University of Toledo **11/20/2019**

Organic Chemistry: Chapters 8-12

Last Name: _____ First Name: _____

MAKE SURE THAT YOUR NAME IS WRITTEN AND BUBBLED ON THE GREEN ANSWER SHEET.

1) Place all books and papers on the floor. **Programmable calculators are not permitted.** Ask if you have questions.

2) * Write your **name** on side one of the green & white bubble answer sheet.

   * Write your **name (last name first)** on side 2 of the answer sheet. Fill in the bubbles.

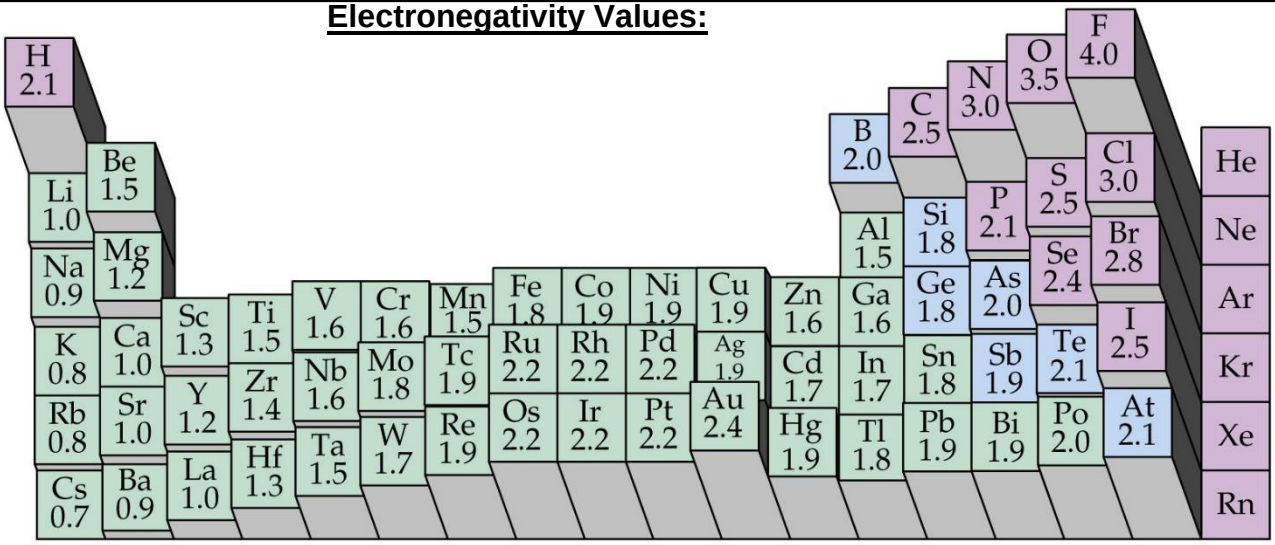
3) Answer the multiple-choice questions by filling in the correct bubble on the green answer sheet. (You may want to mark your answers on these pages as well so you can check your work later.) For these questions, only the bubble sheet will be graded.

5) **A Periodic Table and scrap paper are also provided.**

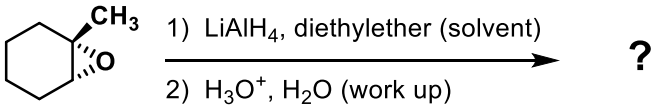
6) Regulations on **Academic Honesty** will be strictly enforced during the exam. Violation of this policy WILL result in a grade of F in the course.

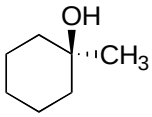
7) **If any instructions are not clear, be sure to ask for assistance.**

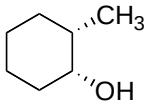
Electronegativity Values:

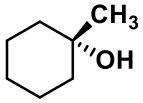


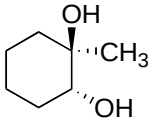
1. For the transformations below, what is the structure of the product? HINT: You will need to draw the chair form of the starting material. (**5 PTS**)



A) 

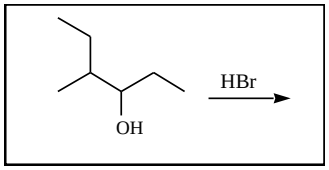
B) 

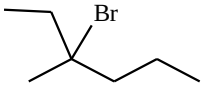
C) 

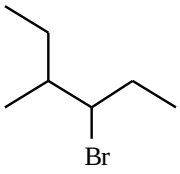
D) 

E) none of the above

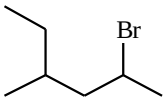
2. Predict the **major** product of the following reaction. **HINT:** Think about carbocation stability. (**5 PTS**)



A) 

B) 

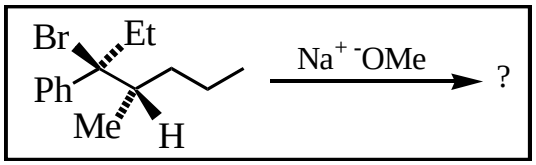
C) B and C in equal proportions

D) 

