

10/13/11

Angle Strain

Chair + Boat forms of cyclohexane

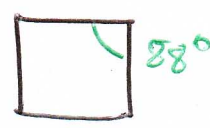
Cis + trans

axial vs equatorial

Angle strain - higher potential energy caused by distortion of bonds caused by deviation of molecular geometry from ideal angles not planar!

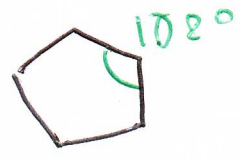


Cyclopropane

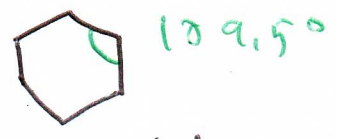


Cyclobutane

highly strained



cyclopentane

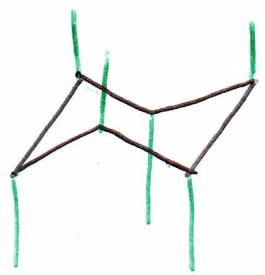


Cyclohexane

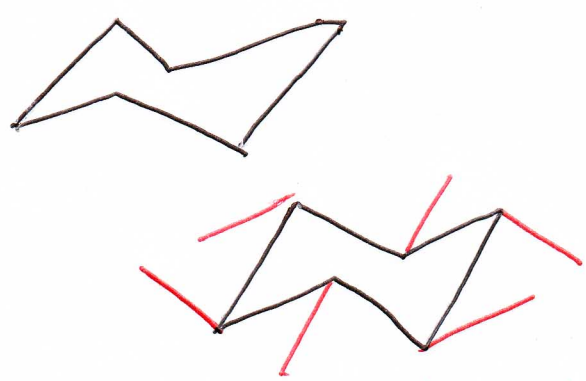
Little or no angle strain

- Rings with 7-11 carbons have a very small amount of strain; past 11 carbons, rings again have no strain

cyclohexane



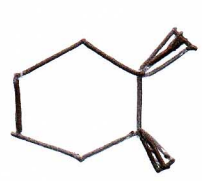
axial substituents



equatorial substituents

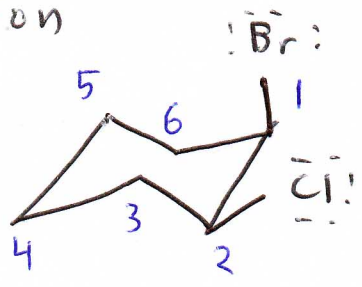
vicinal - refers to neighboring positions

geminal - refers to two substituents on the same position

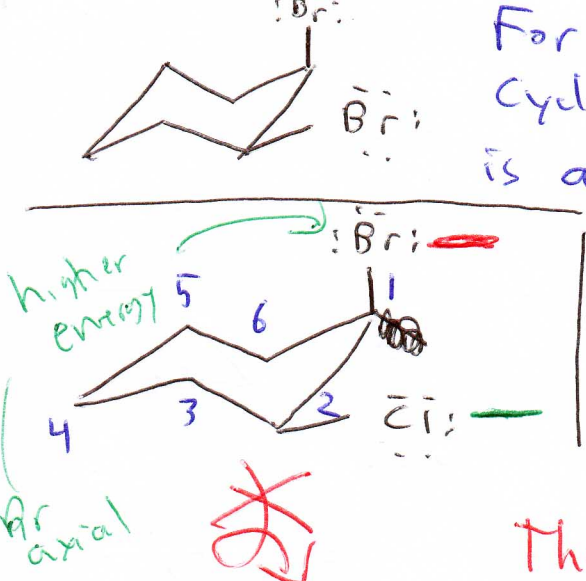


vicinal dihalide

cis - both pointed the same way

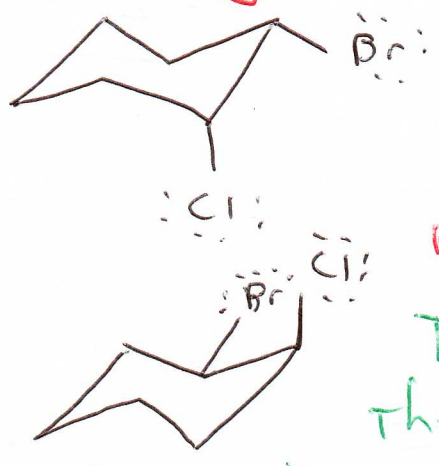


For vicinal cis-substituted cyclohexane rings, one substituent is always axial, the other equatorial

