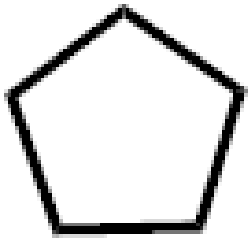
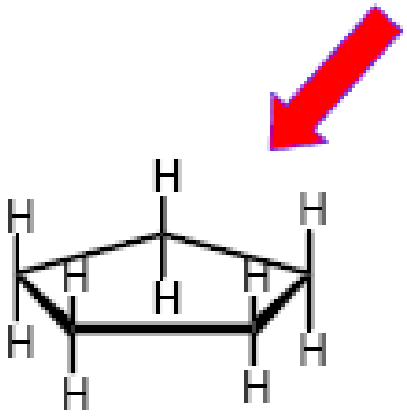
Chapter 4:
Organic Compounds

Part 3: Substituted Cycloalkanes

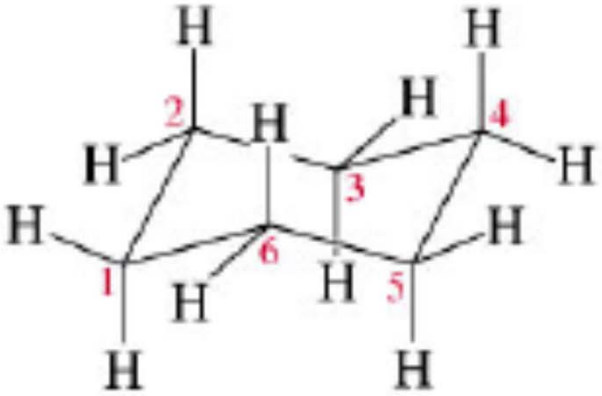
Cyclopentane



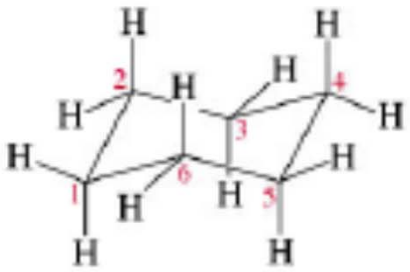


Cyclohexane

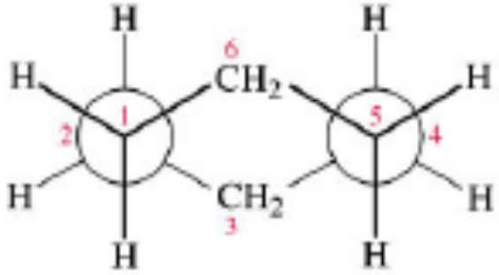
- The most important cyclic alkane and found throughout nature (i.e. similar to structural units in sugars).
- MCAT's love cyclohexanes



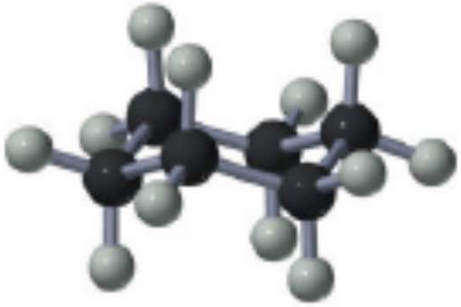
Drawing Cyclohexane



chair conformer of cyclohexane



Newman projection of the chair conformer

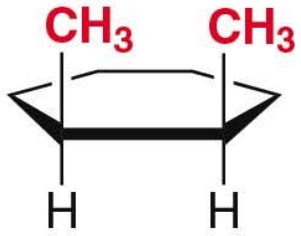


ball-and-stick model of the chair conformer of cyclohexane

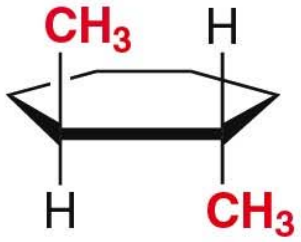
The chair conformation of cyclohexane is free of ring strain, because the carbons are closer to tetrahedral.

Cis-trans Isomerism

- These two structures are NOT constitutional isomers. WHY?



