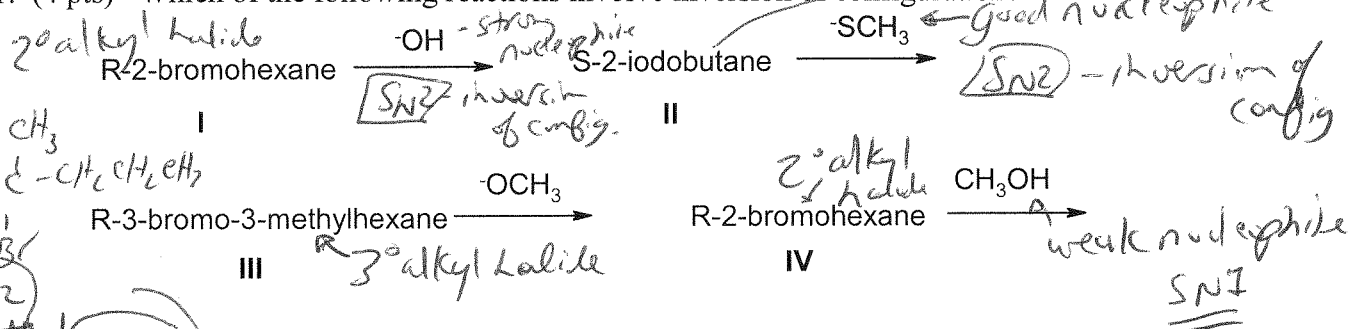


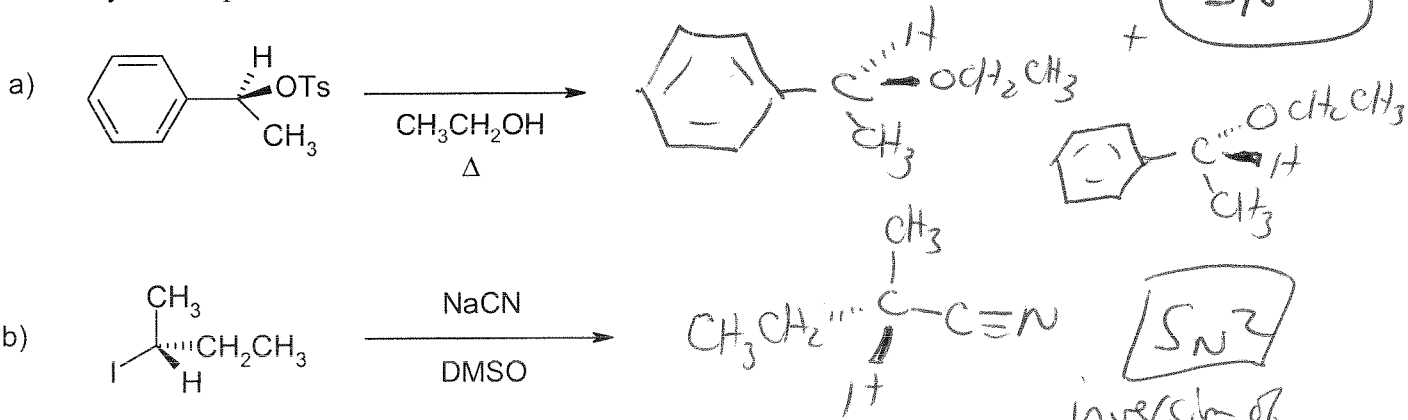
1. (4 pts) Which of the following reactions involve inversion of configuration? ^{2° alkyl halide} ^{2° alkyl halide}



