

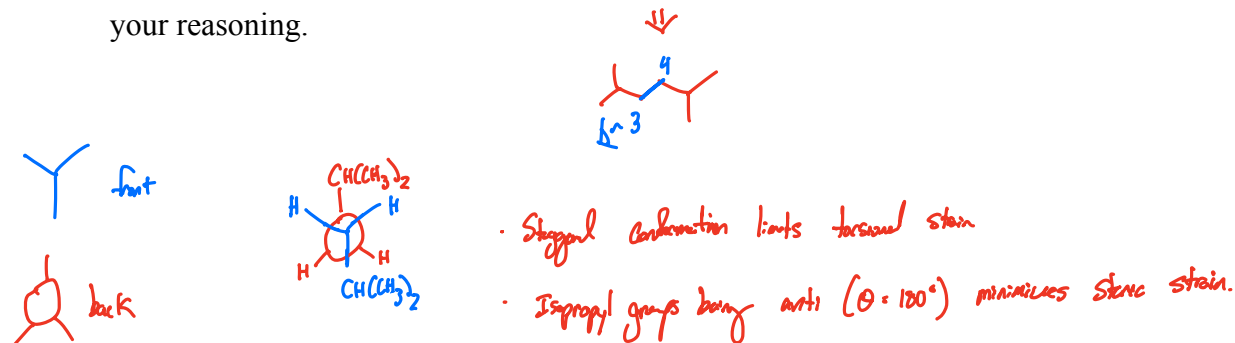
CHEM 223 (2024) SI Session #5

Learning Objectives: By the end of this session, students should be able to:

- Draw the chair-chair interconversions between cyclohexane.
- Draw newman projections for cyclohexane
- Apply concepts from chapters 1, 2 and 3 to previous year's exam questions

Section 1: Applying Newman Projections

1. Draw the most stable conformer of 2,5-dimethylhexane down the C3-C4 bond. Explain your reasoning.



Section 2: Cycloalkanes

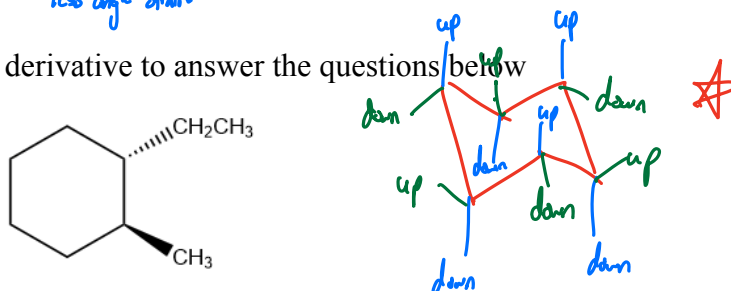
2. Which cycloalkane is the most stable? Explain.

Cyclohexane: bond angles are the closest to 109.5° , while also being small enough to minimize steric strain.

