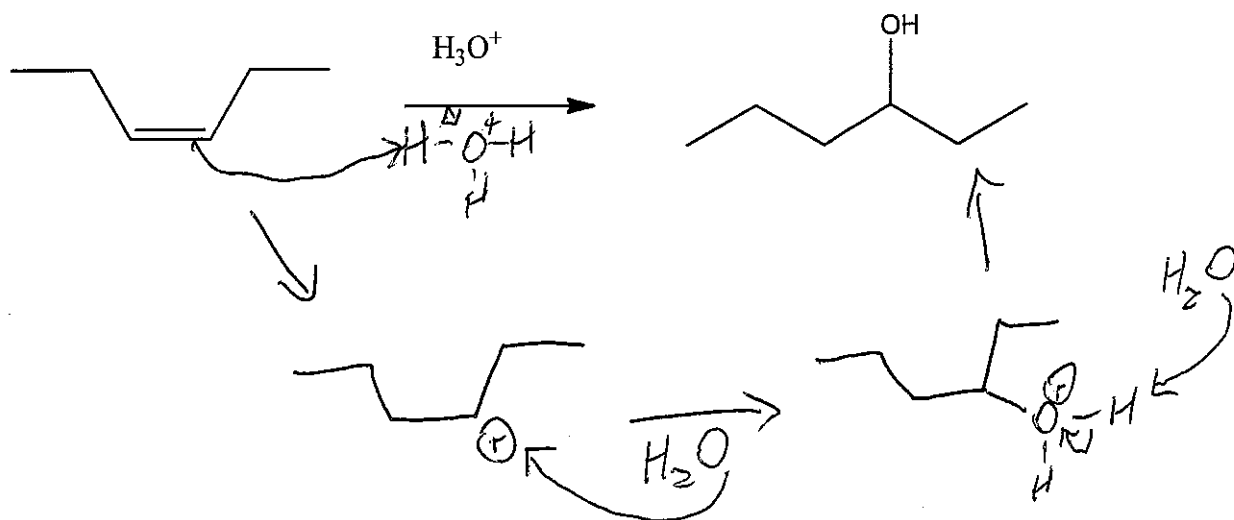
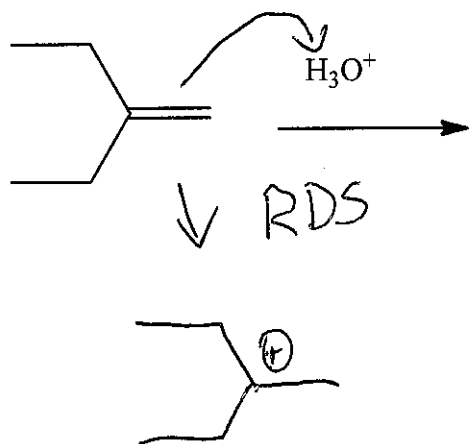


1. (10pts) Provide a mechanism for this transformation:

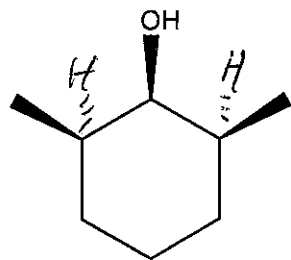


Would you expect the reaction below to proceed faster or slower than the one above? Explain, with reference to the mechanism.



