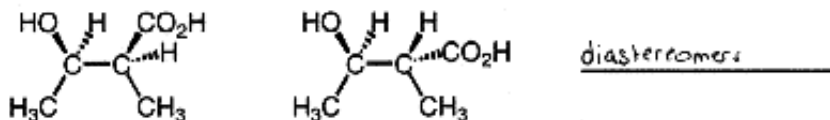


Question 1 (12 points)

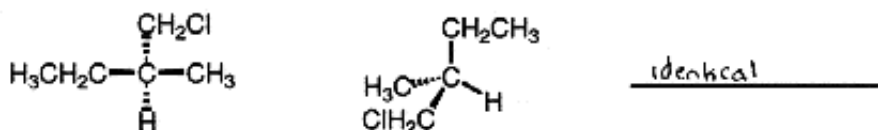
Name key

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

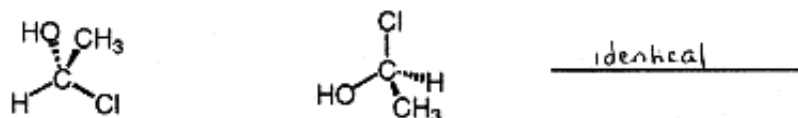
i. (3 pts)



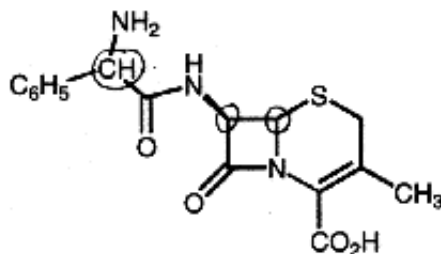
ii. (3 pts)



iii. (3 pts)



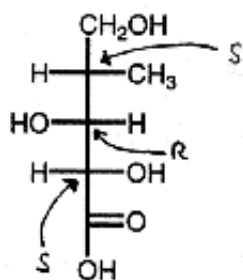
b. (3 pts) Cephalixin, shown below, belongs to a class of antibiotics known as cephalosporins. Circle all the stereogenic centers in Cephalixin.



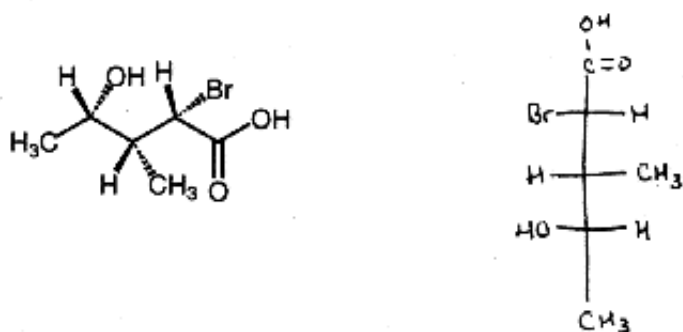
Question 2 (12 points)

Name key

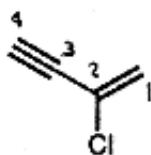
- a. (3 pts) Assign an **R** or **S** configuration to each stereogenic center in the following molecule



- b. (3 pts) Draw a Fischer projection of the following molecule.

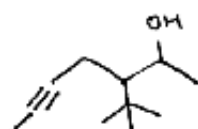


- c. (3 pts) What is the IUPAC name for the following molecule?



2-chloro-1-buten-3-yne

- d. (3 pts) Draw the structure of 3-*t*-butyl-5-heptyn-2-ol.

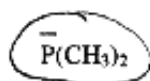


Question 3 (16 points)

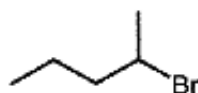
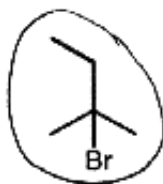
Name key

For each of the following sets of structures in parts a - d, choose the compound that best fits the description.

