

Stereochemistry Exam Preparation Pack

Answer Key - Beginner / Intermediate

Section A: Assigning relationships

Link to answer

<http://bit.ly/Stereochem-EI-MOC-1>

Decide if these molecules are enantiomers or diastereomers
based on the name alone.

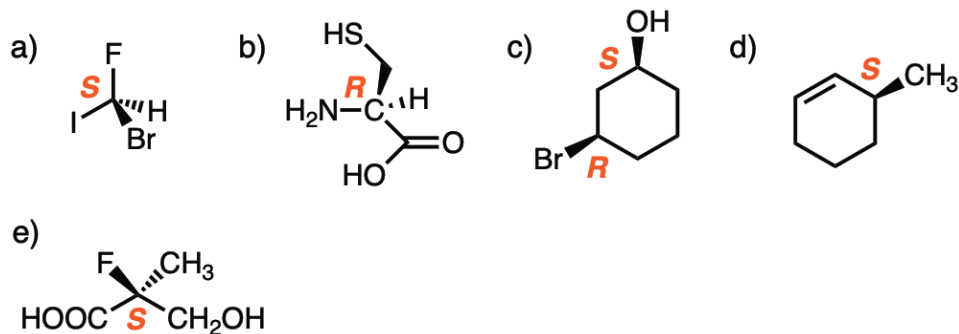


- 1) (*R*)-Butan-2-ol and (*S*)-Butan-2-ol **enantiomers**
- 2) (*2R,3R*)-2-Bromo-3-chlorobutane and (*2S,3S*)-2-Bromo-3-chlorobutane **enantiomers**
- 3) (*R,R*)-Tartaric acid and (*R,S*)-Tartaric acid **diastereomers**
- 4) (*2R,4R*)-2,3,4-Pentanetriol and (*2S,4S*)-2,3,4-Pentanetriol **enantiomers**
- 5) (*R,R,R,R,R*)-BigComplicatedMoleculicine and (*R,R,R,R,S*)-BigComplicatedMoleculicine **diastereomers**
- 6) (*E*)-Hex-3-ene and (*Z*)-Hex-3-ene **diastereomers**
- 7) (*R,E*)-4-Hexen-2-ol and (*S,Z*)-4-Hexen-2-ol **diastereomers**
- 8) (*R,E*)-4-Hexen-2-ol and (*R,Z*)-4-Hexen-2-ol **diastereomers**
- 9) (*R,E*)-4-Hexen-2-ol and (*S,E*)-4-Hexen-2-ol **enantiomers**
- 10) (*1R,2S*)-1,2-Dimethylcyclohexane and (*1S,2R*)-1,2-Dimethylcyclohexane **diastereomers**
- 11) *cis*-1,2-Dimethylcyclohexane and *trans*-1,3-Dimethylcyclohexane **constitutional isomers**
- 12) (*R,S*)-2,3-Dichlorobutane and (*S,R*)-2,3-Dichlorobutane **same (meso)**

