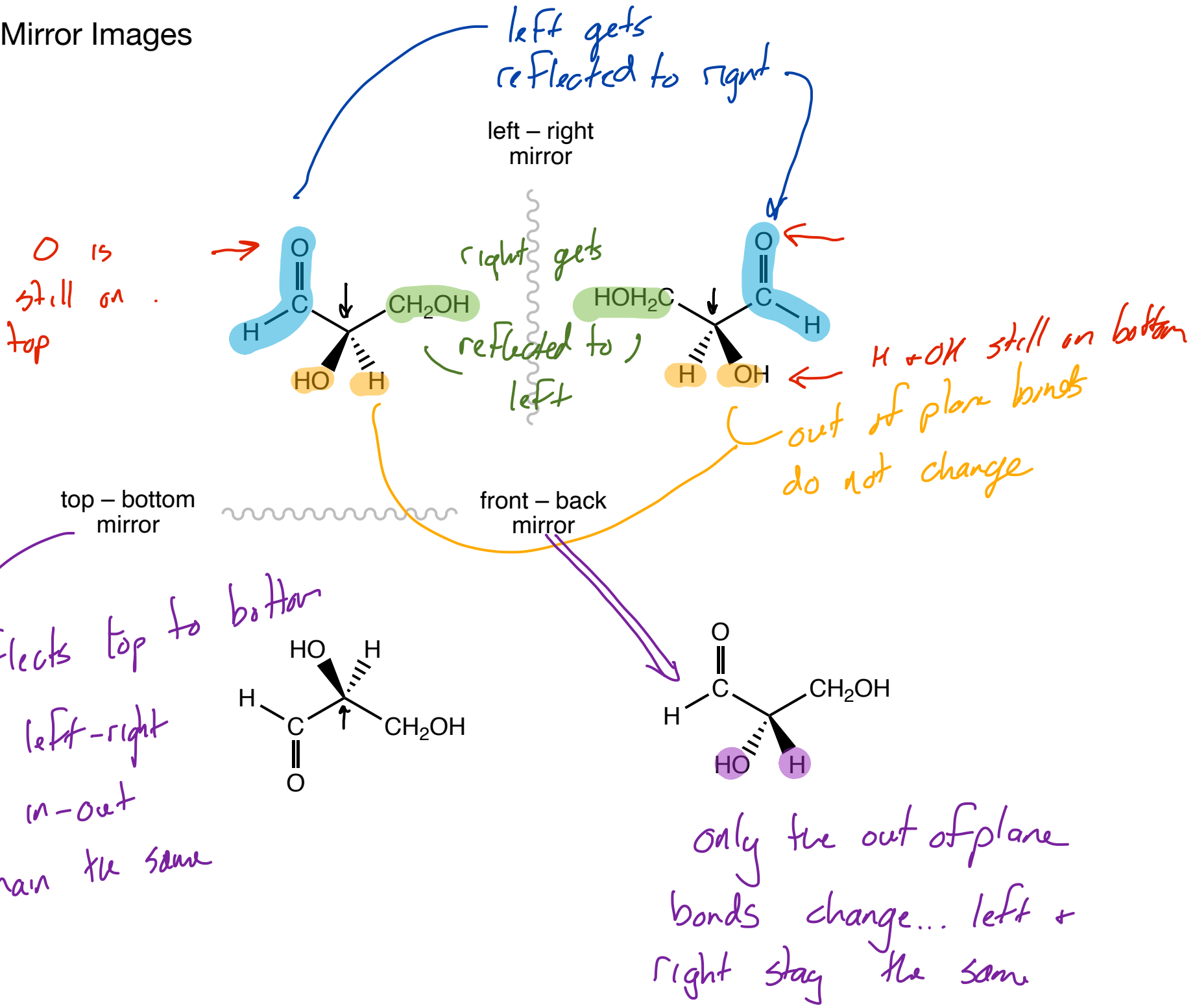
Fall 2024: Test 2; Test 3, 1 – 6

Fall 2023: Test 2, 3 – 12; Test 3, 1 – 9

Fall 2022: Test 1, 10 – 11; Test 2, 1 – 7, 9, 10

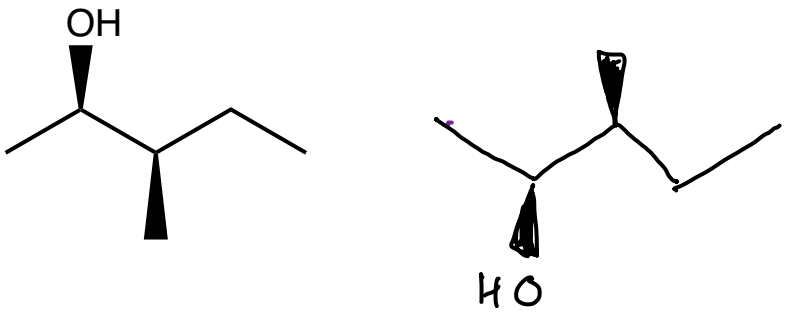
Fall 2021: Test 1, 5b, 7, 8, 10; Test 21 – 3, 4b, 5 – 9

