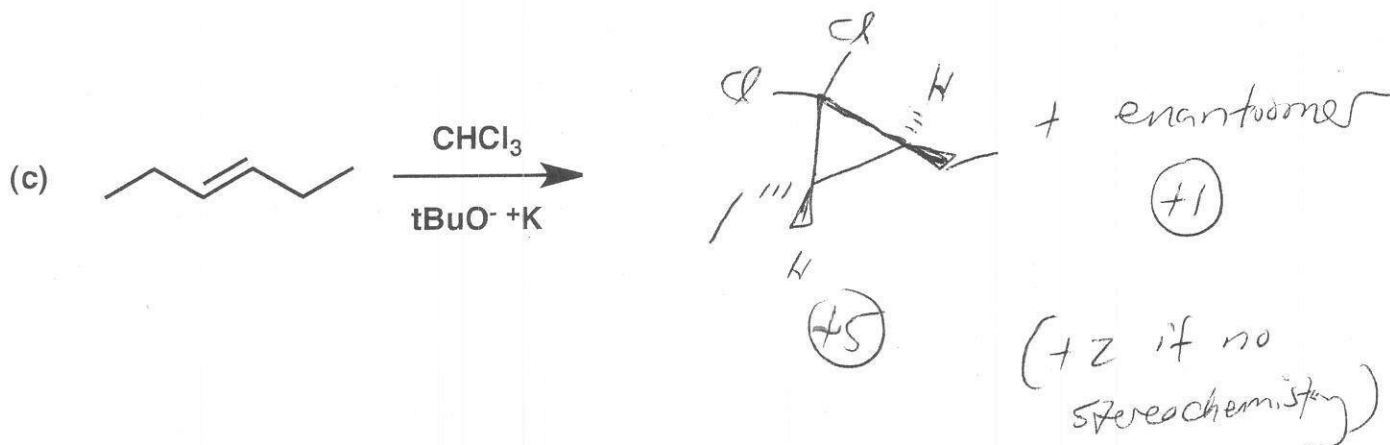
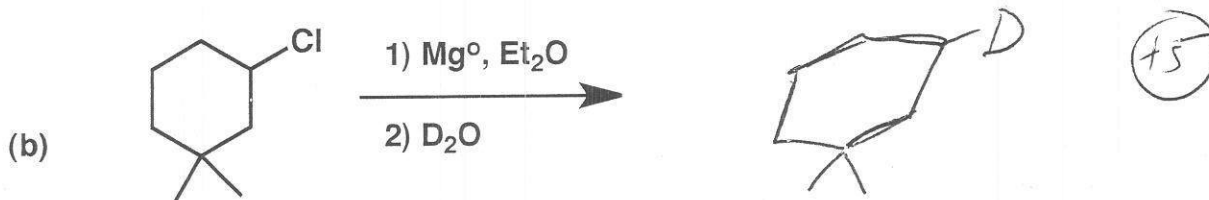
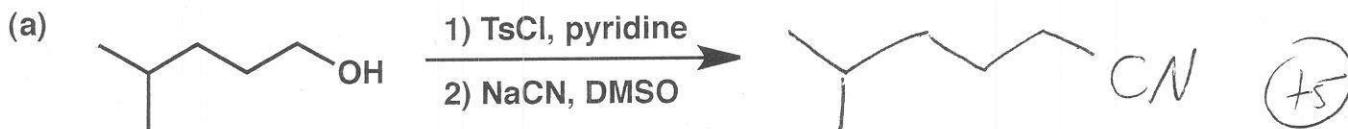


