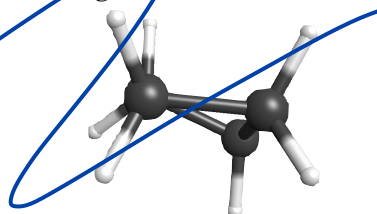
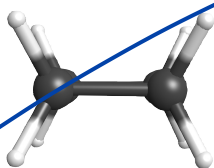


1. (4 pts.) Which of the shapes drawn below is adopted by cyclobutane.

a. Planar ring with 90° C-C-C bond angles

Puckered ring with 88° C-C-C bond angles



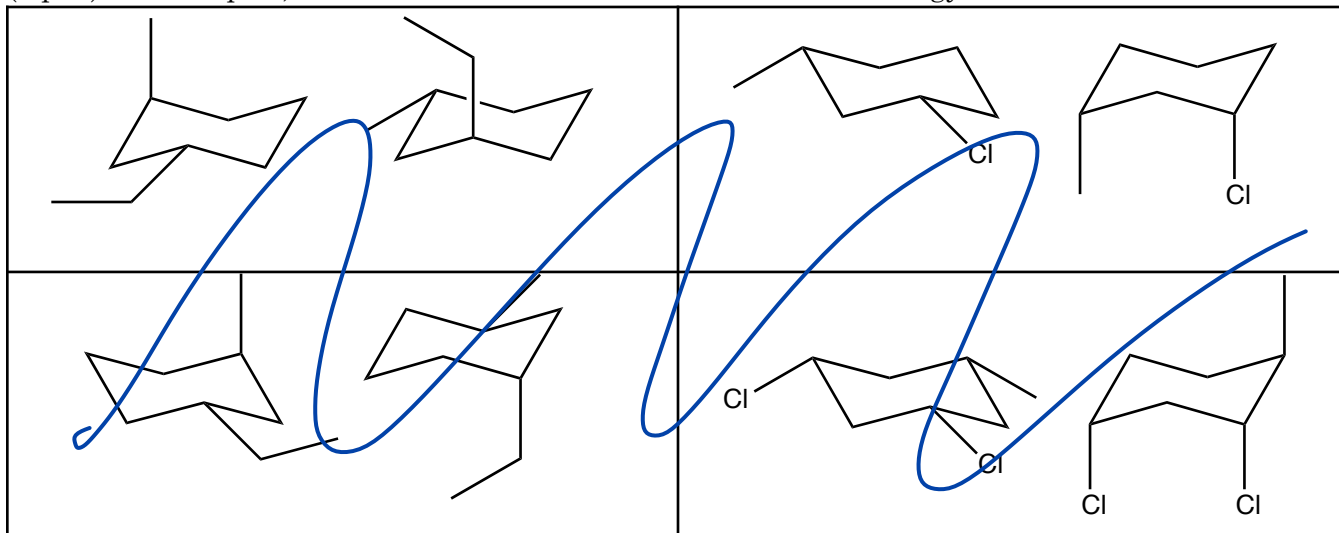
b. (6 pts.) Briefly explain why your choice is the lower energy structure.

2. (8 pts.) Draw the lowest energy structure for *cis*-1-methyl-3-propylcyclohexane.

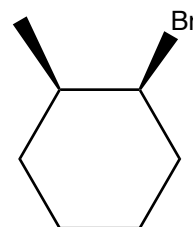
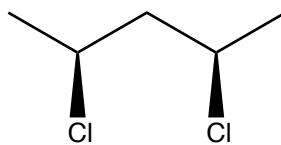
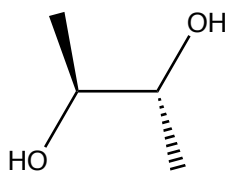
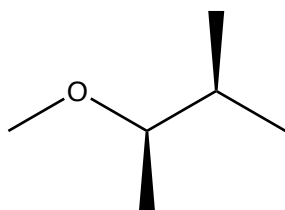
3. Four pairs of substituted cyclohexane rings are drawn below.

a. (8 pts.) If the two structures in a given pair can be interconverted by a so-called ring flip write "yes" under the pair; if not write "no". When examining the structures you should assume that the molecules themselves have not been rotated in space.

