Lakehead UNIVERSITY

Department of Chemistry
Chemistry 2211 (Organic Chem. I)
Midterm Examination II
November 8, 2005

Name: _____ Student ID Number:_____

Answer questions in the space provided. You have **80 minutes** in which to complete the test. There are 7 questions worth 41 marks. You are only allowed to use writing implements - no calculators, notes, or books. Use the back of the page for scrap paper.

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1. Dichlorocyclopentane is shown below in a variety of isomeric forms. In each of the blanks below, select a structure or structures that best fit the description. Note: there may be NO structure that fits the description (answer with "none") and/or there may be more than one correct answer. (5 points)

(i) Two molecules that are enantiomers: D, E OR C, F

(ii) Two molecules that are diastereomers: B, C OR B, F

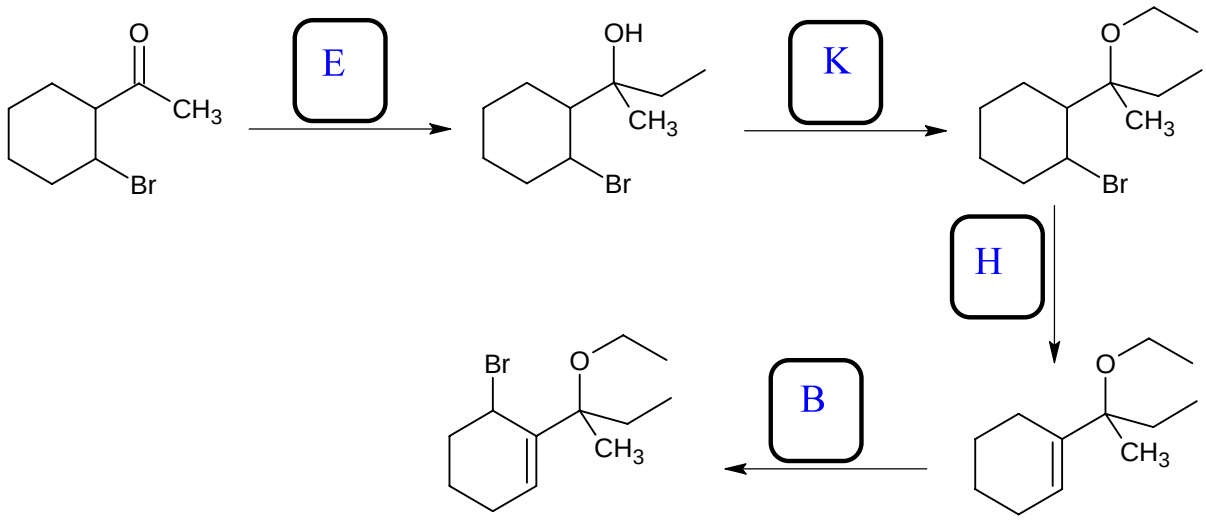
(iii) One *meso* isomer: B

(iv) One isomer with no chiral centre: A

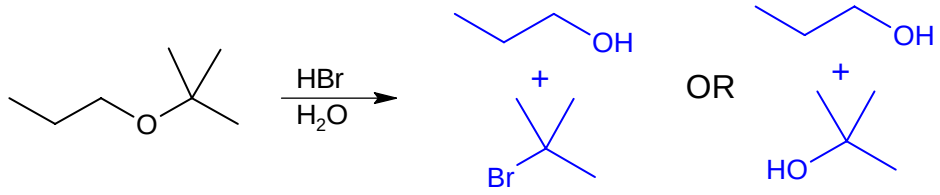
(v) Two structures that are identical to each other: none

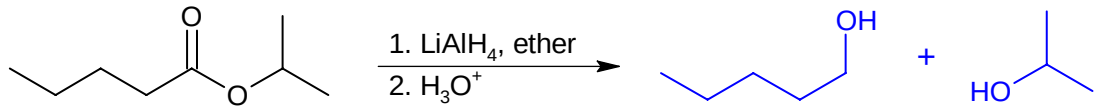
2. (b), (b), (d), (c), (b), (b), (c), (e), (e), (b)

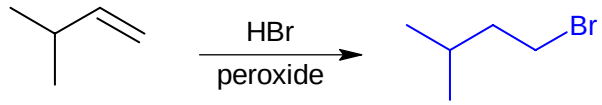
3. The following is a 4-step transformation to create the final product shown. From the list below, give the reagents required for each transformation in the sequence. (4 points)



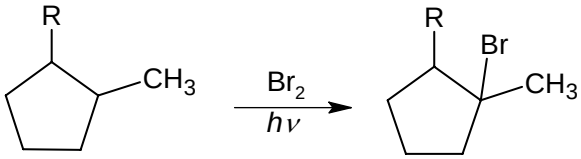
4. **For 2 of the following 3**, supply products for the following reactions. Be sure to show the correct stereochemistry if appropriate. (4 points)

(i) 

(ii) 

(iii) 

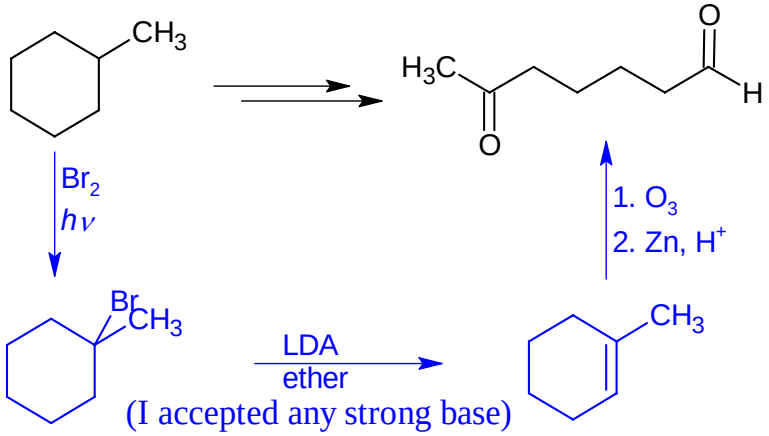
5. For the following reaction, explain why the product shown is the major product (and why it's racemic). Note: you do not have to draw a mechanism, but you can (or part of one) if it helps your explanation. (3 points)



(racemic)

- Why at the 1 position? Because this gives rise to the most stable intermediate, which is a tertiary radical.
- Why racemic? Because the tertiary radical is planar, so attack from either face is possible in equal amounts.

