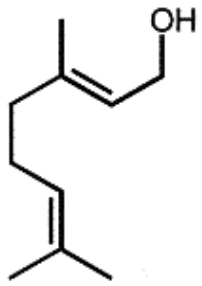
Question 1 (19 points) **Name** key

a. (5 pts) What is the IUPAC name for the molecule drawn below?

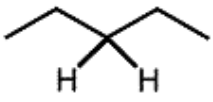


(E) - 3,7 - dimethyl - 2,6 - octadien - 1 - ol

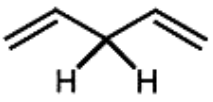
(E) - 3,7 - dimethyl - 2,6 - octadienyl alcohol

(E) - 1 - hydroxy - 3,7 - dimethyl - 2,6 - octadiene

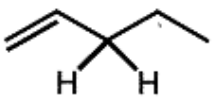
b. (3 pts) Which of the following is **most acidic**? Which is **the least acidic**? The acidic hydrogens that you should consider are shown for each molecule. (NO PARTIAL CREDIT.)



least



most



c. (3 pts) Which of the following is **most acidic**? Which is **the least acidic**? (NO PARTIAL CREDIT.)

CFH_2CH_2OH CH_3CH_2OH CF_3CH_2OH

least most

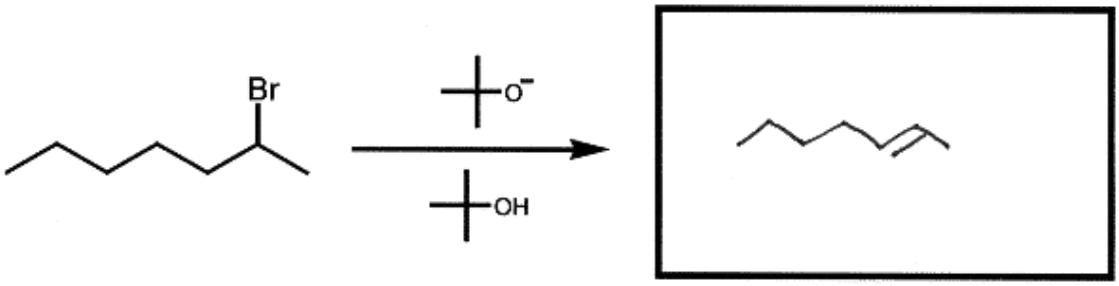
d. (8 pts) What are the pK_a's for the following acids?

Acetic acid	4.8
Ethane	50
Water	15.7
Phenol	10

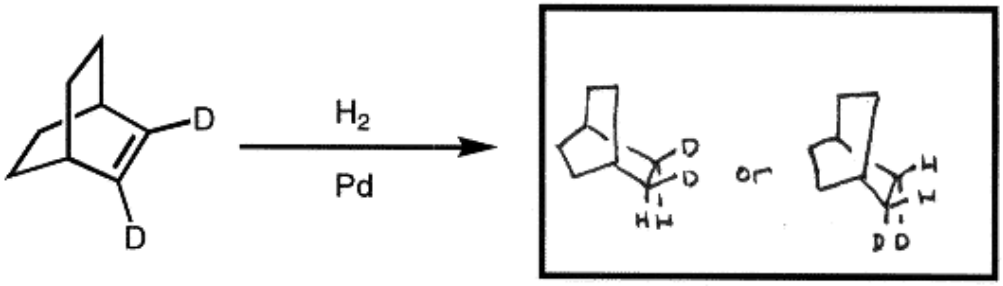
Question 2 (9 points) **Name** Key

Give the complete structure of the major organic product for the following reactions. Put your answer in the box provided. Be sure to indicate stereochemistry where appropriate.

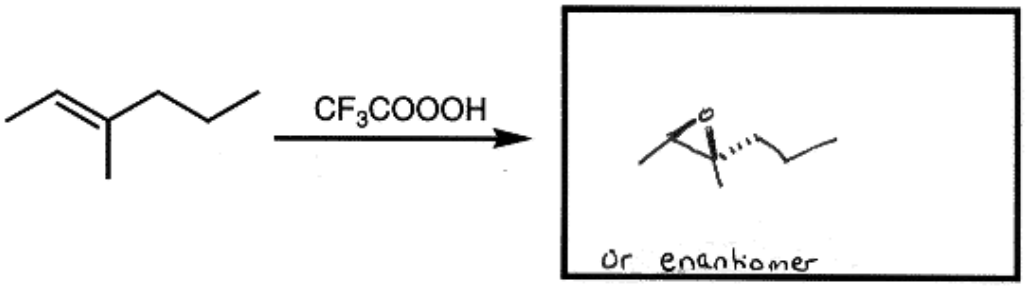
a. (3 pts)



b. (3 pts)