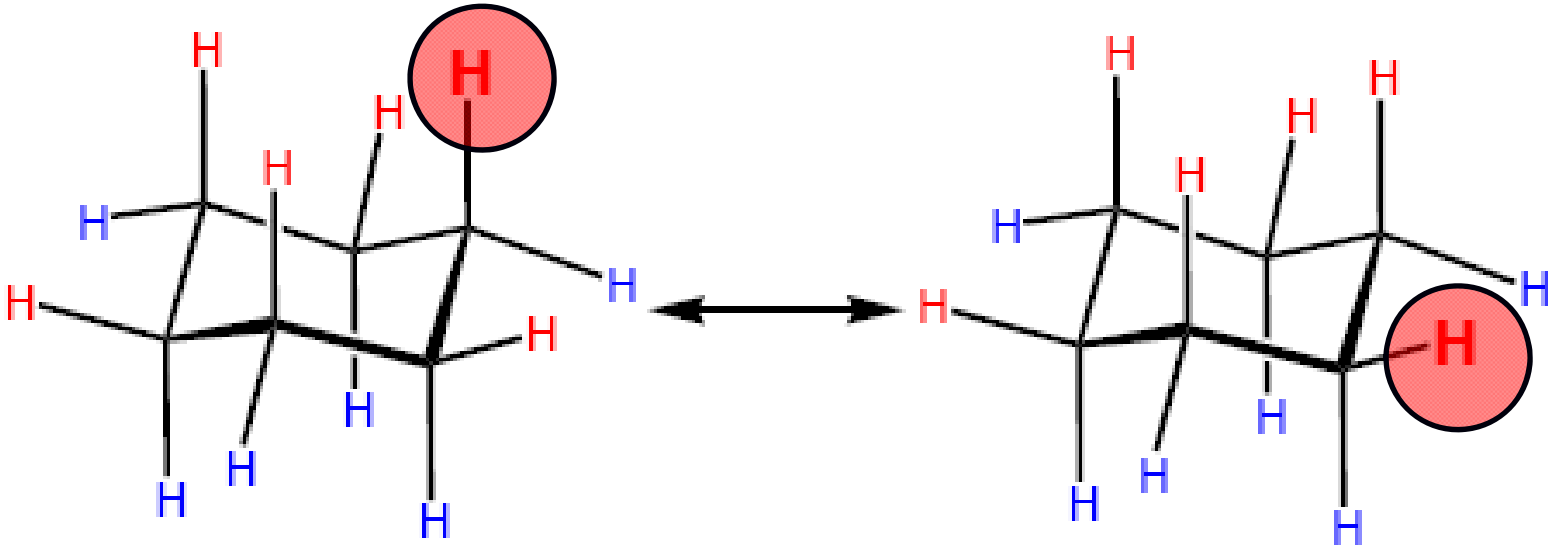
cis-1,2-Dimethylcyclohexane