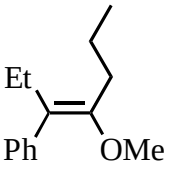
E) A and B in equal proportions

3. From Question #2, please provide a detailed mechanism for the formation of the **major compound**. Please note in your mechanism if the final compound is “chiral racemic” or “chiral non-racemic”. (**10 PTS**)

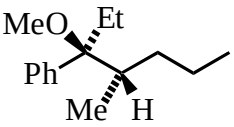
4. Predict the product of the following E2 reaction. (**5 PTS**)



A)



B)



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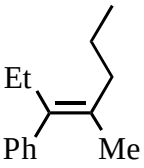
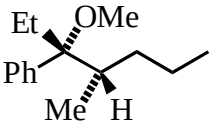
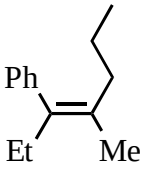


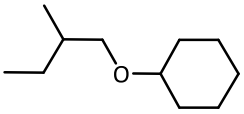
D)



E)

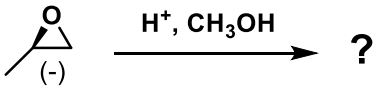


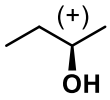
5. What would be the best name of the following compound? (**5 PTS**)

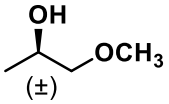


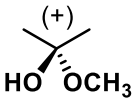
A) 3-methyl-4-oxocyclohexane
B) (1-ethyl)-diethylcyclohexyl ether
C) 1-methy-1-ethoxycyclohexane
D) (2-methylbutoxy)cyclohexane
E) 2-ethoxycyclohexane

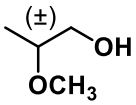
6. What is the **major** product of the following reaction using the enantiopure epoxide as the starting reagent? (**5 PTS**)

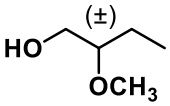


A) 

B) 

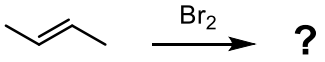
C) 

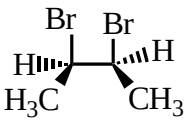
D) 

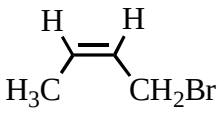
E) 

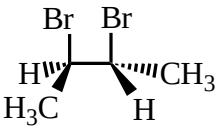
7. From **Question #6**, please provide a detailed mechanism for the formation of the product. Please note in your mechanism if the final compound is “chiral racemic” or “chiral non-racemic”. (**10 PTS**)

8. What would be the product of the following reaction? (**5 PTS**)

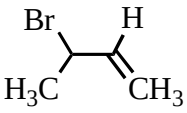


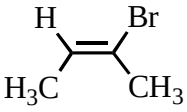
A) 

B) 

C) 

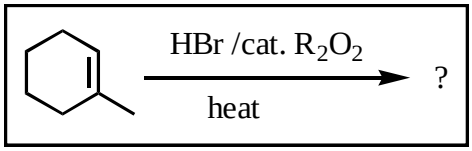
(racemic)

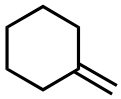
D) 

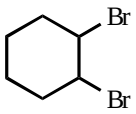
E) 

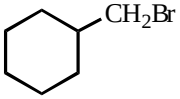
9. From **Question #8**, please provide a detailed mechanism for the formation of the product. Please be sure to show the halonium ion intermediate as a 50% concerted top-face addition, and a 50% bottom-face addition. Use both intermediates to derive the final compound. (**10 PTS**)

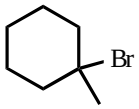
10. What is the **major** product of the following reaction? **HINT:** Homolytic process. (**5 PTS**)

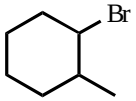


A) 

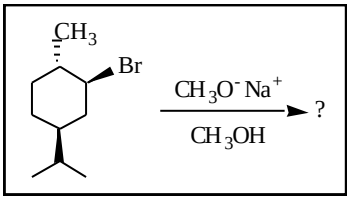
B) 

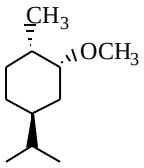
C) 

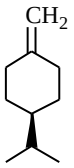
D) 

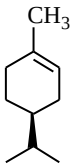
E) 

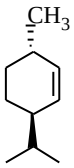
11. What product would you expect from the E2 reaction shown below? HINT: Draw the most stable chair conformer to determine proton in anti-periplanar position. (**5 PTS**)

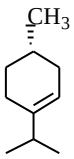


A) 

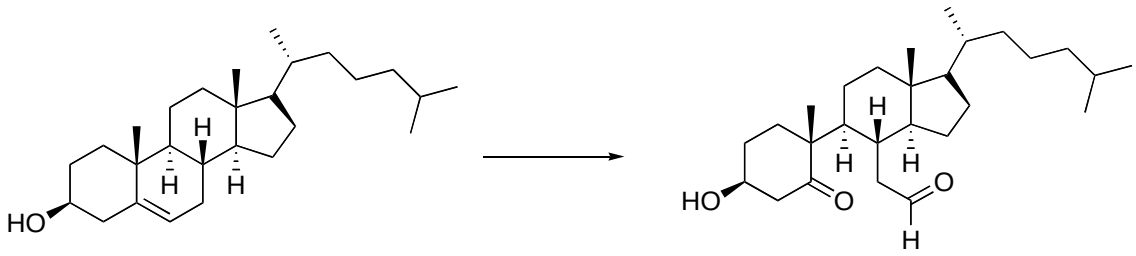
B) 

