

# Chem 112A: Second Midterm

November 9th, 2010

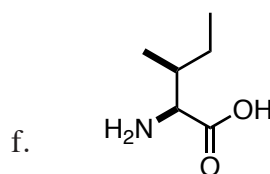
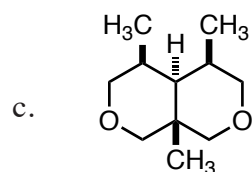
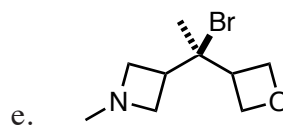
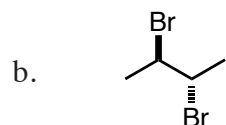
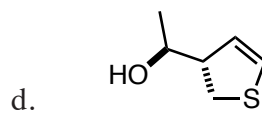
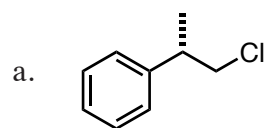
Please provide all answers in the space provided. You are not allowed to use a calculator for this exam, but you may use molecular model kits. Only cyclohexane rings may be pre-assembled. Including the title page, there should be **8** total questions spread over **6** pages. There is also a **seventh** page that should be blank. You can use this last page for scratch paper if you need it, but please remember to copy your answers into the blanks that are provided for each question.

Name: \_\_\_\_\_

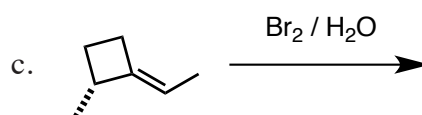
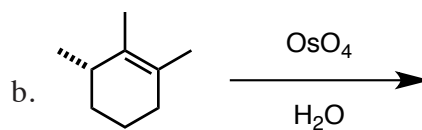
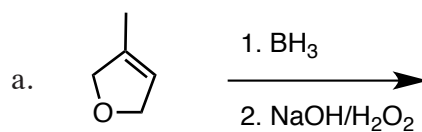
GSI/Section: \_\_\_\_\_

(1)	_____	(12 points)
(2)	_____	(18 points)
(3)	_____	(12 points)
(4)	_____	(12 points)
(5)	_____	(18 points)
(6)	_____	(6 points)
(7)	_____	(7 points)
(8)	_____	(15 points)
TOTAL	_____	(100 points)

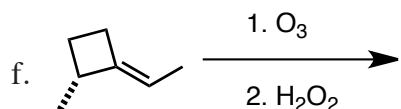
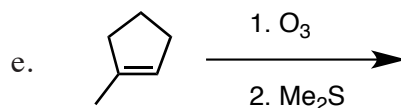
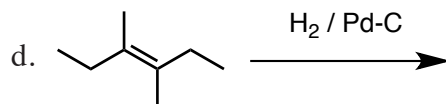
1. Circle all of the stereogenic centers in the following compounds and label them as (*R*) or (*S*). Also label each compound as “chiral” or “achiral” (2 points each):



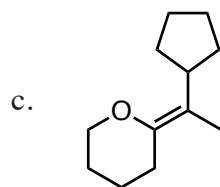
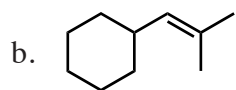
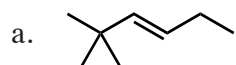
2. Provide the major product(s) for each of the reactions shown below, including all unique stereoisomers (3 points each).



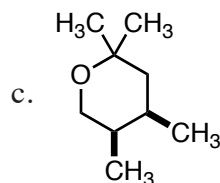
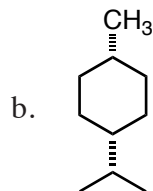
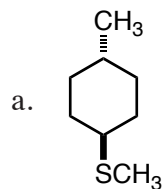
Question 2, continued:



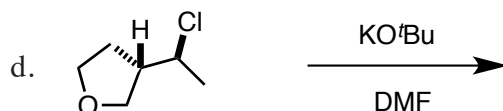
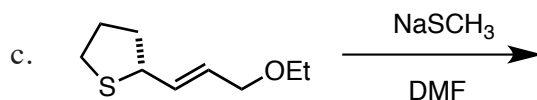
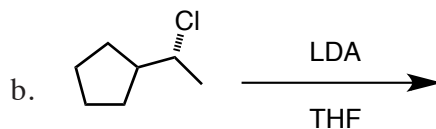
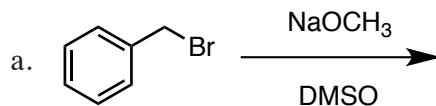
3. Provide an appropriate alkyl bromide starting material that could be used to prepare each of the following alkene products with the indicated stereochemistry. Also supply the reaction conditions that you would use to carry out your transformations. There will be more than one possible answer in some cases (4 points each).