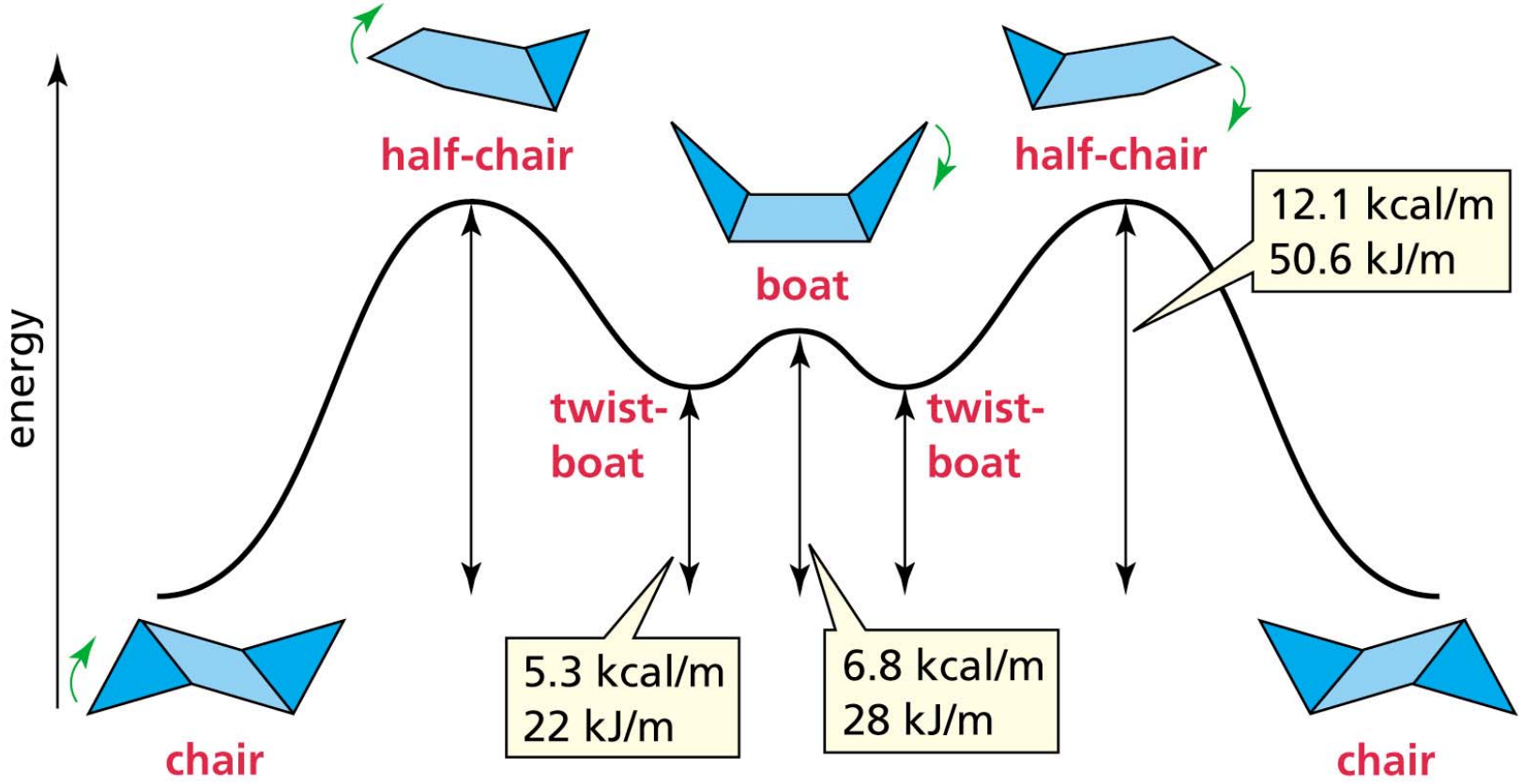
trans-1,2-Dimethylcyclohexane

- They are STEREOISOMERS. HOW?

