Course chem 343 Lecturer Sam Kellman

Day Monday Date 10/21/13

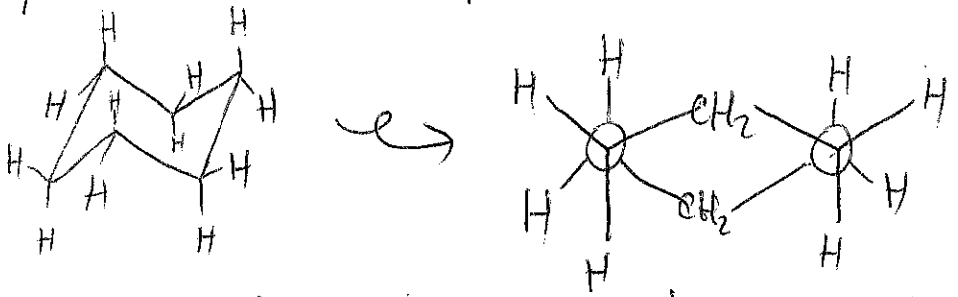
Notes Taken By Floriana Foarta Total # of Pages 6

Submit a *Single-sided Copy* to the Undergraduate Office

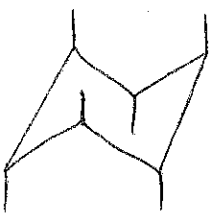
NO NOT STAPLE - ONLY WRITE NOTES INSIDE THE SQUARE BELOW

Recall: Cyclohexane displays unusual stability, among cycloalkanes

Conformational analysis of cyclohexane..



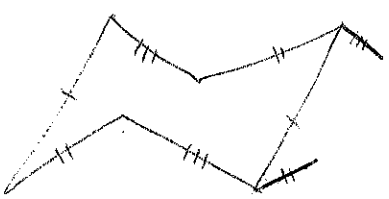
Two types of H positions (one per C): Axial and Equatorial



Axial

VS

Equatorial → Rules - system of parallel lines;



cyclohexane

nonsense:

← nonsense

Course _____ Lecturer _____

Day _____ Date _____

Notes Taken By _____ Total # of Pages _____

Submit a *Single-sided Copy* to the Undergraduate Office

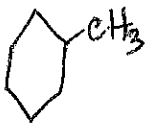
NO NOT STAPLE - ONLY WRITE NOTES INSIDE THE SQUARE BELOW

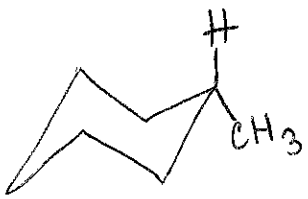
Principles

In  , all axial H's are equivalent to one another, and all equatorial H's are equiv. to one another, BUT axial positions are different from equatorial

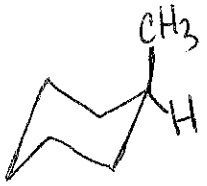
(Apply to substituted cyclohexanes as well)

Consider a monosubstituted cyclohexane:



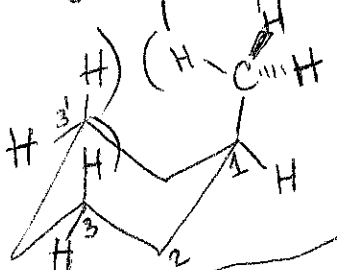


is more stable than



Equatorial CH_3 axial CH_3

Origin of difference - internal strain in the axial CH_3 conformation



"Relative numbering"

"1,3-diaxial interactions"

Course _____ Lecturer _____

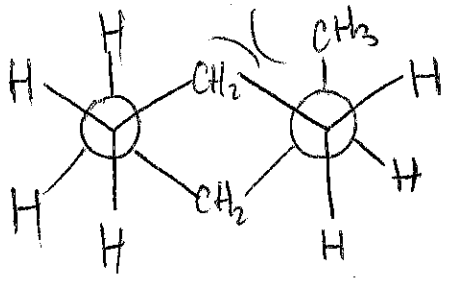
Day _____ Date _____

Notes Taken By _____ Total # of Pages _____

Submit a *Single-sided Copy* to the Undergraduate Office

NO NOT STAPLE - ONLY WRITE NOTES INSIDE THE SQUARE BELOW

Alternative view:



Gauche interaction of CH_3 vs a ring CH_2

Questions:

① Where is the second 1,3 diaxial interaction from the Newman perspective?

② What is the Newman proj. of the equatorial conformation? Why no gauche?

Nearly
Every cyclohexane derivative has two chair conformations Switching from one to the other interconverts all axial and equatorial substituents.