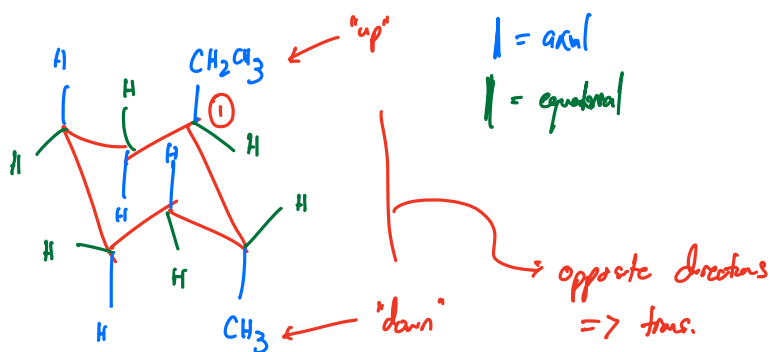
less angle strain

3. Use the following cyclohexane derivative to answer the questions below

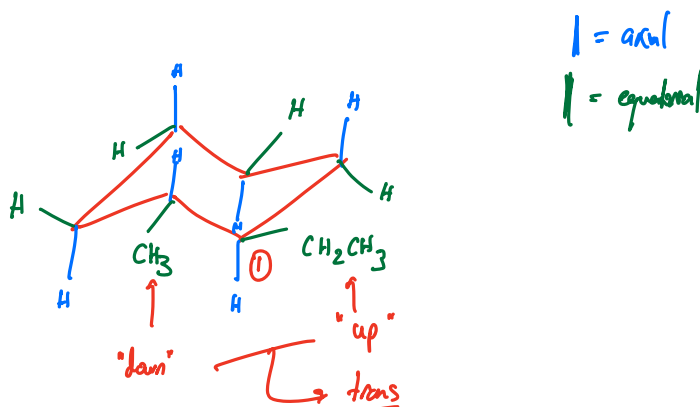
- Start w/ ring pos. (axial/equ)
- talk abt. up/down
- talk abt. cis/trans



- a. Convert the structure into its chair conformation. Draw all hydrogens and label the axial and equatorial bonds.



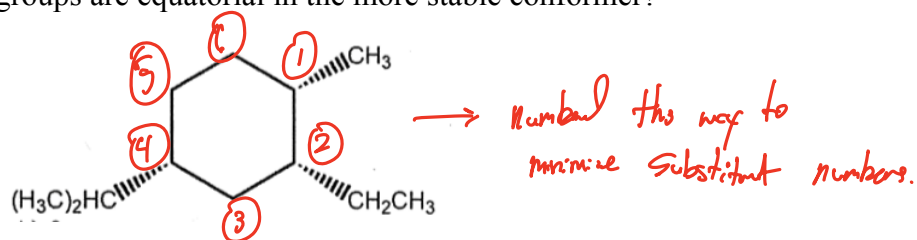
- b. Convert the structure in (a) to its other chair conformation (chair-chair interconversion). Draw all hydrogens and label the axial and equatorial bonds.



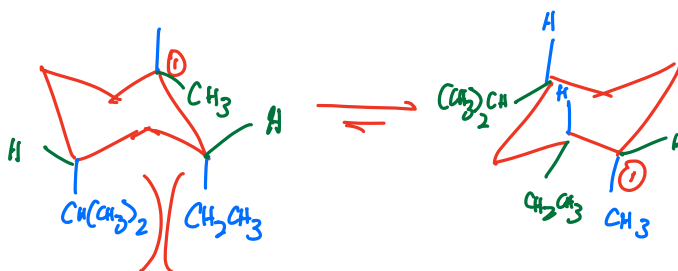
- c. Which structure (a or b) is more stable? Explain your answer.

B is more stable; both groups are equatorial, which minimizes steric effects with the ring.

4. (From 2023's Exam 1) Draw the two chair conformers for the given cyclohexane derivative. How many groups are equatorial in the more stable conformer?



all groups
down

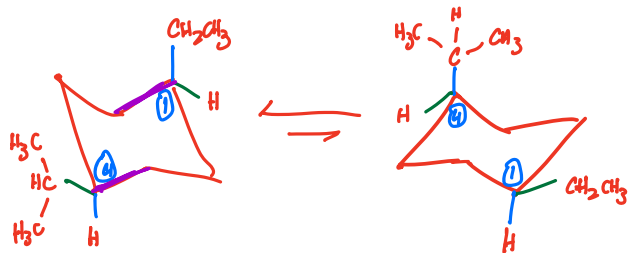


2,4 axial
interaction

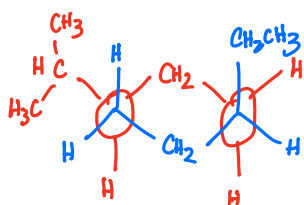
ethyl and isopropyl are equatorial in this conformer, reducing 1,3-diaxial interactions and thus stabilizing the resulting structure.

5. (Modified From 2023's Exam 1) Using the compound cis-1-ethyl-4-isopropylcyclohexane, answer the following questions

a. Draw the two chair conformations.



b. Explain which chair conformation is most stable. Use a newman projection, looking down C1-C6 and C3-C4 to explain your answer.

