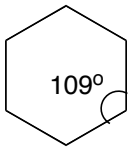
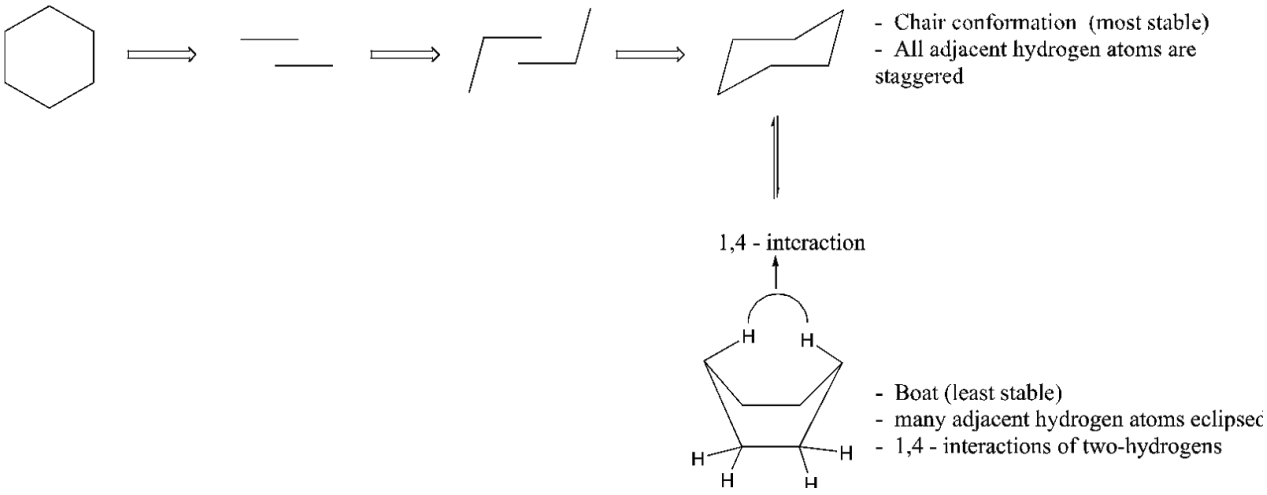
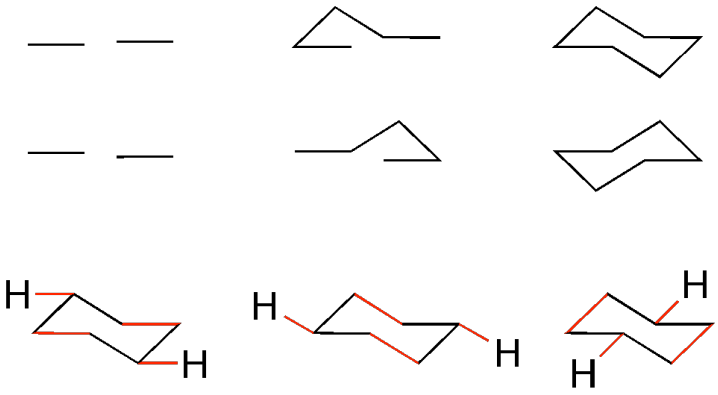
Cyclohexane – bond angles actually 109^o, not 120^o as in flat hexagon



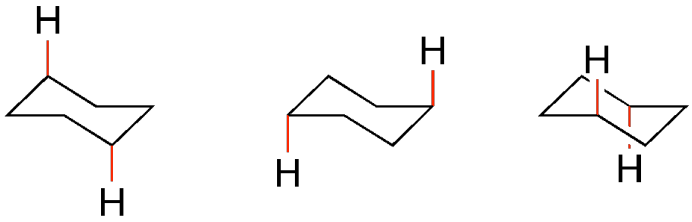
Cyclohexane Conformations – How to draw:



Another way to draw cyclohexane:

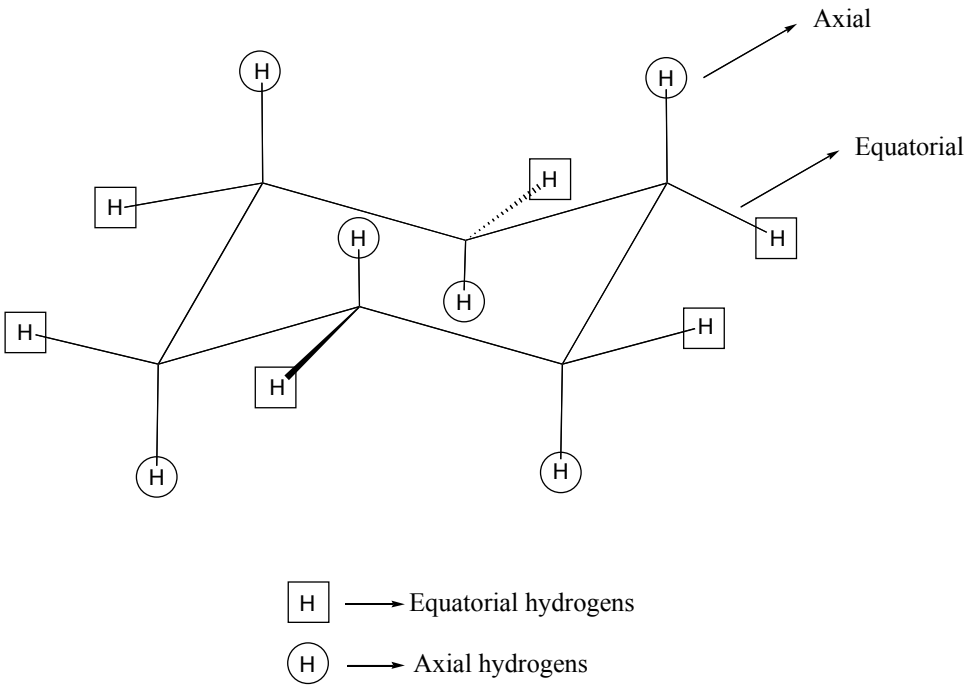


Parallel Lines in Equatorial Position

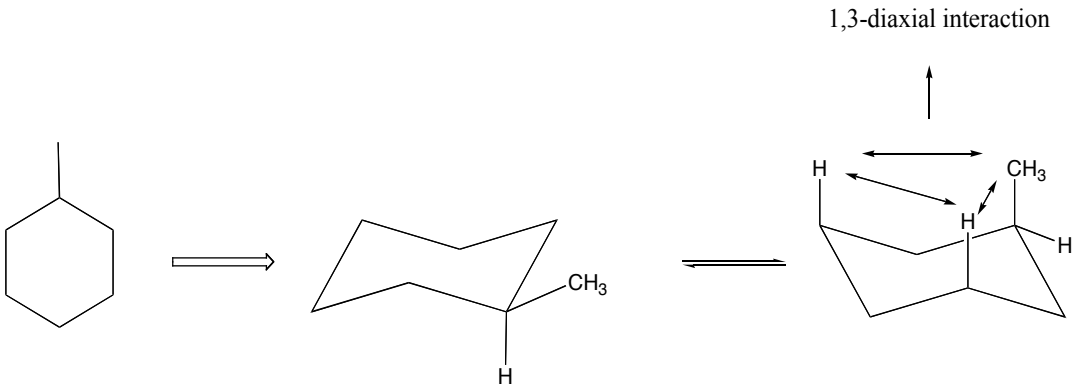


Vertical Lines in Axial Position

Cyclohexane Conformations Axial vs Equatorial positions

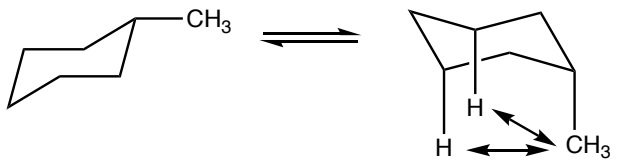


Substituted Cyclohexanes – Draw most stable conformation



- Largest (bulkiest group close to ring) group generally placed equatorial – otherwise get unfavorable 1,3-diaxial interactions