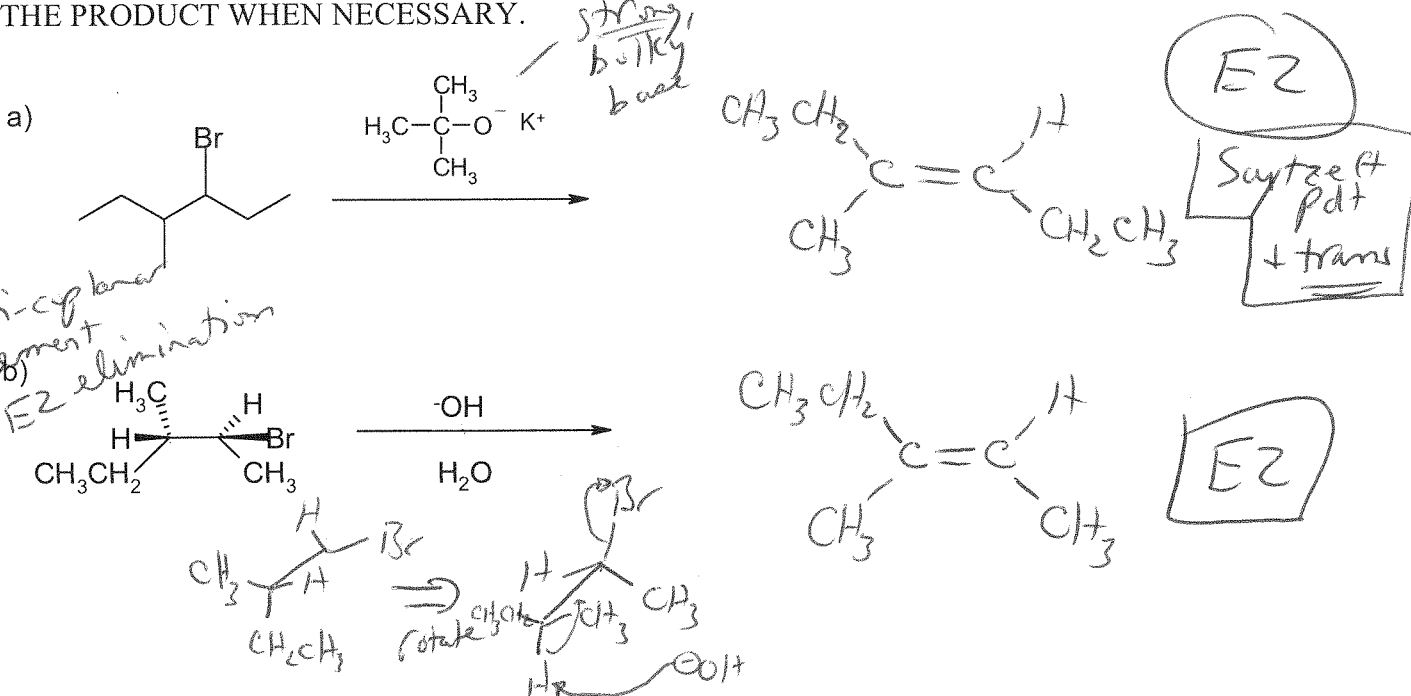
$\text{CH}_3\text{CH}_2-\text{C}(\text{Br})-\text{CH}_2\text{CH}_2\text{CH}_3$
 I
 $\text{CH}_3\text{CH}_2-\text{C}(\text{Br})-\text{CH}(\text{CH}_3)-\text{CH}_2\text{CH}_2\text{CH}_3$
 III
 No S_N2
 3° alkyl halide