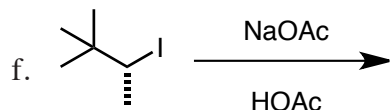
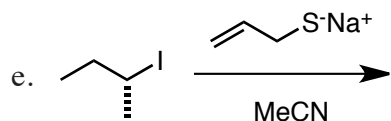
4. For each of the substituted cyclohexanes shown below, provide clear drawings for each of the two possible chair conformations. Also indicate which of the conformations you would expect to be lower in energy (4 points each).



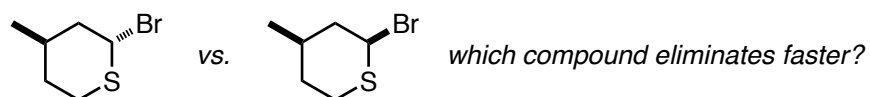
5. Predict whether each of the following reactions will proceed through an  $S_N2$ ,  $S_N1$ ,  $E_2$ , and/or  $E_1$  pathway. Also provide the structures of the major product(s) that would be obtained. In some cases, more than one reaction type may occur, and in others, no reaction will occur (3 points each).



Question 5, continued:

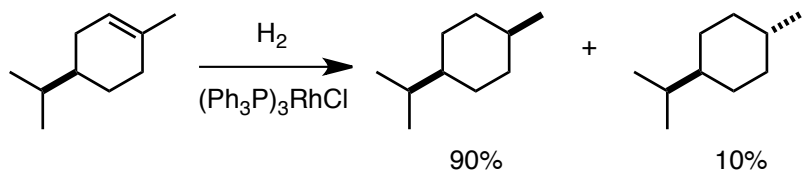


6. The following two compounds undergo  $E_2$  elimination reactions with drastically different rates:

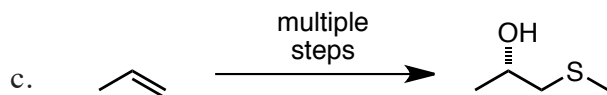
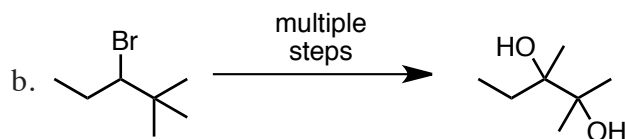
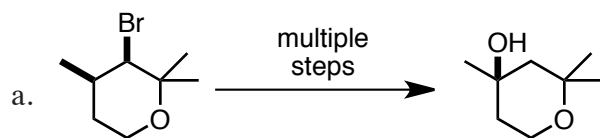


Predict which substrate will eliminate faster and rationalize your choice with a clear structural drawing (6 points).

7. The following reaction produces two different products in the indicated ratio. Use this information and the product structures to generate a reaction coordinate diagram that compares the energetics leading to the formation of these two products. Also, clearly label the energy difference on the diagram that is responsible for the observed reactivity difference. For the purpose of this question, you may assume that the reaction proceeds through a single step (7 points).



8. Each of the following overall transformations occurs through a series of multiple chemical steps. Link together the reactions you have learned in class to show how each starting compound can be converted into the indicated product. Draw all of the intermediates along the synthetic routes that you propose, and supply all reagents and reaction conditions as appropriate. No "arrow-pushing" mechanisms are required. For the compounds that are chiral, you only need to indicate how the racemic mixture can be made. There can be more than one answer in some cases (5 points each).



This last page should be blank. You may use it as scratch paper, but be sure to recopy your answers into the exam questions so that we can grade them easily.