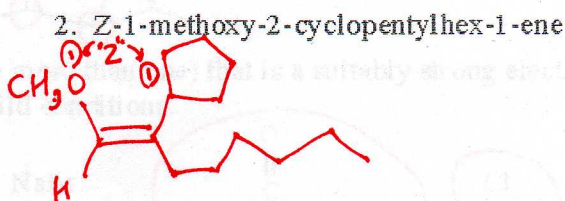
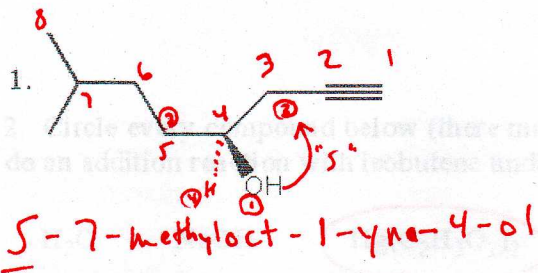
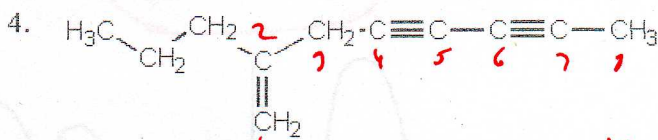
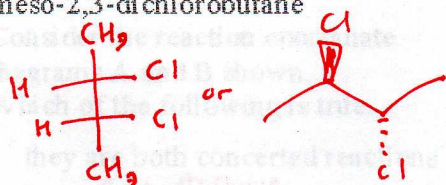


I. Give the complete IUPAC name for each structure (including stereochemistry where appropriate). Draw the complete structure for each name (including stereochemistry where appropriate). 5 pts each, 20 pts tot.



3. meso-2,3-dichlorobutane



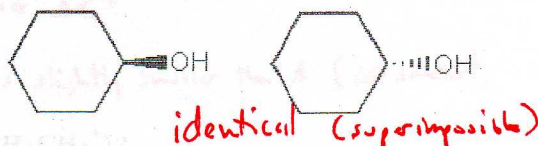
2-propyloct-1-ene-4,6-diyne

II. Indicate the relationship between the members of each pair as either- identical, enantiomers, diastereomers, geometric isomers, skeletal/constitutional isomers. 4 pts each, 16 pts total.

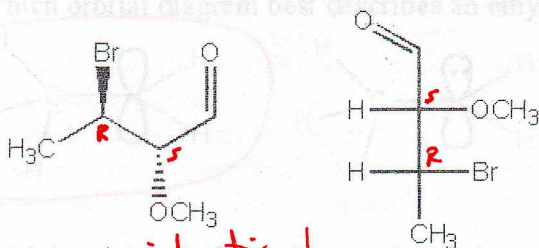
1. (+)-trifluridine (-)-trifluridine

enantiomers

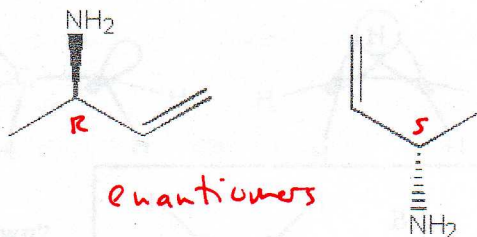
2.



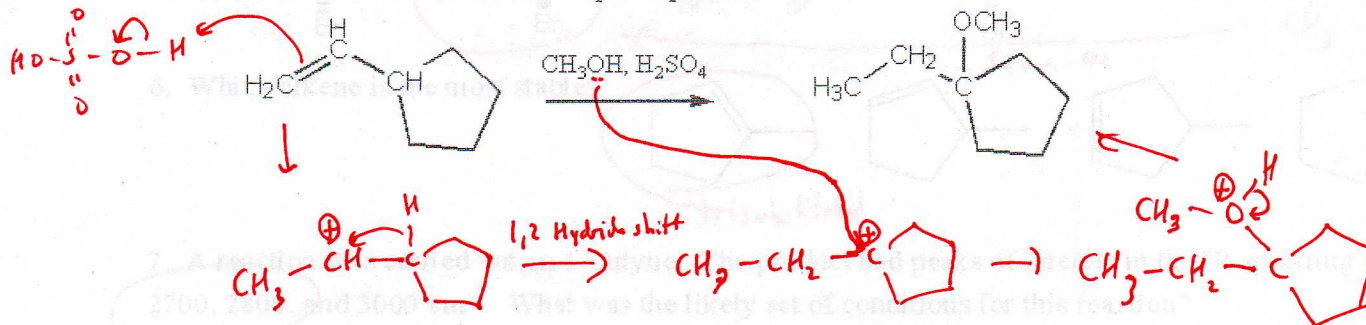
3.