- a) I, II b) III, IV c) II, III d) I, IV e) I, II, III

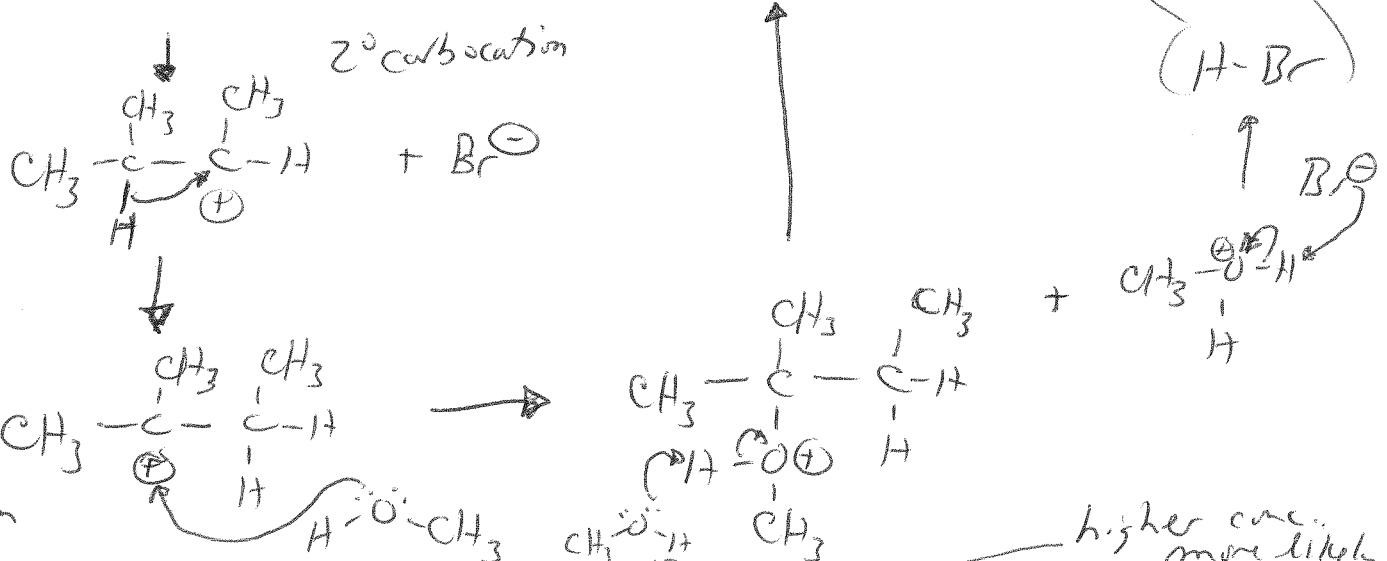
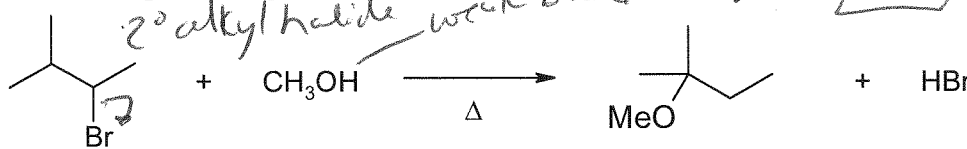
2. (10 pts, 5 each) **A)** Give the structure of the **major** organic product in each of the following **substitution** reactions, and **B)** predict whether the mechanism will be predominantly **1st order** (S_N1) or **second order** (S_N2). Be sure to show the correct stereochemistry of the product when necessary. If the product is a racemic mixture, draw both enantiomers.



3. (10 pts, 5 each) **A)** Give the structure of the **major** organic product in each of the following **elimination** reactions, and **B)** predict whether the mechanism will be predominantly **first order** (E1) or **second order** (E2). BE SURE TO SHOW THE CORRECT STEREOCHEMISTRY OF THE PRODUCT WHEN NECESSARY.

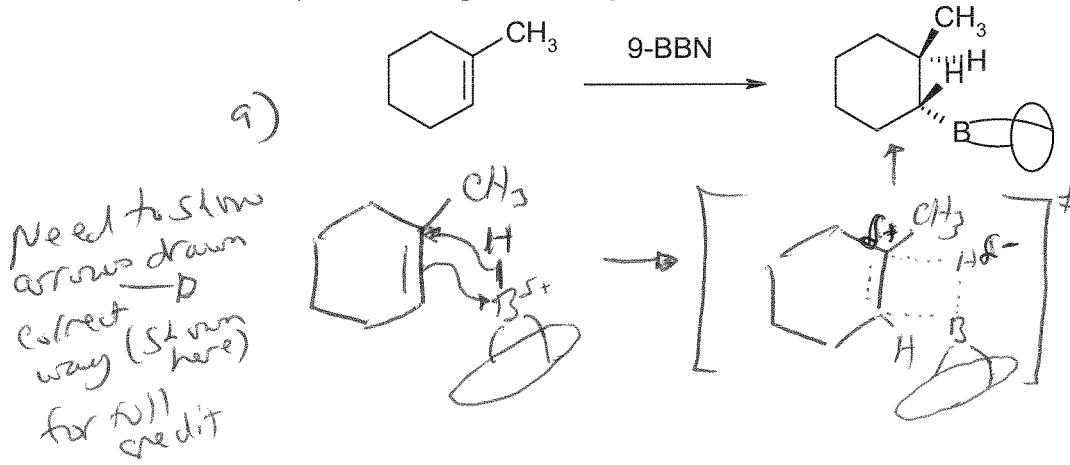


4. (10 pts) Write the **complete mechanism** for the following substitution reaction that explains the formation of the products given.