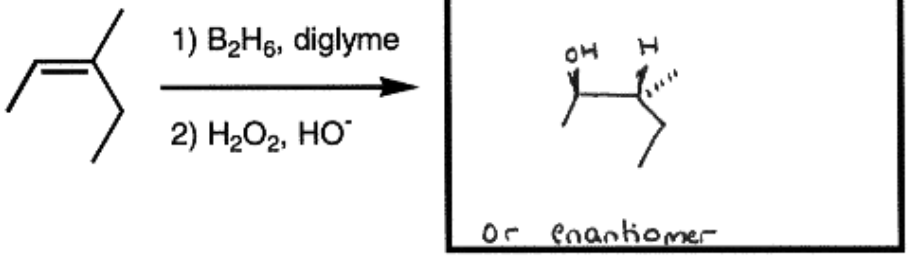
c. (3 pts)



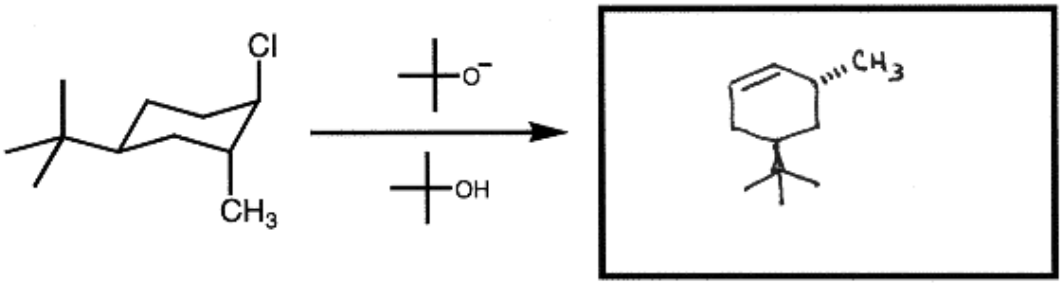
Question 3 (15 points) **Name** Key

Give the complete structure of the major organic product for the following reactions. Put your answer in the box provided. Be sure to indicate stereochemistry where appropriate.

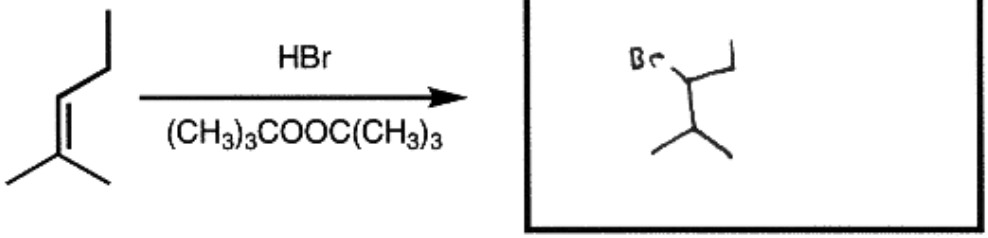
a. (4 pts)



b. (3 pts)