Drawing Mirror Images

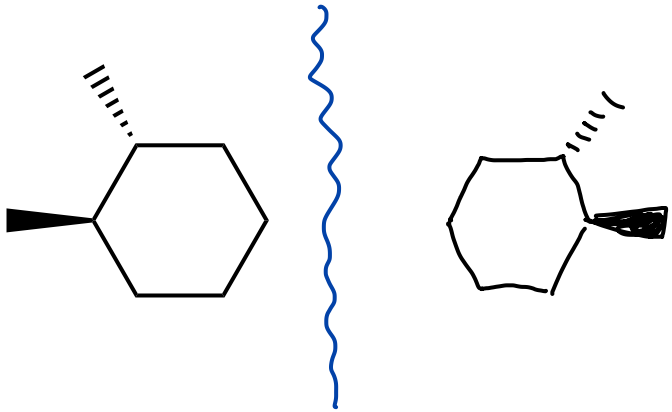


Drawing Mirror Images

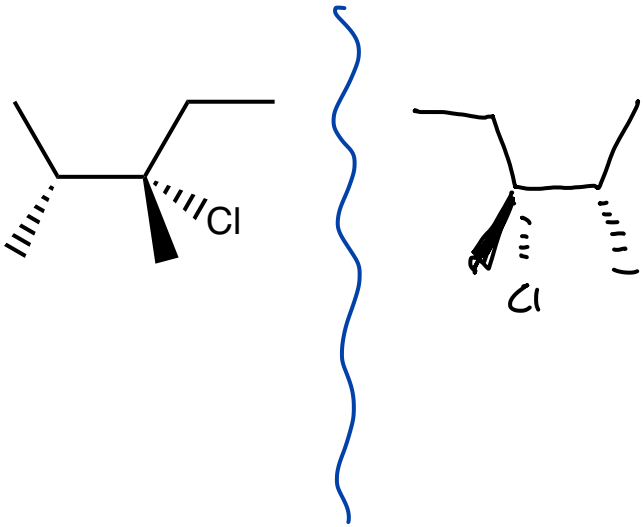
top – bottom



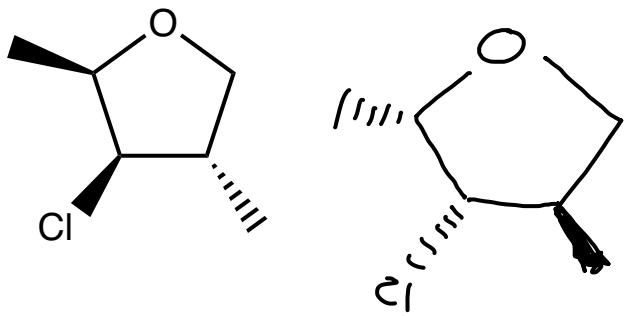
left – right

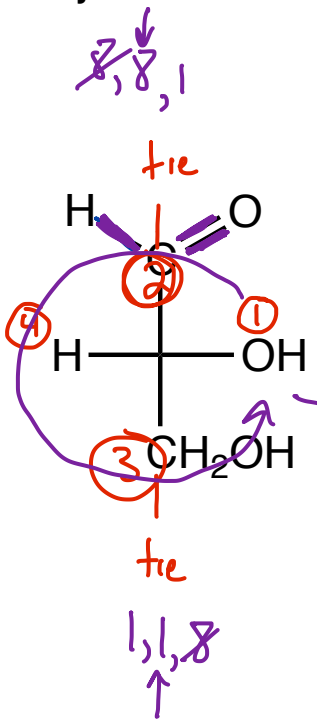


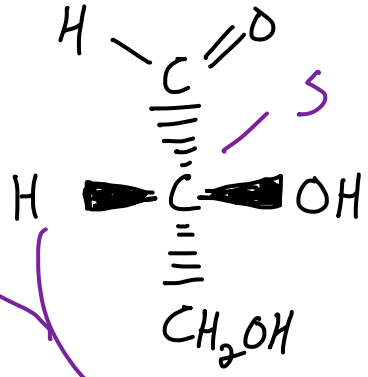
left – right



front – back



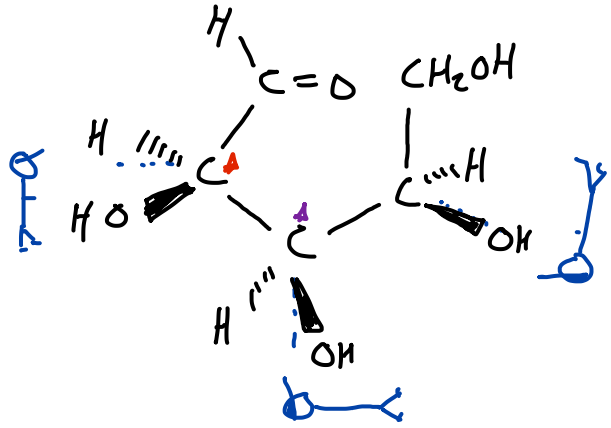


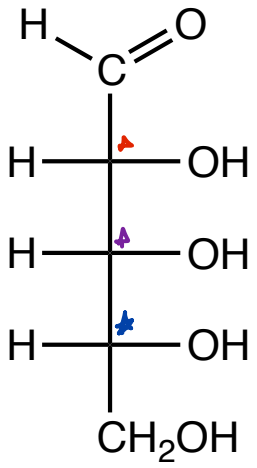


All vertical bonds point away from the viewer