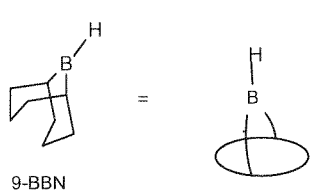
5. (8 pts) a) Explain WHY the syn addition product is the only product obtained when 1-methylcyclohexene undergoes hydroboration by 9-BBN. (Please show the mechanism of this hydroboration to aid in your explanation).

b) Please explain the regioselectivity of the 9-BBN addition.



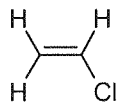
Don't need to draw T.S. for full credit

The addition rxn of $H-B$ is a concerted rxn - so the $B + H$ add only to one face of the alkene to give the syn add. product.



b) The buloon of 9-BBN adds to the less-hindered side of the alkene because it is so bulky. Also, hydride adds to more substituted carbon (3° more stable than 2°) because of δ^+ on that carbon is most stable.

6. (2 pts) The IUPAC name of the following compound is 1-chloroethene.



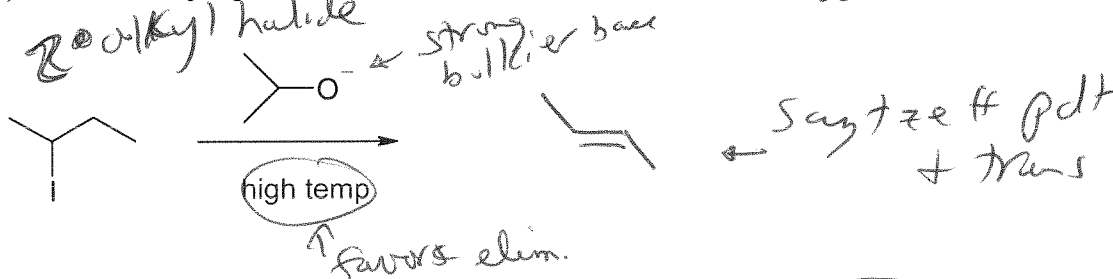
Another way to name this compound (the common name) is vinyl chloride

7. (3 pts) Which of the following is the optimum set of conditions for an E1 reaction of t-butyl bromide?

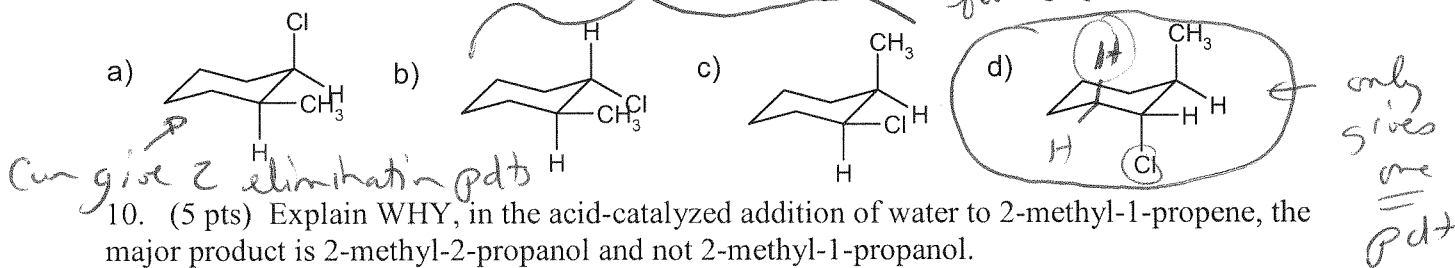
nucleophile/solvent	temperature (°C)
a) CH ₃ OH	25°C
<u>b) CH₃OH</u>	<u>80°C</u>
c) CH ₃ O ⁻ CH ₃ OH	25°C
d) CH ₃ CH ₂ O ⁻ DMSO	25°C
e) CH ₃ CH ₂ O ⁻ DMSO	80°C