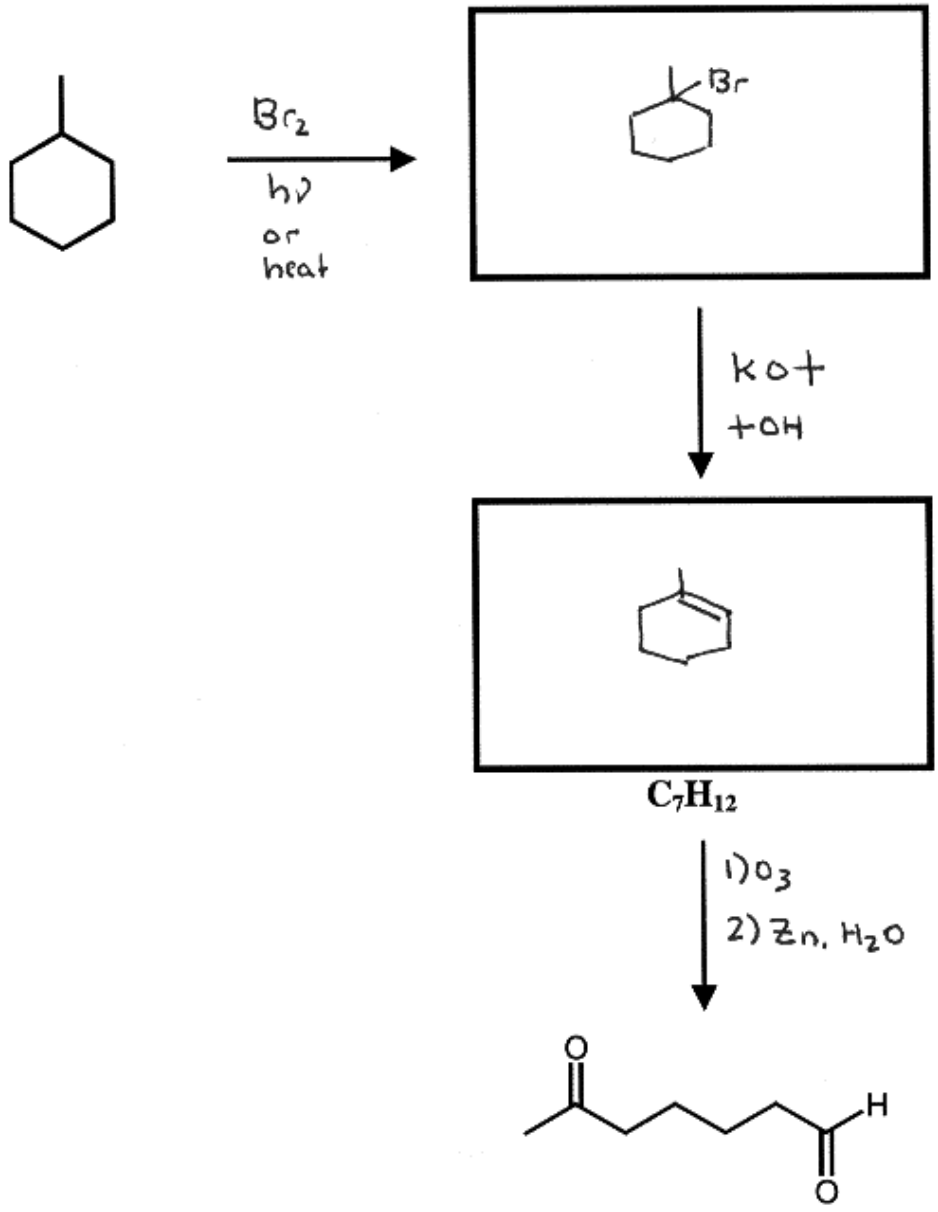
c. (3 pts)



d. (5 pts)

Question 4 (15 points) **Name** key

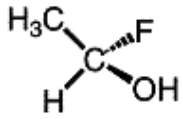
Provide the missing reagents and products for the following transformation.. The reagents should be listed in order of use if more than one synthetic step is necessary. You may neglect stereochemistry on this page.

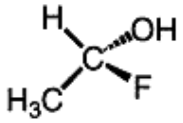


Question 5 (15 points) **Name** key

a. Label the following pairs of structures as one of the following: **identical, structural isomers, enantiomers**, or **diastereomers**.

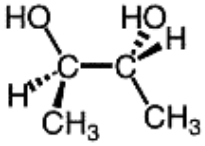
i. (3 pts)

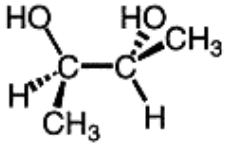




identical

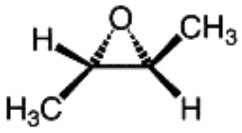
ii. (3 pts)

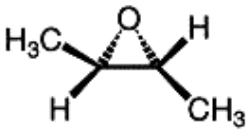




diastereomers

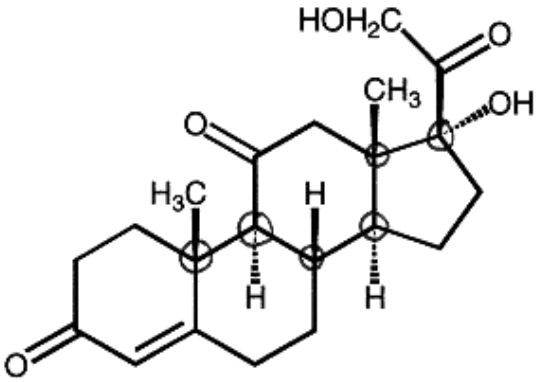
iii.(3 pts)





