(28) **Today**

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

Next Class (29)

Chap 6

(30) **Second Class from Today**

Chap 6

Third Class from Today (31)

Chap 6

Please hand in reworked test 2 on your way out

Maximum possible number of stereo isomers

1 flip of a coin H or T

1 chirality center could be R or S

2^n 2 chirality centers { RR RS SR SS

where n is the number of stereogenic centers

Stereogenic centers are locations that cause the molecule to exist as different stereoisomers:

R vs S, *cis* vs *trans*

$2^4 = 16$ ... 16 stereoisomers possible with 4 chirality centers

our 6-carbon aldoses have 4 chiral centers

16 possible stereoisomers

Definitions

ol means alcohol, the 2 means the OH is on the 2 C atom

stereoisomers are molecules that have the same connectivity but different 3-D relationships between parts of the molecules

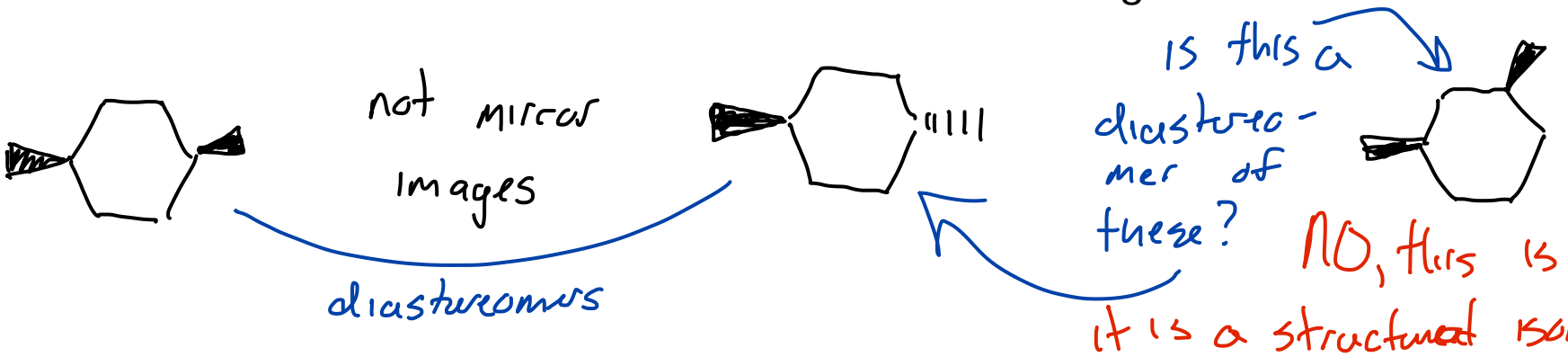
e.g. (*R*)-2-butanol vs (*S*)-2-butanol

cis-1,4-dimethylcyclohexane vs *trans*-1,4-dimethylcyclohexane

The words **enantiomer** and **diastereomer** describe the relationship between two stereoisomers.

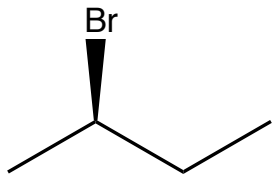
enantiomers are stereoisomers that are nonsuperposable mirror images
an object must be chiral to have an enantiomer

diastereomers are stereoisomers that are not mirror images of each other

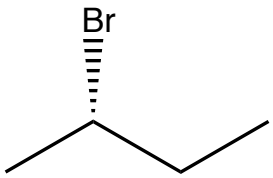


Enantiomers	and	Diastereomers
Chiral molecules that are **nonsuperposable** and **mirror images** of each other		molecules that have the same connectivity and are **nonsuperposable** but **NOT mirror images** of each other
The relationship can be identified using *R*,*S* system of nomenclature		
If all chirality centers in a chiral molecule have opposite configurations and Z,E alkenes, if present, remain the same		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

Recognizing Enantiomers and Diastereomers: Why important?



BP = 91 °C

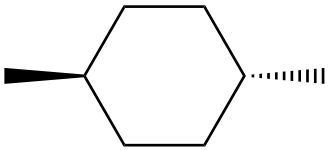


BP = 91 °C*

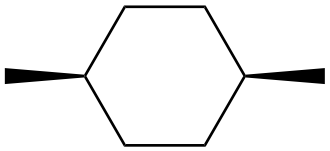
same MP, BP, solubility etc...
only difference is how they interact with other chiral objects, ex polarized light.