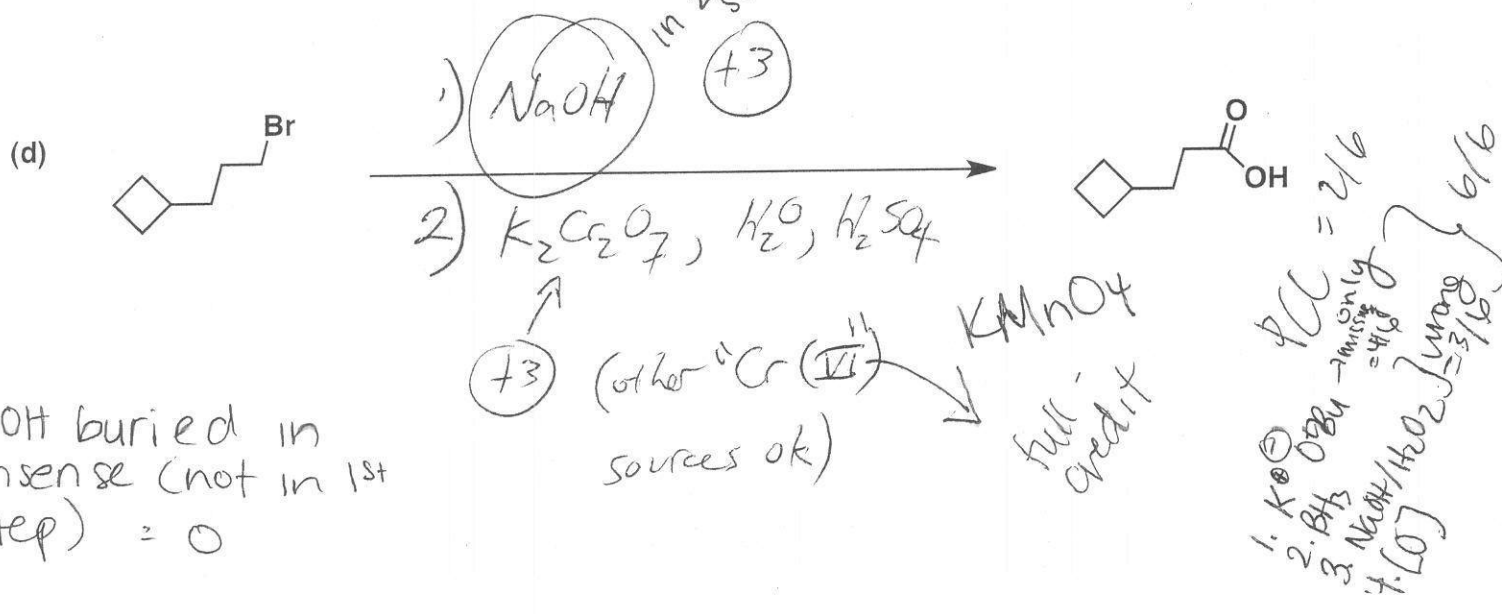
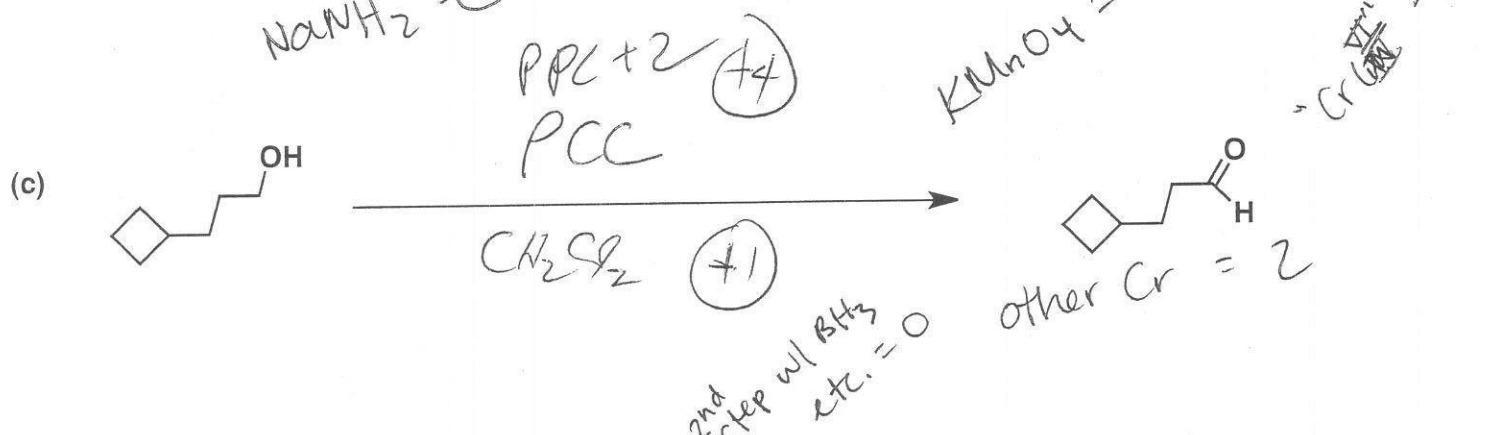
