CHM102A
Tutorial 5

Topics covered in lecture 9-11 to be discussed in Tutorial 5

- Detailed conformational analysis of cyclohexane: Chair & boat conformations, drawing structures, axial, equatorial bonds, stability in mono and disubstituted cyclohexane and various interactions between substituents.
- Isomerism: constitutional, enantiomer, diastereomer, optical activity, specific rotation, %ee, determination of absolute configuration (R/S assignment).
- Fischer projections and it's manipulation, R/S assignment in Fischer projections, molecules with multiple stereogenic centers, Relationship b/w various stereoisomers, Meso-compounds, atropisomerism/ conformational isomerism: biphenyls, allenes.

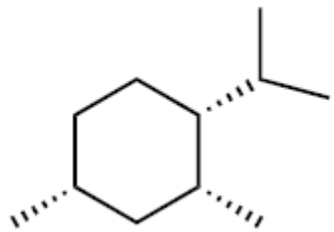
1. Draw the most stable conformations of

(a) cis-1-ethyl-3-methyl cyclohexane.

(b) 1,1, 3-trimethyl cyclohexane

(c) *trans*-1-isopropyl-3-methylcyclohexane

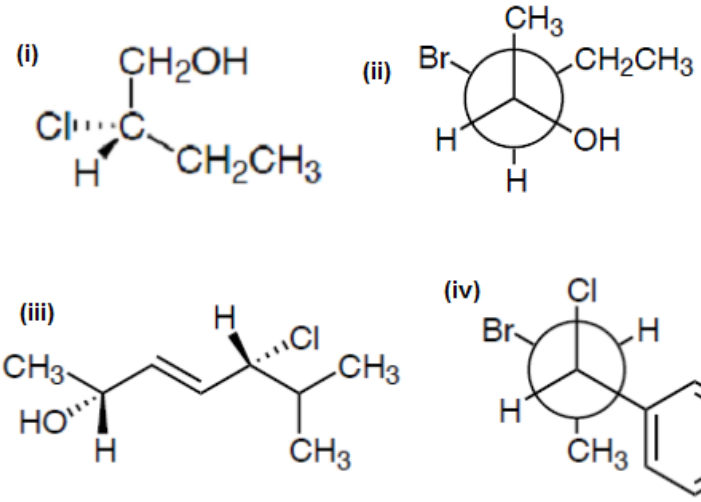
2. Draw the both the chair conformation (interconvert by means of the ring-flip) present in equilibrium for following compound. Comment on their relative stabilities.



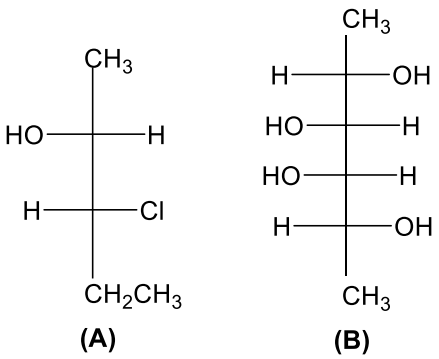
3. (i) When 0.300 g of natural cholesterol is dissolved in 15.0 mL of chloroform and placed in a 10.0 cm polarimeter tube, the observed rotation at 20 ^{0}C using sodium D-line is -0.630^0. Calculate the specific rotation of cholesterol.

(ii) A mixture of natural cholesterol and its enantiomer has a specific rotation at 20 ^{0}C of -27. Calculate %ee (%enantiomeric excess) of this mixture. What % of the mixture is natural cholesterol?

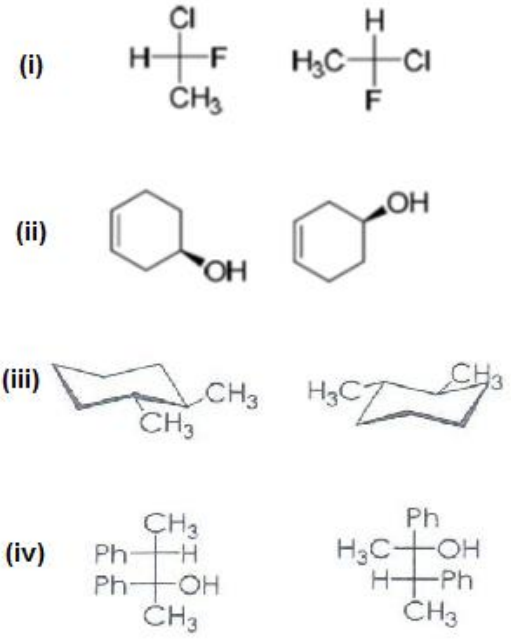
4. Assign the absolute configuration (R or S) to each chirality center.



5. Determine absolute configuration of each chirality centers in the following molecules. Which of these compound will be optically inactive?

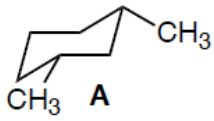


6. Identify the relationship between following molecules as enantiomers, diastereomers, conformers or identical molecules.



7. Give the relationship between the following molecules. They may be the same molecule, different molecules, constitutional isomers, enantiomers, or diastereomers. Show your work for partial credit.

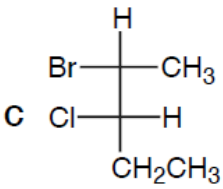
(a)



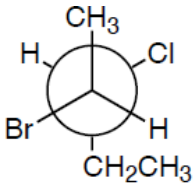
A

B

(b)



C



D

8. Draw the possible enantiomers for 2,3-pentadiene.

Answer the following questions:

(a) Pointout the type of hybridization of each carbon.

(b) Show the overlap of orbitals involved in formation of pi-bonds.

(c) Is there any **chirality center** present in this molecule?

(d) Will it show any optical activity?

9. Show the reaction that occurs between (S)-2-bromopentane and cyanide anion (NC-). Assign the absolute configuration to the product. *(To be discussed in detail in class 12)*