Thus,

"chair flip"

Course _____ Lecturer _____

Day _____ Date _____

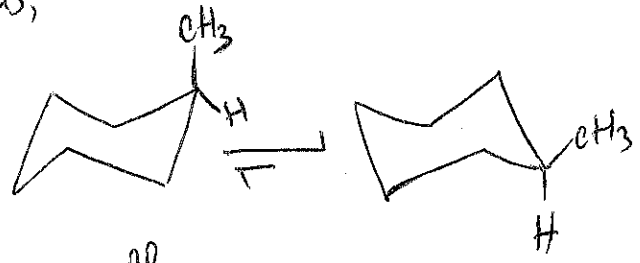
Notes Taken By _____ Total # of Pages _____

Submit a *Single-sided Copy* to the Undergraduate Office

NO NOT STAPLE - ONLY WRITE NOTES INSIDE THE SQUARE BELOW

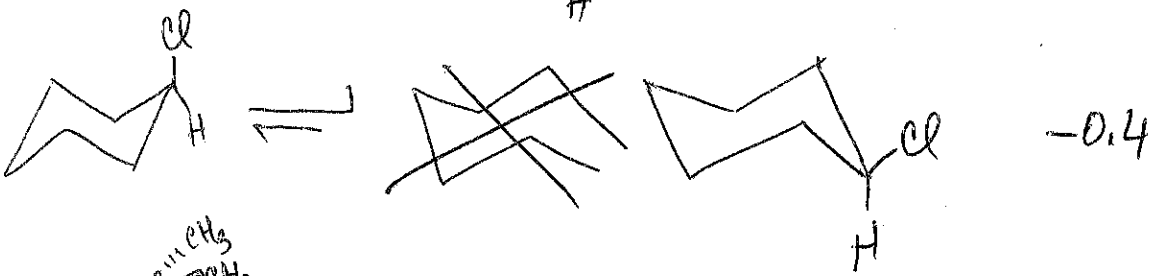
Since axial position experiences steric crowding (1,3-diaxial), but equatorial position does not, position of "chair flip" equilibrium provides insight on substituent size.

Thus,

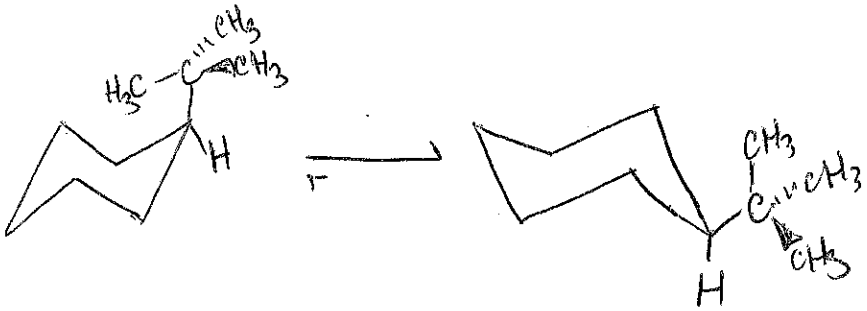


ΔH° (Kcal/mol)

−1.8



−0.4



−5 ⇒ "tBu" locks cyclohexane ring in one chair conformation

"A values" – see Wiki

We must be able to recognize when drawings, based on different perspectives, define the same molecule/conformation

