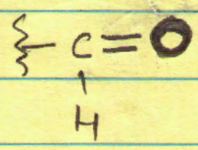
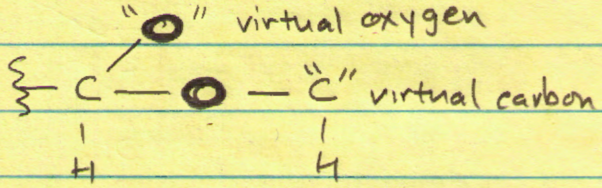
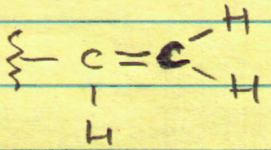
Ch5-15

How to treat multiple bonds in CIP rules.

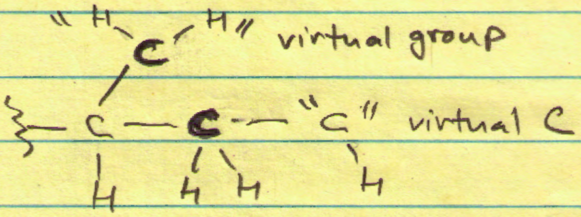


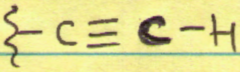
equivalent to



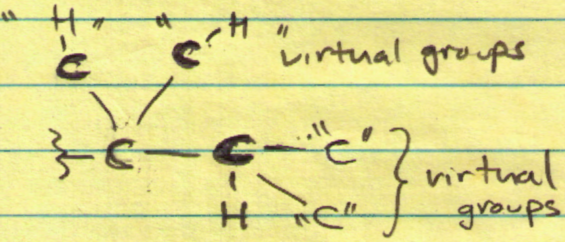


equiv to



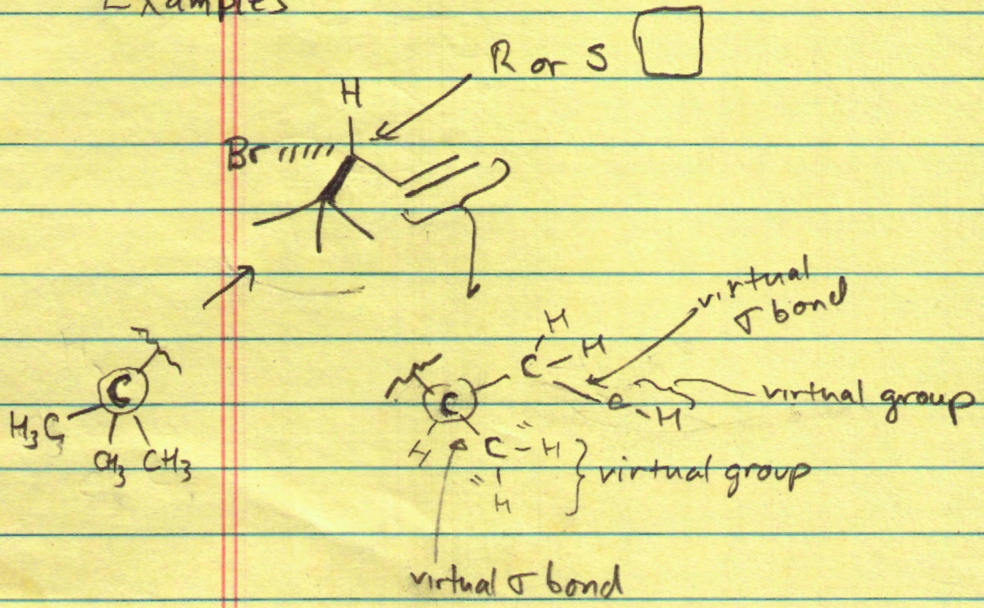


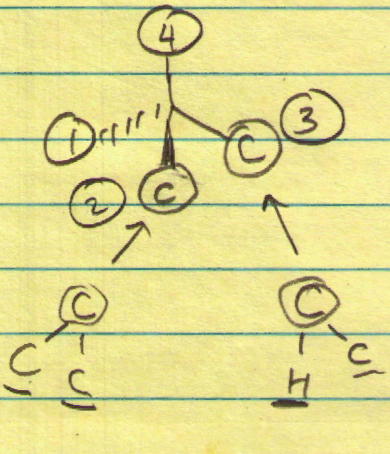
equiv to



each attachment to a π bond creates a new sigma (σ) bond with a "virtual" atom/group attached