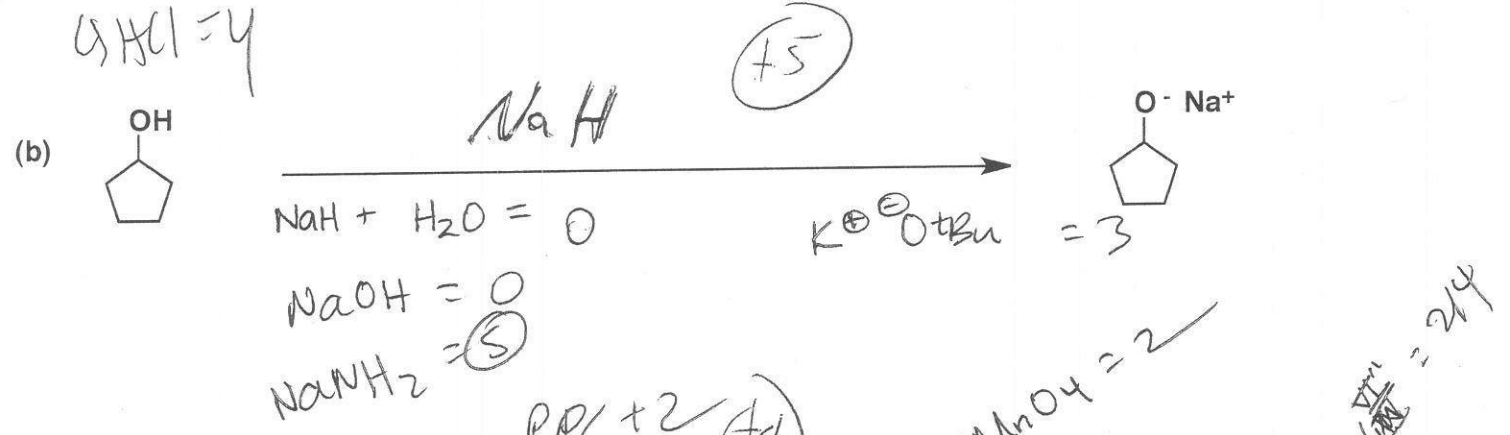
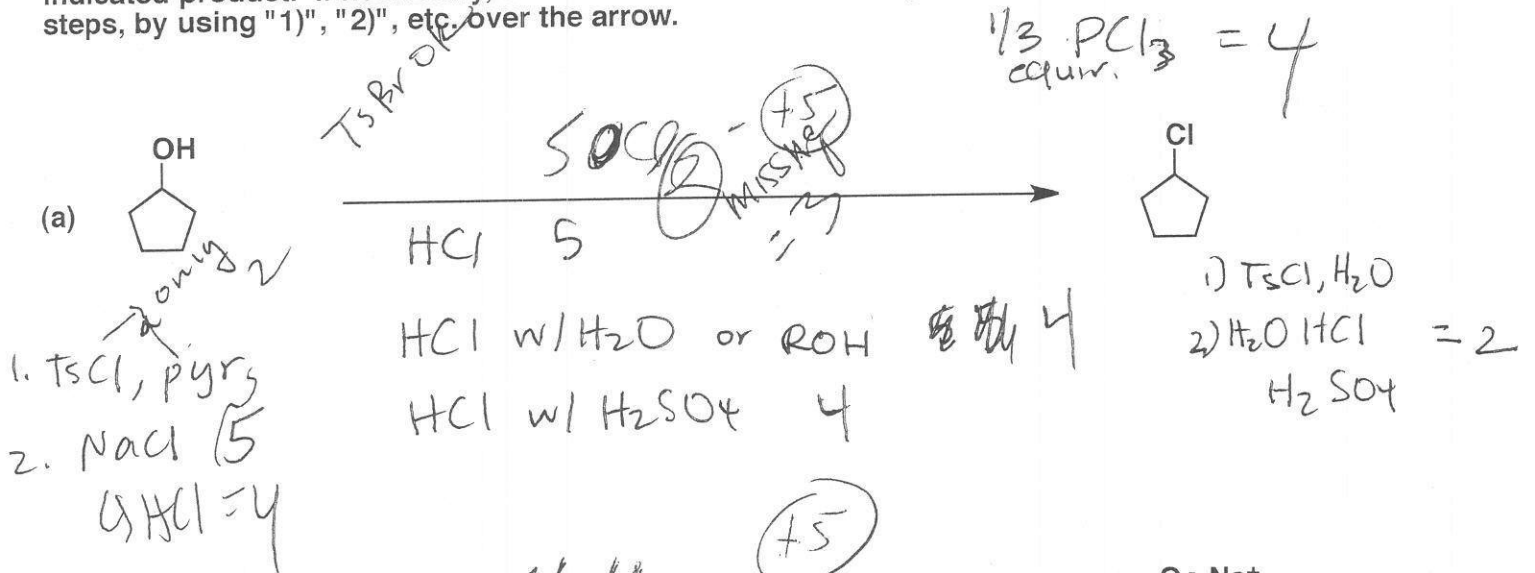
General Instructions:

- (i) Use scratch paper at back of exam to work out answers; final answers must be recorded at the proper place on the exam itself for credit. Models are allowed.
- (ii) Print your name on each page.
- (iii) Please keep your paper covered and your eyes on your own work. Misconduct will lead to failure in the course.

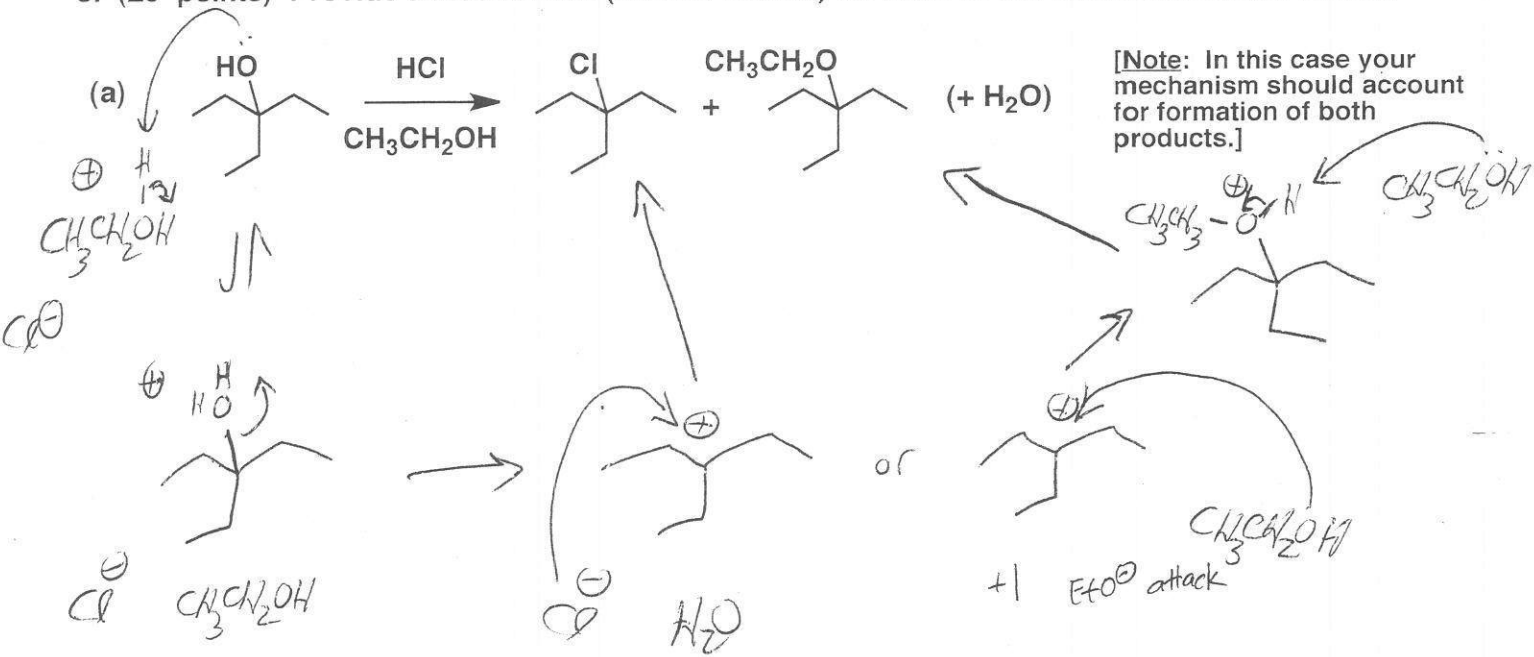
1. (16 points) Show the major product(s) expected from the reactions below.



