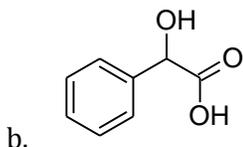
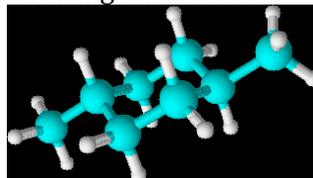
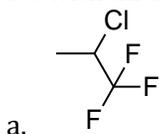


Stereochemistry: Definitions & Stereogenic Centers

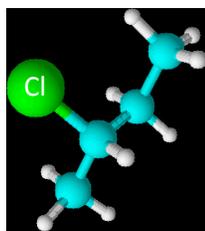
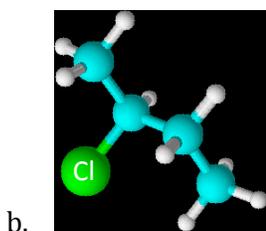
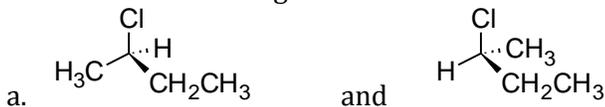
- Define or describe the following terms:
 - stereogenic center
 - chiral molecule
 - enantiomers
 - plane-polarized light
 - specific rotation
 - diastereomers
 - plane of symmetry
 - meso* form
 - racemic mixture
 - resolution
- State whether each of the following substances contains a stereogenic center:
 - 1,2-dichloropropane
 - 2,2-dichlorobutane
- Locate with an asterisk the stereogenic centers, if any, in the following structures:


Optical Activity

- What would happen to the observed and to the *specific* rotation if, in measuring the optical activity of a solution of sugar water, you
 - doubled the concentration of the solution?
 - doubled the length of the sample tube?
- The observed rotation for 100. mL of an aqueous solution containing 1.0 g of sucrose, $C_{12}H_{22}O_{11}$, placed in a 2.0-dm sample tube, is $+1.33^\circ$ at $25^\circ C$ (using a Na lamp). Calculate and express the specific rotation of sucrose.

Relationships Between Stereoisomers

- Tell whether the following structures are identical or enantiomers:

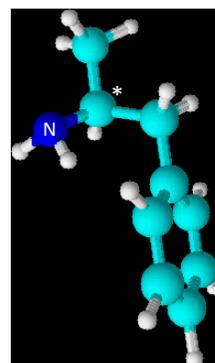
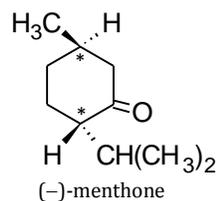


7. Draw a structural formula for each of the optically active compounds with the molecular formulas:
- a. $C_6H_{13}Cl$ b. $C_4H_{10}O$
8. Draw the formula of an unsaturated bromide, C_5H_9Br , that can show
- a. neither *cis-trans* isomerism nor optical activity
- b. no *cis-trans* isomerism but optical activity

The *R-S* and *E-Z* Conventions

9. Place the members of the following groups in order of decreasing priority according to the *R-S* convention:
- a. CH_3- , $H-$, C_6H_5- , CH_3CH_2- ,
- b. CH_3CH_2- , $HO-$, $BrCH_2-$, $HOCH_2-$,
10. Assume that the four groups in each part of #9 are attached to one carbon.
- a. Draw a 3-D formula for the *R* configuration of 9a.
- b. Draw a 3-D formula for the *S* configuration of 9b.
11. Tell whether the stereogenic centers marked with an asterisk in the following structures have the *R* or the *S* configuration:

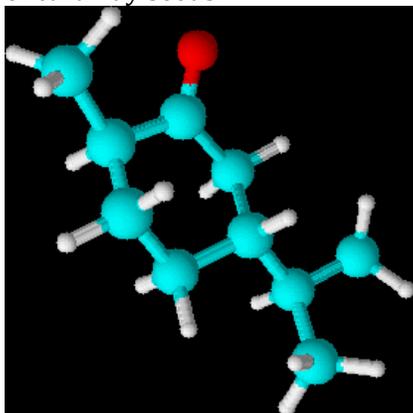
a.



b.