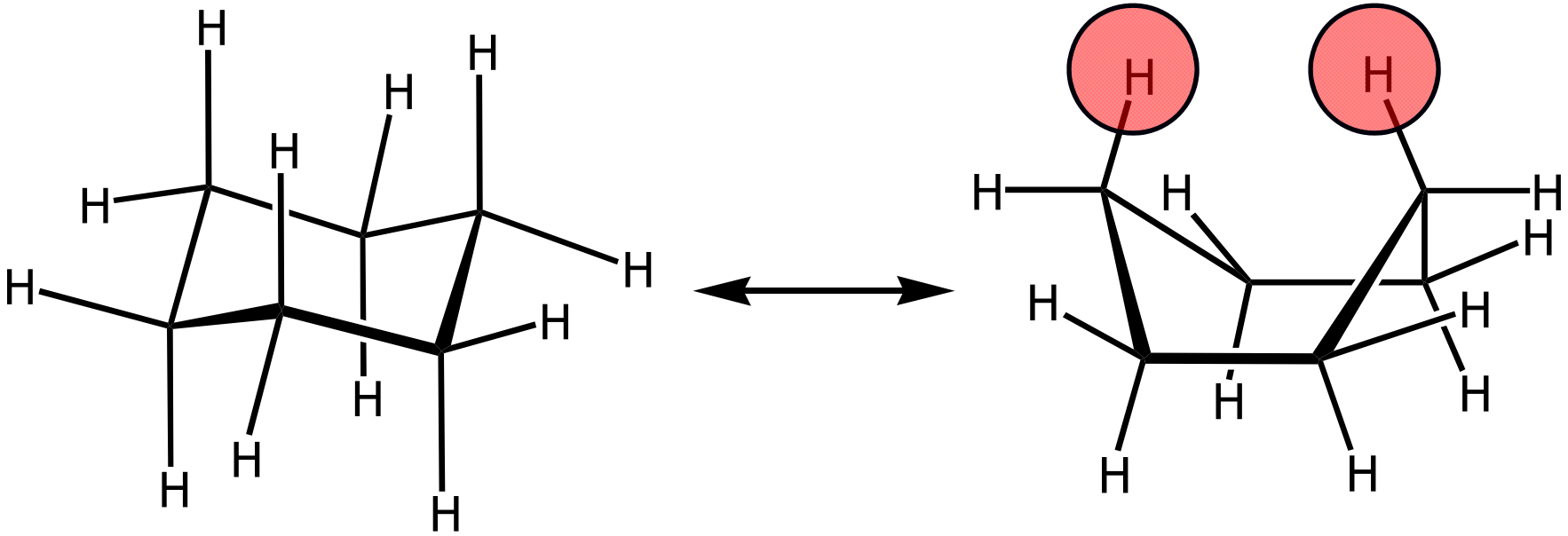
Ring Flipping in Cyclohexane

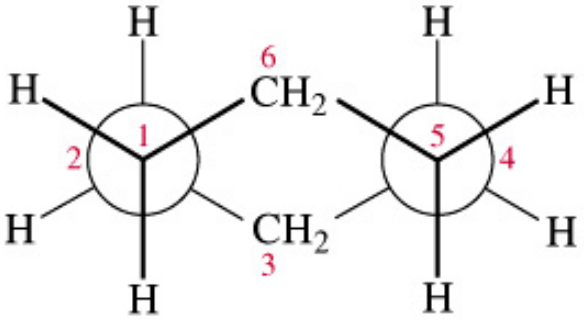


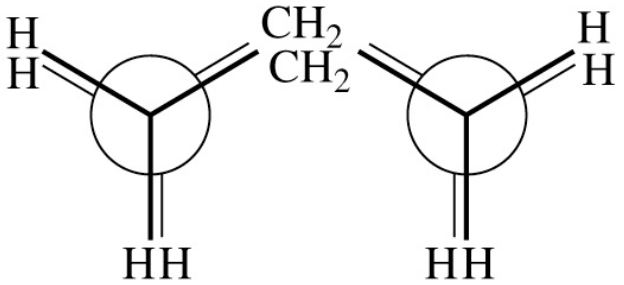
Conformations of Cyclohexane



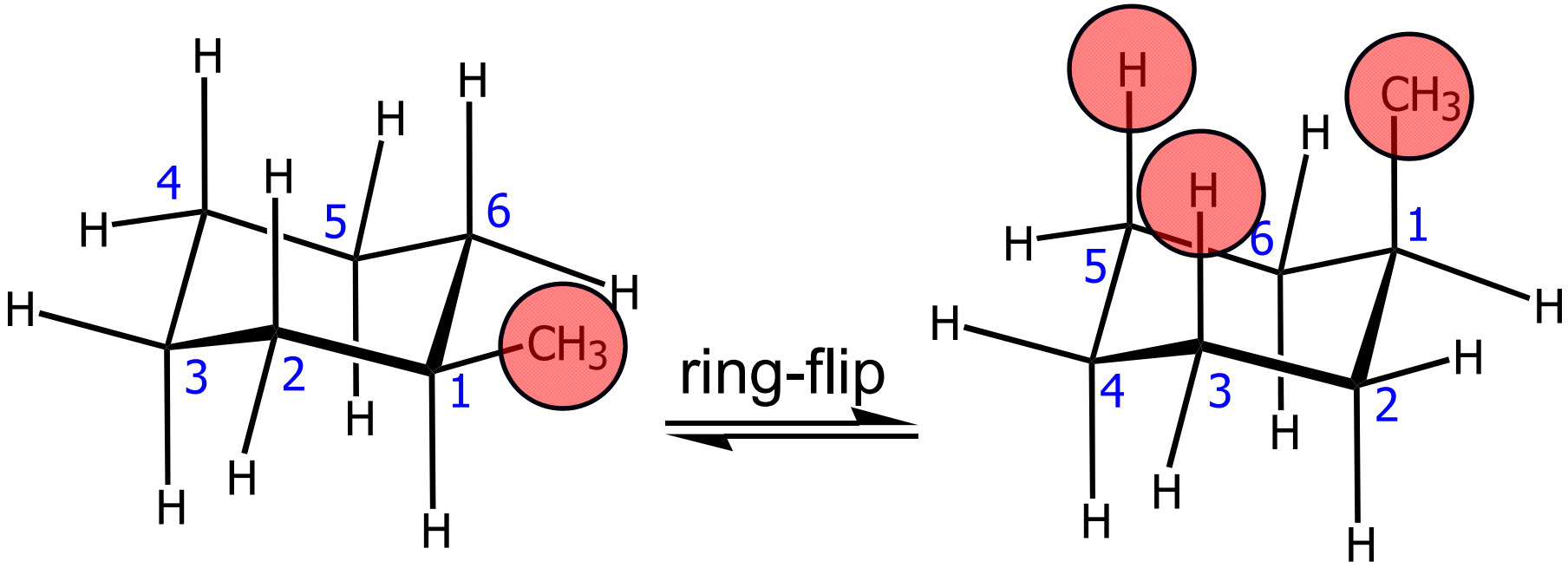
Ring Flipping in Cyclohexane





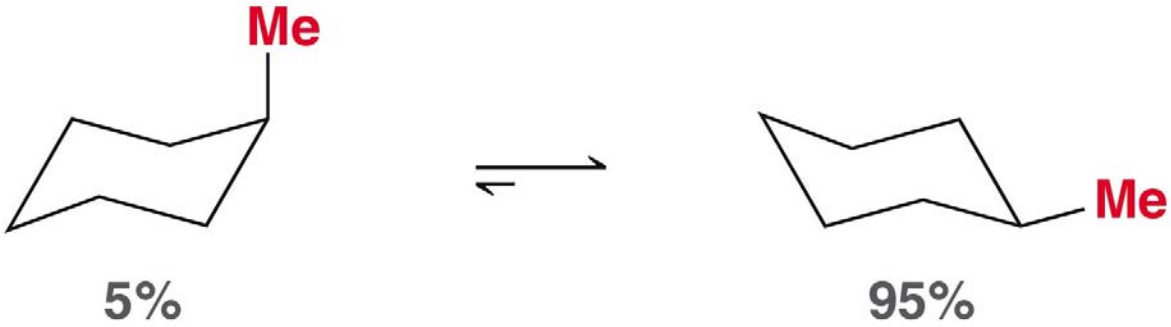


Conformations of Monosubstituted Cyclohexanes



Monosubstituted Cyclohexane

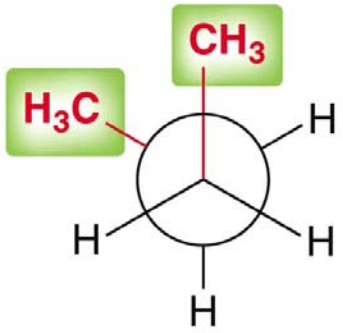
- Flipping a chair is not like flipping a pancake. Flipping a chair is the result of C–C single bonds rotating ONLY.



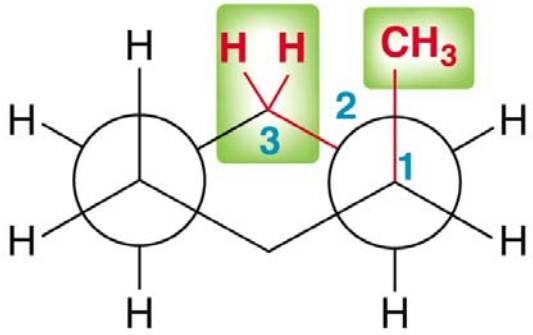
- If both versions of the CHAIR were equally stable,

- Why does the equatorial chair dominate the equilibrium?