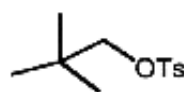
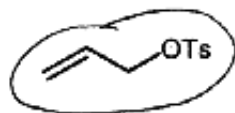
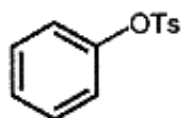
a. (3 pts) Is the best nucleophile:



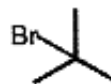
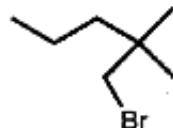
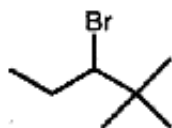
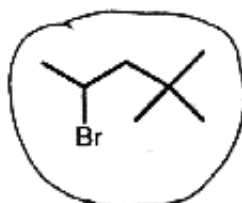
b. (3 pts) Reacts most rapidly in a solvolysis reaction in water:



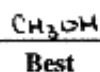
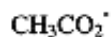
c. (3 pts) Reacts most rapidly with NaCN in acetone solvent:



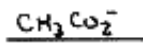
d. (3 pts) Reacts most rapidly with NaI in DMSO solvent:



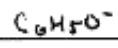
e. (4 pts) Arrange the following in order of **decreasing** leaving group ability.



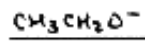
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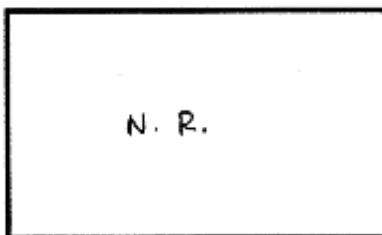
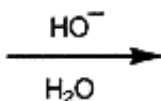
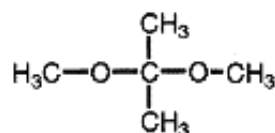


Question 4 (12 points)

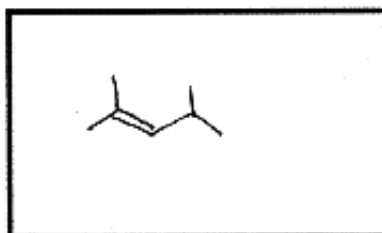
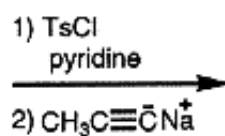
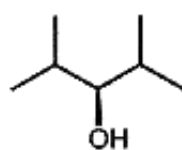
Name key

Give the complete structure of the major organic product(s) for the following reactions. Put your answer in the box provided. Be sure to indicate stereochemistry where appropriate. Write N.R., if no reaction occurs.

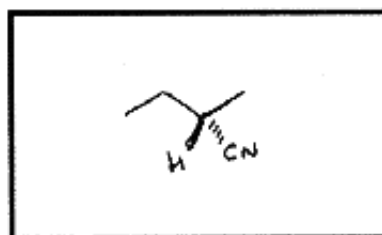
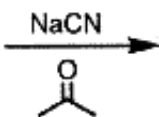
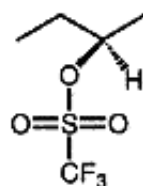
a. (3 pts)



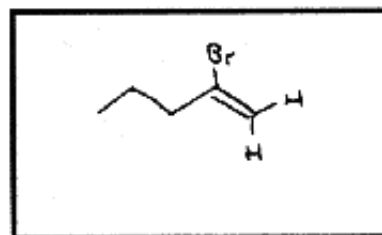
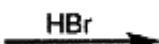
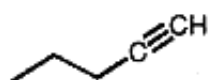
b. (3 pts)



c. (3 pts)



d. (3 pts)

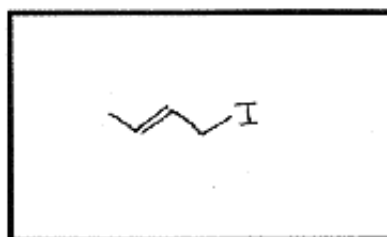
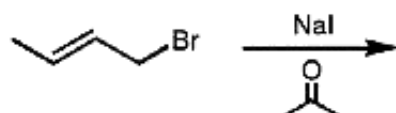


Question 5 (13 points)