4.

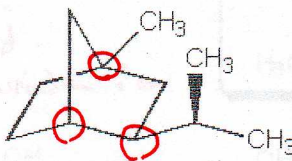


III. All materials necessary for the given reaction are shown. Use curved arrow formalism to show a plausible, step-by-step mechanism that accounts for the formation of the product shown. Show all likely intermediates. Do not "combine" steps. 8 pts total.

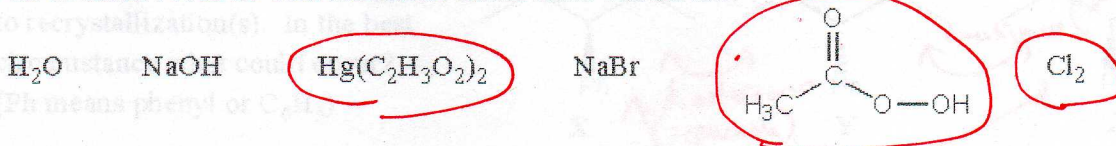


IV. Answer each of the following with a concise answer or calculation or, where appropriate, by selecting the best choice of answers given. Best 8 count 4 pts each, 32 pts total. Try all for bonus.

1. Identify each chiral center



2. Circle every compound below (there may be more than one) that is a suitably strong electrophile to do an addition reaction with isobutene under mild conditions.

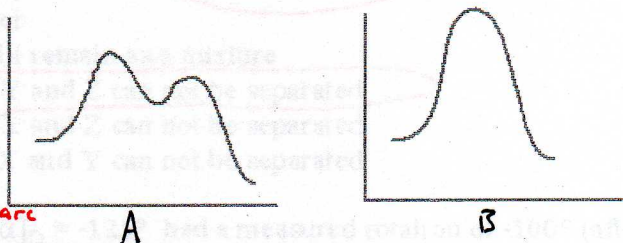


3. Consider the reaction coordinate diagrams A and B shown. Which of the following is true.

they are both concerted reactions

*A is stepwise*

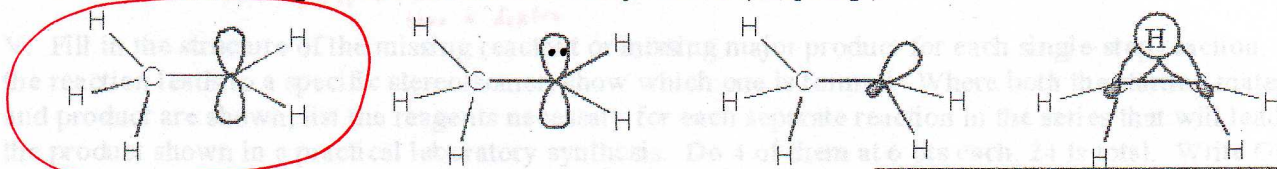
only one of them is exergonic - both are



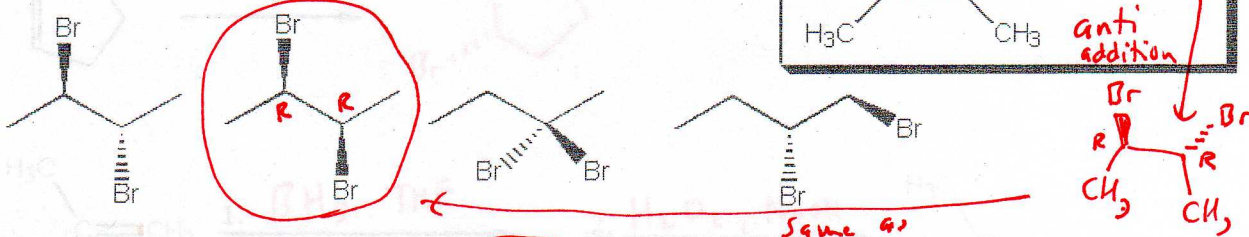
reaction A is a fundamentally faster reaction  $\rightarrow$  lower  $\Delta G^\ddagger$

reaction B has a significantly larger  $K_{eq}$   $K_{eq}$  of B is slightly smaller than A ( $\Delta G$  smaller)

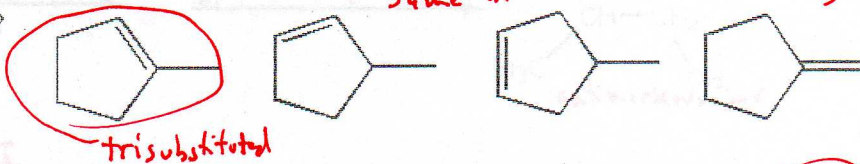
4. Which orbital diagram best describes an ethyl cation ( $CH_3CH_2^+$ )?