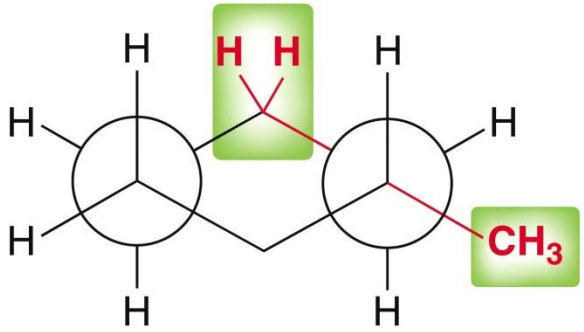
Monosubstituted Cyclohexane



Gauche interaction

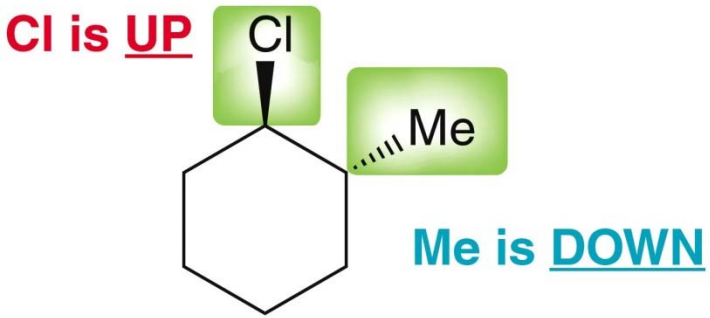


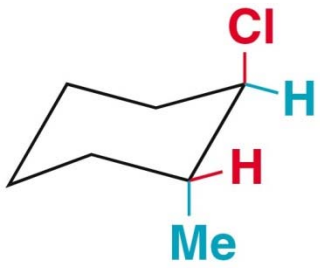
1,3-Diaxial interaction

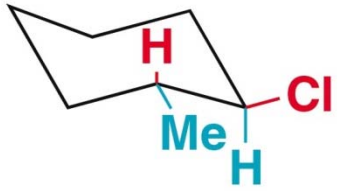


Disubstituted Cyclohexane

- When multiple substituents are present, the positioning of the groups on the chair must be shown by using solid or dashed wedges or by showing the groups in either axial or equatorial positions.

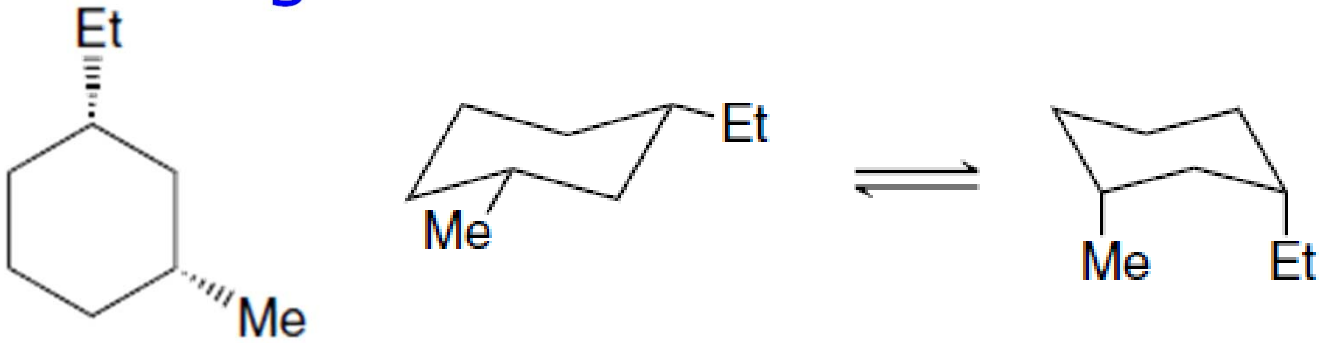




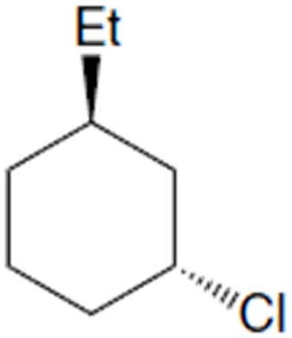


Disubstituted Cyclohexane

- Consider both chair conformations for the following molecule.



- Which would you expect to be more stable? WHY?
- Do the same analysis for this molecule.



For Next Time….

- Monday Finish Chapter 4 (if we haven't)
  - Chapter 5 (5.1-5.4)
  - BRING YOUR MODEL SET!
- Wednesday Exam #1 (Chapters 1-4)
- Homework Problems Chapter 4
- #1, 6, 10, 19, 25, 28, 36, 43, 48, 51,52, 63