Section B: Assigning R/S

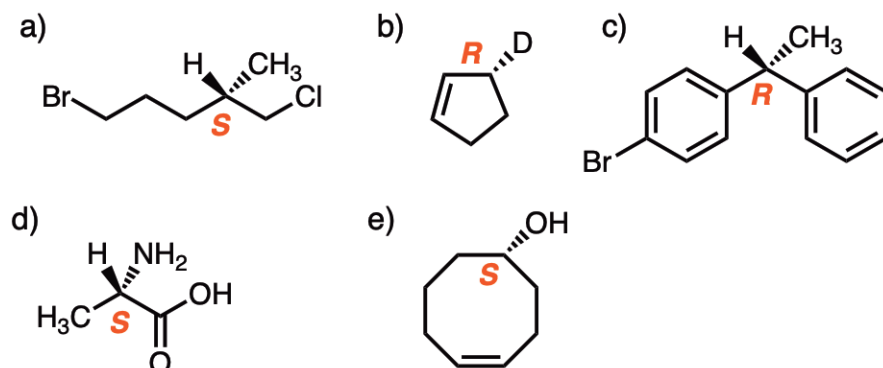
B-1 Assign all chiral centers as R or S

<http://bit.ly/Stereochem-EI-MOC-2>



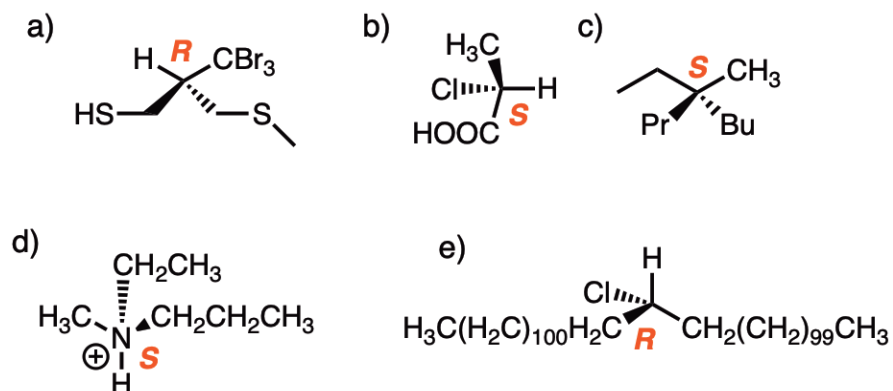
B-2 Assign all chiral centers as R or S

<http://bit.ly/Stereochem-EI-MOC-3>

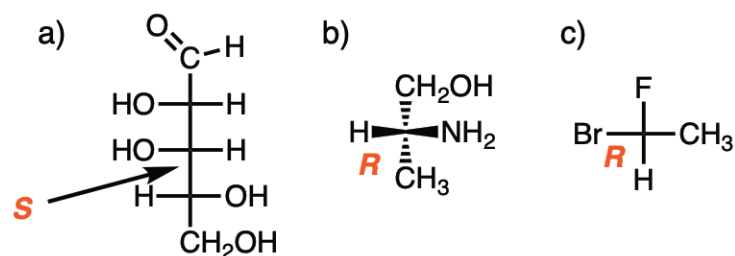


B-3 Assign R or S to all chiral centers

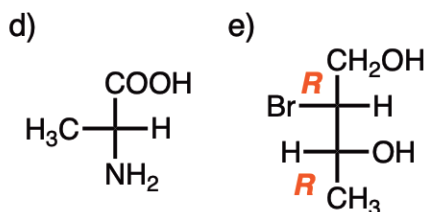
<http://bit.ly/Stereochem-EI-MOC-4>



B-4 Assign R or S to the indicated chiral center in these Fischer projections

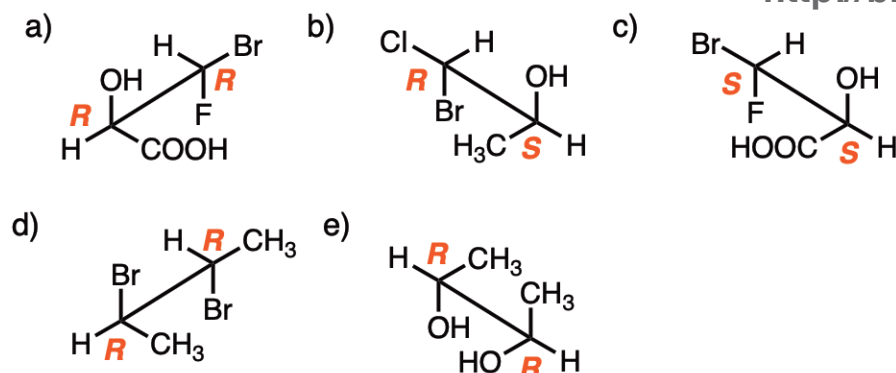


<http://bit.ly/Stereochem-EI-MOC-5>



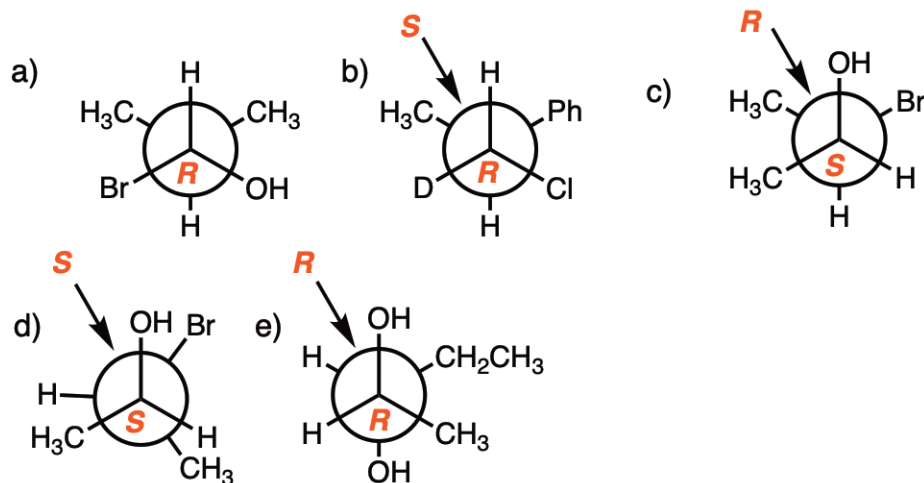
B-5 Assign R or S to the chiral centers in these Sawhorse projections