5. Which product is the major one for the bromination shown?



6. Which alkene is the most stable?



7. A reaction was carried out on 1-butyne. The product had peaks of interest in the IR spectrum at 1710, 2700, 2800, and 3000  $cm^{-1}$ . What was the likely set of conditions for this reaction?

$H_2$ , Lindlar's cat

$H_2O$ ,  $H_2SO_4$ ,  $HgSO_4$

disiamylborane then  $H_2O_2$ ,  $OH^-$

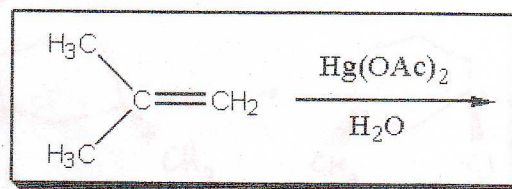
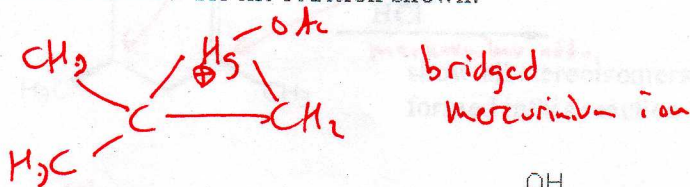
xs  $HBr$

aldehyde

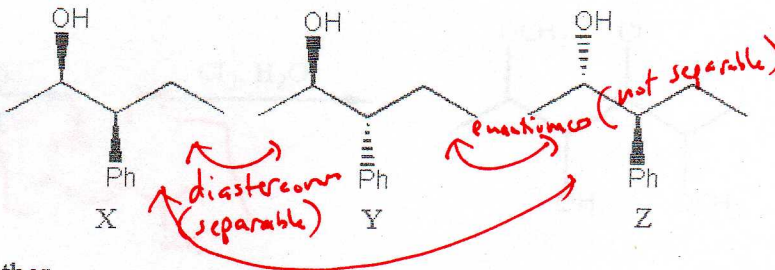


anti-markovnikov  $\therefore$  hydroboration-oxidation

8. Draw the first likely intermediate involving the alkene reactant for the reaction shown.



9. A mixture of X, Y, and Z is subjected to recrystallization(s). In the best circumstance what could occur?  
(Ph means phenyl or  $C_6H_5$ )



all three will be separated from each other

no separation will occur and the three will remain as a mixture

X will be separated from the others, but Y and Z can not be separated

Y will be separated from the others, but X and Z can not be separated

Z will be separated from the others, but X and Y can not be separated

10. A sample of the analgesic oxycodone  $[\alpha]_D = -125^\circ$  had a measured rotation of  $-100^\circ$  (after correcting for concentration and pathlength). What is the percentage of dextrorotatory oxycodone in this sample? Show your work.

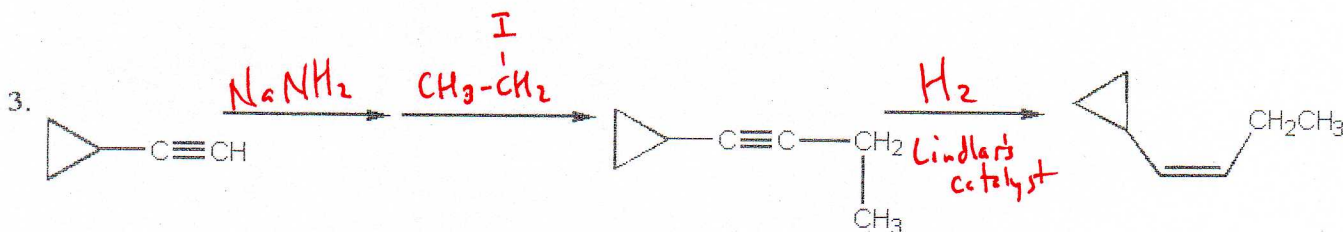
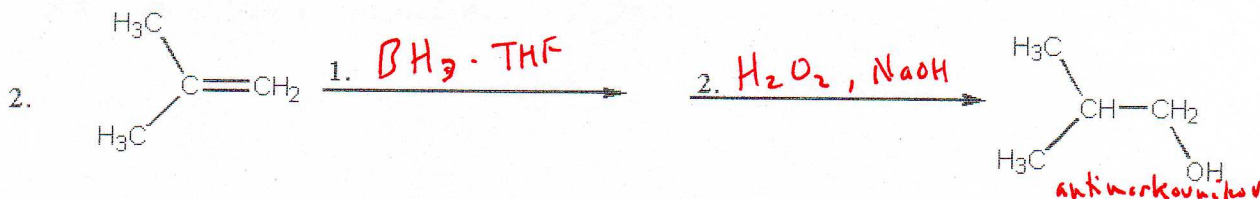
$$100^\circ = 125^\circ \times ee$$