Examples

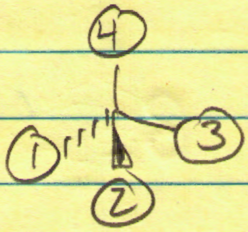




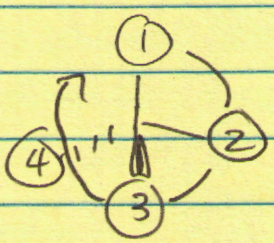
C beats H

next page

Ch5-16

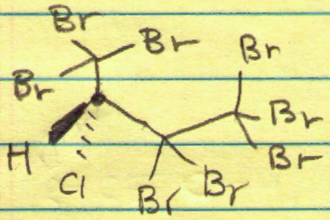


- get ④ to back, switch ① and ④
- switch ② and ③



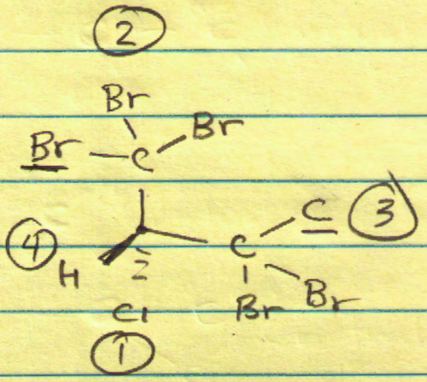
right turn

R



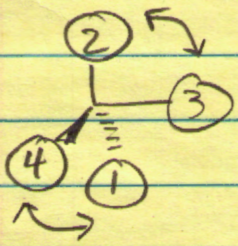
initial diagnosis

4 unique grps attached to chiral C



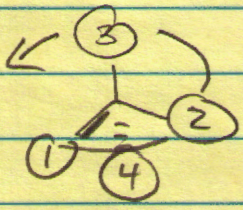
Br beats C

Redraw



④ is not already in back

④ ⟷ ① ; ② ⟷ ③



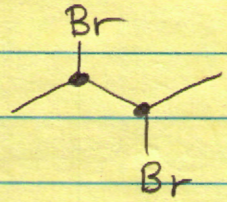
↺ **S**

Ch5-17

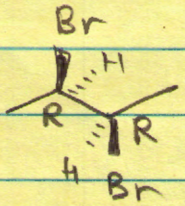
if molecule has 1 chiral center, the molecule is chiral.

2 or more chiral centers

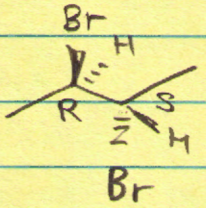
if n = # of chiral centers, then the total # of stereoisomers for a given molecule = 2^n



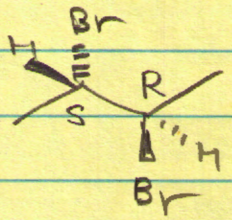
2 chiral centers ∴ total # of stereoisomers cannot be greater than $2^2 = 4$.



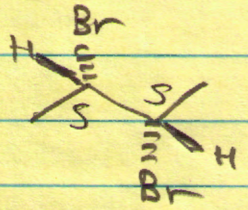
A



B



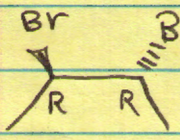
C

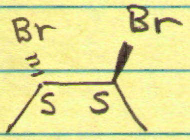


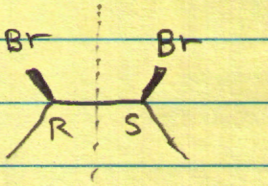
D

A and D are enantiomers (NOTE: R,R (A) S,S (D) switch)

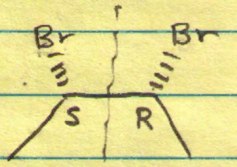
one might think B and C are enantiomers, but let's redraw in eclipsed perspective conformations to find symmetry!







plane of symmetry



plane of symmetry

A enantiomers D

B identical C

meso

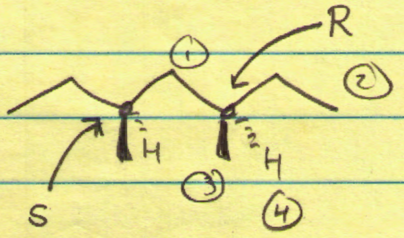
Ch5-18

MESO compound — If a molecule has 2 or more chiral centers, but the molecule has a plane of symmetry, then **meso**.

Hint: if a molecule has an odd # of C, then draw out perspective zigzag chain and evaluate for plane of symmetry.

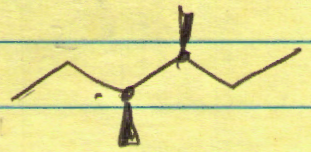
if there are an even # of C, then draw perspective chain in eclipsed form

C_7

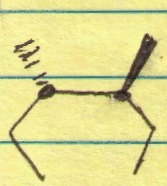


can identify symmetry
∴ molecule is meso and NOT chiral (achiral)

C_6



redraw



not symmetric ∴ chiral

Name: could be (3R,5S) or (3S,5R)
alphabetically R is before S

(3R,5S) - 3,5-dimethylheptane

↳ stereochemistry descriptor (#R or S) - or (#R or S, #R or S) - (name)