<http://bit.ly/Stereochem-EI-MOC-6>

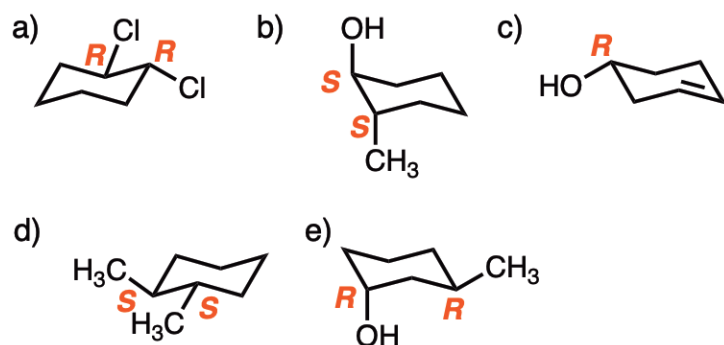


B-6 Assign R or S to the chiral centers in these Newman projections

<http://bit.ly/Stereochem-EI-MOC-7>



B-7 Assign R or S to the chiral centers in these cyclohexane chairs

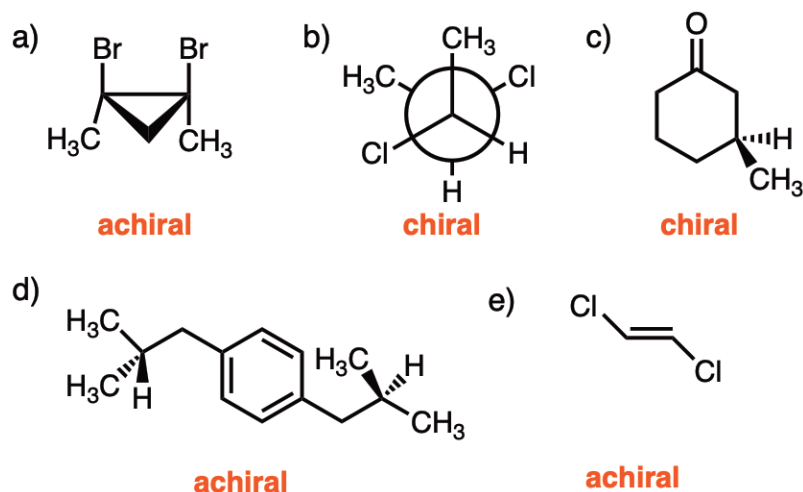


<http://bit.ly/Stereochem-EI-MOC-8>



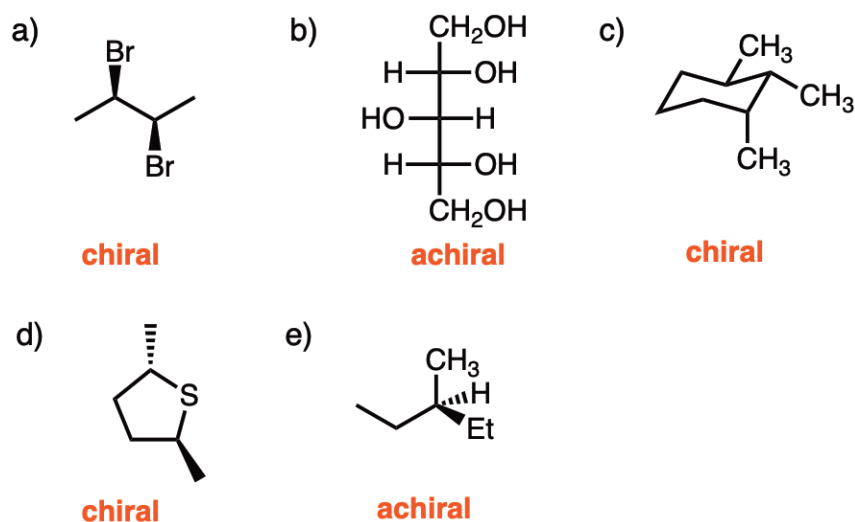
C-1 Are these chiral or achiral molecules?

<http://bit.ly/Stereochem-EI-MOC-9>

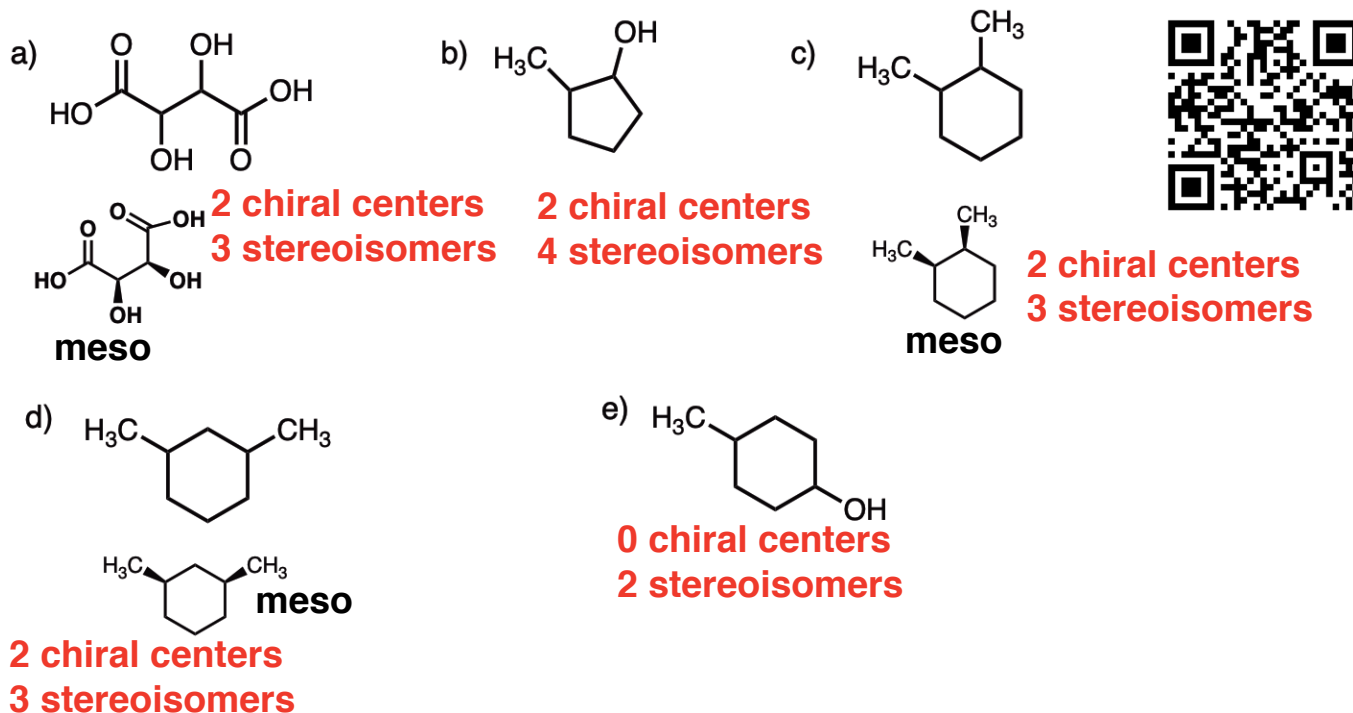


C-2 Another set. Chiral or achiral molecules?

