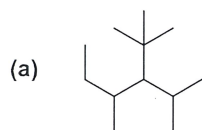


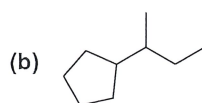
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Key Topics: *Nomenclature, Conformational Stability, Newman Projections, Chair Structures*

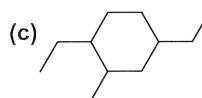
1. Using IUPAC rules (*see Chapter 2.14-2.18 and Table 2.4 and 2.5 in text*) provide a name to each structure below. Use common names for branched substituents where applicable. (6pts)



3-isopropyl-2,4-dimethylhexane

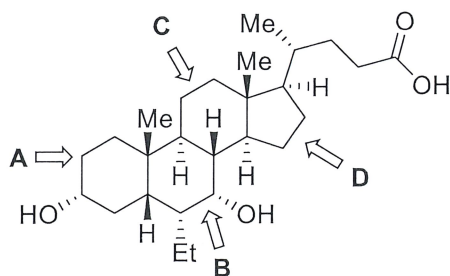


sec-butylcyclopentane

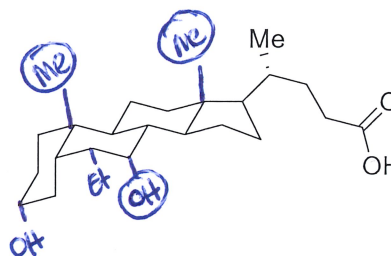


1,4-diethyl-2-methylcyclohexane

2. (a) Convert the semi-synthetic animal steroid shown below in bond-line form to its proper chair form by drawing in the missing non-hydrogen groups in their proper orientation and circle the groups that are axial. The skeleton is made up of the tetracyclic ring core. These 4 rings have been labeled A thru D for clarity. (7pts)



Bond-Line Form

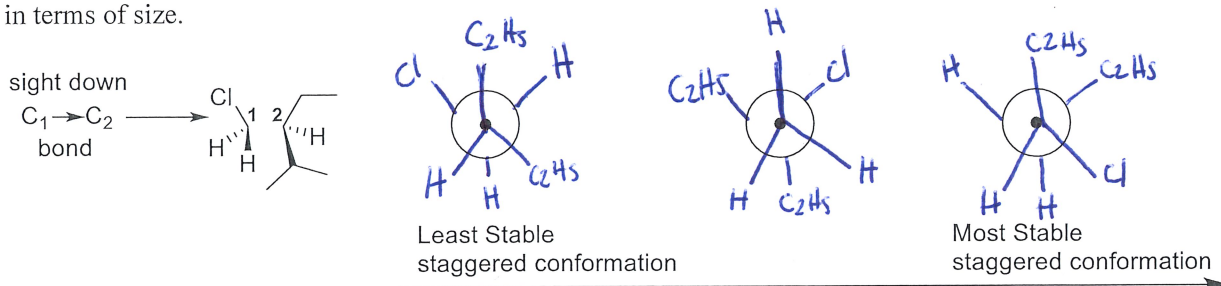


Chair Form

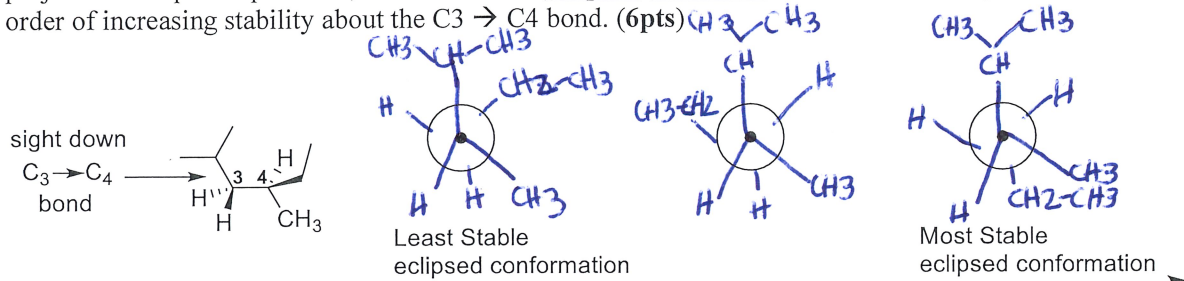
(b) Identify the two fused rings that represent a trans-decalin system (1pt) A, B

(c) Identify the two fused rings that do not represent a decalin skeleton. (1pt) B, C

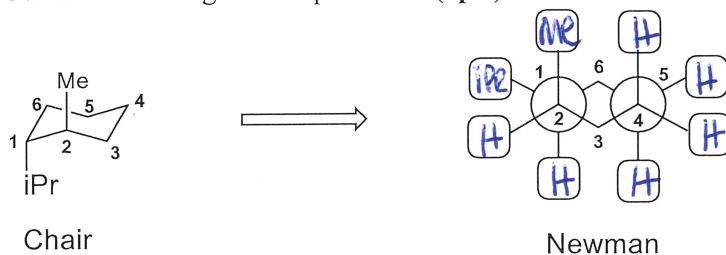
3. (a) Sighting down the $C_1 \rightarrow C_2$ bond, consider the bond-line structure shown below. Using the Newman projection templates provided, draw all three **staggered conformations** in Newman projection form in order of increasing stability about the $C_1 \rightarrow C_2$ bond. (6pts) You may assume that $iPr > Et > Cl$ in terms of size.



