NAME (Print): _____

SIGNATURE: _____

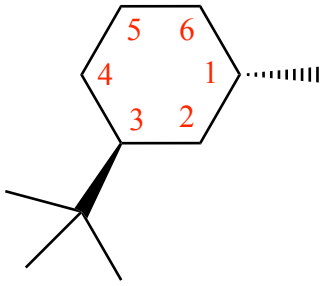
Chemistry 320M/328M
Dr. Brent Iverson
3rd Homework
September 13, 2022

Please print the first three letters of your last name in the three boxes

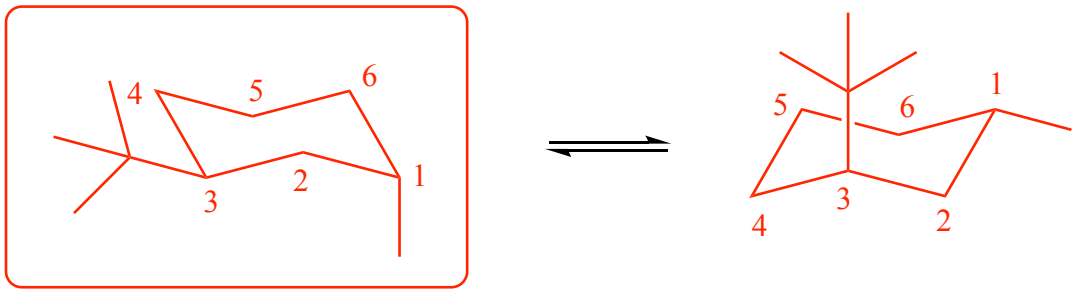
Score:_____

(Please include this as the second page of your homework problem set)

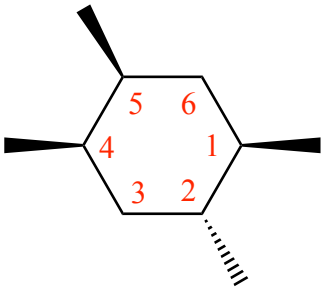
1) (7 pts each)Draw the alternative chair conformations of the following cyclohexane derivatives. When there is a difference in energy, circle the more stable chair conformation (i.e. the one that predominates at equilibrium).

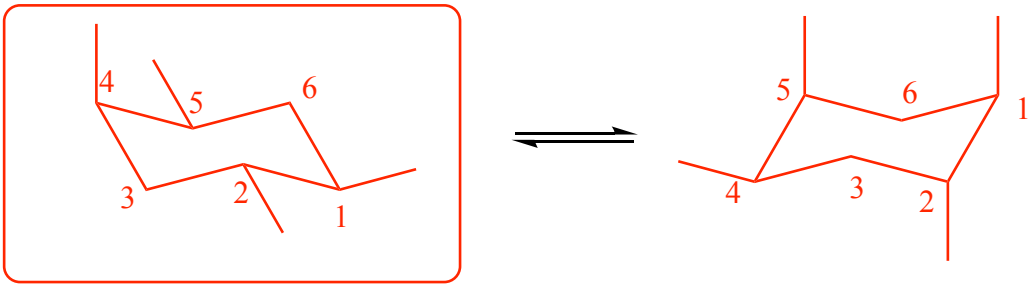


Size is important for steric interactions!!



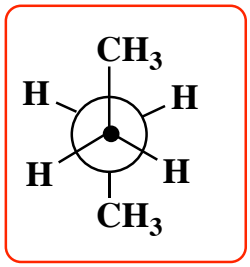
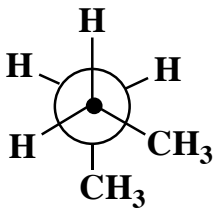
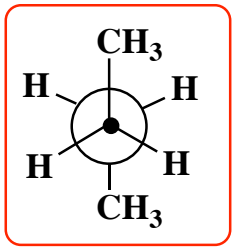
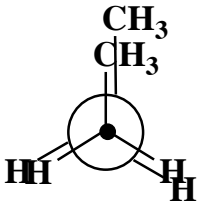
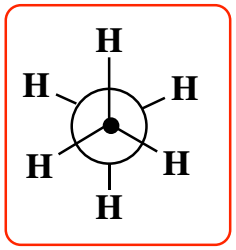
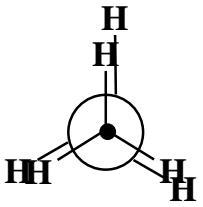
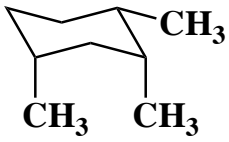
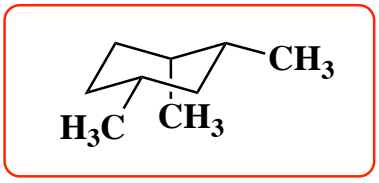
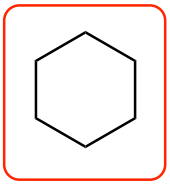
The much larger *tert*-butyl group is equatorial so this is more stable



