Fall Semester
Final Exam

Name (print):

Name (Sign) :

Instructions:
1. Keep the exam closed until you are instructed to begin.

2. The exam consists of 9 questions. The first thing you should do is make sure that no pages are missing. If a page is missing, notify a proctor immediately.

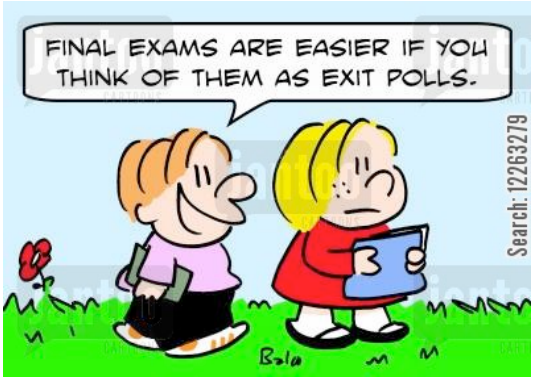
3. You will have **2 hrs** to complete the exam, at which time pencils must be put down. Budget your time wisely.

4. Make sure to show all of your work, and make it clear what your thought process was. Answers should fit in the space provided. If you need to use the back of the sheet of paper, you must make note of it in the space allotted for credit.

5. No potty breaks

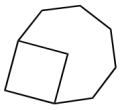
Breakdown

1. Nomenclature (12 points)	_____ / 12
2. Newman Projection (4 points)	_____/ 8
3. Equilibrium (12 points)	_____/ 8
4. Chair Conformation (8 points)	_____ / 8
5. Reactions (12 points)	_____/14
6. Mechanism (15 points)	_____/15
7. Synthesis (15 points)	_____ / 15
8. NMR (10 points)	_____ /10
9. General Spectroscopy (10 points)	_____ /10
	total _____ / 100



1) Nomenclature (12 points)

a. Give the IUPAC name of the following molecule (2 points)

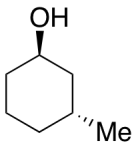


name: _____

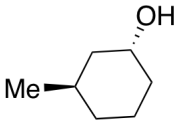
b. Draw (s)-octan-3-ol in line-angle notation (2 points)

c. One of these three is not like the others. Identify which of the following 3 are NOT the same, and state the relationship to the other 2 compounds (ie enantiomer, diastereomer, etc) (8 points, 4 points each)?

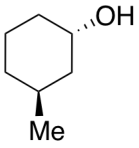
A



1



2

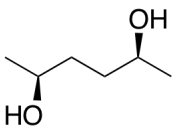


3

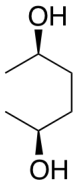
Different: ___

Relationship: _____

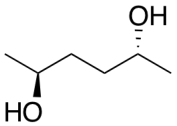
B



1



2



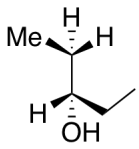
3

Different: ___

Relationship: _____

2) Newman Projections (8 points)

Convert the following molecule into a Newman projection and convert that into its lowest energy conformations. Make sure to explain your reasoning.

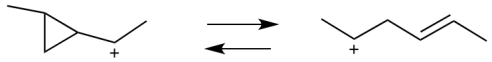


Newman in EXACT same comformation as shown	Lowest Energy Newman

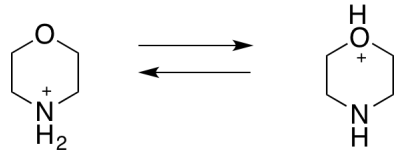
3) Knowing your organic molecule stability (12 points, 4 points each)

Predict which way the equilibrium would lie and explain your answer. Use structures when possible to support your answer, especially if you are invoking a resonance argument.

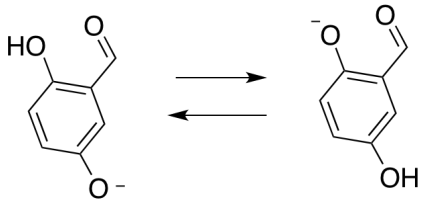
a)



b)

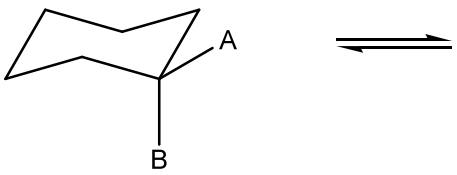


c)

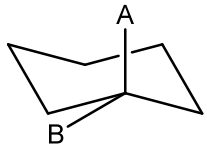


4) Chair Conformation (8 points)

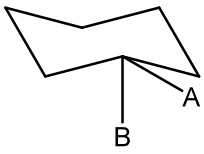
a. Chose the most appropriate alternate Chair Conformation (3 points).



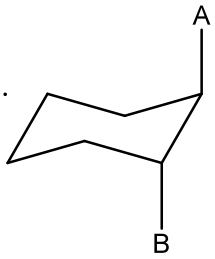
a.



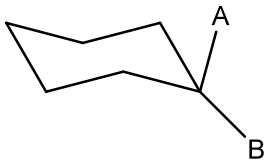
b.



c.

