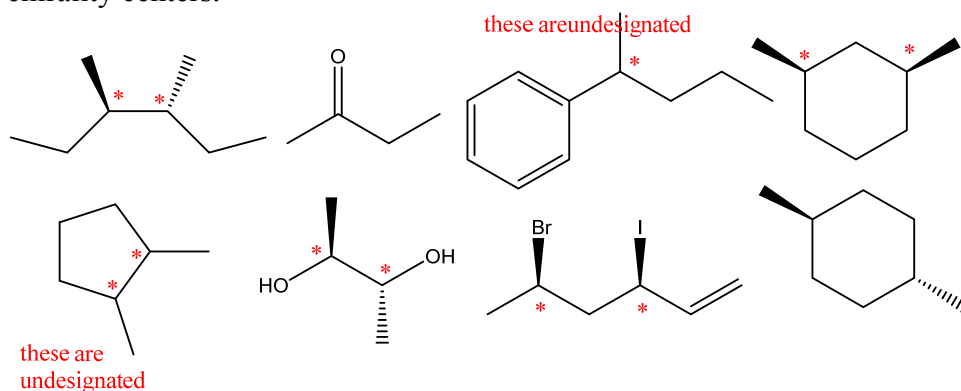


Discussion Worksheet #5 Stereochemistry

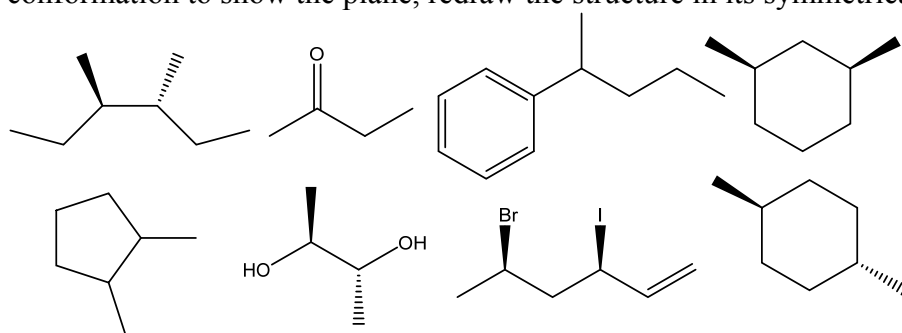
Skill 1: Identify chiral and achiral molecules

- Achiral molecules are superimposable on their mirror images
- Chiral molecules are not superimposable on their mirror images.
- You can use the definition as a test for chirality
- In some cases, you can identify chirality centers to determine if a molecule is chiral
- You can look for an internal plane of symmetry. If you find one, it is achiral.

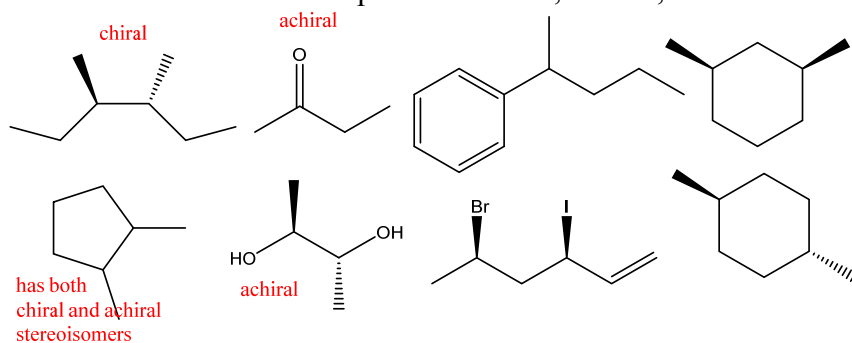
Problem 1. Indicate all chirality centers in these molecules. Indicate any that are undesignated chirality centers.



Problem 2. Find any internal planes of symmetry in these molecules. If you need to change the conformation to show the plane, redraw the structure in its symmetrical conformation.



Problem 3. Label each compound as chiral, achiral, or can be both.