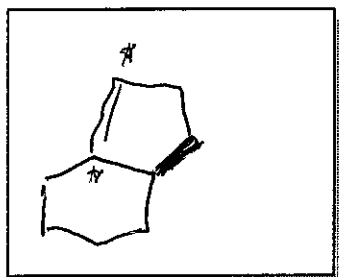
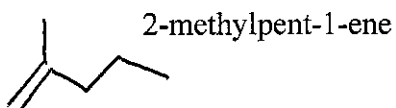
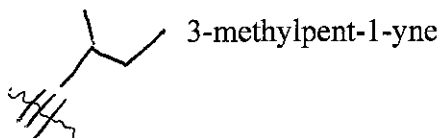
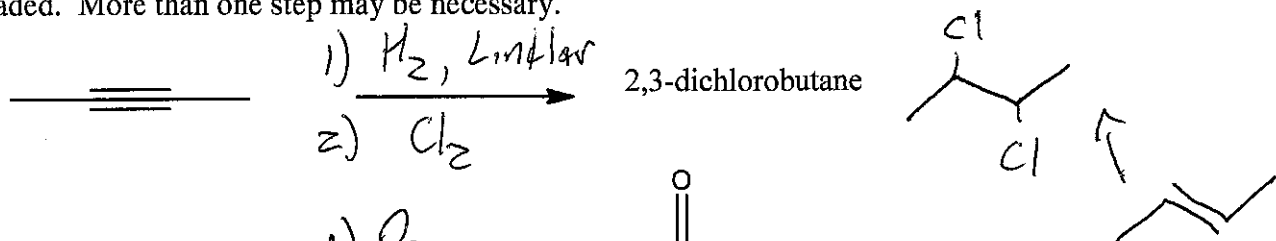
This rxn is faster because the RDS has a lower E_A . By Hammond's Postulate, the TS is lower in energy because it resembles the more stable $3^\circ \oplus$.

2. (2pts) In one sentence, give a mechanistic explanation of why this compound cannot be made using hydroboration/oxidation. (More than one sentence earns you a zero!)

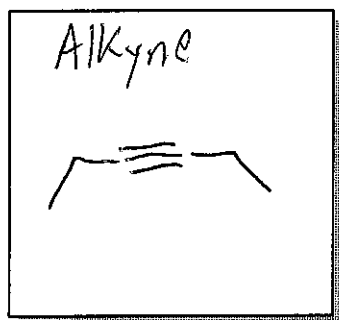
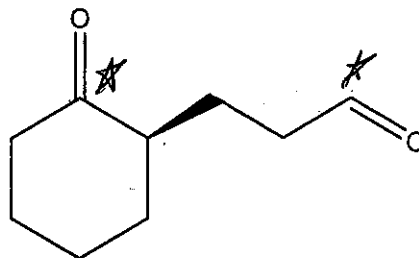


This product cannot form because the $-OH$ and $-H$ are added through syn, concerted addition of BH_3 .

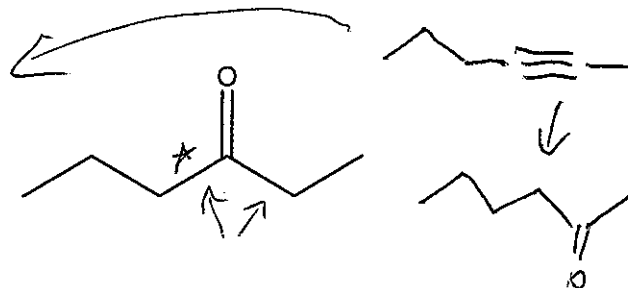
3. (20pts) Provide reagents or starting materials necessary for 5 of the following 6 transformations. CLEARLY MARK the one you do not want graded or else the first five will be graded. More than one step may be necessary.