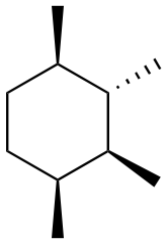


d.



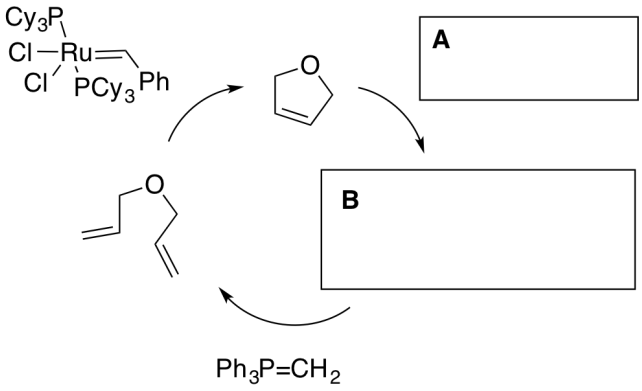
e. none

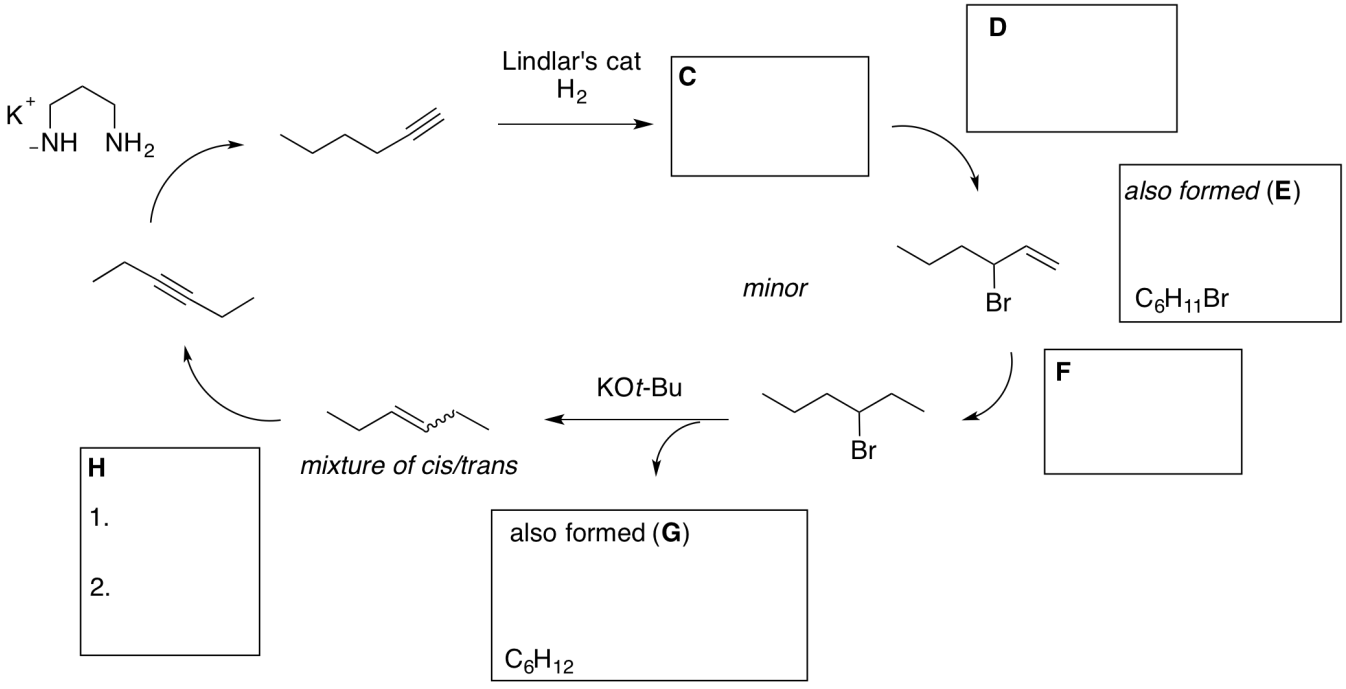
b. Convert the following molecule into its both chair conformations, and chose the one that is lower in energy (5 points).



5) Reactions (14 points)

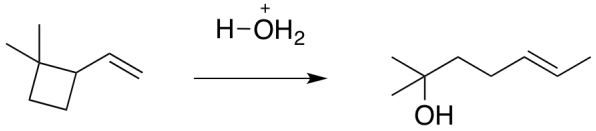
Fill in the blanks. It is not necessary to choose solvents, but you should show all reagents and related conditions necessary (ie heat, light, etc) for full credit.