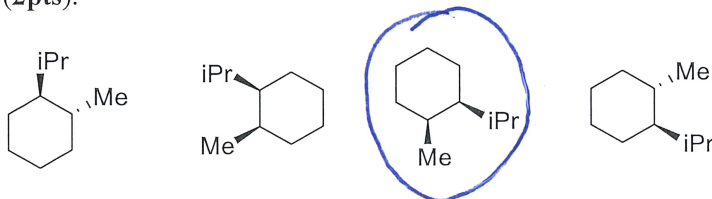
(b) Sighting down the $C_3 \rightarrow C_4$ bond, consider the bond-line structure shown below. Using the Newman projection templates provided, draw all three **eclipsed conformations** in Newman projection form in order of increasing stability about the $C_3 \rightarrow C_4$ bond. (6pts)



(c) (i) Convert the chair structure below into its proper Newman projection using the template provided. You need to fill in the empty boxes with the correct substituents (hydrogen and non-hydrogen groups). Use the numbering scheme provided. (4pts)



(ii) Circle the bond-line structure below that best represents the same structure provided above in part c(i) (2pts).



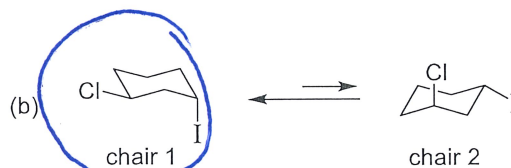
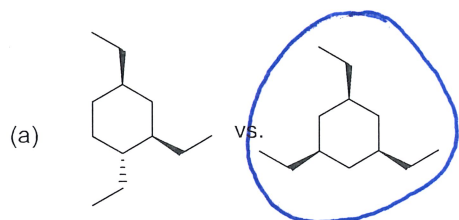
(iii) (1pt) Is the iPr group at C-1 in the chair axial or equatorial?

Axial

(iv) (1pt) Is the CH_3 group at C-2 in the chair axial or equatorial?

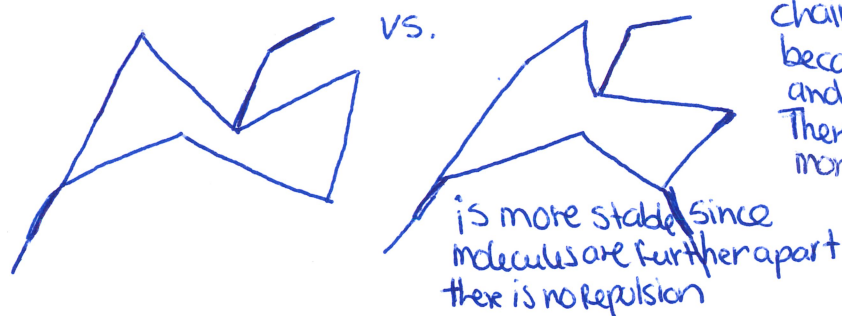
Equatorial

4. For (a) circle the most relative stable structure. Show work by drawing relevant chair structures and/or Newman projections (as needed) to clearly illustrate why. Explain your choice with a few words (no more than one sentence). It is best practice here that only the most stable conformations for each compound are being compared. For (b), provide a brief explanation for why chair 1 is more stable than chair 2. (10pts)

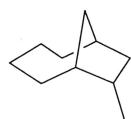


Briefly explain why chair 1 is more stable (and more favorable) than chair 2.

chair 1 is more stable than chair 2 because the molecules are further apart and are unlikely to interact with each other. There is less energy involved that means more stability.



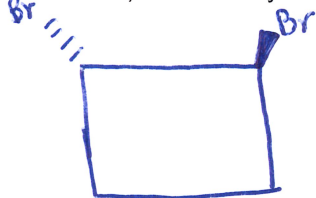
5. (a) (3pts) Provide a systematic (IUPAC) name for the structure below. You may ignore stereochemistry.



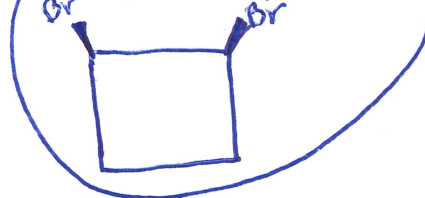
7-methylbicyclo[4,2,1]nonane

(b) Draw the structure of each compound below. Be sure to clearly show the relative stereochemistry. Then, circle the compound that will have the highest heat of combustion. (4pts)

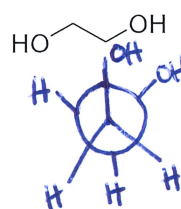
trans-1,2-dibromocyclobutane



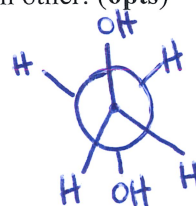
vs. cis-1,2-dibromocyclobutane



6. Draw and compare the Newman projections of when the OH groups are anti to each other versus when they are gauche to each other. Then, explain in a few words why the compound is more stable in the conformation where the OH groups are gauche to each other. (6pts)



Gauche form is more stable due to H-bonding.



Both the hydroxyl group is anti to each other.

The compound is more stable in the conformation where OH groups are gauche as the two OH groups are too close to each other or together leading to a repulsive interaction and more energy.