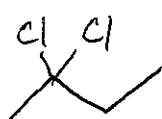
1. O₃
2. DMS



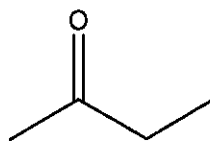
1. 9-BBN
2. HO⁻/H₂O₂



2,2-dichlorobutane

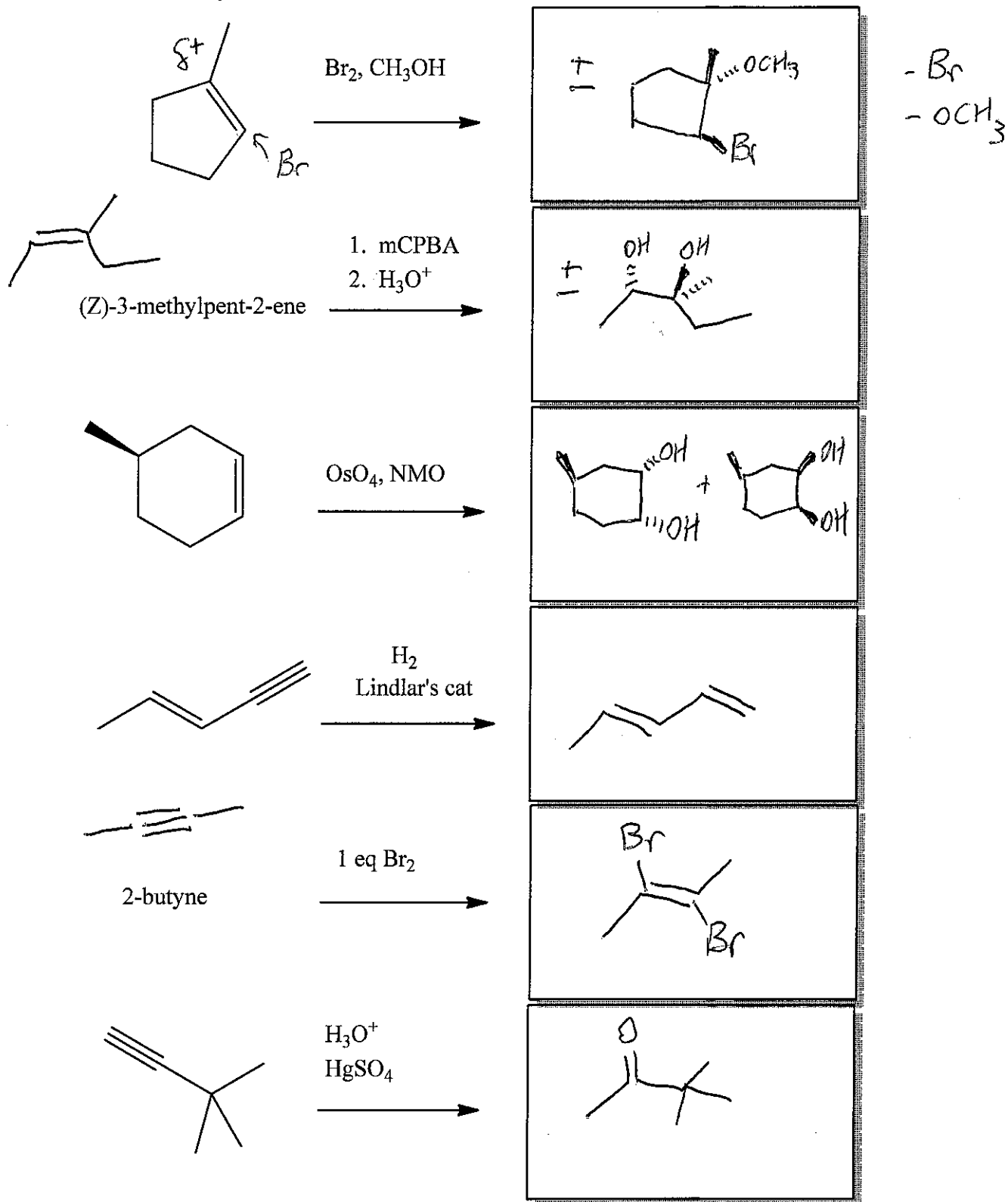