Skill 2: Recognize and draw enantiomers

- Draw the enantiomer of a compound by drawing its mirror image, most commonly by inverting all chirality centers.
- If a molecule is drawn with undesignated stereocenter(s), it indicates a mix of stereoisomers
- The absolute stereochemistry of a compound is labeled with the R/S nomenclature
- The relative stereochemistry can be determined by specific rotation
- Achiral compounds and racemic mixes are optically inactive.

Problem 4. A student has three solutions of 2-chlorobutane with the following labels. Draw the structure of the compound(s) contained in each solution. If not enough information is provided, write “indeterminable.”

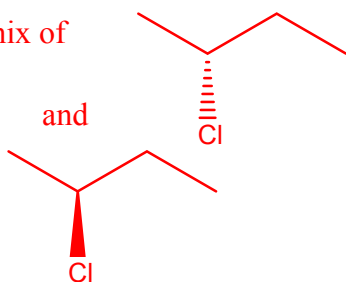
A. “2-chlorobutane, specific rotation = 0° ”

B. “(S) 2-chlorobutane”

C. (*d*) 2-chlorobutane

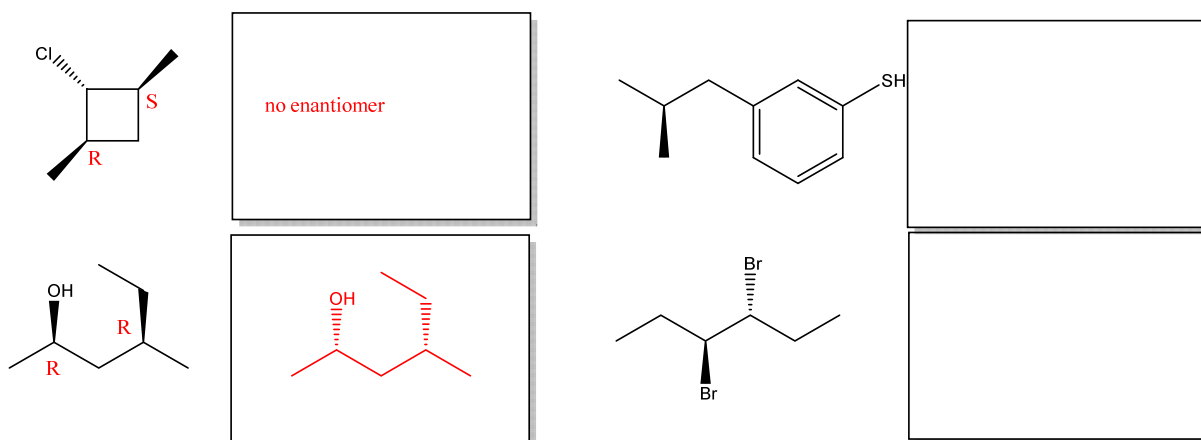
D. “2-chlorobutane, specific rotation = $+15^\circ$ ”

A. mix of

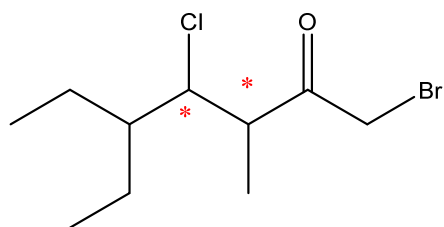


C. not enough information

Problem 5. Label all chirality centers in the molecules below as R or S, then draw their enantiomers.. If the compound does not have an enantiomer, write “no enantiomer.”



Problem 6. Draw all possible stereoisomers for this compound. Label each chirality center as R or S in each structure you draw.



There are 4 stereoisomers

Skill 3: Identify relationships between molecules.

- Enantiomers are nonsuperimposable mirror images
- Diastereomers are stereoisomers that are not enantiomers. They include cis/trans isomers.
- Meso compounds are achiral molecules that have chirality centers, and therefore have diastereomers but no enantiomers.

Problem 7. Indicate the relationship between each molecule as “same”, “enantiomers”, “diastereomers”, constitutional isomers”, or “no relationship.” Circle any meso compounds.