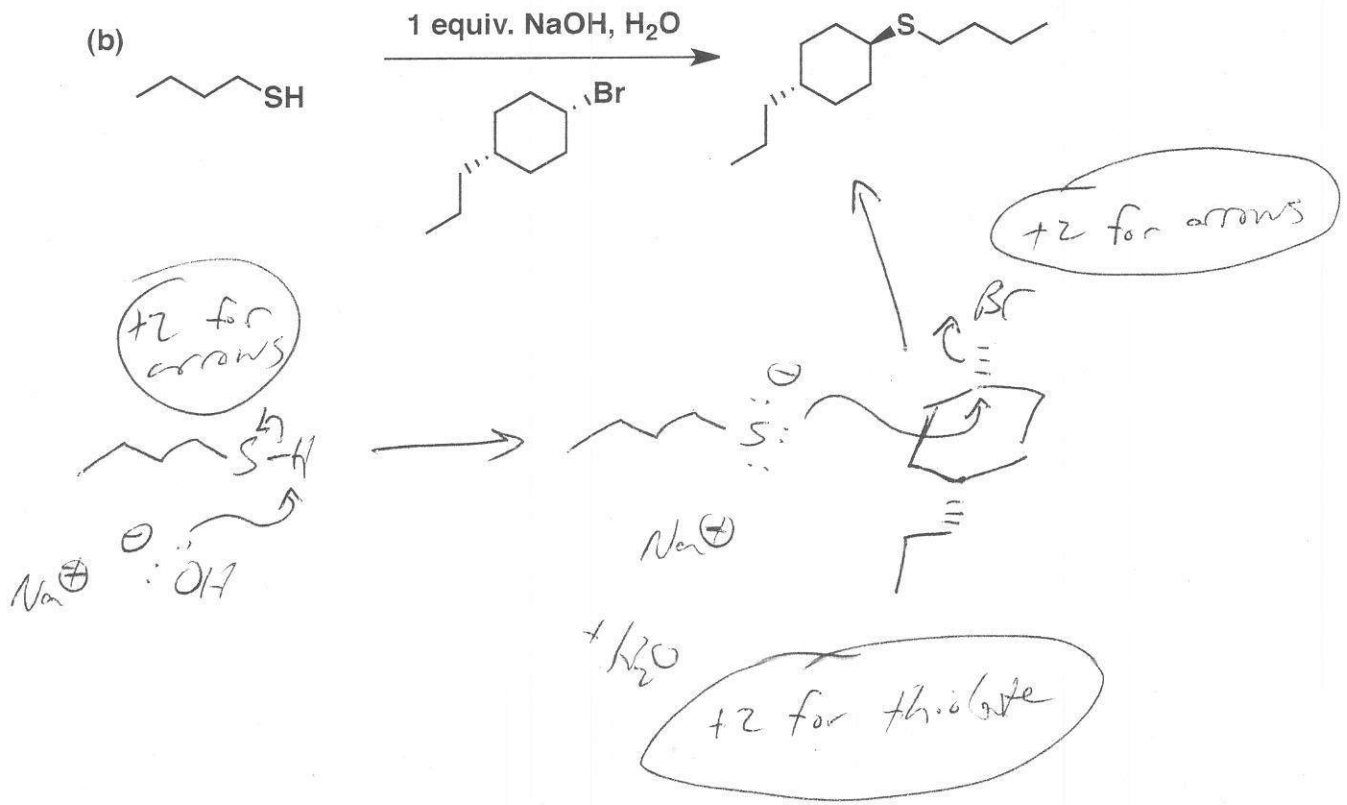
2. (21 points) Show the reagents required to convert the starting molecule to the indicated product. If necessary, be sure to differentiate clearly between distinct steps, by using "1)", "2)", etc. over the arrow.



