Course Chem 343 Lecturer Gellman (11am)

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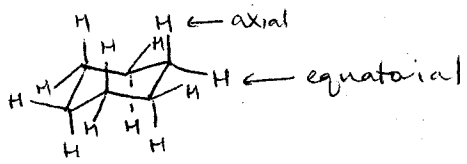
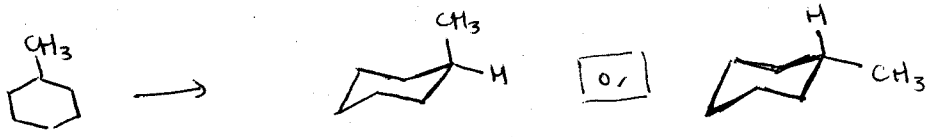
Recall: "Chair Conformation"



With Substituent:



Axial Methyl (Less stable)

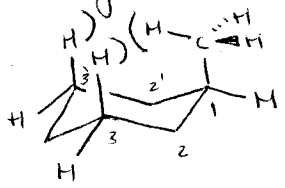
Equatorial Methyl (more stable)

[~1.8 kcal/mol difference in energy]

→ Origin of energetic difference between conformations

Axial Methyl has additional internal strain relative to the conformation with equatorial methyl

More specifically: 1,3 diaxial interactions (relative numbering)



Axial Methyl bumps into other axial atoms (Hydrogens in this case).

→ Example of **Steric Repulsion**

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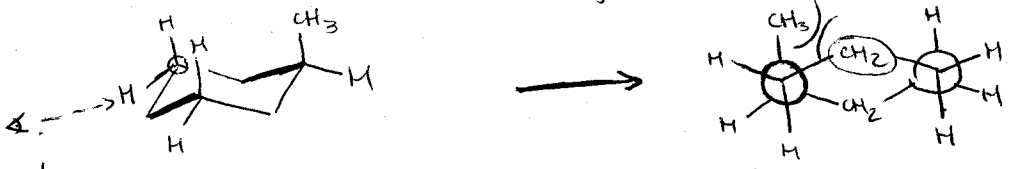
Consider also the Newman Projection:



Axial Methyl has Gauche interaction with ring CH_2's (Another is not pictured in this projection

→ Consider on your own:

① Where is the other ring Carbon that is gauche to the CH_3 group?

② The Newman projection for the equatorial Methyl conformation

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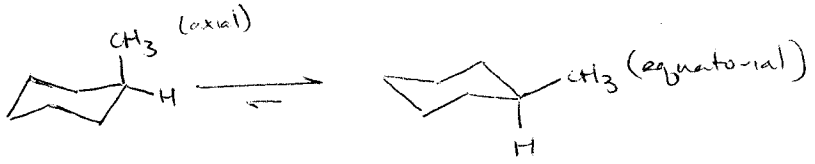
Cyclohexane:

Has two chair conformations. Converting one to the other causes each axial bonding partner to become equatorial, and each equatorial bonding partner to become axial



- Interconversion occurs! -

Forms biased equilibrium

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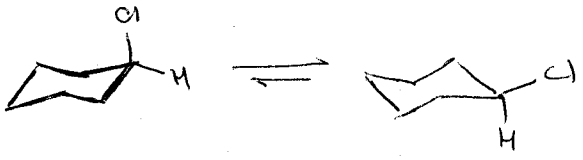
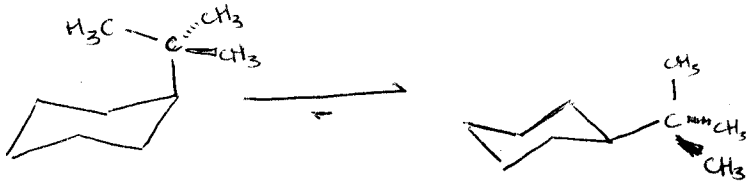
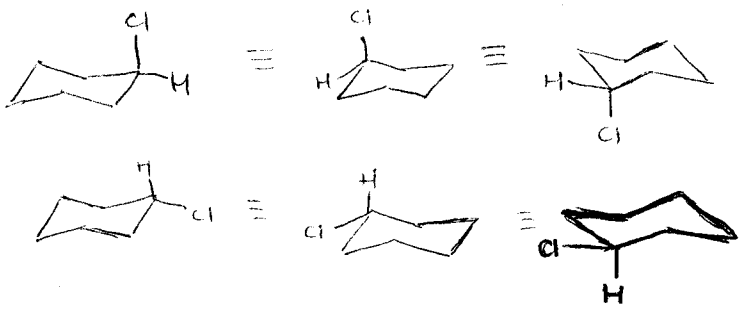
The size of a given substituent (its steric bulk) can be "measured" by the equilibrium ratio between the two conformational isomers of a monosubstituted cyclohexane

	ΔH° (kcal/mol)
	-1.8
	-0.4
	-5 kcal/mol

(^{t}Bu cyclohexane is essentially "locked" in the equatorial conformation).