1) xs NaNH₂
2) H⁺ quench
3) HgSO₄/H₃O⁺

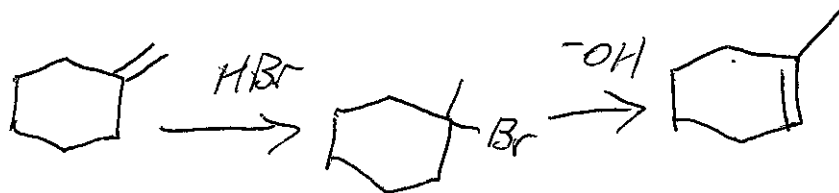
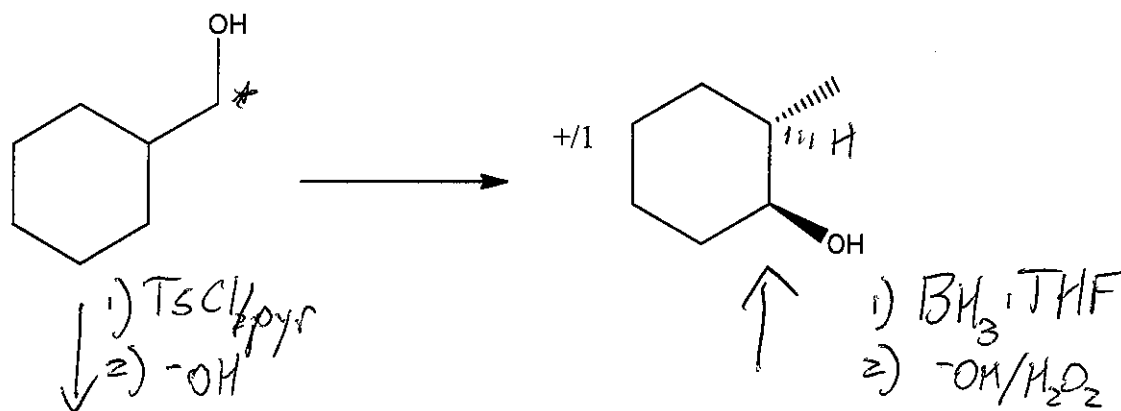
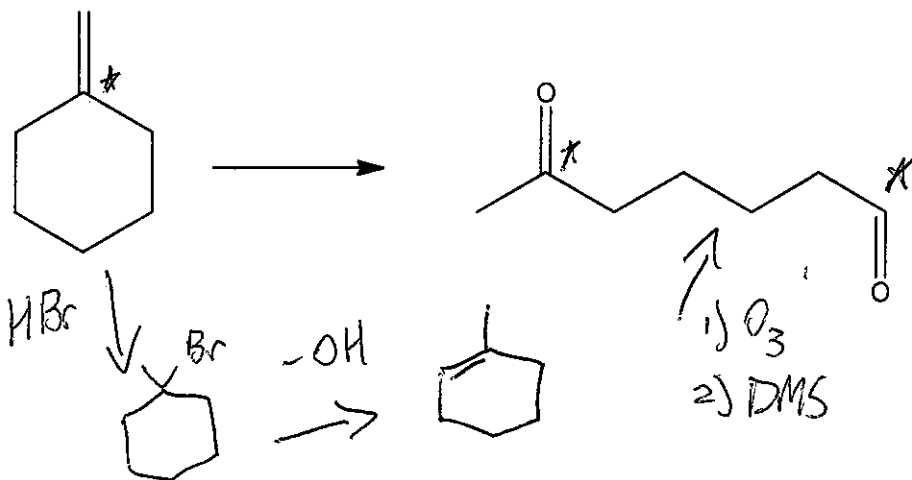