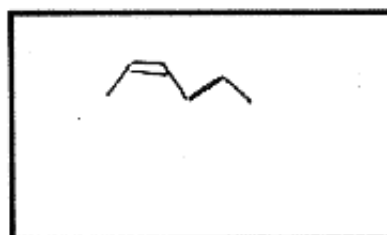
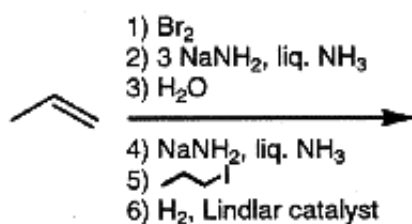
Name key

Give the complete structure of the major organic product(s) for the following reactions. Put your answer in the box provided. Be sure to indicate stereochemistry where appropriate. Write N.R., if no reaction occurs.

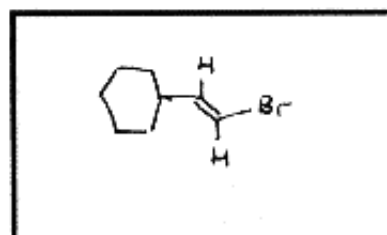
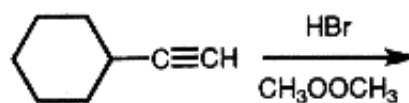
a. (3 pts)



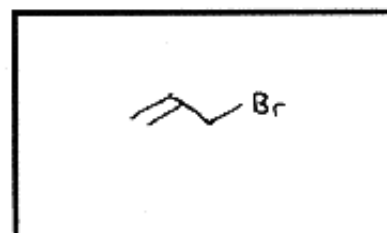
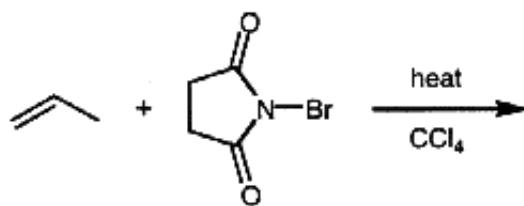
b. (4 pts)



c. (3 pts)



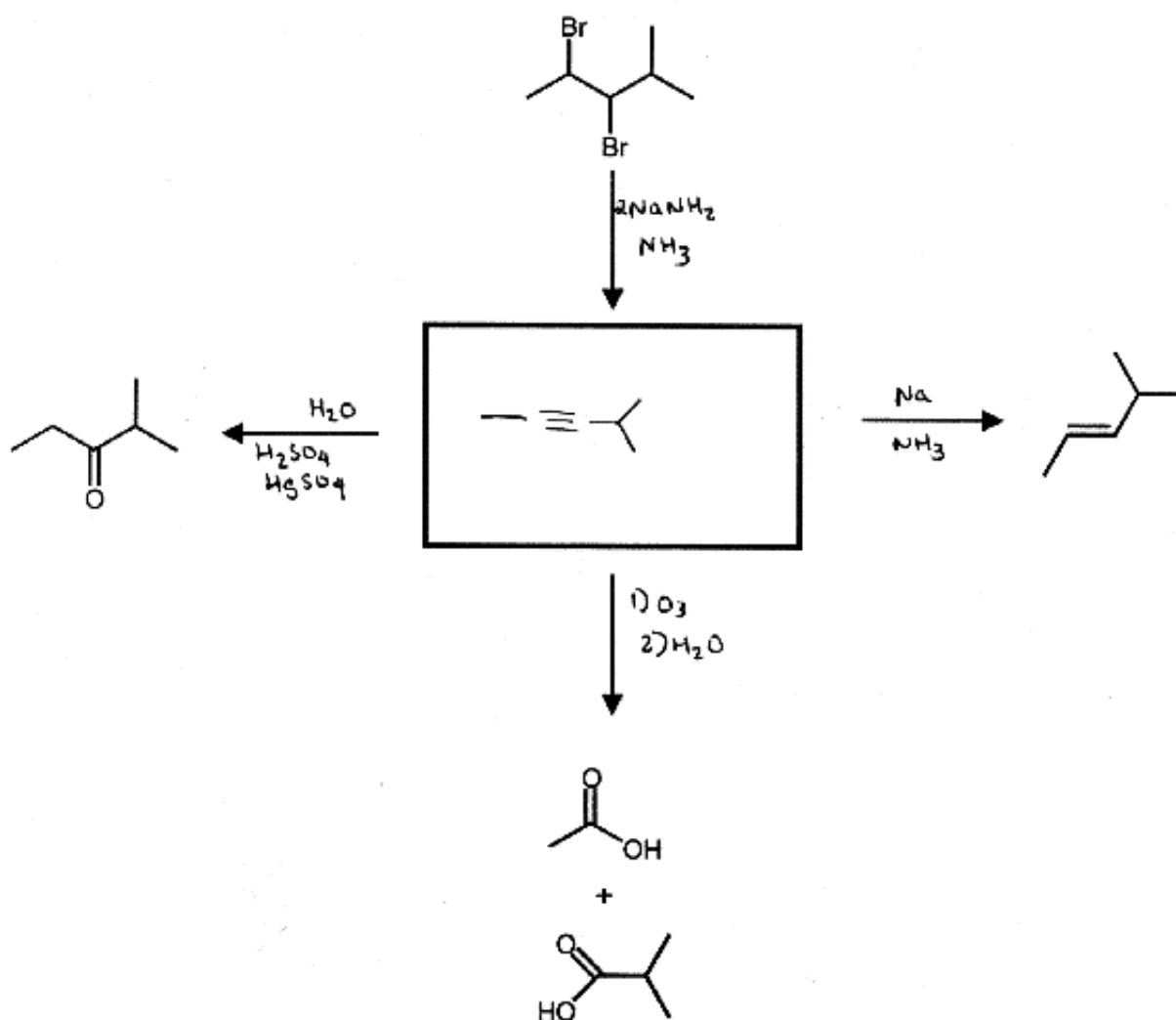
d. (3 pts)



Question 6 (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.

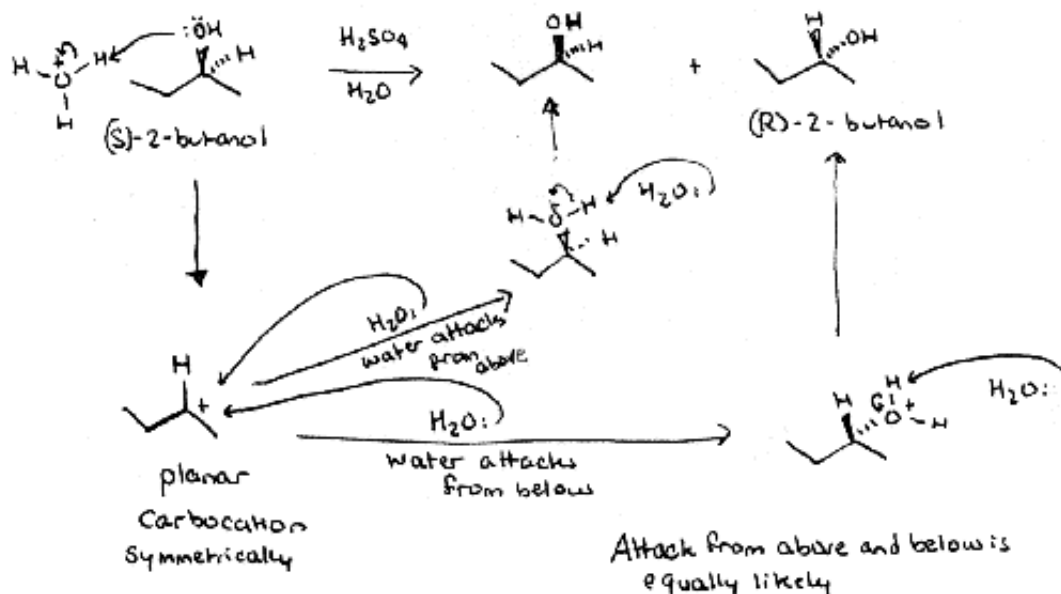


Question 7 (20 points)

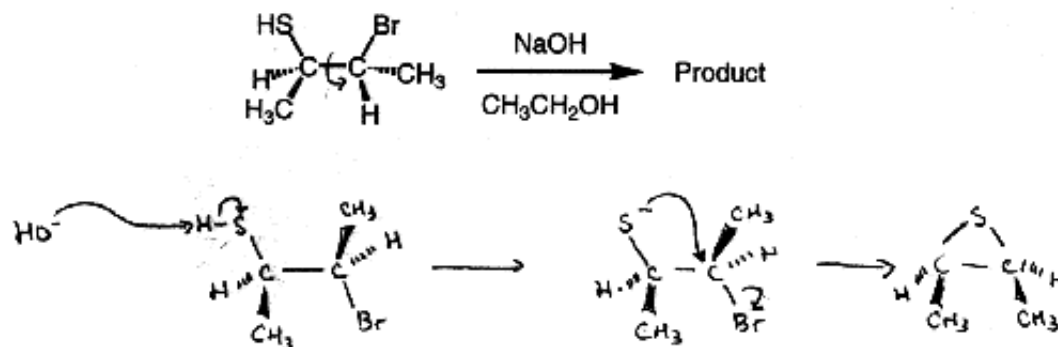
Name key

- a. (10 pts) Explain the following observations using structures, equations, curved arrows, and a minimum amount of prose.

Why does (S)-2-butanol slowly form a racemic mixture upon standing in dilute sulfuric acid?

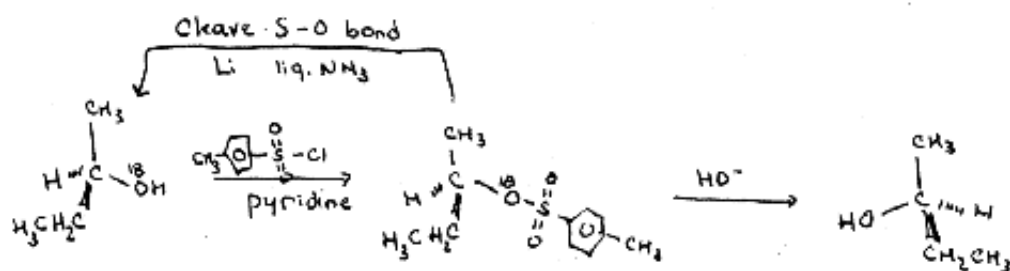


- b. (10 pts) Using the correct curved arrow formalism, show the best mechanism for the following reaction. Be sure to draw complete structures for all intermediates. Be sure to draw the correct stereochemistry for the products. Give as much detail as possible.

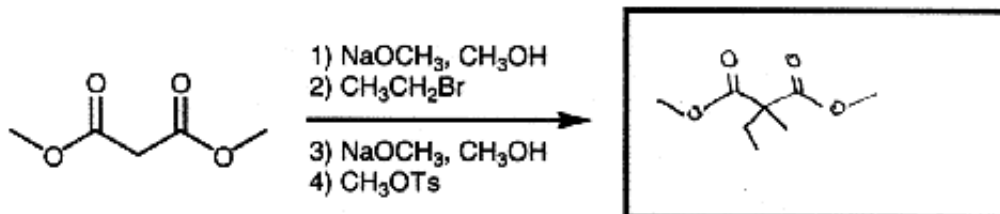


a. (5 pts) What conclusion did Phillips and Kenyon draw from the results of their experiment?
How did they draw that conclusion?

Phillips and Kenyon showed that inversion of configuration occurred during a S_N2 reaction. They showed that inversion of configuration doesn't occur during tosylation (the first step of a two-step process). Therefore the inversion must occur in the second step, the S_N2 reaction.



b. (5 pts) Draw the product of the following reaction.



c. (2 pts) How often do you visit the website for this course?