BP's are the same so the can't be separated by fractional distillation

different physical properties
MP, BP, solubility



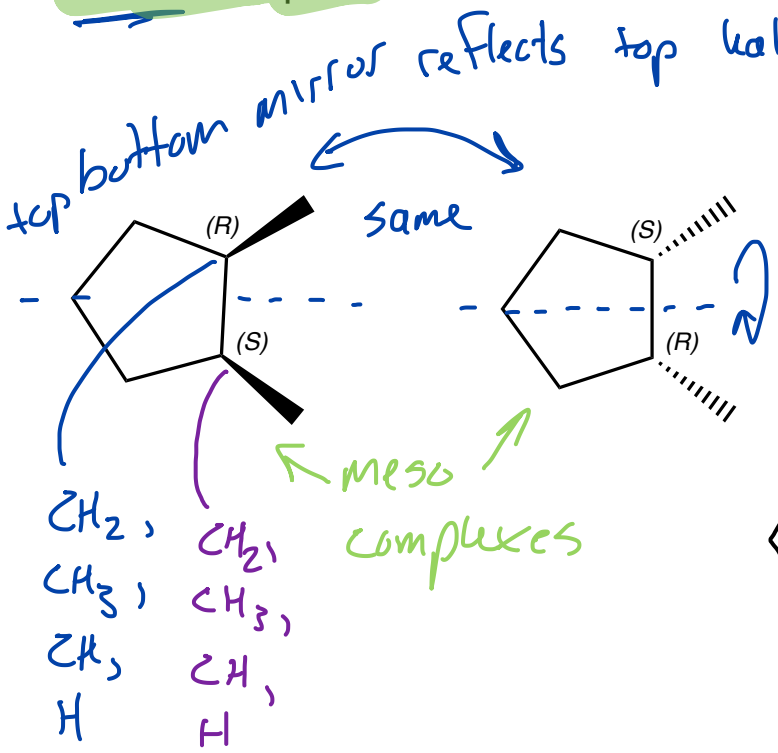
BP = 119 °C†

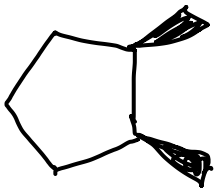


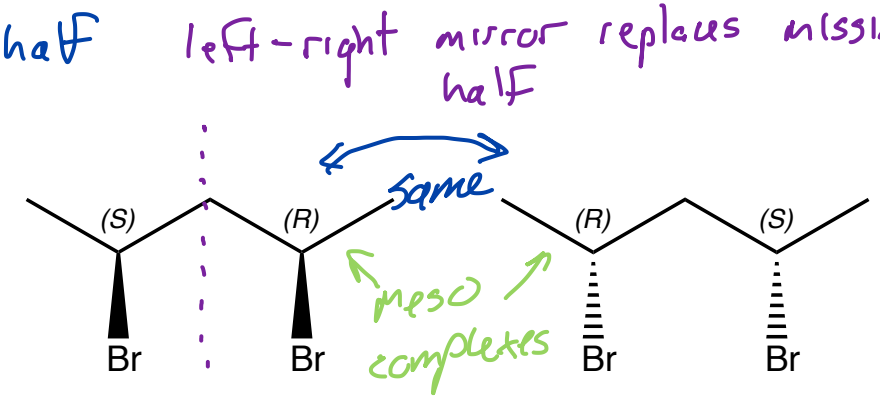
BP = 125 °C††

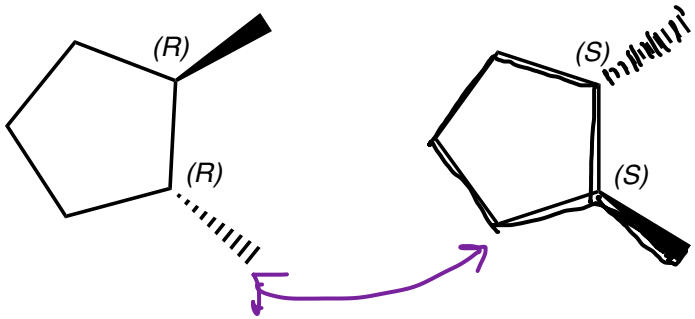
6°C dif in BP allows us to separate them by fractional distillation