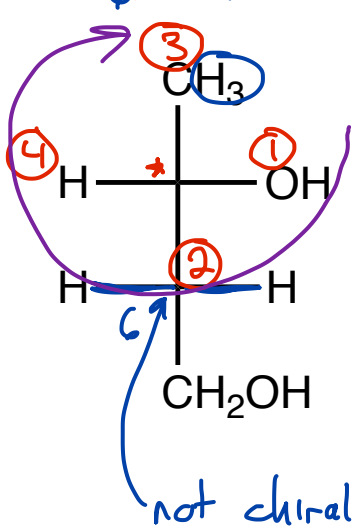
All horizontal line point toward the viewer

looks like ~~S~~ (counter clockwise) but lowest priority is pointed at me.... must be (R)





eclipsed geometry



tree 1,1,1

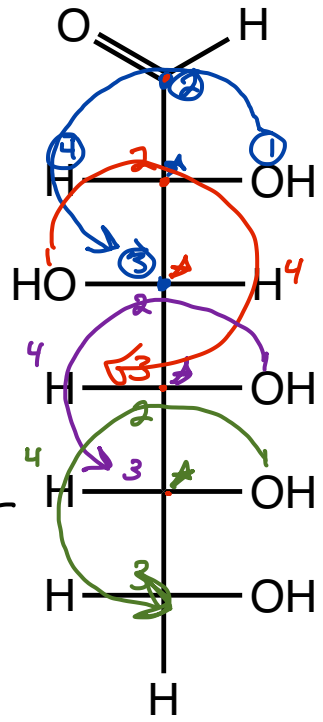
not chiral

tree 1,1,6

looks like R, but #4 is pointed at us, so it is

(S)

four chirality centers



8,8,1

8,8,1 (R)

8,t,6

8,6,1 (S)

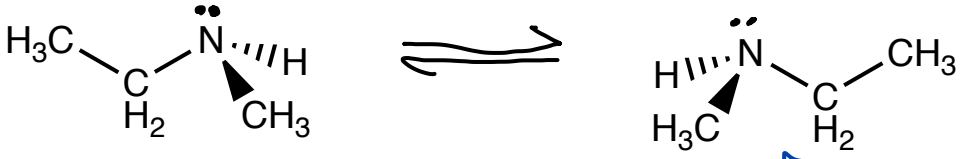
8,6,1

8,t,6 (R)