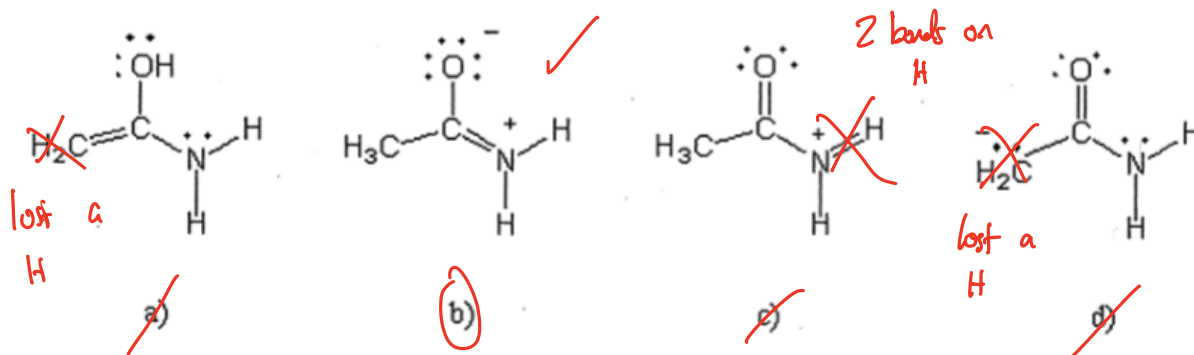
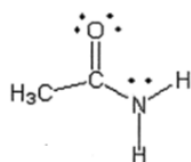


- avoiding diaxial interactions, as the 2 groups are farthest apart
- equatorial isopropyl allows the bulky group to be far from the main ring.

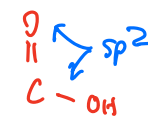
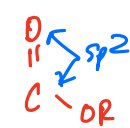
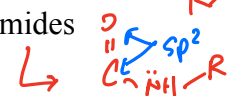
↳ minimizes steric effects with the ring.

Section 3: Practice Problems (All from 2022's Exam 1 or 2023's Exam 1)

6. Which of the following structures is another resonance structure for the compound below?



7. Which of the following functional groups does not contain an sp^2 hybridized atom?

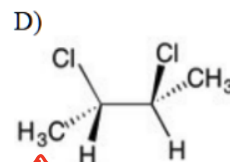
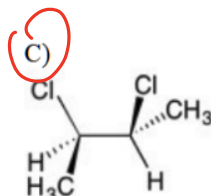
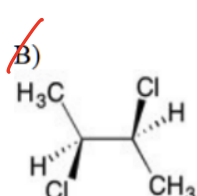
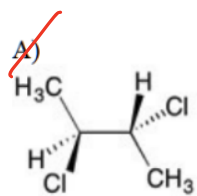
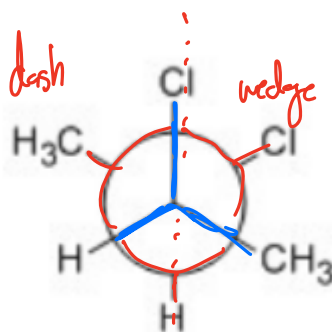
- a. Carboxylic Acids \rightarrow 
- b. Esters \rightarrow 
- c. Ethers \rightarrow $R-O-R$ all sp^3
- d. Amides \rightarrow 

8. Which of the following pairs of bases lists the stronger base first?

- a. $I^- > Cl^-$
- b. $H_2O > OH^-$
- c. $OH^- > H_2N^-$
- d. $CH_3COO^- > OH^-$
- e. $H_2N^- > CH_3COO^-$

\downarrow
least stable 1st

9. Which of the following perspective drawings best represents the Newman projection below?



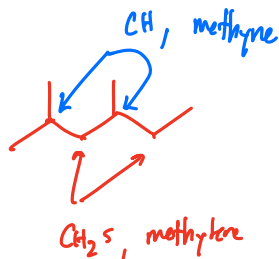
need Cl up on front carbon

wrong direction

10. How many methylene groups are in 2,4 dimethylhexane?

- a. 0
- b. 2
- c. 4
- d. 6
- e. 8

$R-CH_2-R$



11. Provide other reasonable resonance structures for the compound below