3. (20 points) Provide a mechanism (curved arrows) for each of the reactions shown below.

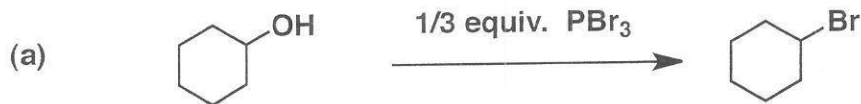


+ 2 for each arrow or pair of arrows (+10 total)
 + 1 for O-protonated intermediates (+2 total)
 + 2 for carbocation intermediate
 2 random me / +14 total



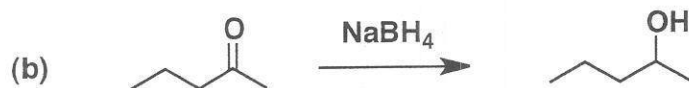
4. (6 points) Using the 'simplified' rules we discussed in class for assigning oxidation states to carbon atoms within molecules, categorize each of the reactions below as "oxidation", "reduction" or "no redox change". These categorizations should be based on the organic starting material and product indicated. (Do not concern yourself with the mechanism of any reaction below, or with other products that might form under the reaction conditions.)

CIRCLE ONE



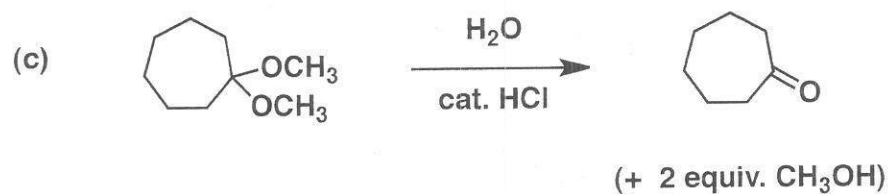
Oxidation
Reduction
No redox change

+2



Oxidation
Reduction
No redox change

+2



Oxidation
Reduction
No redox change

+2

+1 for correct circle; +6 for correct explanation.

Name _____

5. (21 points) For each pair of reactions shown below, CIRCLE the one that you would expect to occur MORE RAPIDLY. Briefly explain your reasoning.



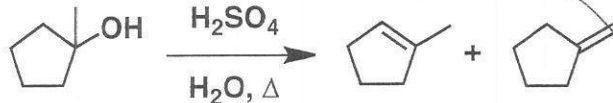
vs.