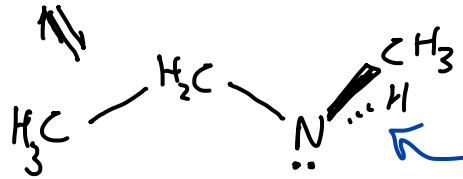
8,1,6 (R)

8,1,1

note that the lowest priority group is always pointing at us (exactly backwards) at each center



amine inversion



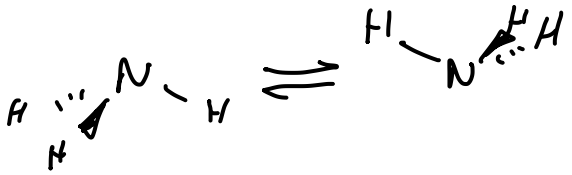
same

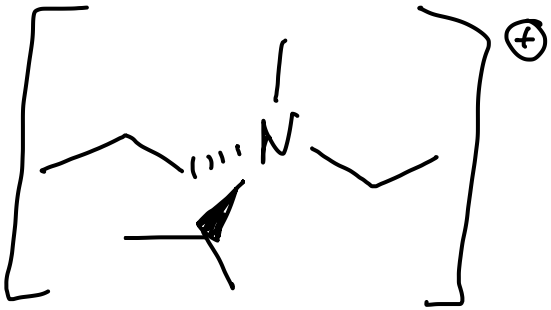
mirror images ✓

nonsuperposable ✓

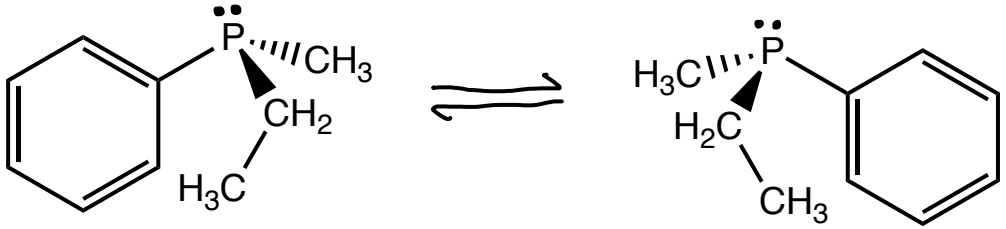
not configurational inert - so not chiral