<http://bit.ly/Stereochem-EI-MOC-10>

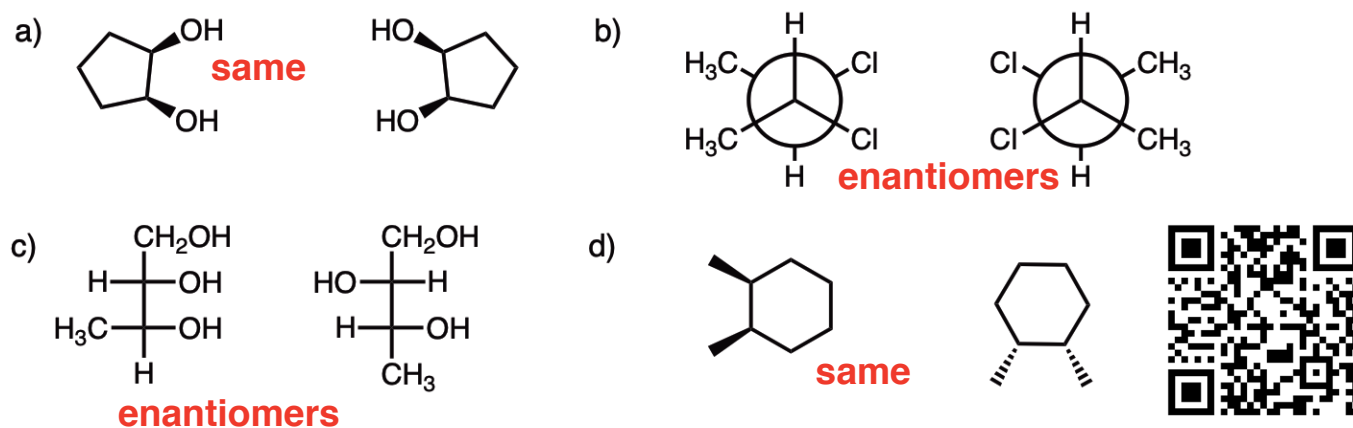


D-1 Decide if a molecule has chiral centers and if so, how many stereoisomers each has. If there is a meso compound, draw the structure using wedge/dash
<http://bit.ly/Stereochem-EI-MOC-11>



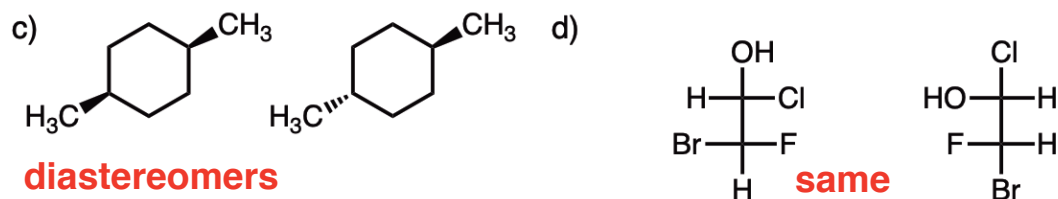
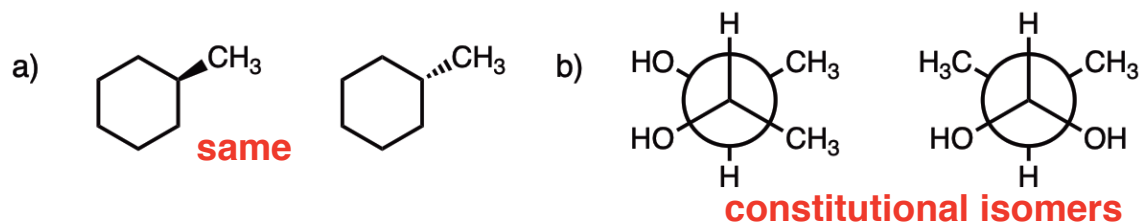
E-1 Decide if these molecules are enantiomers, diastereomers, the same, or constitutional isomers [*pssst - this is a very common class of exam problem!*]