Course _____ Lecturer _____

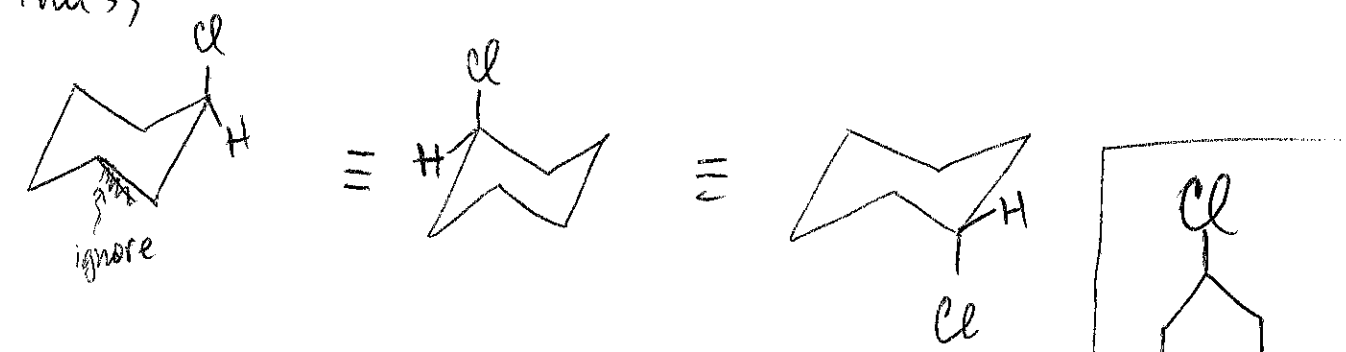
Day _____ Date _____

Notes Taken By _____ Total # of Pages _____

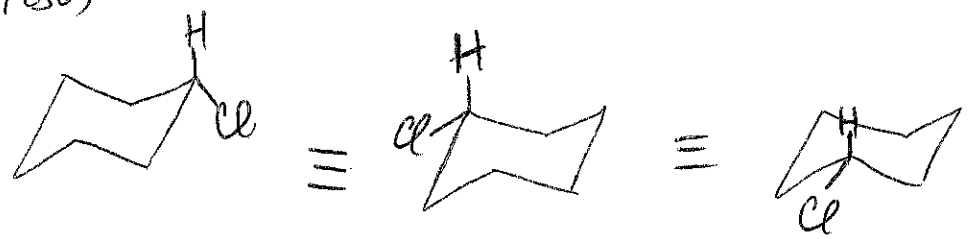
Submit a *Single-sided Copy* to the Undergraduate Office

NO NOT STAPLE - ONLY WRITE NOTES INSIDE THE SQUARE BELOW

Thus,

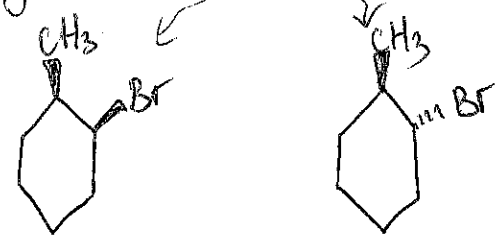


Also,

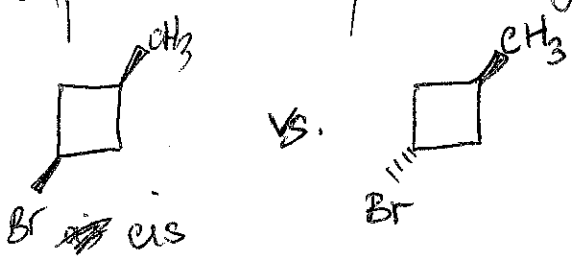


Disubstituted cyclohexanes

In general, cis's vs trans



Also for stereoisomers of other ring sizes:



Course _____ Lecturer _____

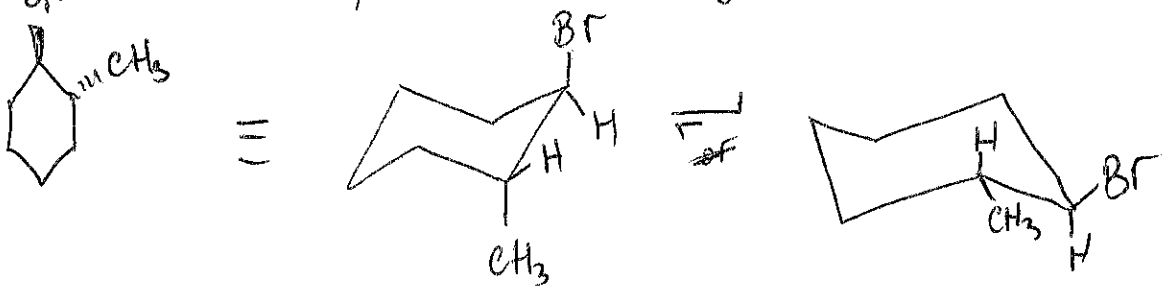
Day _____ Date _____

Notes Taken By _____ Total # of Pages _____

Submit a *Single-sided Copy* to the Undergraduate Office

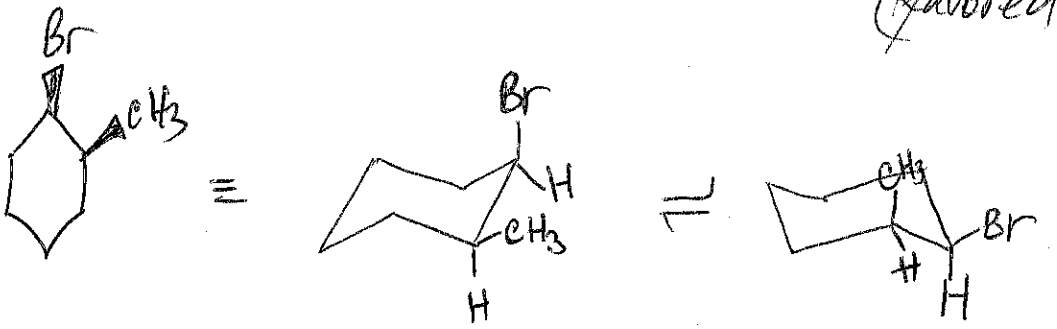
NO NOT STAPLE - ONLY WRITE NOTES INSIDE THE SQUARE BELOW

For cyclohexanes, conformational analysis possible...



diaxial

diequatorial (favored)



Ax, Eq.

Eq, Ax.

1,2

Challenge- relate cis vs. trans to ax/eq. for 1,3 and 1,4