amines rapidly invert like an umbrella in the wind





alkyl ammonium ions don't invert and are chiral



mirror images ✓

nonsuperposable ✓

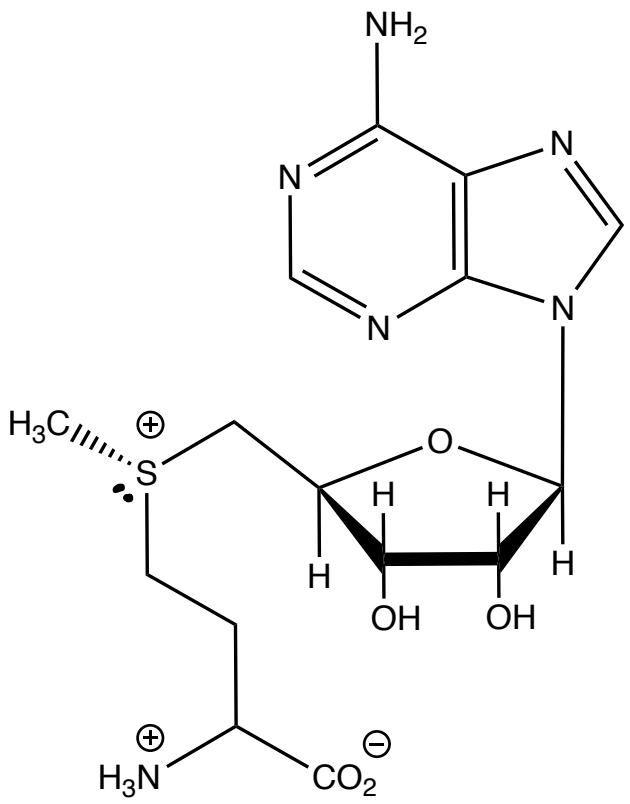
not configurational inert at room temp

large groups + low temps the inversion stops + molecules become chiral

(S)-5-adenosylmethionine methylates and converts to

→ noradrenaline → adrenaline

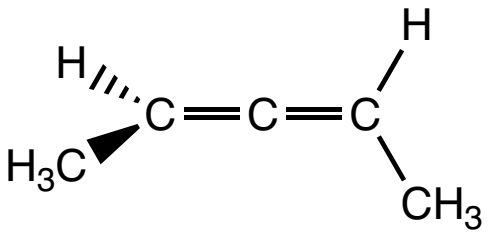
→ norepinephrine → epinephrine

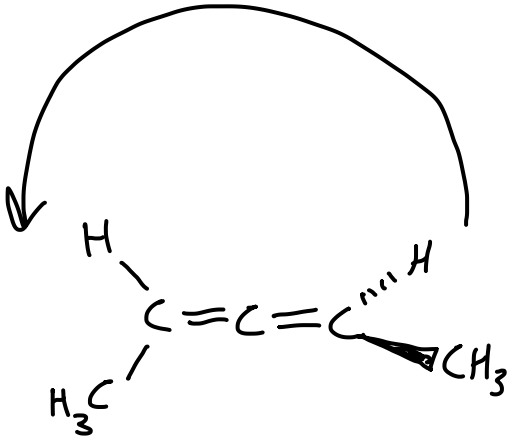


(*S*)-S-adenosylmethionine

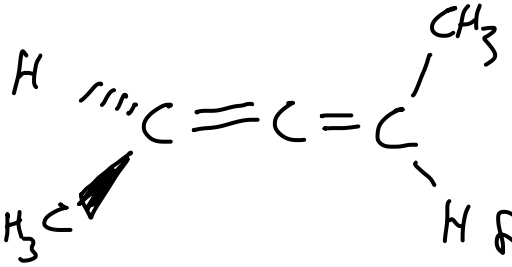
R version is not a methylating agent

stable for days at physiological temps





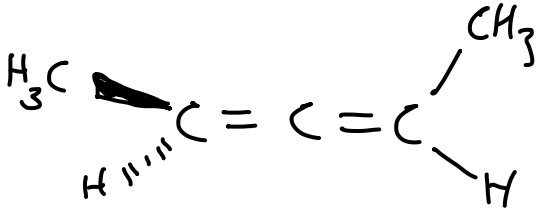
rotate molecule 180°



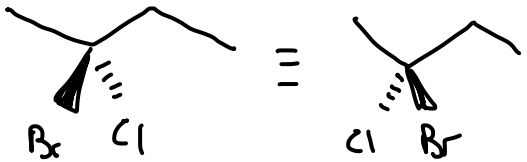
viewed from slightly above

are the same

!!! these



viewed from slightly below



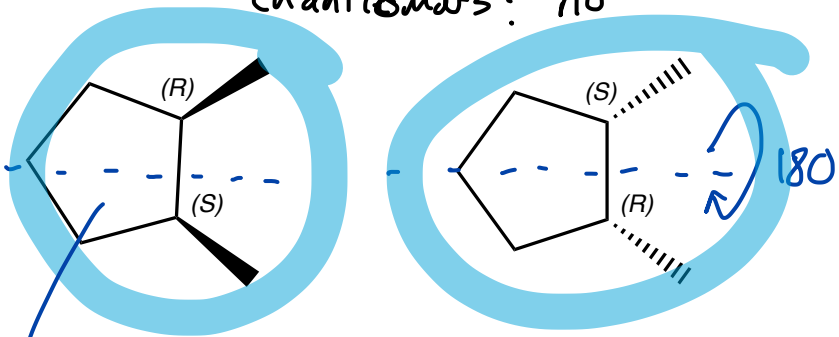
Enantiomers		Diastereomers
molecules that are **nonsuperposable** and **mirror images** of each other		molecules that have the same connectivity and are **nonsuperposable** but **NOT mirror images** of each other
The relationship can be identified using *R*,*S* system of nomenclature		
If all chirality centers in a chiral molecule have opposite configurations and Z,E alkenes, if present, remain the same There's a big BUT…		In molecules with more that one chirality center at least one pair but not all pairs of chirality centers have opposite configurations. In molecules with stereogenic alkenes (*Z*/*E* configuration) the alkenes have opposite configurations