6. Supply reagents for the following conversion. A mechanism is **not** required. (5 points)

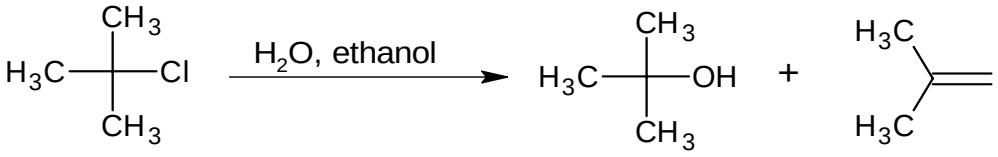


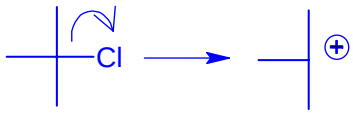
(I accepted any strong base)

(This is the route I used)

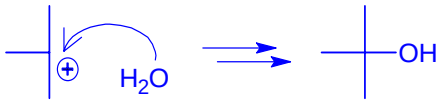
7. Do **2 of the following 3**. (5 points each, 10 points total)

(a) Explain why the following products are both formed (an explanation of the ratio is not necessary). What reaction mechanism(s) led to each product? Detailed mechanisms are not required, but you may wish to draw part of a mechanism to help clarify your answer.

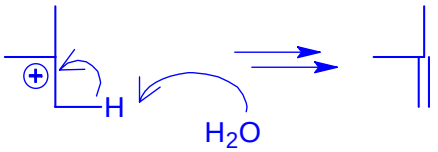




This reaction will likely go by S_N1/E1 because loss of the leaving group would leave a tertiary carbocation.

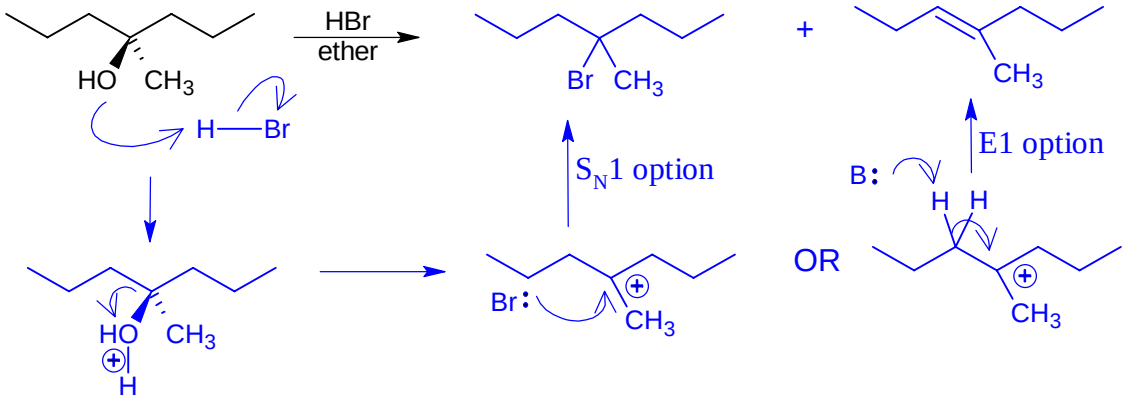


Attack of this cation by H_2O would lead to the substitution product (the alcohol)

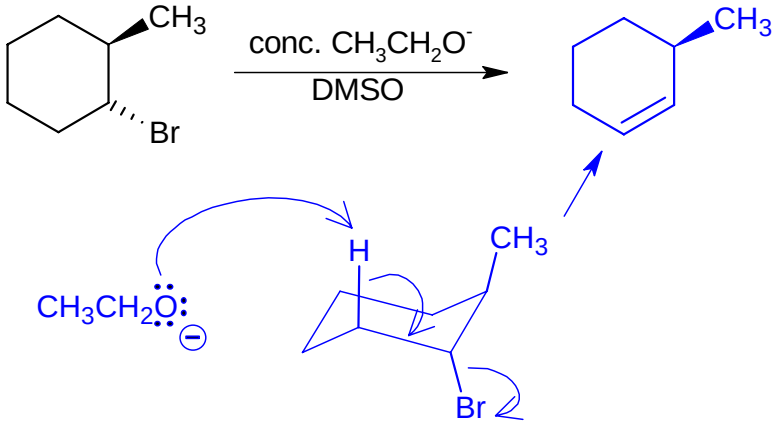


Removal of an H from one of the CH_3's by a base (*e.g.* H_2O) would lead to the elimination product (the alkene)

(b) Predict the product(s) of the following reaction. Show the complete mechanism.



(c) Predict the product of the following reaction. Note: only **one** product is formed! Show the complete mechanism. Hint: one of the byproducts of the reaction is CH_3CH_2OH.



NOTES:

1. Must be elimination (not substitution) if CH_3CH_2OH is a byproduct.
2. These are E2 conditions
3. E2 can only occur through leaving groups (the H and the Br) that are trans relative to each other. The methyl prevents the other alkene from forming.