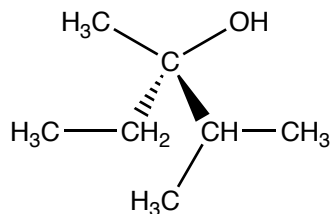
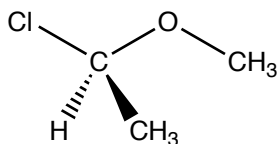
b. (4 pts.) For each pair, circle the molecule that would be lower in energy.



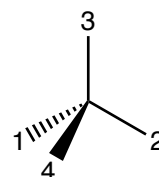
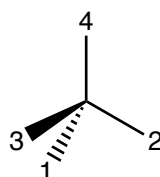
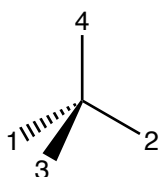
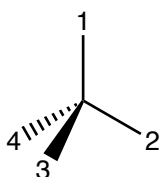
4. (a. 8 pts.) Place a star next to the chirality centers in the following structures and (b. 8 pts) circle the chiral molecules.



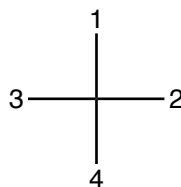
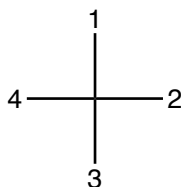
5. (8 pts.) Assign priorities to the groups/atoms bonded to the chirality centers in the following structures.



6. (8 pts.) Priorities have been assigned to the groups (which are not shown) bonded to the following chirality centers. Determine the configurations of the chirality centers.



7. (4 pts.) Priorities have been assigned to the groups (which are not shown) bonded to the following chirality centers on the Fisher projections drawn below. Determine the configuration of the chirality centers.



8. (8 pts.) Label the following statements "true" or "false". Use the complete word when labeling.

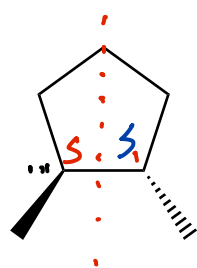
A chiral molecule will rotate the plane of polarized light. _____

Molecules with two chirality centers are always chiral. _____

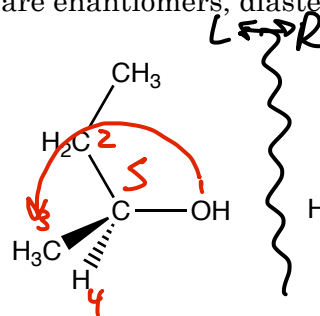
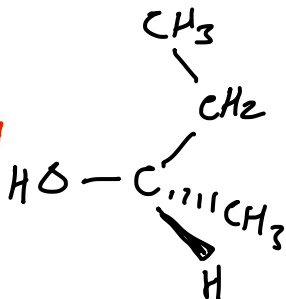
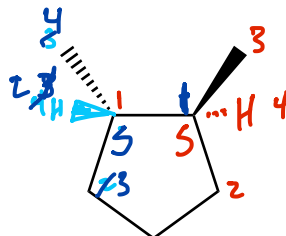
Diastereomers typically have different boiling points. _____

Enantiomers typically have different boiling points. _____

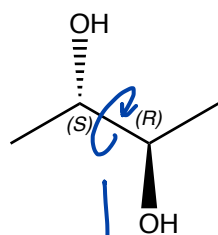
9. (8 pts.) Determine whether the following pairs of structures are enantiomers, diastereomers, or different views of the same molecule.



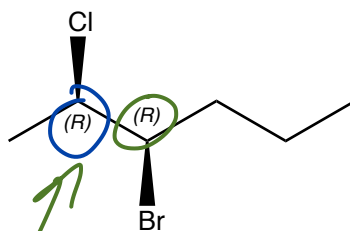
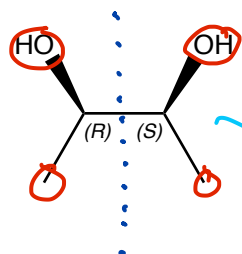
same



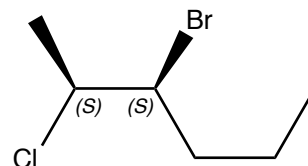
enantiomers



same



enantiomers



not chiral

diastereomers