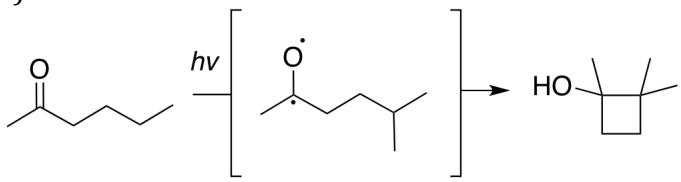
6) Mechanisms (15 points, 5 points each) *Propose a mechanism for the following transformations. Make sure to show <u>all</u> bond-forming and bond breaking events.*

a)



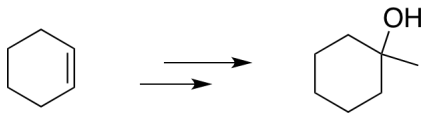
b) *Show a mechanism of the following reaction, and predict which diastereomer would be favored*

c)

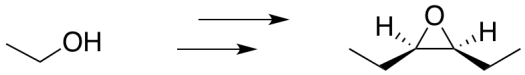


7) Synthesis (15 points) *Propose a synthesis of the following molecules using the starting materials shown as your only carbon-based starting material.* ***Show all of your intermediates****.*

a) (5 points)



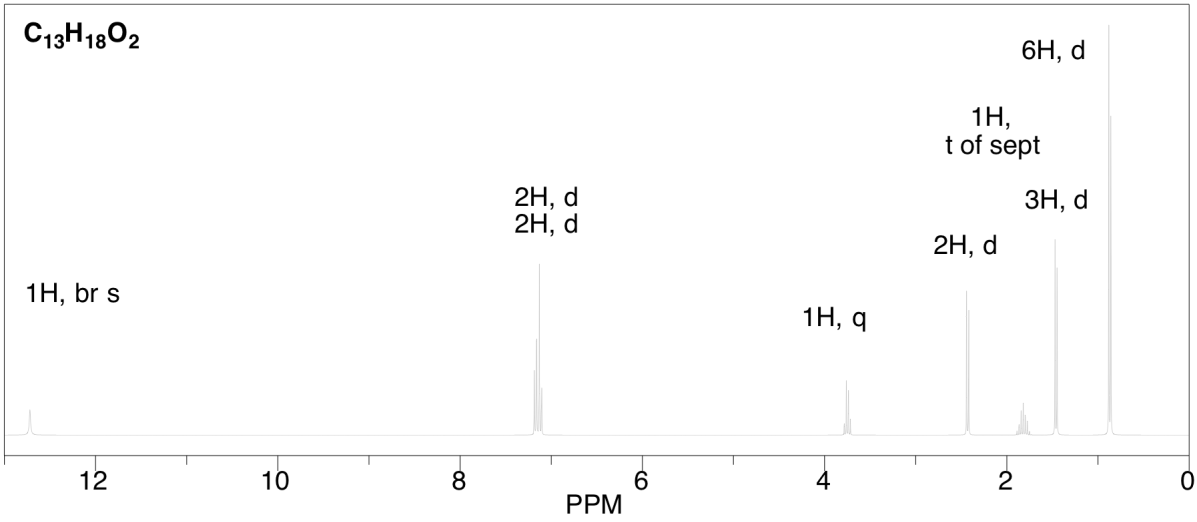
b) (10 points)



only starting material

8) NMR question (10 points)

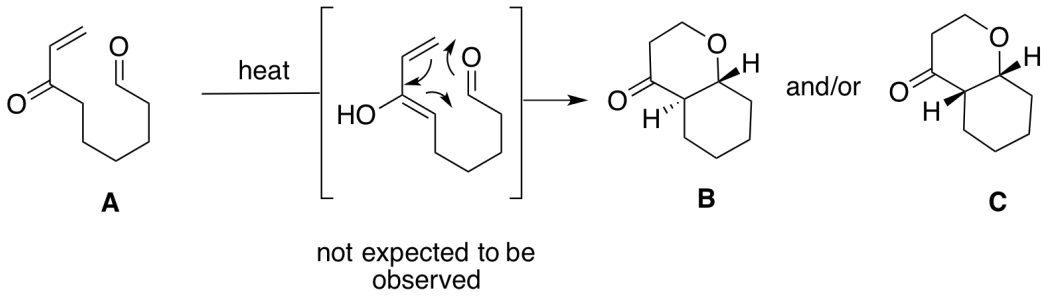
Please place your answer neatly in the box shown. Your grade will be based solely on how consistent your compound is with the NMR and molecular formula shown. (Hint: You may need to take some of this compound once you are done with the exam.)



Answer:

9) General Spectroscopy (10 points)

When synthetic chemists carry out reactions, they usually gauge the reaction progress and success at least initially using "signature spectroscopic changes" that are reflective of the change from starting material to product that can be the easiest to see and make determinations based on whether or not they observe those changes. The following is a reaction I am proposing that I have no idea if it were to work or not. It probably wouldn't. Let's assume we were to try it.



9a. Using 2 types of spectroscopy of your choosing (IR, NMR, MS), explain 2 key, specific and noticeable differences that you would predict to observe spectroscopically between the starting material (**A**) and product (**B/C**) that would help us determine success. (5 points)

9b. Let's pretend we got a mixture of **B** and **C** in some ratio, but we weren't sure which one was which. What specifically might we do to determine/predict which compound is **B** and which compound is **C**, assuming that no one had ever made these compounds before. (We do not NEED to use spectroscopy, but we can)