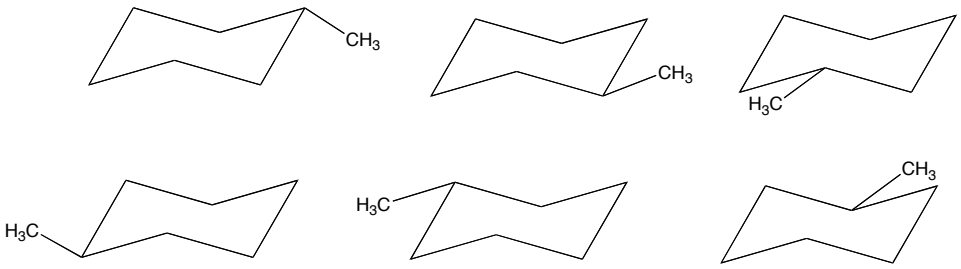
- 1,3-diaxial interaction (steric effect) makes this conformation less stable.



Equatorial methyln interaction
More stable

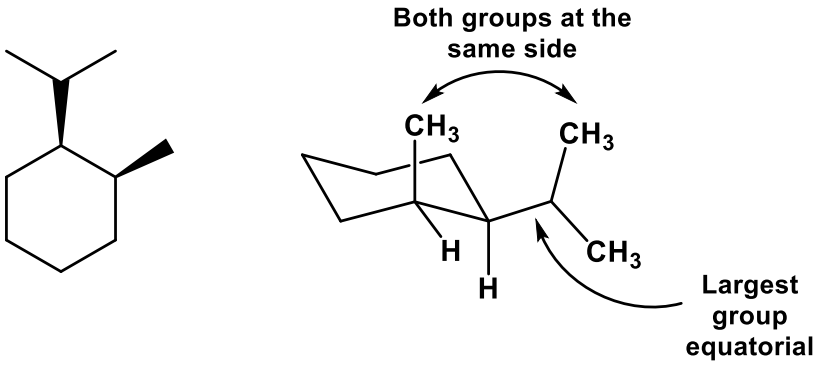
Axial methyl interaction
Less stable

Most Stable Conformation of Methylcyclohexane – 6 drawings of same molecule below