Alternative explanation of 'meso' that might be easier to understand

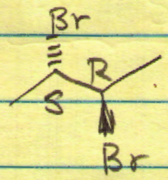
Ch5-18a

MESO compound

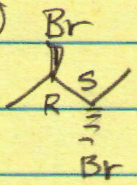
If a stereoisomer and its mirror image compound have the same name, then the stereoisomer and its mirror image are identical (i.e. superimposable) and the molecule ∴ is NOT CHIRAL

Example

(A)



(B)



(B) is presumed mirror image of (A)

Name (A)
(2R,3S) - 2,3-dibromobutane

R gets lowest # before S

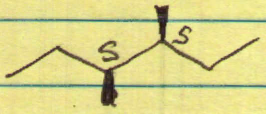
Name (B)
(2R,3S) - 2,3-dibromobutane

(A) & (B) are identical, but contain stereoisomers
∴ (A) is a meso compound
(B) is a " "

(A) = (B)

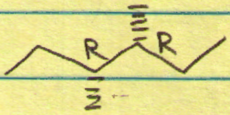
Is the example from before MESO?

(C6)



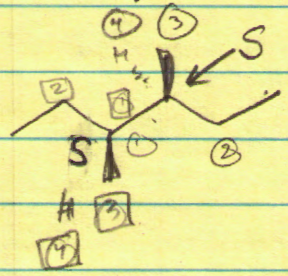
(3S,4S) -

① Draw "enantiomer"
② Assign R/S to chiral centers
③ Names ⇒ Different
∴ enantiomers
SS ⟶ RR



(3R,4R) -

Ch 5-19



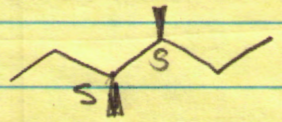
(3S,4S)-3,4-dimethylhexane

see convention

Diastereomers are stereoisomers that are not enantiomers

For example

(A)



NOT meso

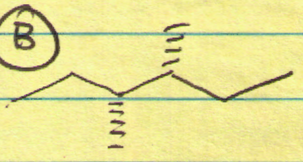
∴ chiral molecule

~~that is not identical~~

to its mirror image

I know enantiomer is (without thinking)

is (B)



and that its name is

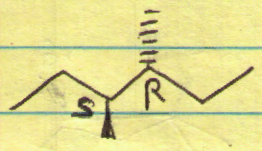
(3R,4R)-3,4-dimethylhexane

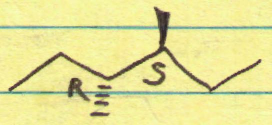
LOOK ⇒

stereoisomers have the same name, but differ in the R, S descriptors!

Name a meso compound and you will see that they are identical

(C)





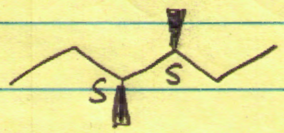
both are named

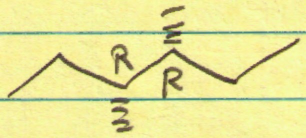
(3R,4S)-3,4-dimethylhexane

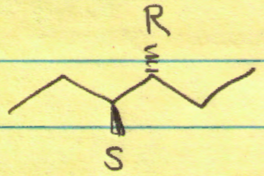
this only tells the stereochemistry!

I need these #'s in the name

Ch 5-19a

(A) 

(B) 

(C) 

meso cpd

	3_, 4_		3_, 4_	
(A)	S S	(B)	R R	} enantiomers
(C)	R S			

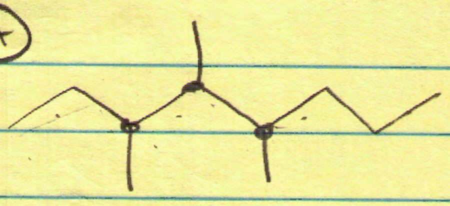
See how enantiomers reciprocate S to R and vice versa!

(C) R S → this is a stereoisomer of (A) & (B) that is not an enantiomer ∴ it is a Diastereoisomer of (A) & (B).

Ch5-20

(A)

C_8 → even #

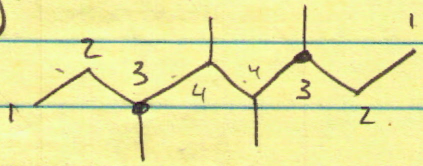


not symmetric ∴ no stereoisomers will be meso!

however

(B)

C_8



there is symmetry ∴ some of the 16 possible stereoisomers will be meso and thus identical to their apparent mirror image.

Let's evaluate all of the possible stereoisomers of (A) w/o drawing them

2^{3} total isomers for (A) 3 chiral centers

3_,	4_,	5_		3_,	4_,	5
R	R	R	⟶	S	S	S
R	R	S	⟶	S	S	R
R	S	R	⟶	S	R	S
S	R	R	⟶	R	S	S

} Enantiomers

See how R chiral centers changed to S and vice versa when we evaluated the enantiomer

Example: this compound has 1 enantiomer and 6 diastereomers

Each of the above also has 1 enantiomer and 6 diastereomers