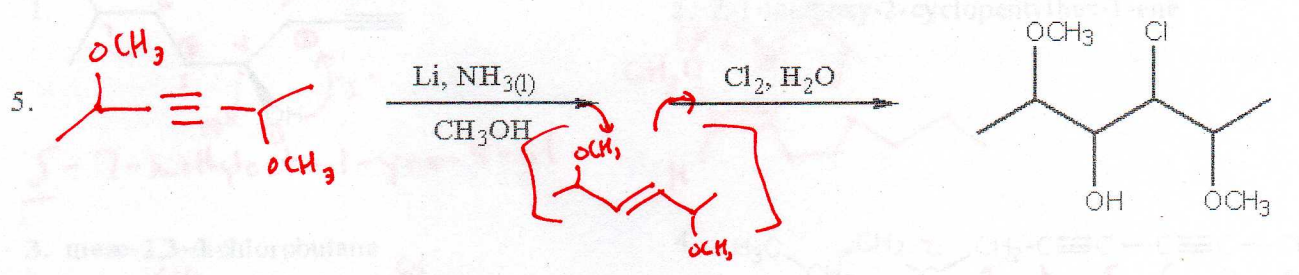
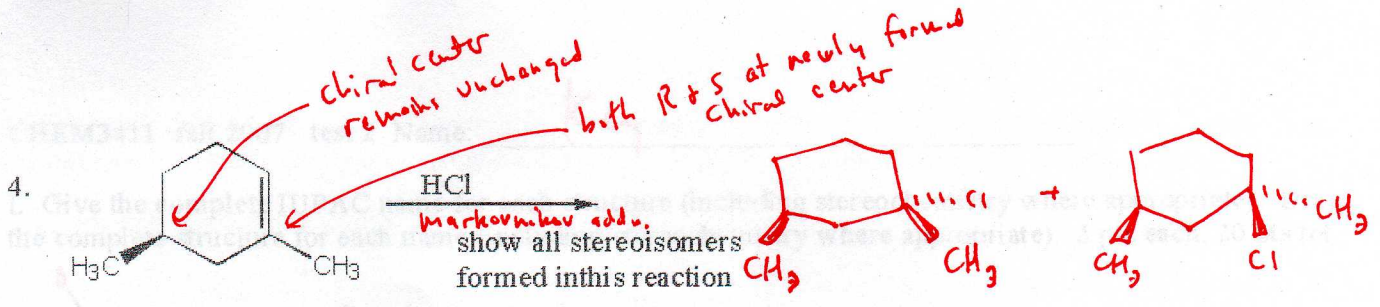
$$ee = 80\%$$

$$\therefore 90\% \text{ levorotatory} + 10\% \text{ dextrorotatory}$$

$$80\% = \frac{\text{levo} - \text{dextro}}{\text{levo} + \text{dextro}}$$

- V. Fill in the structure of the missing reactant or missing major product for each single-step reaction. If the reaction leads to a specific stereoisomer, show which one is formed. Where both the starting material and product are shown, list the reagents necessary for each separate reaction in the series that will lead to the product shown in a practical laboratory synthesis. Do 4 of them at 6 pts each, 24 pts total. Write OMIT for the one you do not wish to have graded.





Scratch Paper

II. Indicate the relationship between the members of each pair as either identical, enantiomers, diastereomers, geometric isomers, skeletal/constitutional isomers. (4 pts each, 16 pts total)



III. All materials necessary for the given reaction are shown. Use curved arrow formalism to show a plausible, step-by-step mechanism that accounts for the formation of the product shown. Show all likely intermediates. Do not "combine" steps. (5 pts total)