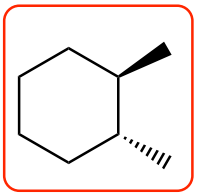
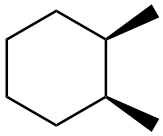


This chair has three equatorial methyl groups (on ring atoms 1,4 and 5) while the other chair only has a single equatorial methyl group.

2. (4 pts each) For each pair of molecules, circle the one that has LESS STRAIN, then put an "X" in the box under all the types of strain that explain(s) your answer:

			Angle strain	Torsional strain	Steric strain
	vs.		☐	☐	X
	vs.		☐	X	X
	vs.		☐	X	☐
	vs.		☐	☐	X
	vs.		X	X	☐

3. (4 pts) **Think about this last one, which one will have the most stable single conformation?**

	vs.		☐	☐	X

4) (2 pts each) Fill in the blanks with the words that best complete the following sentences.

_____Torsional_____ strain is the term used to explain that ecclipsed conformations of ethane are less stable than s.taggered conformations. For butane, the most stable conformation is the staggered, anti conformation because this conformation minimizes steric or (non-bonded interaction) strain between the methyl groups.

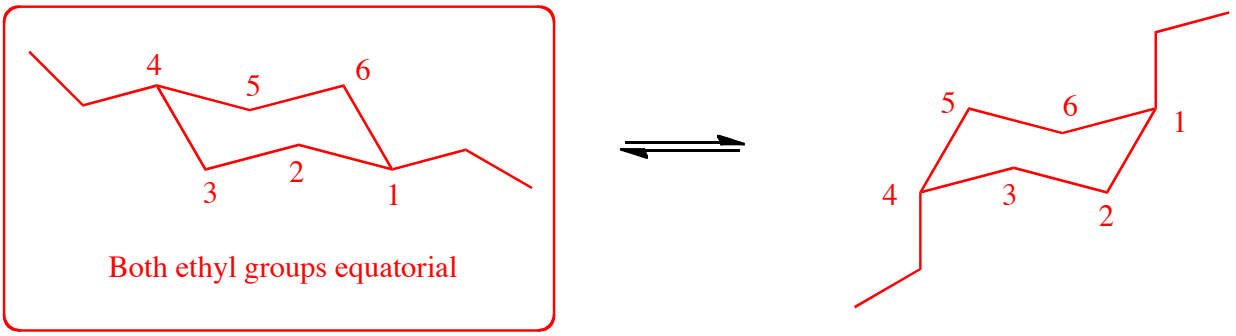
Large groups on cyclohexane molecules prefer to be equatorial primarily because of steric or (non-bonded interaction) strain. Another name for this kind of strain is a _____diaxial (or axial-axial)_____ interaction.

When two groups are on the same side (face) of a cycloalkane, they are described by the following term _____*cis*_____ .

When two groups are on the opposite side (face) of a cycloalkane, they are described by the following term _____*trans*_____ .

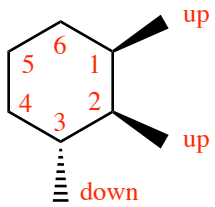
Cyclobutane has considerably more _____angle_____ and _____torsional_____ strain compared to cyclohexane.