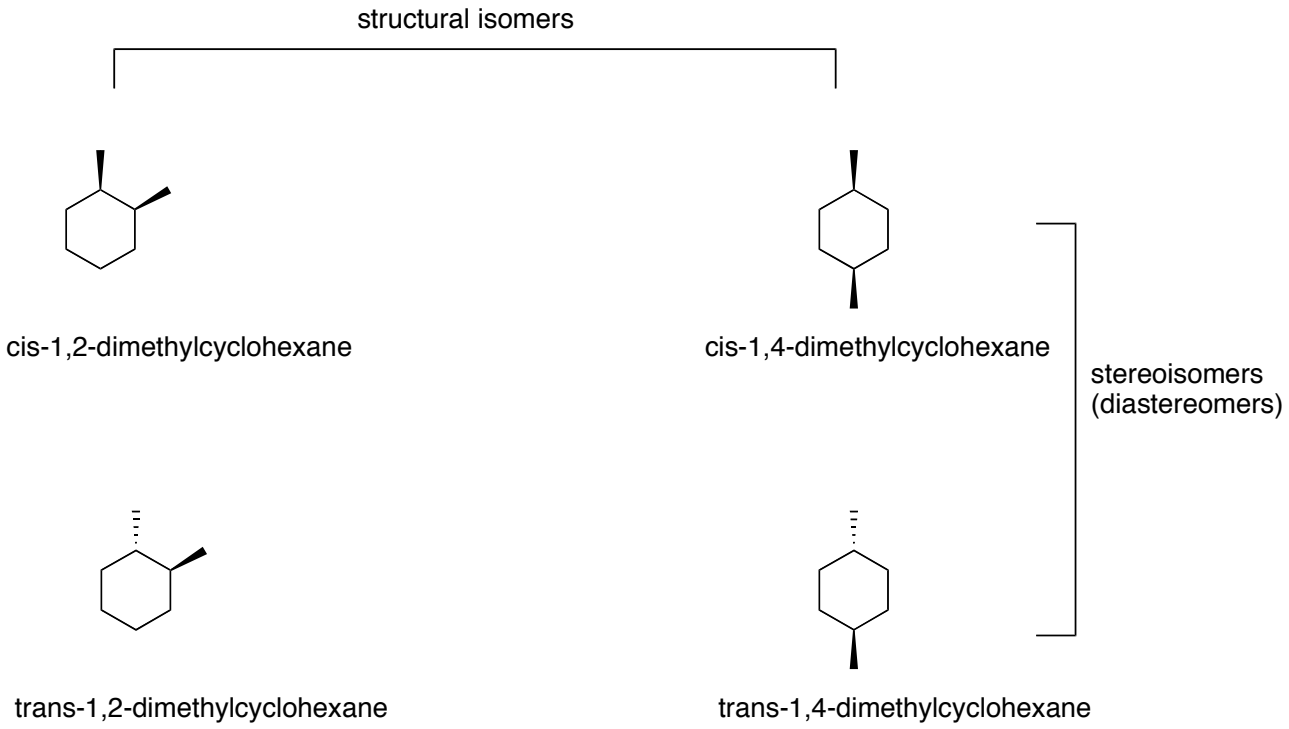


Polysubstituted cyclohexanes

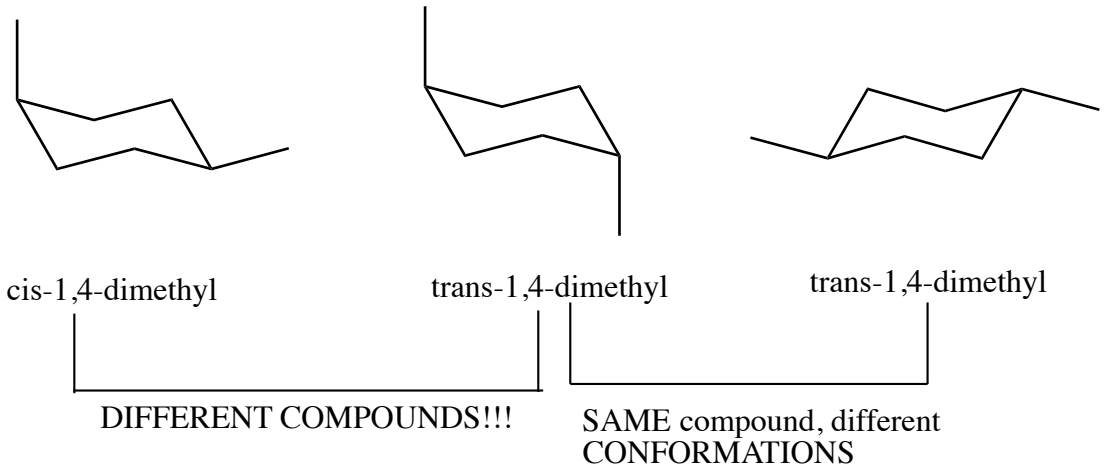
Example: cis-1-isopropyl-2-methylcyclohexane



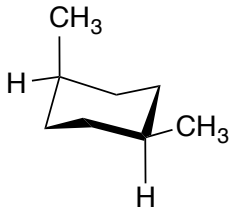
Example: 1,2-dimethylcyclohexane and 1,4-dimethylcyclohexane



cis-1,4-dimethylcyclohexane and trans-1,4-dimethylcyclohexane:

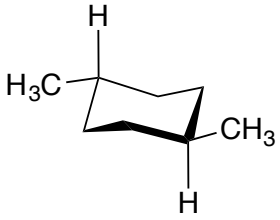


Example: cis-1,4-dimethylcyclohexane:



cis-1,4-dimethylcyclohexane

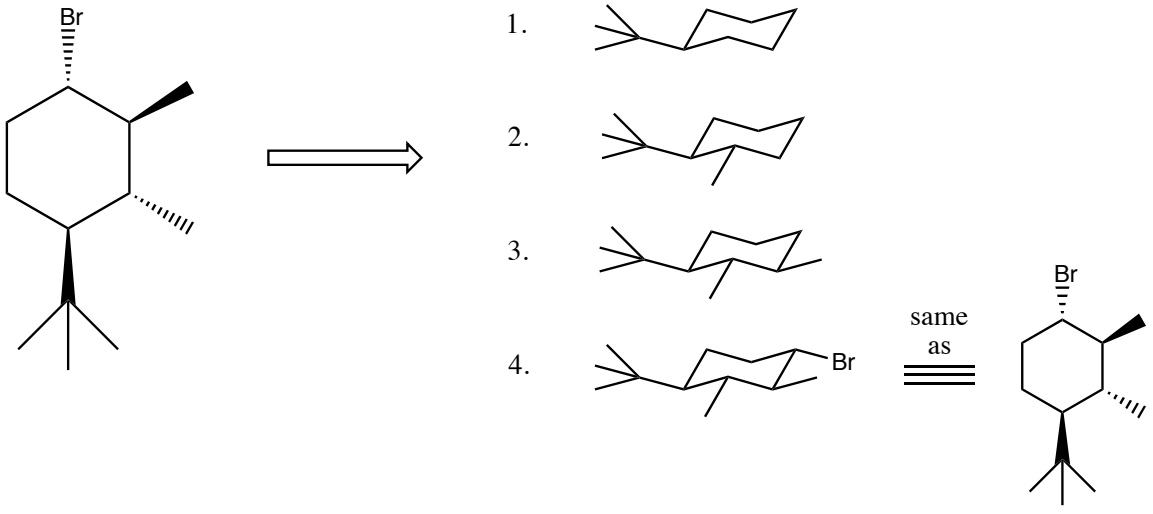
Example: trans-1,4-dimethylcyclohexane:



trans-1,4-dimethylcyclohexane

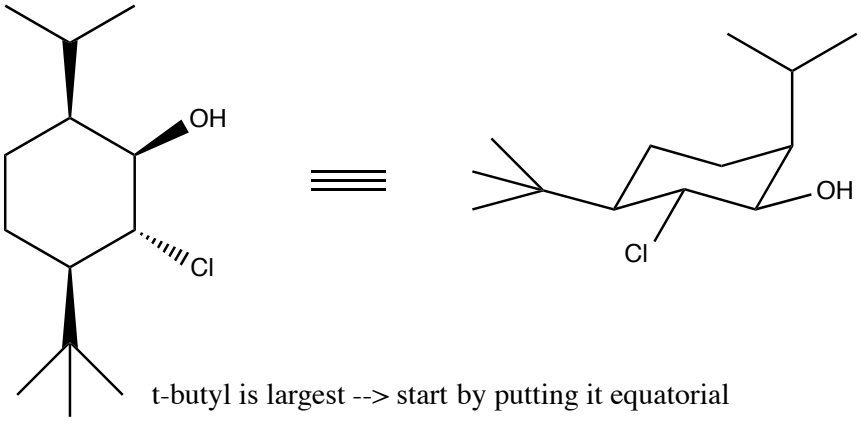
How to draw the most stable conformation of substituted cyclohexanes:

1. Start by drawing the chair conformation of cyclohexane
2. Put the largest group in an equatorial position
3. Draw the next group(s) on the correct side (face) with respect to the largest group



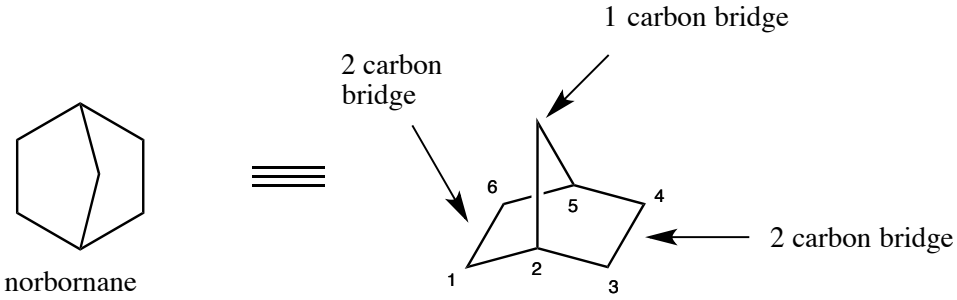
Note that the largest substituent (t-butyl) is placed in the equatorial position to avoid destabilizing 1,3-diaxial interactions