Note: Don't be confused by the ways cyclohexane derivative is drawn

ex:



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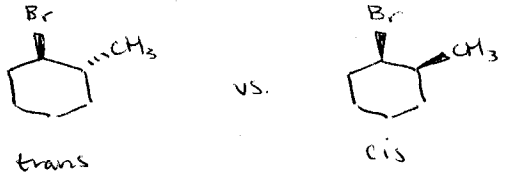
Disubstituted Cyclohexanes

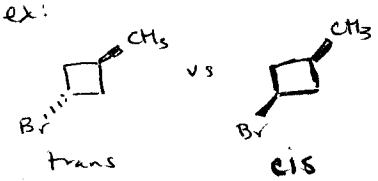
Cis vs. trans



trans cis

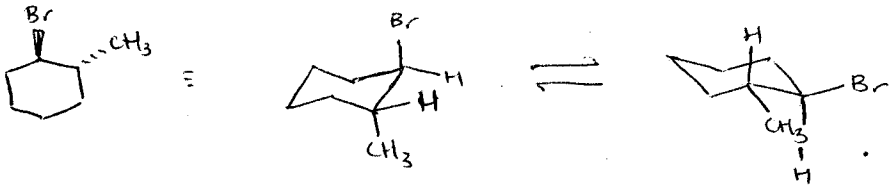
NOTE: Cis/trans nomenclature is operational for all ring sizes

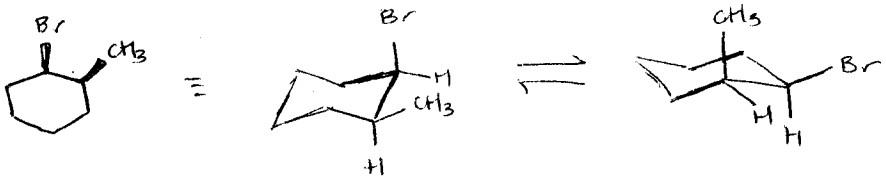
ex:



trans cis

Cis/trans vs. Axial/Equatorial for 1,2 disubstituted cyclohexanes





Consider on your own!

1,3 disubstituted cyclohexanes

1,4 disubstituted cyclohexanes

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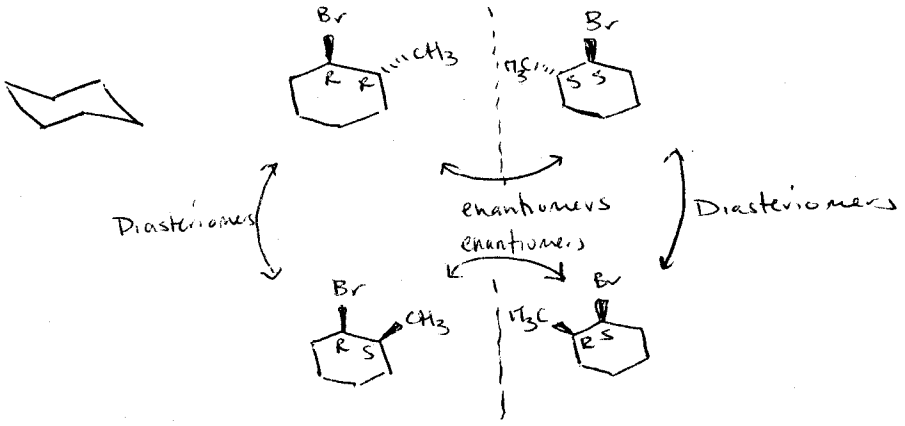
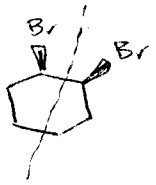
These compounds are chiral!



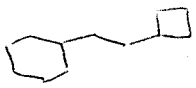
But:



MESO!

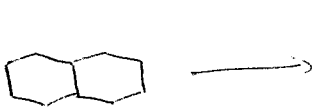
Organic Molecules with Two or more rings

Simple

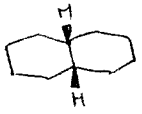


Challenging: Sharing 1 or more atoms

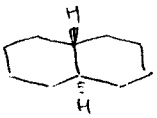
Examples: Fused Rings



decalin



cis-decalin



trans-decalin

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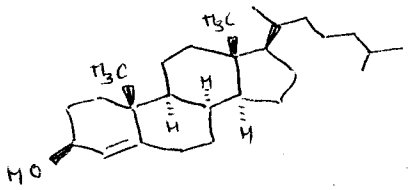
Biological examples of fused rings



'Cholesterol'