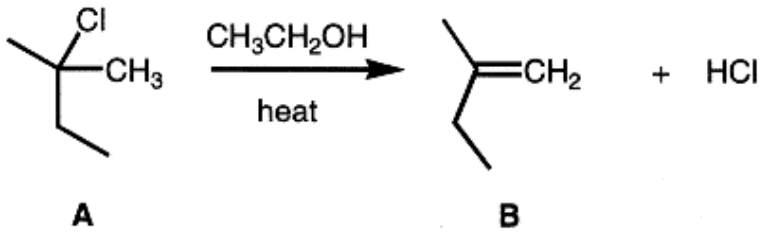
enantiomers

b. (6 pts) Circle all the stereogenic centers in the anti-inflammatory agent Cortisone, which is drawn below.



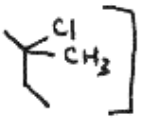
Question 6 (16 points) **Name** key

The reaction (**A** → **B**) shown below is **exothermic**. The rate is found to depend only on the concentration of the starting chloride **A**.



A **B**

a. (2 pts) Write the rate equation for the reaction.

rate = k []

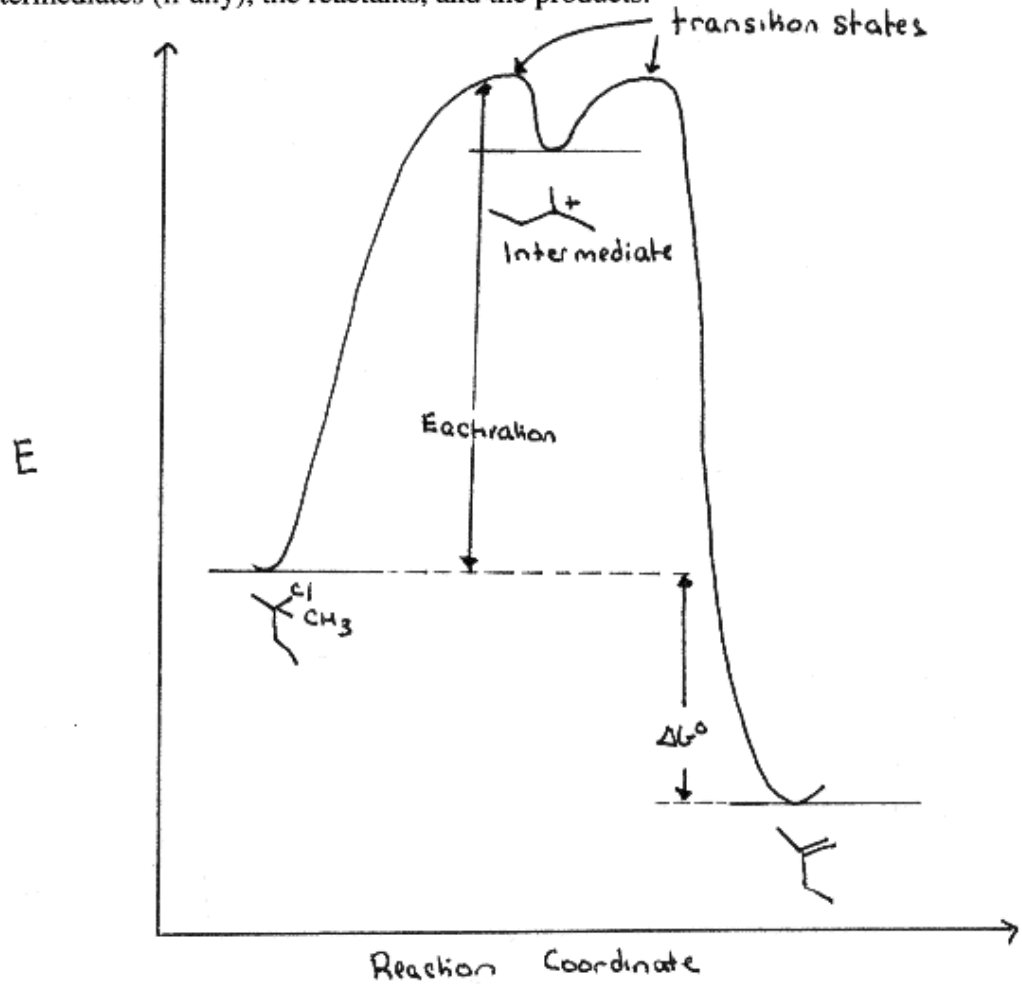
b. (2 pt) What is the kinetic order of the reaction?