C) 

D) 

E) 

12. Cholesterol is a major lipid component of athersclerotic plaques and can be present at such high concentrations that it forms a crystalline phase within a diseased artery. In addition to cholesterol, the 5,6-secosterol compound has also been isolated. 5,6-secostereol has been shown to be the product of an unforeseen oxidation reaction in the body. Which one of these reagents could be used convert cholesterol to the 5,6-secosterol? (*Science* **2003**, *302*, 1053) (**5 PTS**)

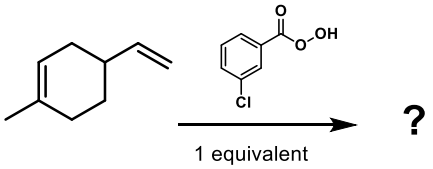


cholesterol

5,6-secosterol

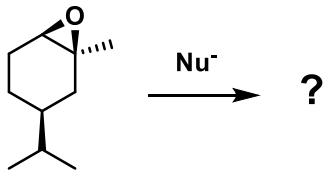
A) $K_2Cr_2O_7$
B) O_3
C) $(CH_3)_2S$
D) HOOH
E) LiOH

13. There are two possible products to this question because there are 2 olefins the peroxyacid (meta-chloroperbenzoic acid) can react with, however, only one olefin wins. Please provide the answer and an intermediate which highlights why one olefin reacts preferentially. **Hint:** Think Markovnikov! (**10 PTS**)

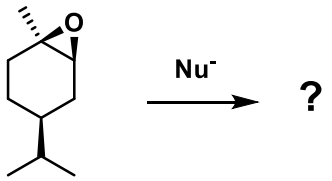


14. In class we learned about the Furst-Plattner Rule for nucleophilic addition to expoxides. Below, you are given two reactions, A & B. Provide an answer for both A & B and then provide one mechanism for one of your answer(s). (**10 PTS**)

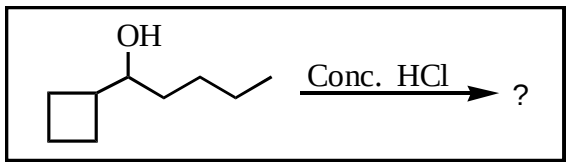
A

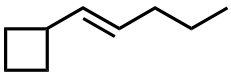


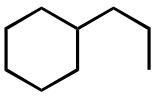
B

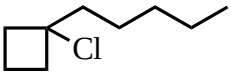


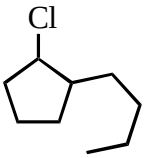
15. In the following reaction, an interesting <u>rearrangement</u> takes place. Suggest a structure for the product that is obtained. (**5 PTS**)

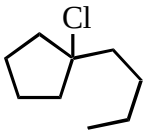


A) 

B) 

C) 

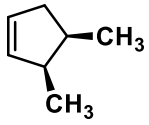
D) 

D) 

BONUS:

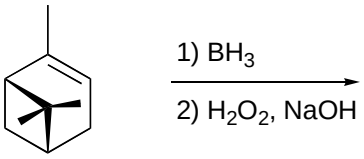
16. Suggest a mechanism for the given rearrangement product in question 15. (**10 PTS**)

17. Choose the name of the following compound. (**5 PTS**)

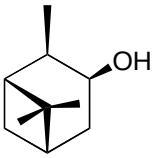


A) trans-1,2-dimethylcyclopent-4-ene
B) cis-3,4-dimethylcyclopentene
C) cis-2,3-dimethycyclopentene
D) cis-4,5-dimethylcyclopentene
E) cis-1,2-dimethylcyclopent-3-ene

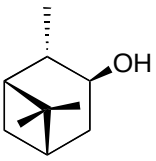
18. Which of the following products is most likely to form under the reaction conditions? (**5 PTS**)



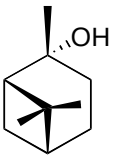
A)



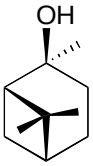
B)



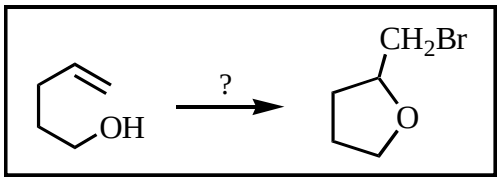
C)



D)



19. Based on your knowledge of the mechanisms involved, which of the reagents below would you expect to accomplish the following reaction? (Think through the mechanism!) (**5 PTS**)



A) NaBr
B) Br_2
C) $LiAlH_4$
D) HBr
E) PBr_3