<http://bit.ly/Stereochem-EI-MOC-12>



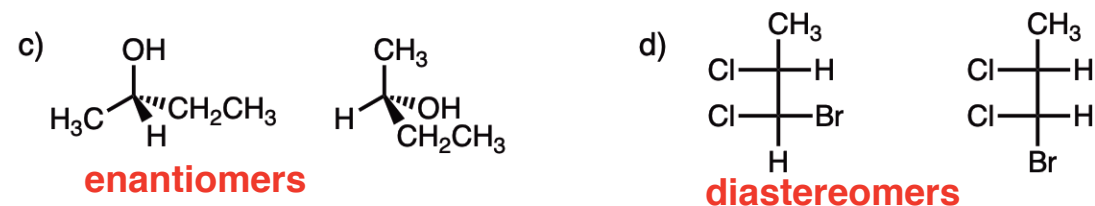
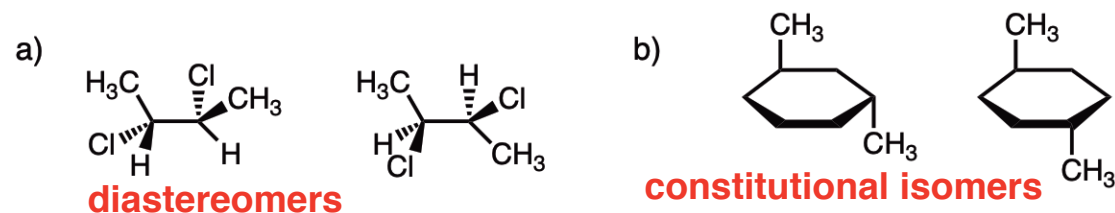
E-2 Enantiomers, diastereomers, the same, or constitutional isomers?

<http://bit.ly/Stereochem-EI-MOC-13>



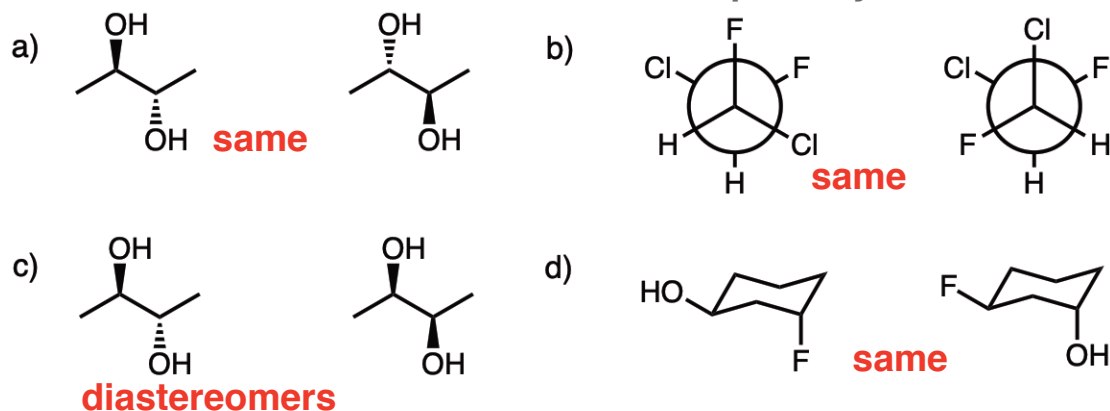
E-3 Enantiomers, diastereomers, the same, or constitutional isomers?