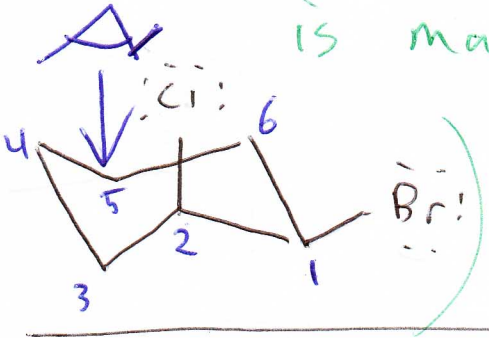


ring flip - an inversion of a cyclohexane ring in which axial substituents become equatorial and vice versa.

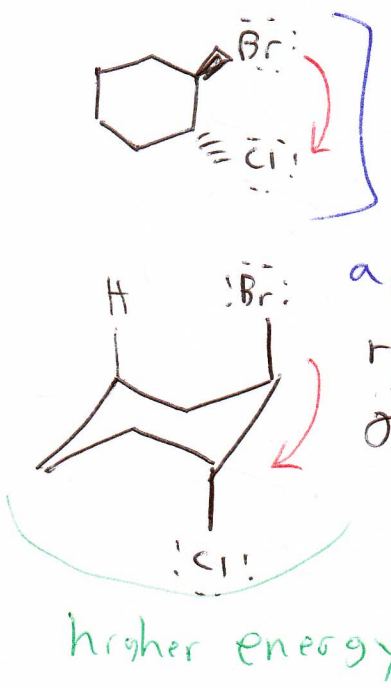
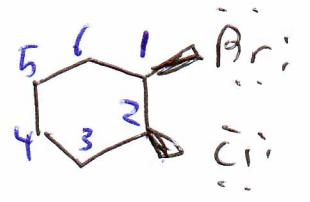
This is an improper ring flip; the axial + equatorial positions were exchanged, producing a mirror image molecule



This is a proper ring flip because the relative geometry (up vs down) is maintained.

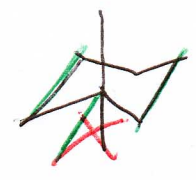
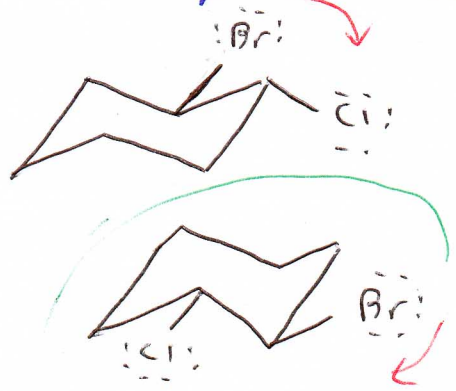


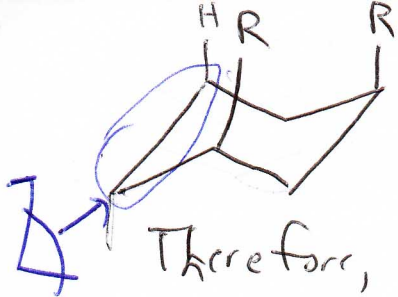
Also correct



trans-substituents pointed opposite ways For vicinal trans-substituted cyclohexane rings, both substituents are either axial or equatorial.

ring flip

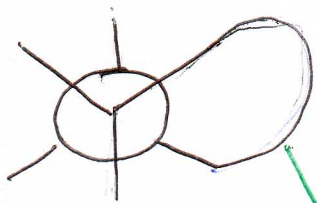




Diaxial steric strain - two axial substituents are close enough together to experience steric hinderance.

Therefore, when possible, the most sterically strained substituent will adopt the equatorial position.

Every bond in a chair structure has a staggered - not eclipsed - geometry.



(crest of the ring)

