

Key

**General Instructions:**

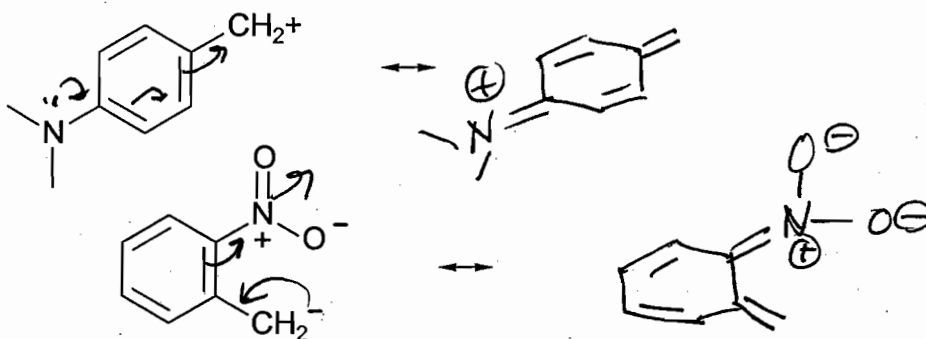
Use scratch paper at the back of the exam to work out answers. Final answers must be recorded at the proper place on the exam itself for credit.

Print your name and ID # on each page.

Please keep your paper covered and your eyes on your own work.

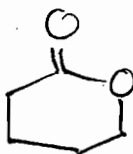
Academic misconduct will lead to failure in the course.

1. (10 pts.) Consider the benzyl cation and benzyl anion shown below. For each write another resonance structure which shows charge delocalization into the substituent group.

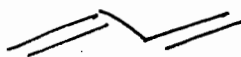


2. (20 pts.) Draw a complete Lewis structure of the following. Use a specific example. Don't use R groups.

a) a cyclic ester



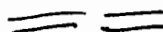
b) a compound that absorbs light in the ultraviolet region of the spectrum



c) a radical anion



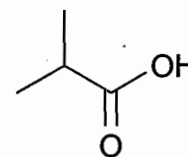
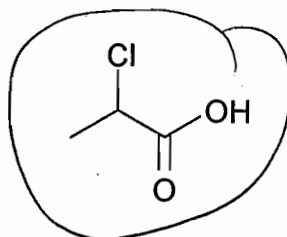
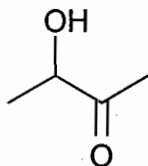
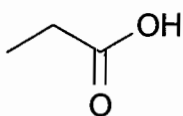
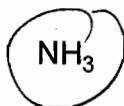
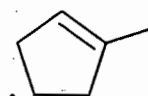
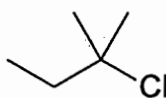
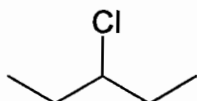
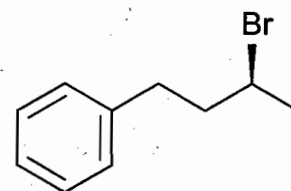
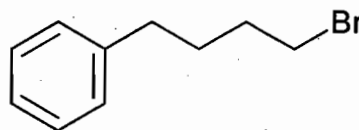
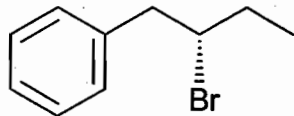
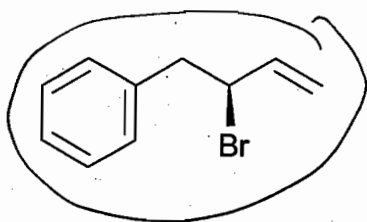
d) an allene



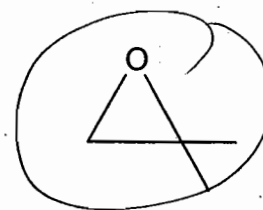
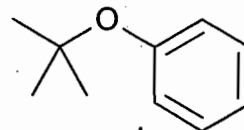
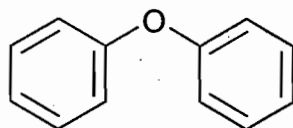
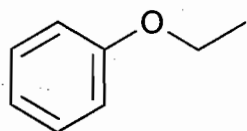
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3. (25 pts.) Circle the correct structure.

(a) The **strongest** acid.(b) The **strongest** base.(c) The **most reactive** chloride when treated with NaCN in dimethyl sulfoxide.(d) The bromide which would give the **most stable** product upon elimination with KOH.

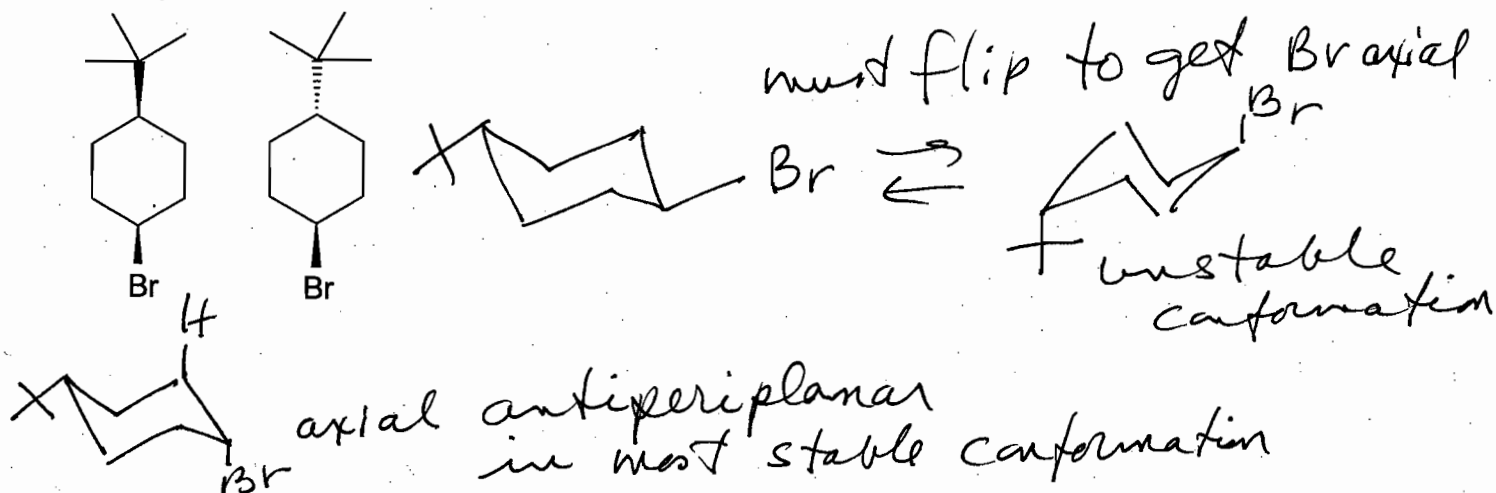
(e) The ether that would be most easily cleaved with HBr.



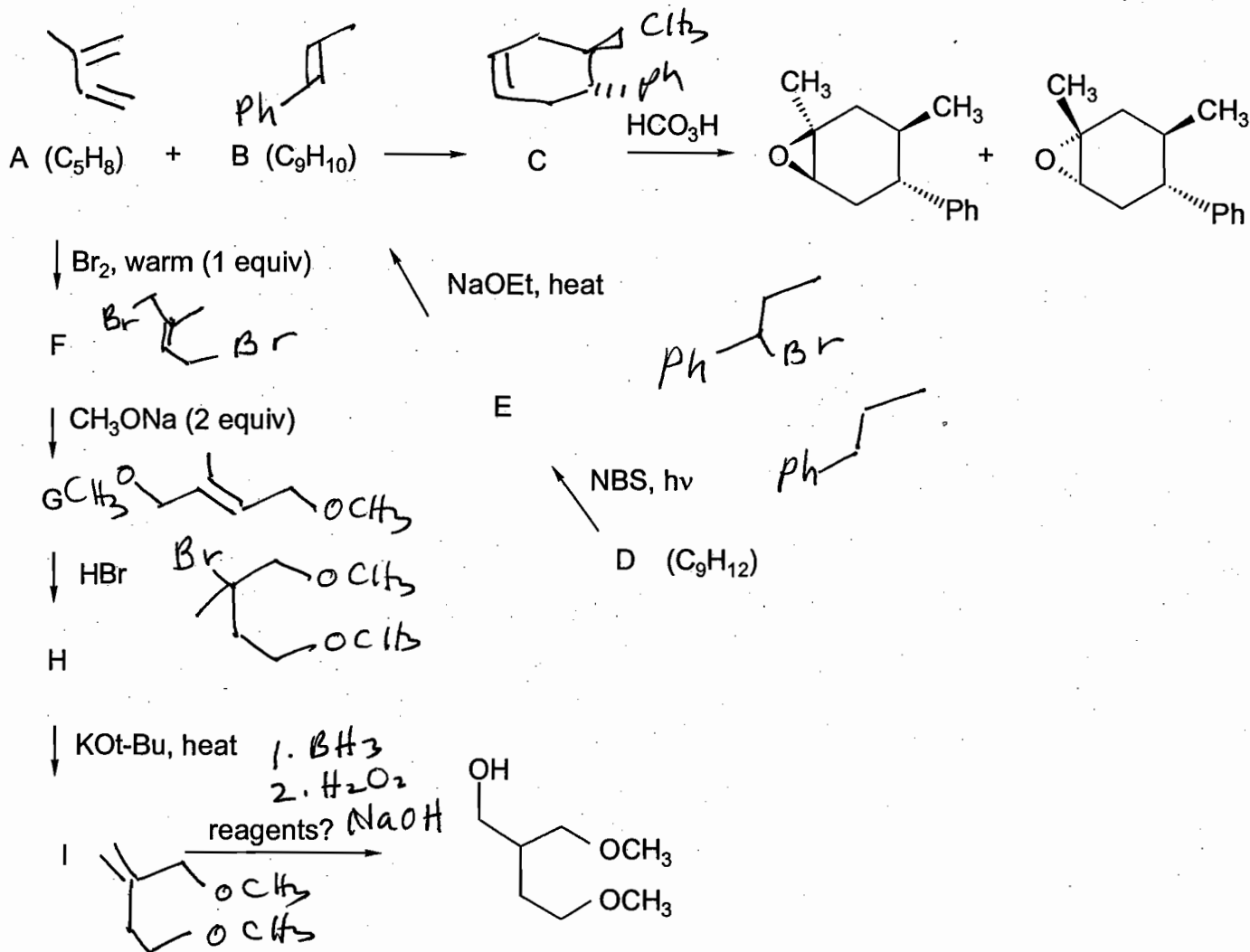
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4. (a) (11 pts.) Which of the two stereoisomers shown will undergo E2 elimination faster. Briefly state why. Drawing chair conformations will help.



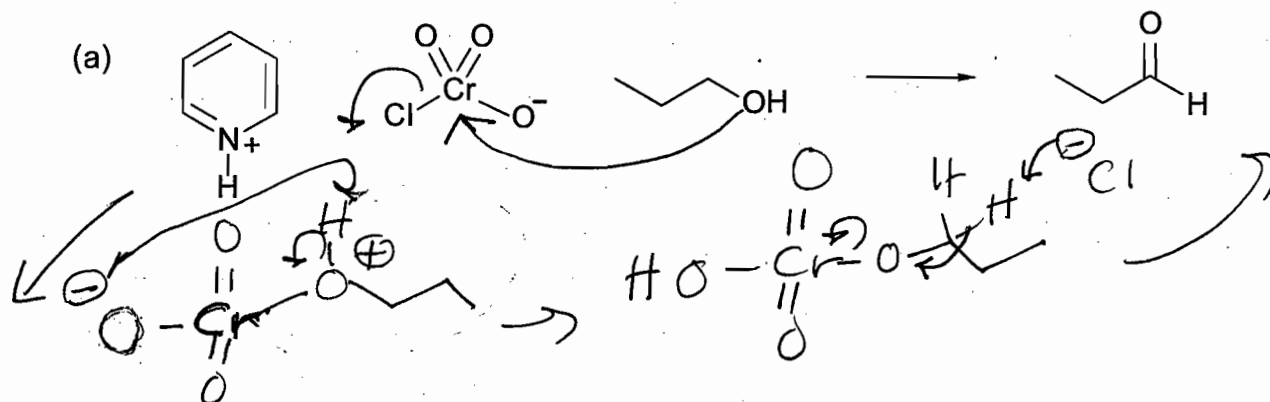
5. (20 pts.) Elucidate the structures of compounds A through I. Specify any missing reagents.



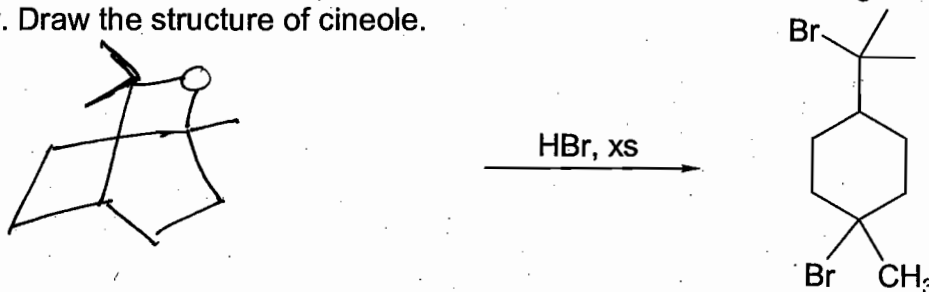
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6. (11 pts.) Write a detailed mechanism for the following transformation using correct electron-pushing arrows and showing all intermediates.



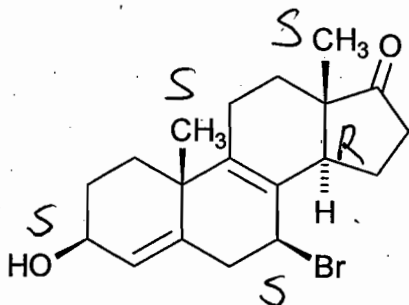
7. (6 pts.) Cineole is the chief component of eucalyptus oil. It has the molecular formula  $C_{10}H_{18}O$  and contains no double or triple bonds. It reacts with excess HBr to give the dibromide shown below. Draw the structure of cineole.



8. (6 pts.) **Circle** the compounds that are oxidation agents. **Box** the compounds that are reducing agents. Some may be neither.



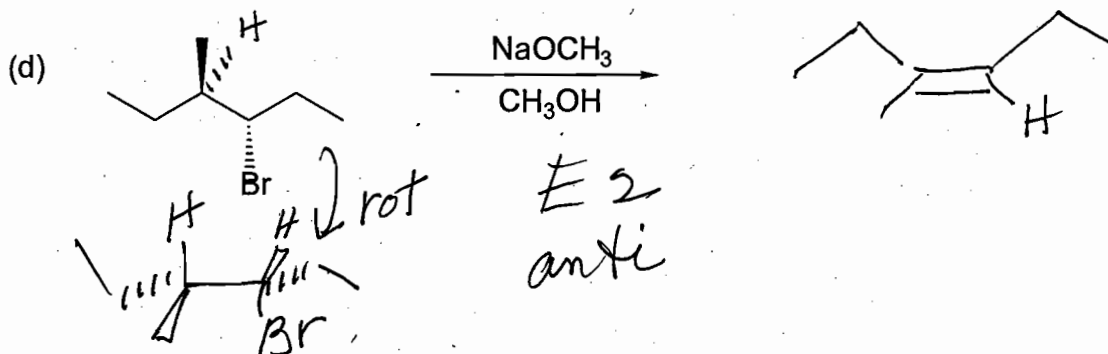
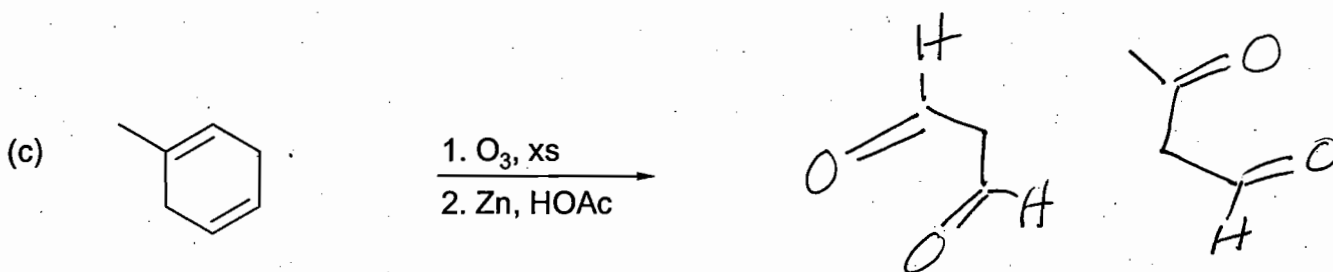
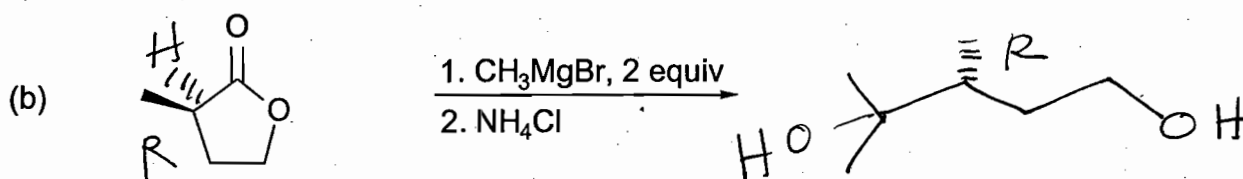
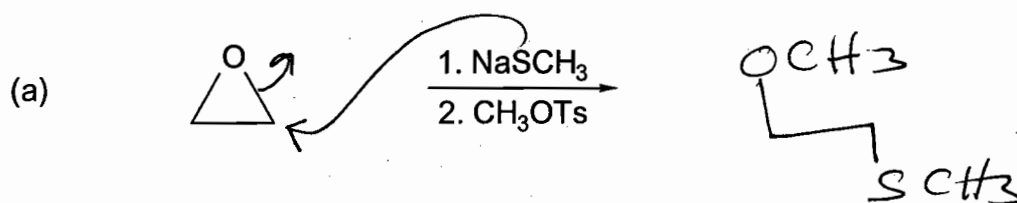
9. (10 pts.) Assign the absolute configuration (R,S) of the stereogenic centers in the following steroid.



Name \_\_\_\_\_

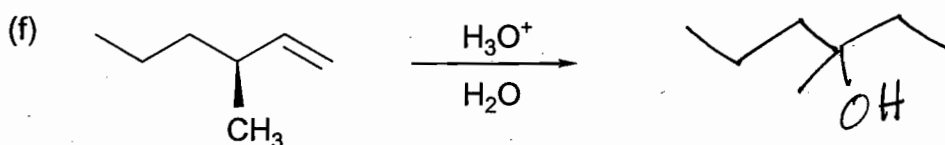
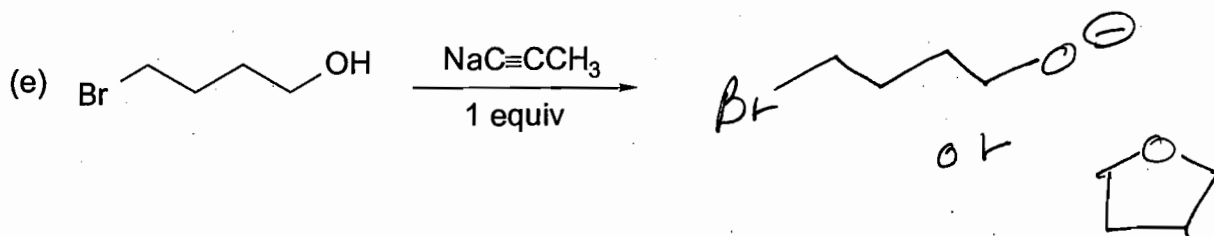
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10. (36 pts.) Write the major products of the following reactions showing stereochemistry in 3-D where necessary. Include **all** stereoisomers that are formed.

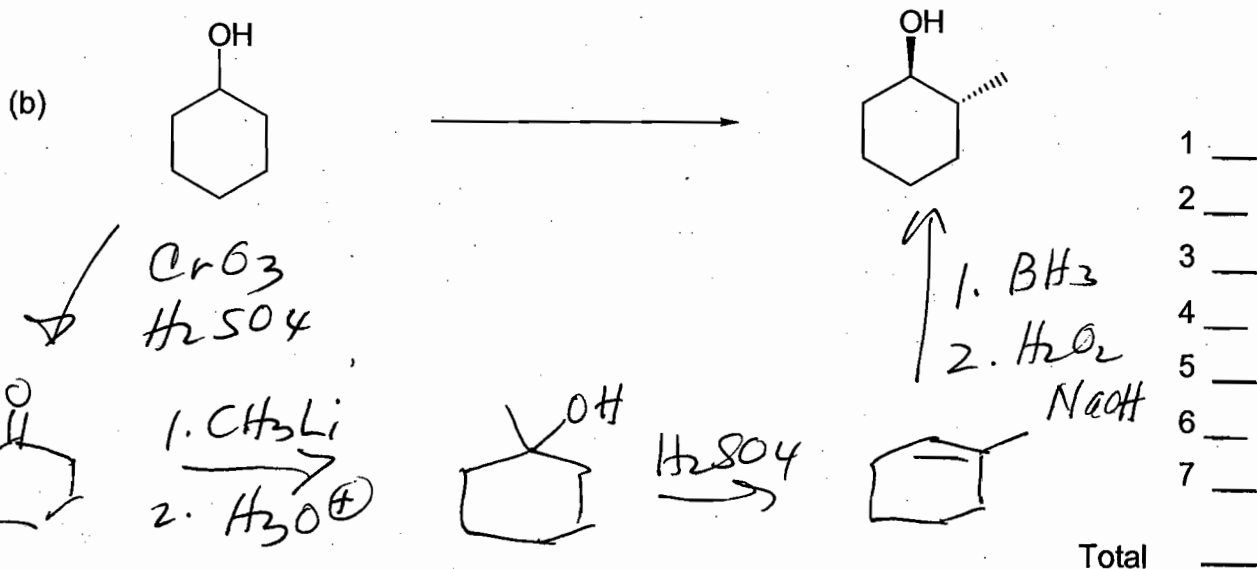
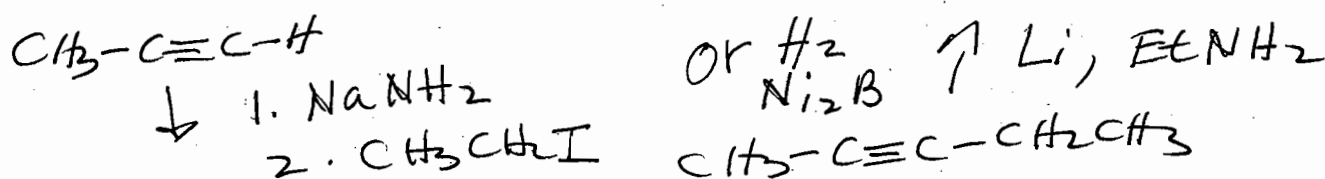
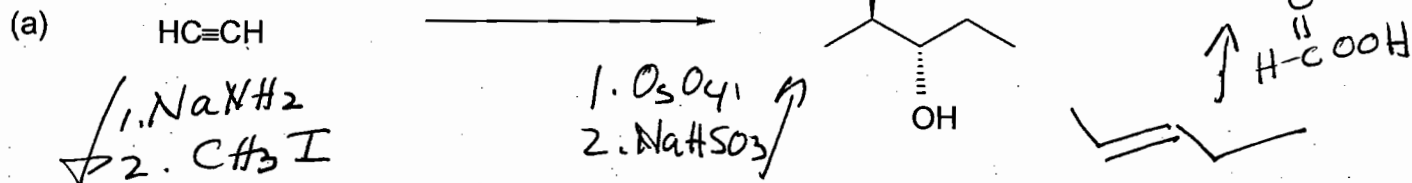


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11. (20 pts.) Show how you would accomplish the following transformations. Give all reagents and isolated intermediate products. More than one step is required.



12. (25 pts.) For each of the following structures identify them as conformers, enantiomers, diastereomers, structural isomers or identical.