1st order

c. (3 pts) What is the name of the mechanism for the reaction?

E1

d. (7 pts) Draw a reaction coordinate diagram, labeling ΔG^{o}, $E_{activation}$, the transition state(s), the intermediates (if any), the reactants, and the products.

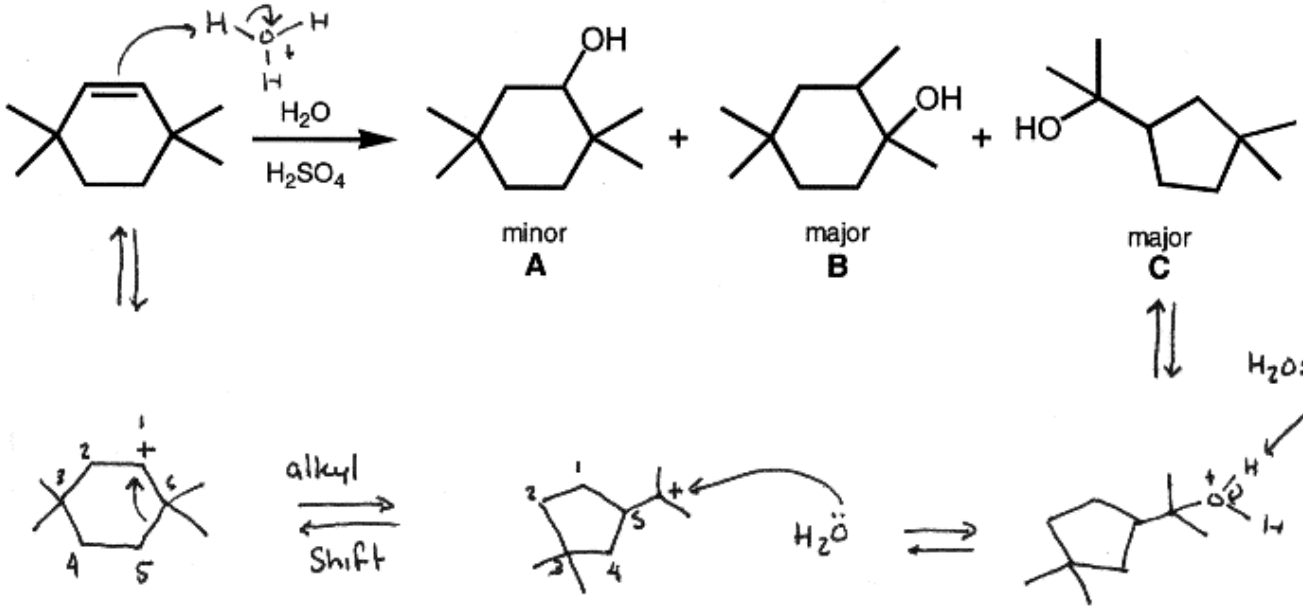


e. (2 pts) What mechanism is the microscopic reverse of the mechanism described in part c?

addition of HCl to an alkene

Question 7 (11 points) **Name** Key

Acid-catalyzed hydration of 3,3,6,6-tetramethylcyclohexene yields three products, which are shown below. Using the correct curved arrow formalism, show the correct mechanism, which accounts for the formation for 1-(1-hydroxy,1-methylethyl),3,3-dimethylcyclopentane, **product C**. Be sure to draw complete structures for all intermediates.



Note: this alkyl shift is the same shift that occured in problem 5.42 in Carey

Extra Credit (10 points) **Name** key

a. (2 pts) The allyl group is derived from the botanical name for what plant?

garlic

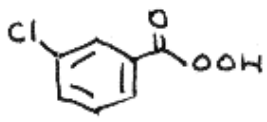
b. (2 pts) What alkene is used to make Teflon?

$F_2C=CF_2$

c. (2 pts) What alkene is used to make Saranwrap?

$H_2C=CCl_2$

d. (2 pts) What is the structure of MCPBA?



e. (2 pts) Name the person(s) who won the 1999 Nobel Prize in chemistry.

Ahmed Zewail