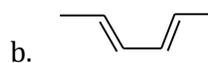
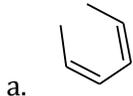
(+)-amphetamine

12. Determine the configuration, *R* or *S*, of (+)-carvone, the compound responsible for the odor of caraway seeds.



13. In a recent collaboration, American and French chemists found that (–)-bromochlorofluoromethane (CHBrClF), one of the simplest chiral molecules, has the *R* configuration. Draw a 3-D structural formula for (*R*)- (–)-bromochlorofluoromethane.

14. Name the following compounds using *E-Z* notation:



15. Two possible isomers of 1,2-dibromoethane are:



Classify them according to the three methods of classifying stereoisomers discussed in class.

16. 4-chloro-2-pentene has a double bond that can have either the *E* or *Z* configuration and a stereogenic center that can have either the *R* or the *S* configuration. How many stereoisomers are possible altogether? Draw the structure of each, and group the pairs of enantiomers.

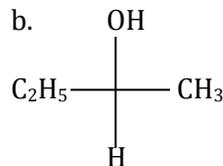
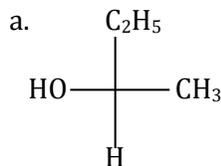
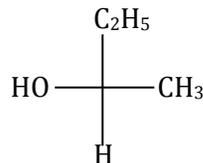
17. How many stereoisomers are possible for each of the following structures? Draw them, and name each by the *R-S* and *E-Z* conventions.

a. 3-methyl-1,4-pentadiene

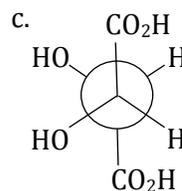
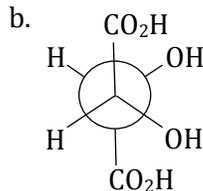
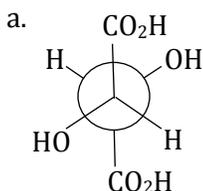
b. 2-bromo-5-chloro-3-hexene

Fischer and Newman Projections

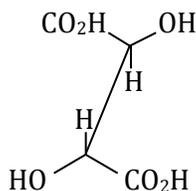
18. Which of the following projection formulas have the same configuration as and which are the enantiomer of the following structure:



19. Below are three Newman projections for the three tartaric acids (*R,R*), (*S,S*), and *meso*. Which is which?

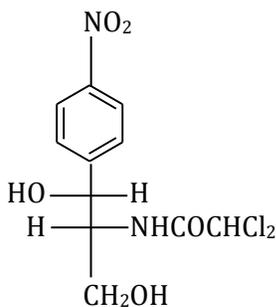


20. Convert the sawhorse formula below for one isomer of tartaric acid to a Fischer projection formula. Which isomer of tartaric acid is it?



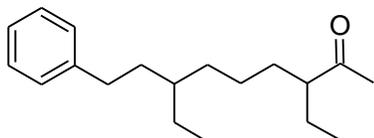
Stereochemistry: Natural Applications

21. Chloramphenicol is an antibiotic that is particularly effective against typhoid fever. Its structure is:



What is the configuration (*R* or *S*) at each stereogenic center?

22. Mature crocodiles secrete from their skin glands the compound with the structure shown below. This compound is thought to be a communication pheromone for nesting or mating.



- How many stereogenic centers are there in this compound? Mark them with an asterisk.
- Two stereoisomers of this compound have been isolated from crocodile skin gland secretions. How many possible stereoisomers of this compound are there?

Stereochemistry and Chemical Reactions

23. Describe what is occurring in the following reaction:

