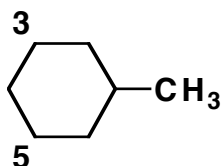


WORKSHOP 3

Conformations of Alkanes and Cycloalkanes

1. Consider rotations around the C₂-C₃ bond of 2-methylbutane. Build molecular models of all of the staggered conformations. Draw the conformations using Newman projections. Circle the low energy conformation(s). **Explain your choices.** Construct a qualitative plot of energy versus angle of rotation around the C₂-C₃ bond.
2.
 - a. For butane, make molecular models of the anti and gauche conformations as well as the conformation in which the two methyls are eclipsed. Using your molecular model, measure the distance between the methyl carbons in the anti, gauche, and eclipsed conformational isomers. Make careful drawings (sawhorse) of the three conformational isomers.
 - b. Make molecular models for methylcyclohexane and carefully draw the two chair conformations. Measure the distance between the methyl carbon and the carbons at the 3- and 5- positions of the ring. Compare these measurements with those that you previously made on butane. On the basis of your measurements, which of the two cyclohexane conformations do you predict to predominate at equilibrium? Is the methyl group axial or equatorial in the more stable conformation? **Explain your reasoning.**



3. Draw all isomeric dimethylcyclobutanes, clearly showing stereochemistry. Designate as cis or trans where appropriate. Indicate whether structures are related as constitutional isomers or stereoisomers.
4. Using only chair conformations, make and draw molecular models for all of the 1,4-dibromocyclohexanes. Clearly indicate which are related as conformational isomers and which are related as configurational isomers. Designate the configurational isomers as *cis* or *trans*. **Explain** which isomers equilibrate rapidly with each other (interconvert).