Another example:



t-butyl is largest --> start by putting it equatorial

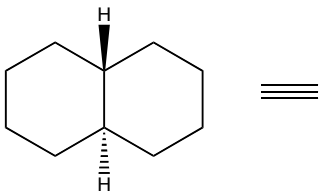
Examples of basic bicyclic compounds:

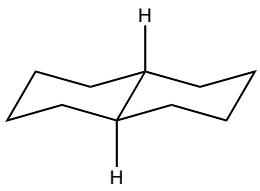


norbornane
C_7H_{12}
Degrees of unsaturation: 2

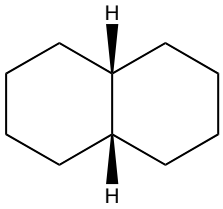
2 bridge head carbons (2 and 5)
6 membered ring in a boat conformation

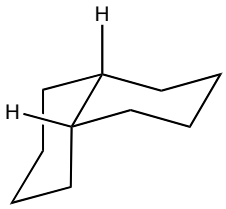
trans-decalin:





cis-decalin:

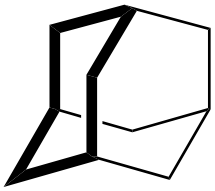




stereoisomers

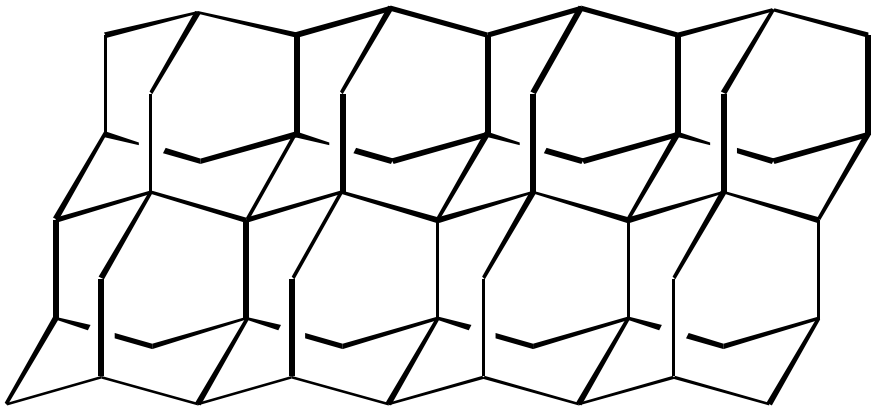
2 degrees of unsaturation

A tricyclic compound:

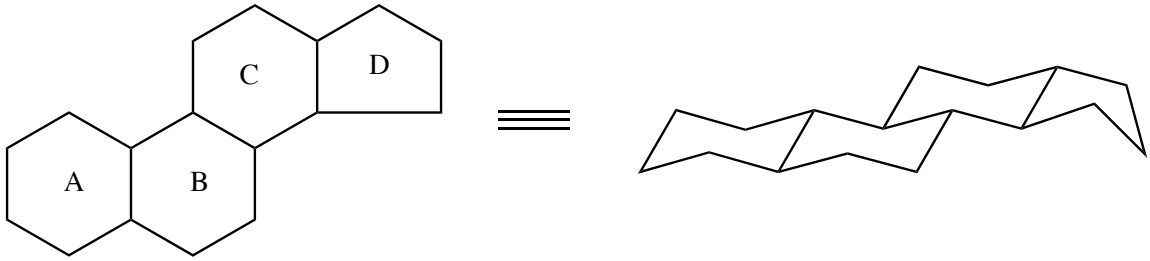


Adamantane

Diamond:



Steroids:



trans-fused