<http://bit.ly/Stereochem-EI-MOC-14>

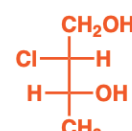
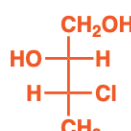
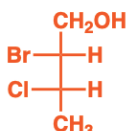
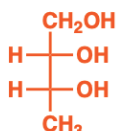
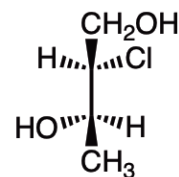
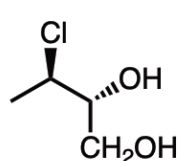
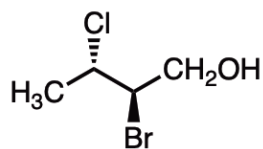
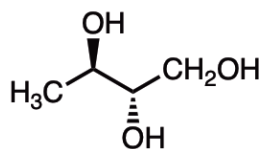


E-4 Enantiomers, diastereomers, the same, or constitutional isomers?

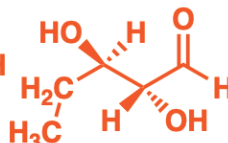
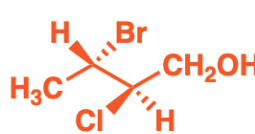
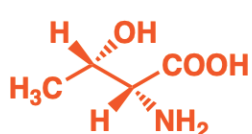
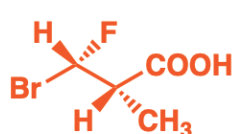
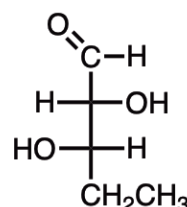
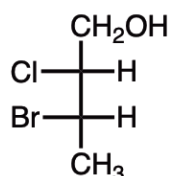
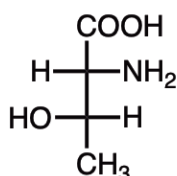
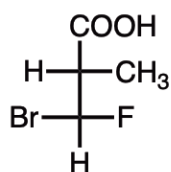
<http://bit.ly/Stereochem-EI-MOC-15>



F-1 Convert each of these line drawings (“perspective” drawings) to a Fischer projection.
<http://bit.ly/Stereochem-EI-MOC-16>

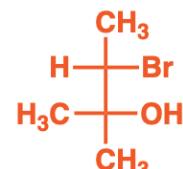
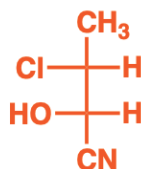
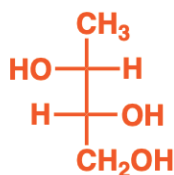
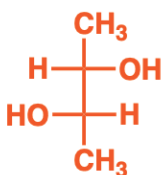
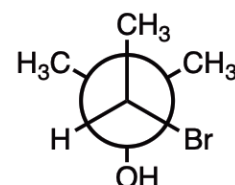
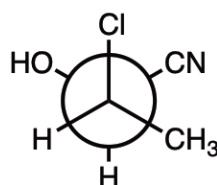
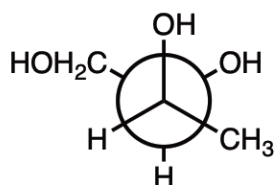
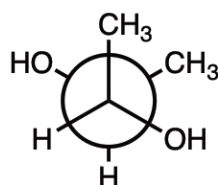


G-1 Convert each of these Fischer projections to line drawings (use the template below)
<http://bit.ly/Stereochem-EI-MOC-17>



H-1 Convert each of these Newman projections to a Fischer projection.

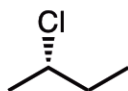
<http://bit.ly/Stereochem-EI-MOC-18>



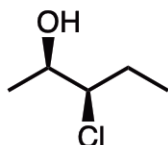
I-1 Given these names, draw the following molecules:

- (S)-2-Chlorobutane
- (2R,3R)-3-Chloropentan-2-ol
- (1R,2S)-2-Amino-1-phenylpropan-1-ol

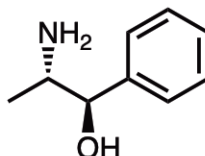
<http://bit.ly/Stereochem-EI-MOC-19>



(S)-2-Chlorobutane



(2R,3R)-3-Chloropentan-2-ol



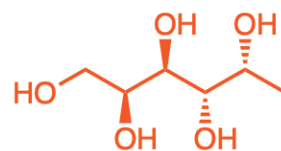
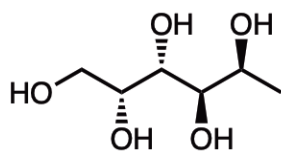
(1R, 2S)-2-amino-1-phenylpropan-1-ol



J-1 The structure below is one enantiomer of the molecule Fucitol.