(+2) E2 reactions. The base is involved in the rate-determining step. Therefore, reaction should be slower for a more bulky base (t-BuO⁻ in this case).



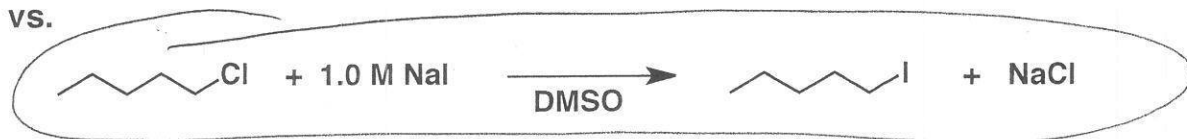
vs.



(+2) E1 reactions. Rate-determining step is formation of a carbocation. Because 3° carbocation is more stable than 2° carbocation, rxn involving 3° carbocation formation is faster.



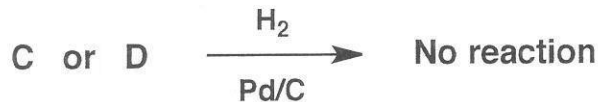
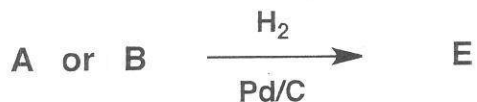
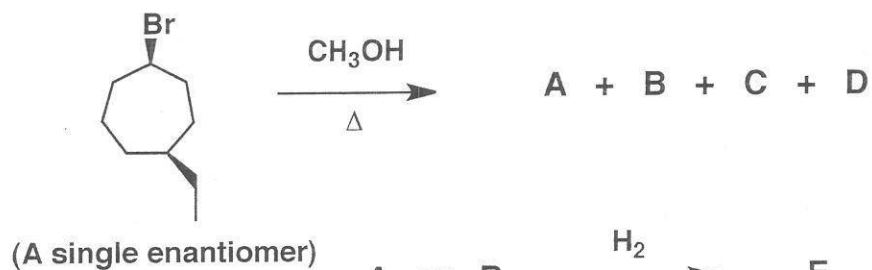
vs.



(+2) S_N2 reactions. Rate law: $V = k[\text{NaI}][\text{R-Cl}]$.
Therefore, raising conc. of NaI causes reaction to proceed more rapidly.

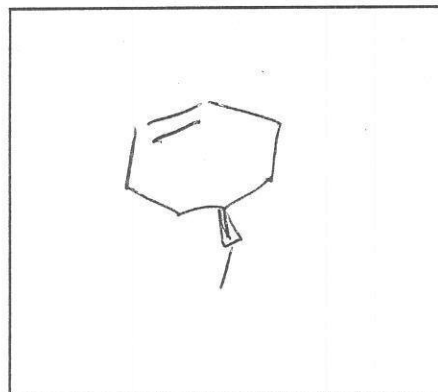
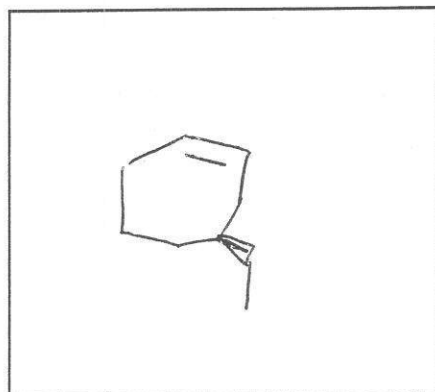
6. (16 points) When the compound shown below (a single enantiomer) is heated in methanol, four new products are formed, A, B, C and D. Among these products A and B are isomers, and C and D are isomers. When A or B is treated with H_2 and Pd/C, the same molecule is produced (E). In contrast, when C or D is treated with H_2 and Pd/C, there is no reaction.

In the boxes below, give structures for A-D. Note that you do not have to distinguish between A and B, or between C and D.



+ 4 each
structure

Structures of A and B =



Structures of C and D =