Alkynes

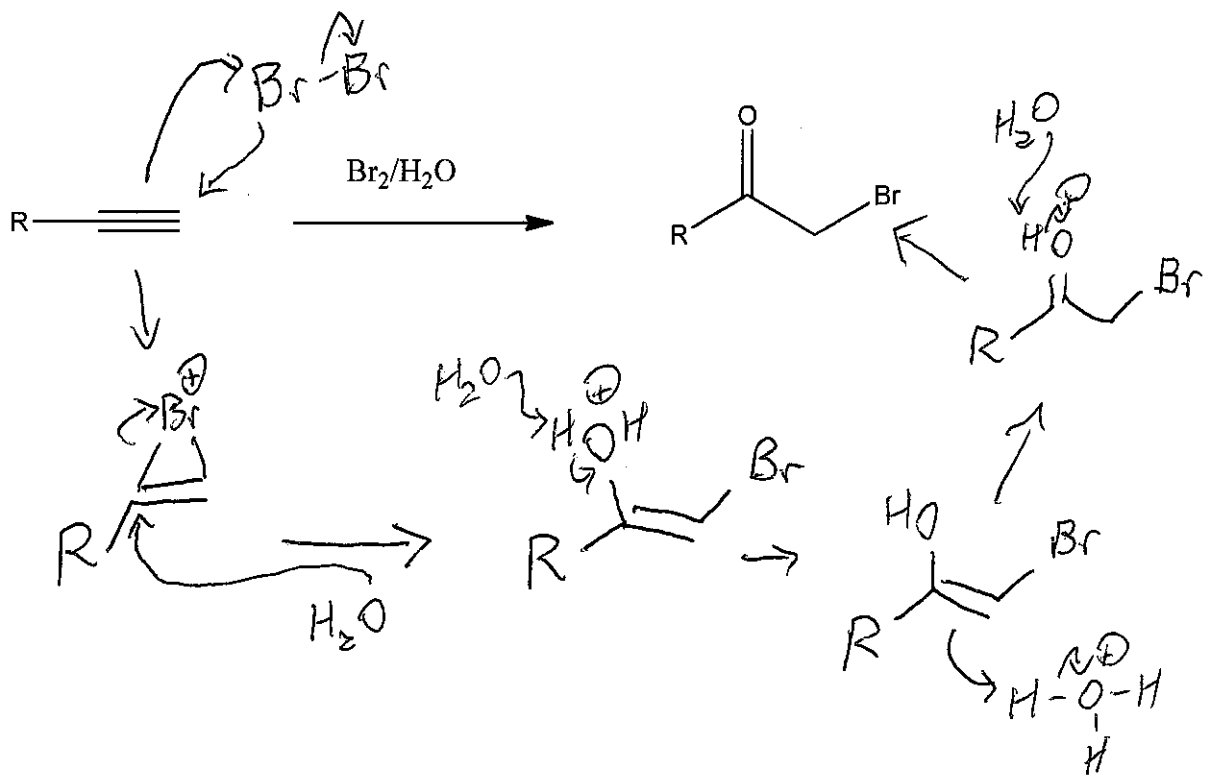
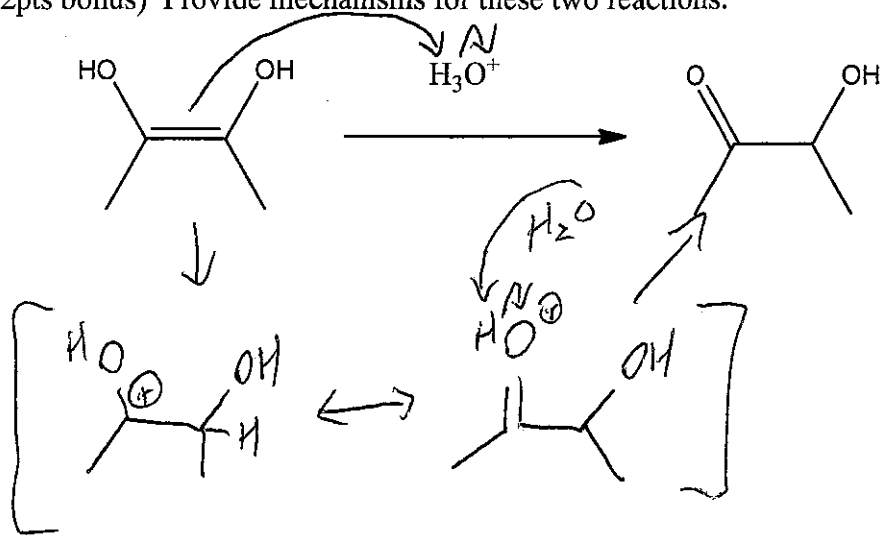
4. (20pts) Predict the MAJOR product(s) of 5 of the following 6 reactions. CLEARLY MARK the one you do not want graded or else the first five will be graded. Include proper stereochemistry, and indicate if the enantiomer also forms.