Meso Complexes Are Achiral Molecules that Contain Chiral Centers

Sections 5.6 – 5.12

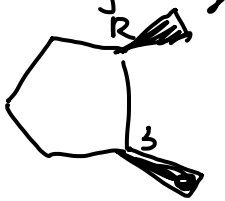
mirror images ✓

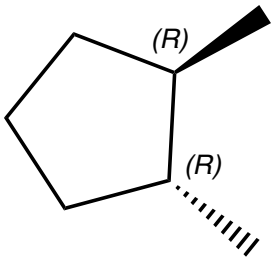
enantiomers? no

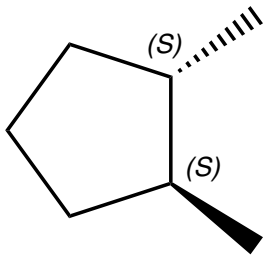


different drawings? yes

dotted line is where the mirror plane is





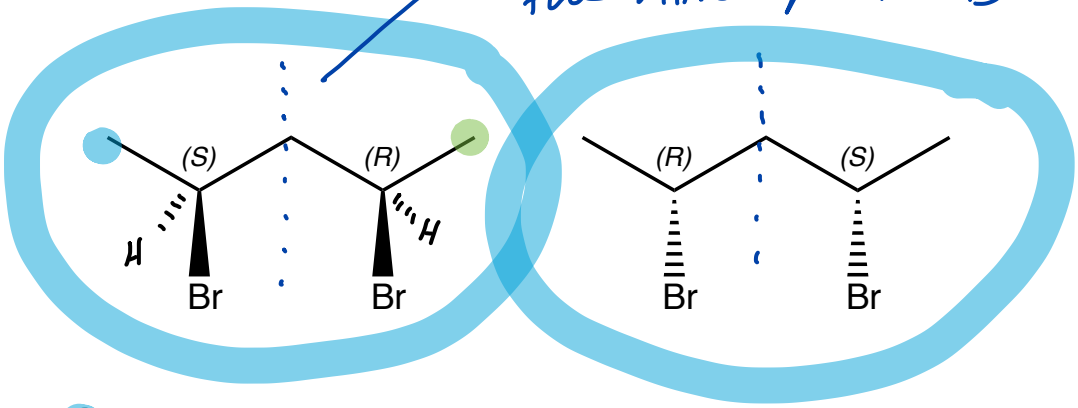


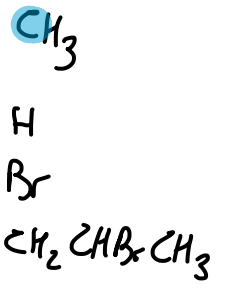
no internal mirror plane

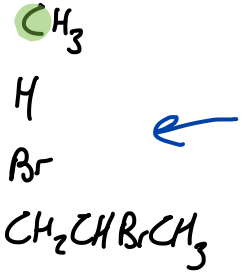
all chirality centers must

enantiomers

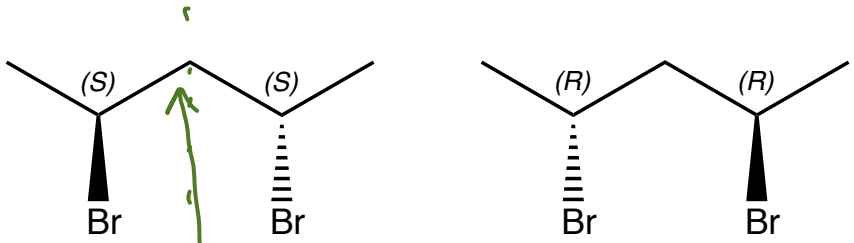
dotted line is where the mirror plane is







the 4 different groups on the 2 chirality centers are the same



No mirror plane here

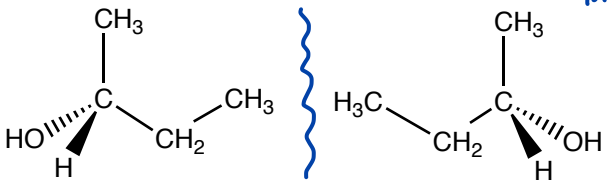
enantiomers

Enantiomers		Diastereomers
molecules that are **nonsuperposable** and **mirror images** of each other		molecules that are stereoisomers **nonsuperposable** but **NOT mirror images** of each other
The relationship can be identified using *R*,*S* system of nomenclature		
If all chirality centers in a chiral molecule have opposite configurations and Z,E alkenes, if present, remain the same Unless the compound is a meso complex Can occur when chirality centers have the same four different groups bonded to each chirality center		In molecules with more that one chirality center at least one pair but not all pairs of chirality centers have opposite configurations. In molecules with stereogenic alkenes (*Z*/*E* configuration) the alkenes have opposite configurations. In a chiral cyclic molecules with *cis*/*trans* relationships the *cis*/*trans* relationship changes