*https://en.wikipedia.org/wiki/2-Bromobutane
†https://us.vwr.com/store/product/16811100/trans-1-4-dimethylcyclohexane-95-0-by-gc
††https://us.vwr.com/store/product/9559540/cis-1-4-dimethylcyclohexane-98-0

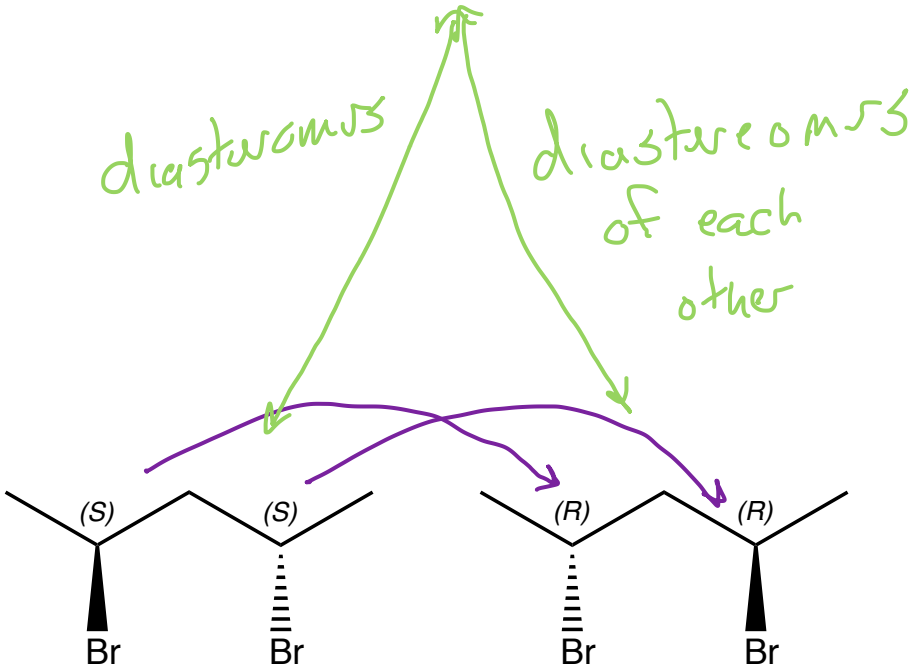








enantiomers
chiral molecules, all R's → 3
therefor mirror images thuefor
enantiomers

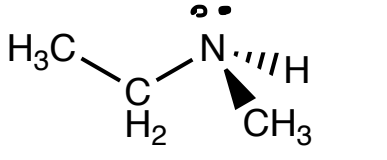


enatiomers
chiral molecules

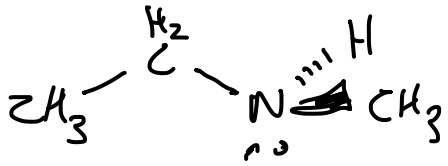
same, enantiomer, diastereomer?

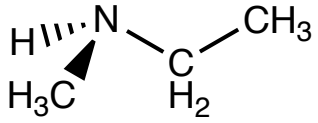
the e⁻'s don't stay put...

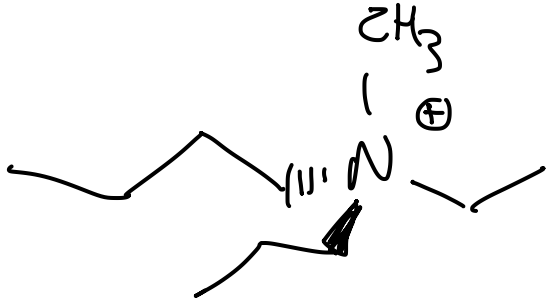
amine inversion interchanges different stereoisomers