Draw the enantiomer of this molecule, which also goes by the name D-Fuc-ol.

<http://bit.ly/Stereochem-EI-MOC-20>

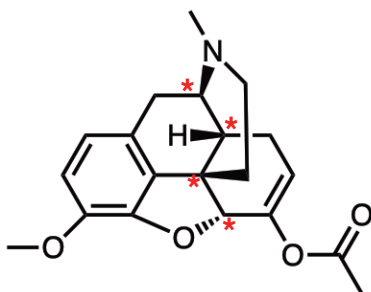


enantiomer

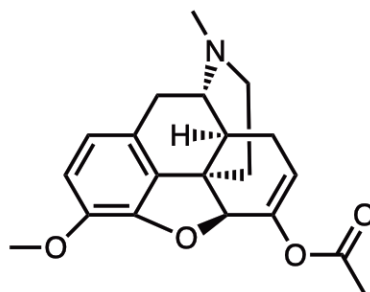


J-2 The structure below goes by the name Thebacon. How many chiral centers does Thebacon have? For bonus points draw the enantiomer using the template on the right.

<http://bit.ly/Stereochem-EI-MOC-21>



4 chiral centers

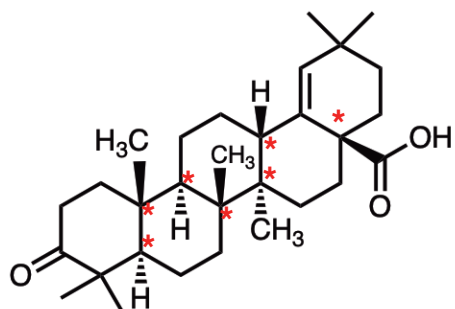


enantiomer

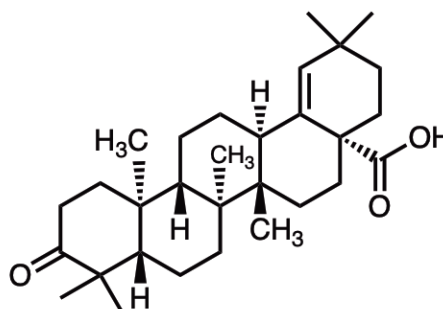


J-3 The molecule below is known as Moronic acid. How many chiral centers does it have? Try drawing the enantiomer using the template on the right.

<http://bit.ly/Stereochem-EI-MOC-22>



6 chiral centers



enantiomer



K-1 Optical rotation questions.

<http://bit.ly/Stereochem-EI-MOC-23>

a) If the specific rotation of (+)-Fucitol is $+50^\circ$, and the rotation of a sample of Fucitol is measured to be -10° , what is the per-cent composition of (+)-Fucitol and (-)-Fucitol in the sample?

60% (-)-Fucitol, 40% (+)-Fucitol

b) A 5.0 mg sample of Thebacon is dissolved in 1.0 mL of methanol and the solution placed in a cell with a 2.0 cm path length. The observed rotation was $+0.105^\circ$.

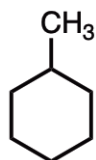
What is the $[\alpha]_D$ for Thebacon?

$+105^\circ$

L-1 [Assumes you have covered free-radical reactions of alkanes]

How many different monochlorinated isomers (including stereoisomers) are possible for each of these molecules?

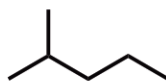
<http://bit.ly/Stereochem-EI-MOC-24>



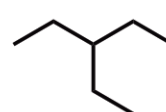
12



4



7



4