Practice Recognizing Relationships between molecules

Different drawings, enantiomers, diastereomers

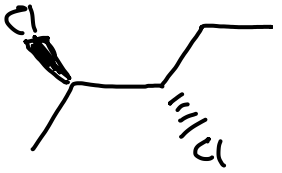
no change in R,S — all switch no internal mirror plan — at least 1 but not all switch

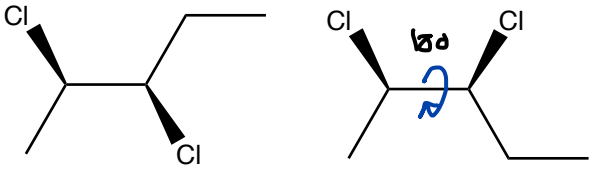


enantiomers

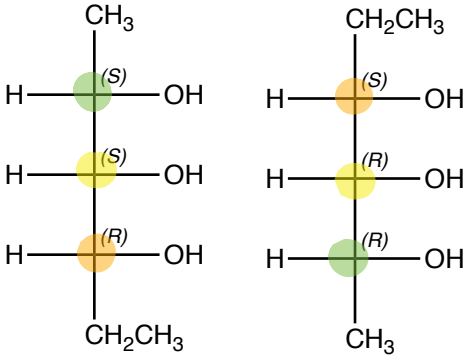
mirror images ✓

no internal mirror plane

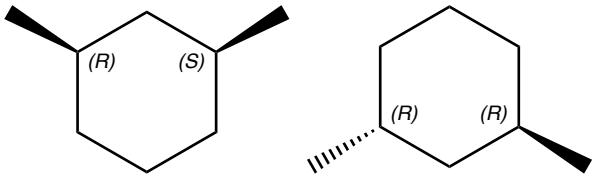




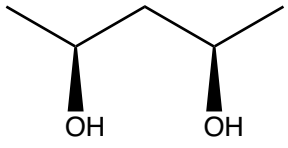
diastereomers

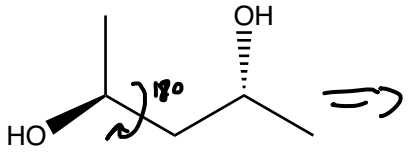


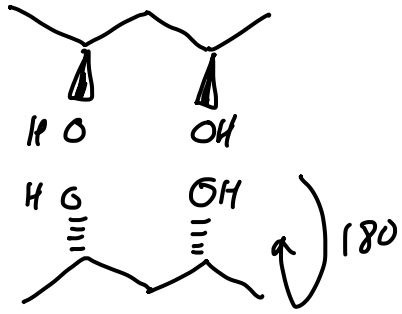
enantiomers



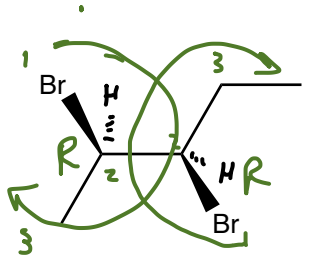
diastereomer

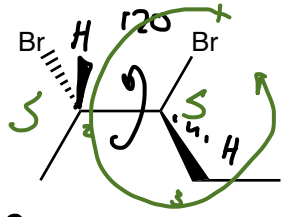


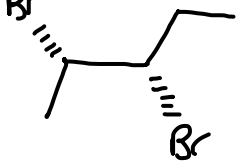




different drawings







enantiomers

1. Draw the molecule

2. Assign priorities and check if the correct configuration is drawn

3. a. If correct, celebrate, you're done
   b. If incorrect, redraw molecule necessary switching the positions of 2 (and only two) substituents.

or

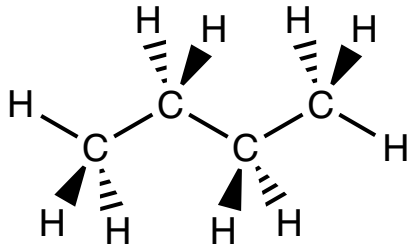
1. Draw the molecule leaving out wedged and dashed bonds

2. Assign priorities and make the circle

3. Add wedged and dashed bonds as

(*R*)-2-chloropentane

(2*S*,3S)-2-bromo-3-chloropentane


H
H
H
H
H
C
C
C
H
H
H
H
H