5. (10pts) Provide the reagents necessary for these multistep syntheses. Show intermediates for partial credit.



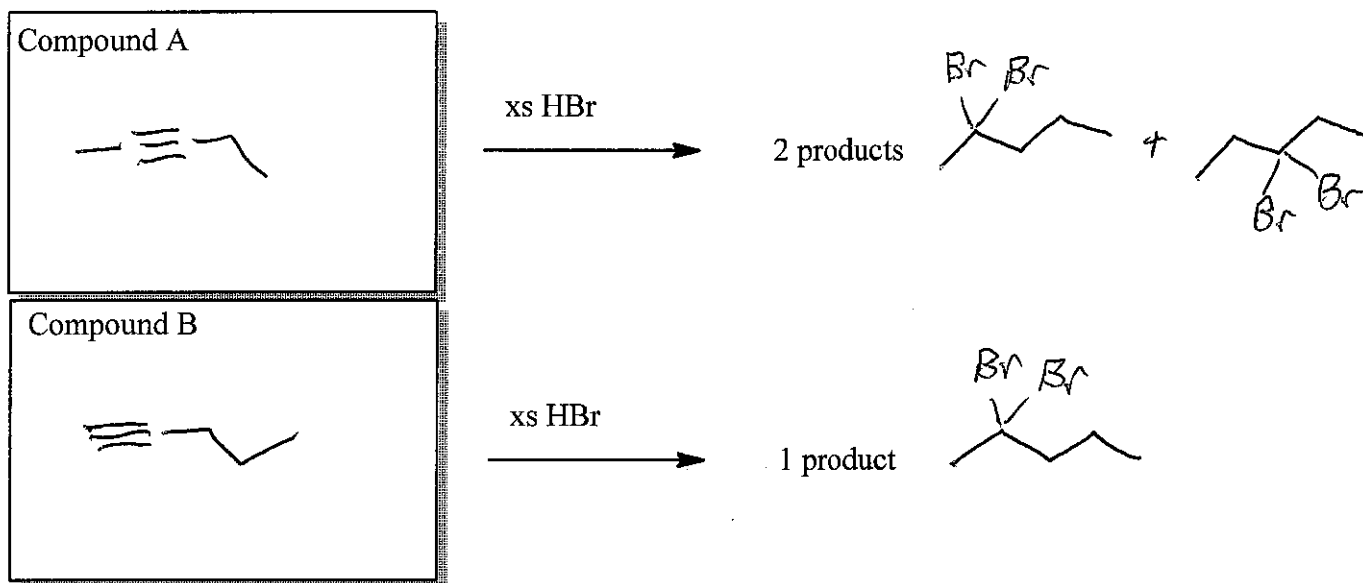
6. (8pts + 2pts bonus) Provide mechanisms for these two reactions:



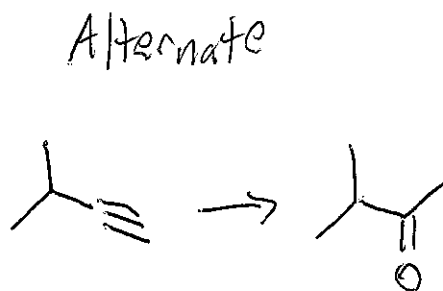
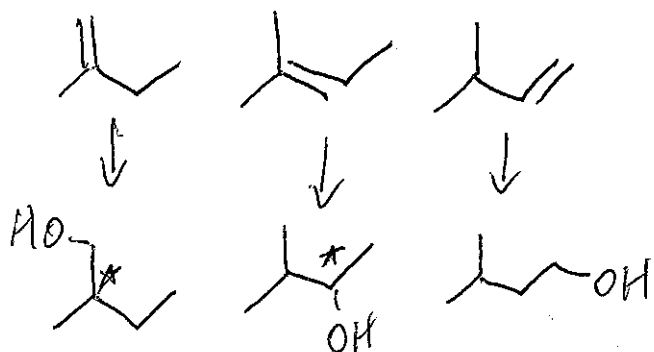
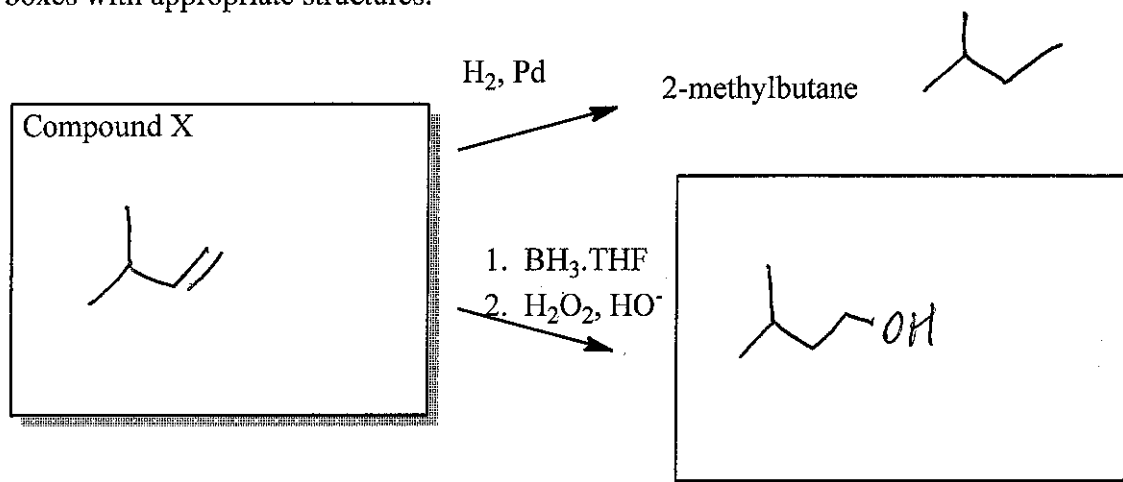
(Hint: Start with the same mechanism as $\text{Br}_2/\text{H}_2\text{O}$ addition to an alkene.)