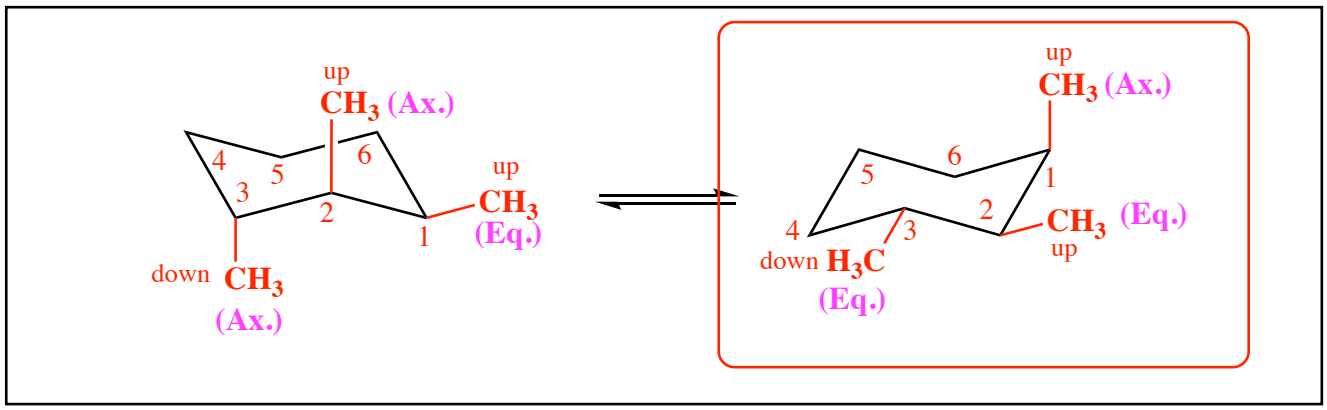
5) (7 pts) Draw the alternative chair conformations of *trans*-1,4-diethylcyclohexane. Draw a circle around the one that is more stable, i.e. the one that predominates at equilibrium.



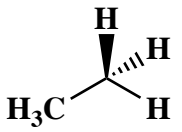
6. (7 pts) For the following cyclohexane derivative, draw the two alternative chair conformations. IF there is a difference in stability, draw a circle around the more stable conformation. If there is not any difference in stability, do not circle either chair form.

A)





7. (2 pts each) Examine the following structures. For each molecule with a chiral center, assign the stereochemistry then write "R" or "S" as appropriate in the box provided below each structure. For all molecules that have no chiral centers, leave the box blank.



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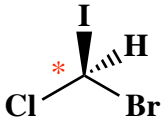
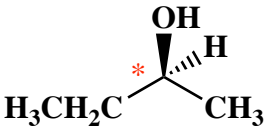
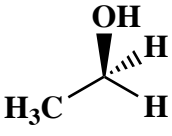


R



S



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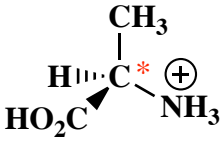
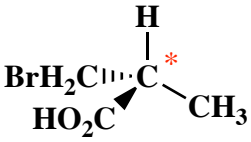
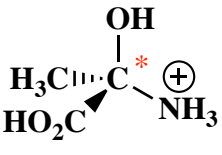


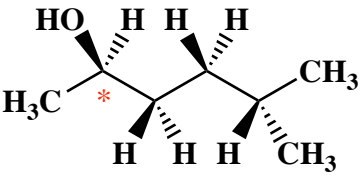
R



R



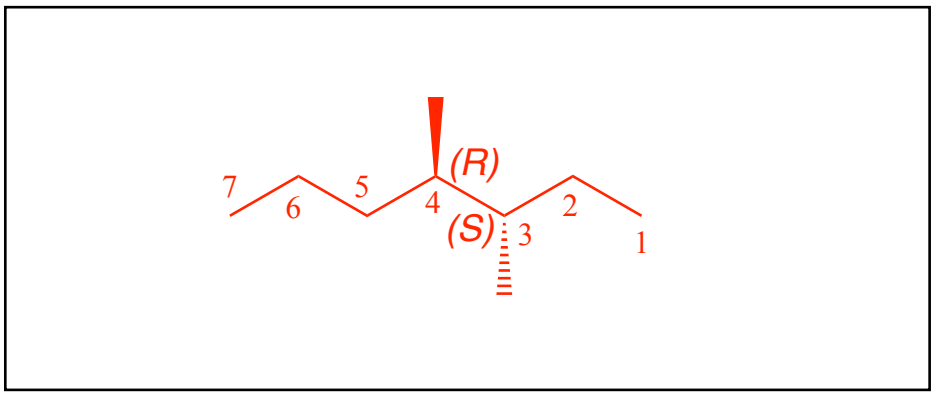
R



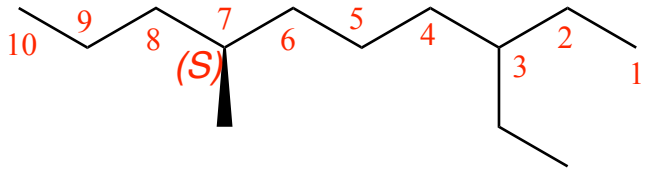
R

8. (6 points each) Write the structure that corresponds to the following IUPAC name:

(3*S*,4*R*)-3,4-dimethylheptane



Write the IUPAC name for the following molecule, including the use of "R" or "S" for all chiral centers.



(*S*)-3-Ethyl-7-methyldecane

Note it is OK if you started your answer with (*7S*)