rapid inversion

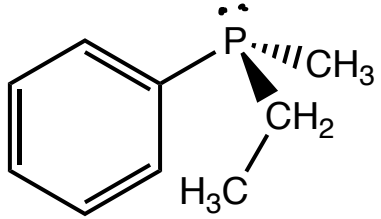


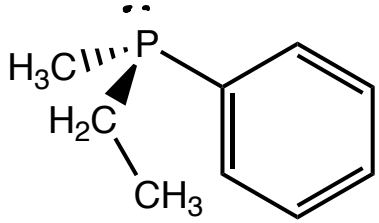




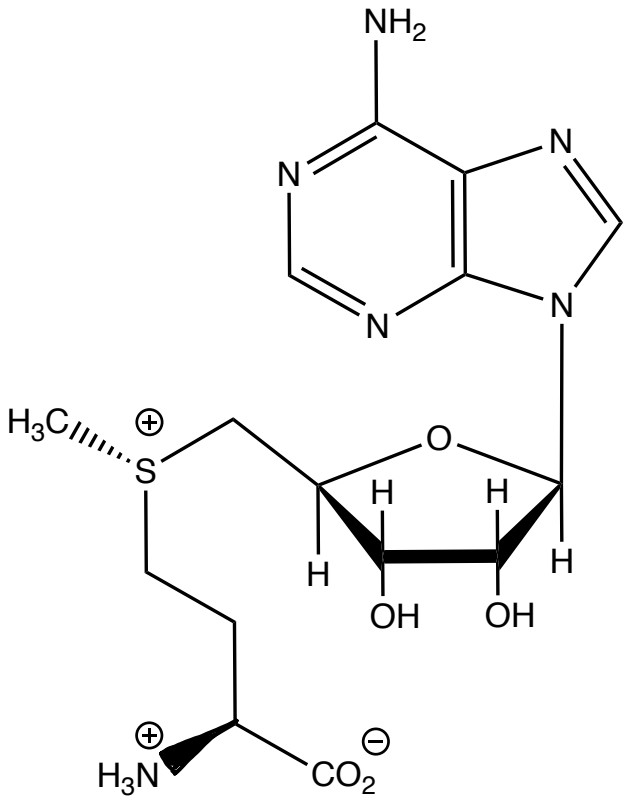
don't invert because e⁻'s are now in N to CH_3 bond

much slower to invert.. so can be isolated at low temps





slower inversion



(*S*)-S-adenosylmethionine

stable for days

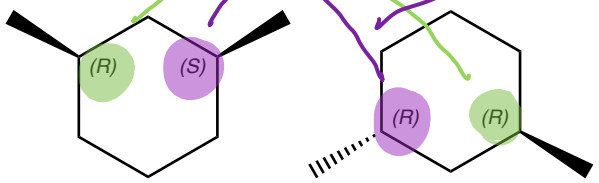
Reversion is not biologically active as a methylating agent

meso

achiral molecule

1 stayed the same

and one changed



1

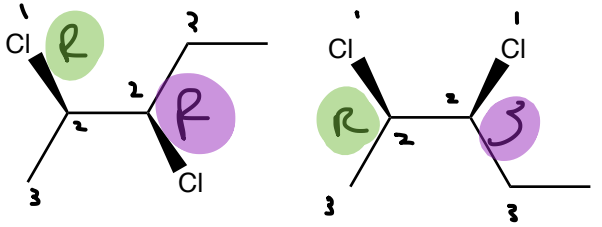
chiral molecule

diastereomers

chiral molecules

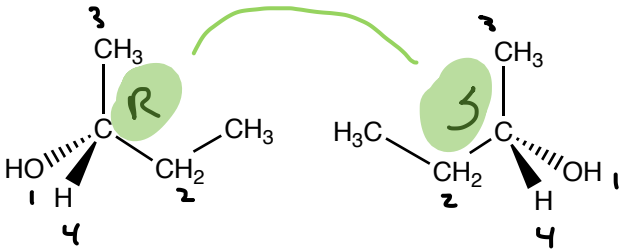
one stayed the same

one changed



diastereomers

only chirality center changed

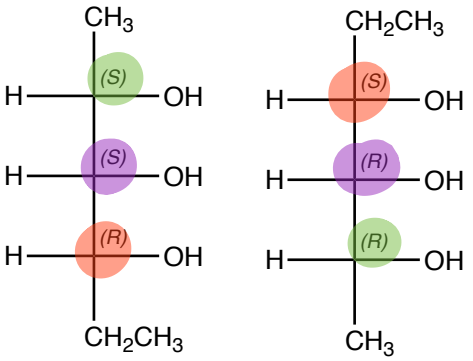


chiral molecule

all R → S

enantiomers

both chiral



all chiral centres of a chiral molecule changed

enantiomers