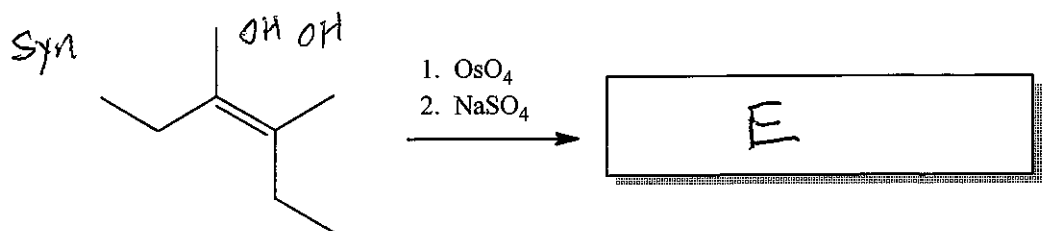
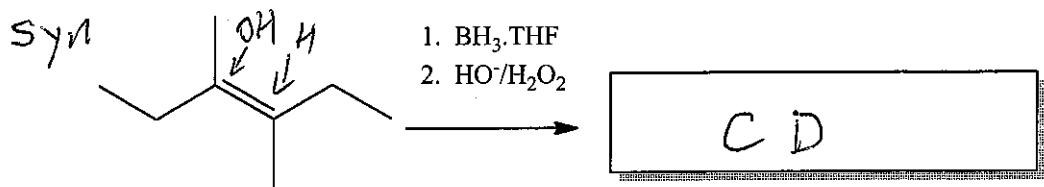
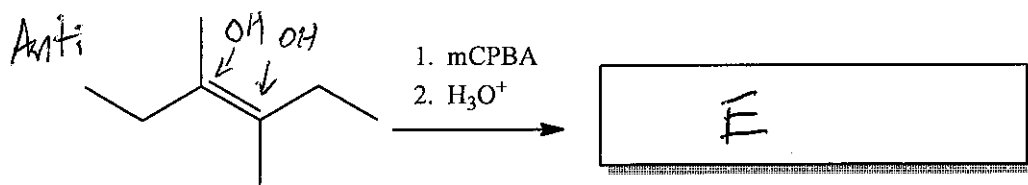
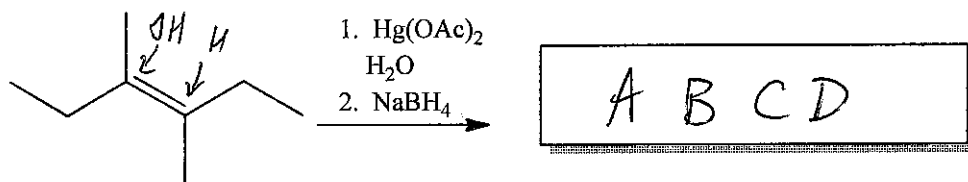
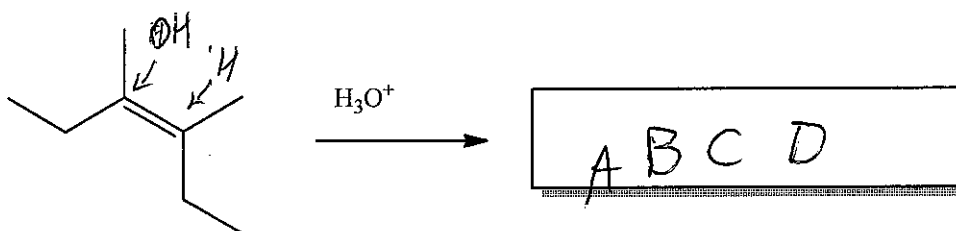
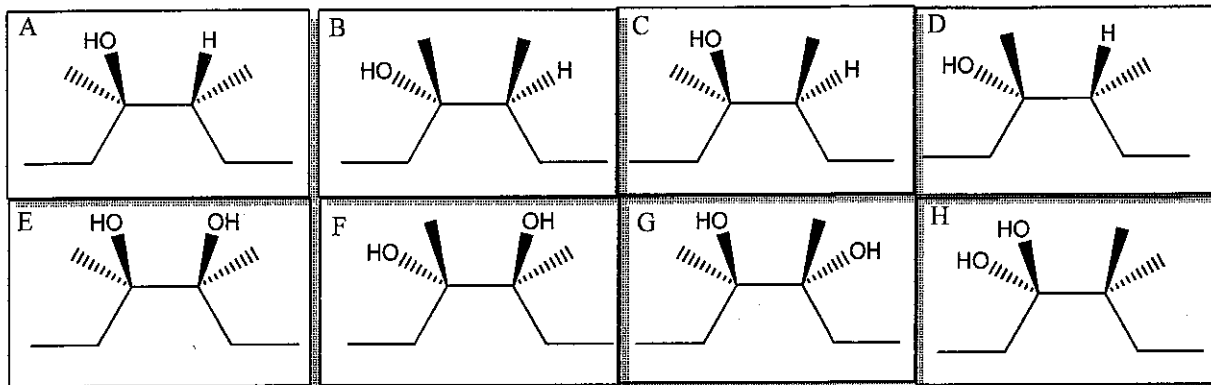
7. (4pts) Compounds A and B are alkynes with molecular formula C_5H_8 . Compound A reacts with excess HBr to give two products; Compound B reacts with excess HBr to give one product. Give the structures of these compounds.



8. (6pts) Compound X reacts with H_2 and Pd to give 2-methylbutane. When Compound X undergoes hydroboration/oxidation, it gives a compound with no chirality centers. Fill in the boxes with appropriate structures.



9. (10pts) Fill in the boxes next to the reactions with the **letters of all products** that form from this list below:



10. (10pts) Provide all reagents necessary for this multistep synthesis. Show intermediates for partial credit.

