

Stereochemistry III

Multiple Stereogenic Centers

Rxns & Resolution

Ref 5 : 12, 14, 16

Prob 5 : 17 - 20, 23 - 27, 35 a-l, 37
(HMWK #11, complete)

Adv Rdg 6 : 1 - 5

Cmpds w/ Multiple Stereogenic Centers

if n = # of stereogenic centers

then # of pairs of enantiomers = 2^{n-1}

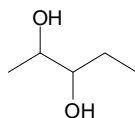
of stereoisomers = 2^n

Verify:

n	pairs	# of stereoisomers
1	$2^0 = 1$	2; R,S
2	$2^1 = 2$	4; RR, SS RS, SR
3	$2^2 = 4$	8; RRR, SSS RRS, SSR RSR, SRS RSS, SRR

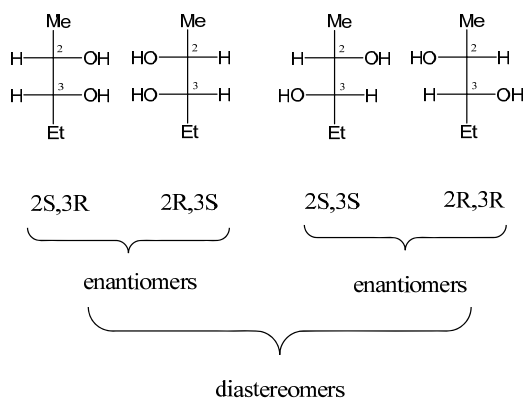
Practice

Find all stereoisomers of



Expect: 4

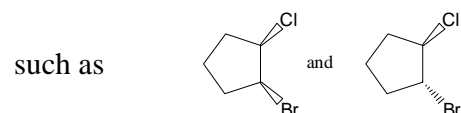
Show by Fischer projection:



Diastereomers

(stereoisomers, but not enantiomers)

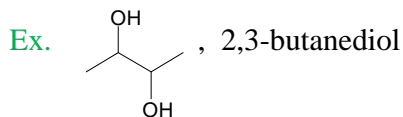
- spatial relationships between “substituents” are different
- e.g., cis/trans isomers are diastereomers,



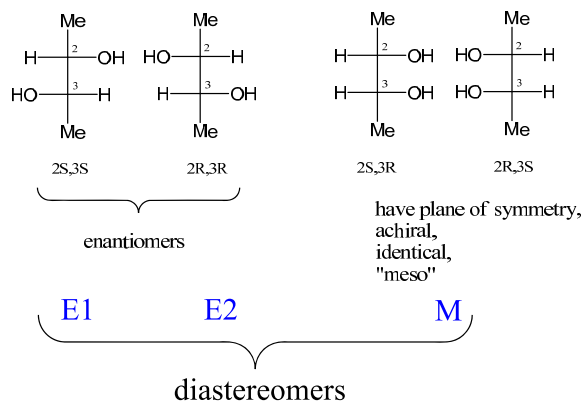
- Cl, Br distance different
 - e^- clouds have different relationships
 - molecular polarity different
- ∴ have different phys./ chem. properties:
- can be separated by phys. means, such as distillⁿ, chromatography, ...
 - have diff. m.p., b.p., ..
 - react differently

Meso Compounds

- have “stereogenic centers”
- but are achiral (2^{n-1} rule is violated)



of stereoisomers ?



Meso

Summary of Example:

2,3-butanediol has 3 stereoisomers:

- 1 pair of enantiomers (E1, E2)
- 1 meso compd (M)

M is a diastereomer of E1 and of E2.

Ignore the following

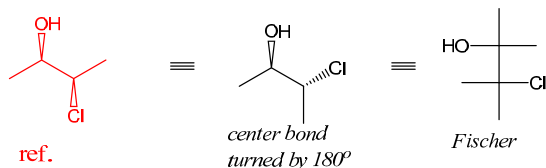
HMWK, Prize Question

Can you have a meso compd with 3 stereogenic centers?

If so, give an example.

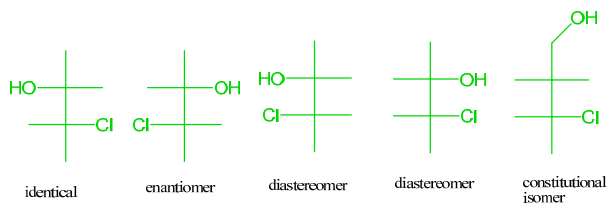
Answer

Practice



Compare the structures below with the reference structure above and identify their relationship

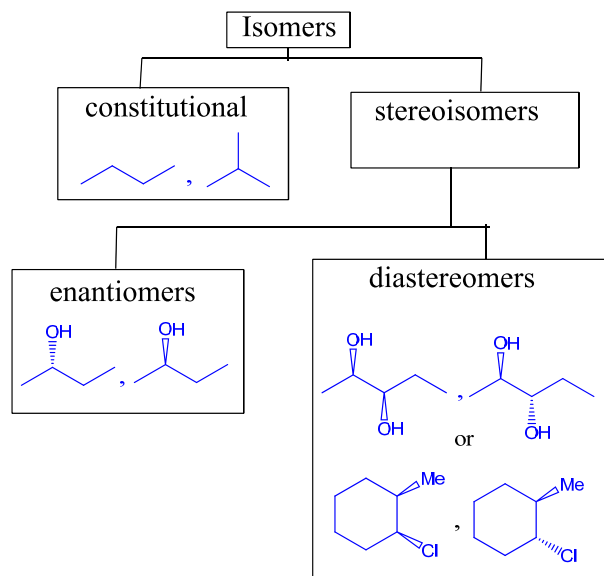
(constit. isomer, conformer, enantiomer ...)



Alternative method:

Determine R & S everywhere,
then compare

Summary of

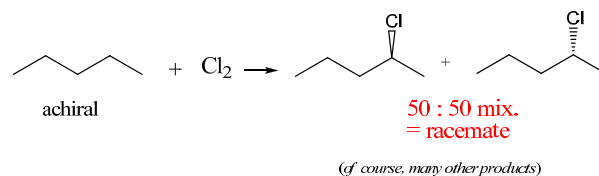


Also,

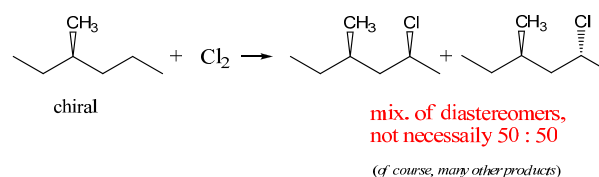
realize that there are non-isomers;
recall different conformations possible.

Chem. Rxns. & Chirality

Ex. 1



Ex. 2



(presence of methyl group at stereogenic center will influence approach of reactant)

Generalization

If rxn produces a new stereogenic center, then

achiral substance → racemate

chiral substance → unequal mix. of diastereomers

Resolution (Separation of Enantiomers)

General Scheme