Handwritten notes:
 - Both favor E1 but
 - all favor E2
 - higher temp favors elimination more than lower temp
 - CH₃-C(CH₃)₂-Br

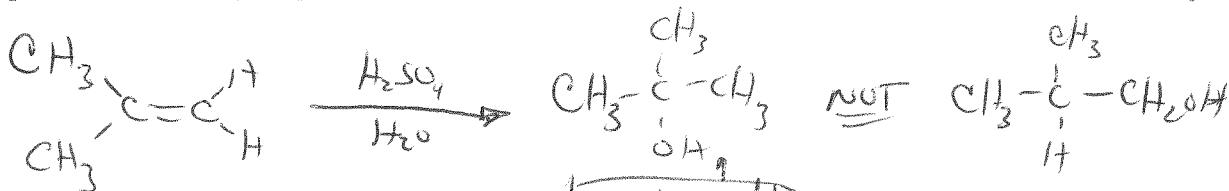
8. (4 pts) Give the major product of the following reaction:



9. (3 pts) One of the isomers of 1-chloro-2-methylcyclohexane gives a single E2 elimination product upon reaction with potassium tert-butoxide. What is the reactive conformation of this isomer?



10. (5 pts) Explain WHY, in the acid-catalyzed addition of water to 2-methyl-1-propene, the major product is 2-methyl-2-propanol and not 2-methyl-1-propanol.



When the alkene reacts with the electrophilic H⁺, the hydrogen attaches to the carbon with the most hydrogens because this gives the most stable carbocation intermediate (a 3° carbocation in this case). This intermediate goes on to react w/ the H₂O nucleophile to form the 3° alcohol.

11. (6 pts, 3 each) Which compound in each of the following pairs will react faster in an S_N2 reaction with OH^- ? (Circle answer) **Briefly** explain why you chose your answer.

Brief explanation

a) CH_3CH_2I in ethanol or CH_3CH_2I in dimethyl sulfoxide

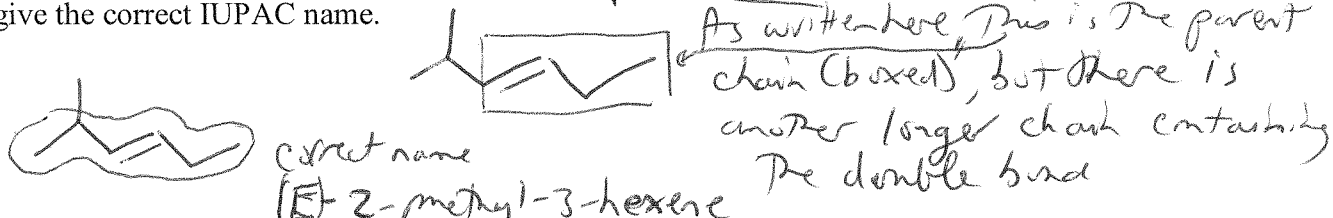
• polar, aprotic DMSO better solvent for S_N2 rxn

b) $H_2C=CHBr$ or $H_2C=CHCH_2Br$

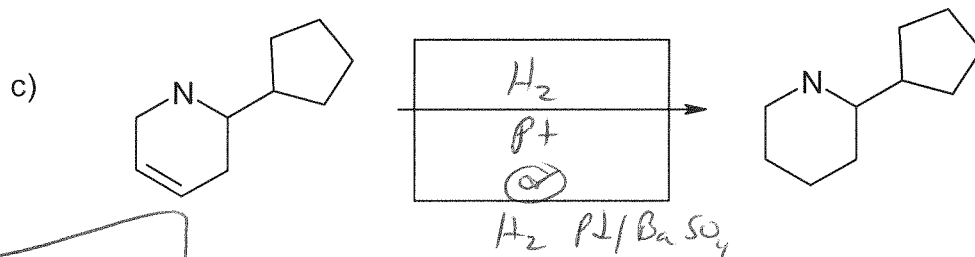
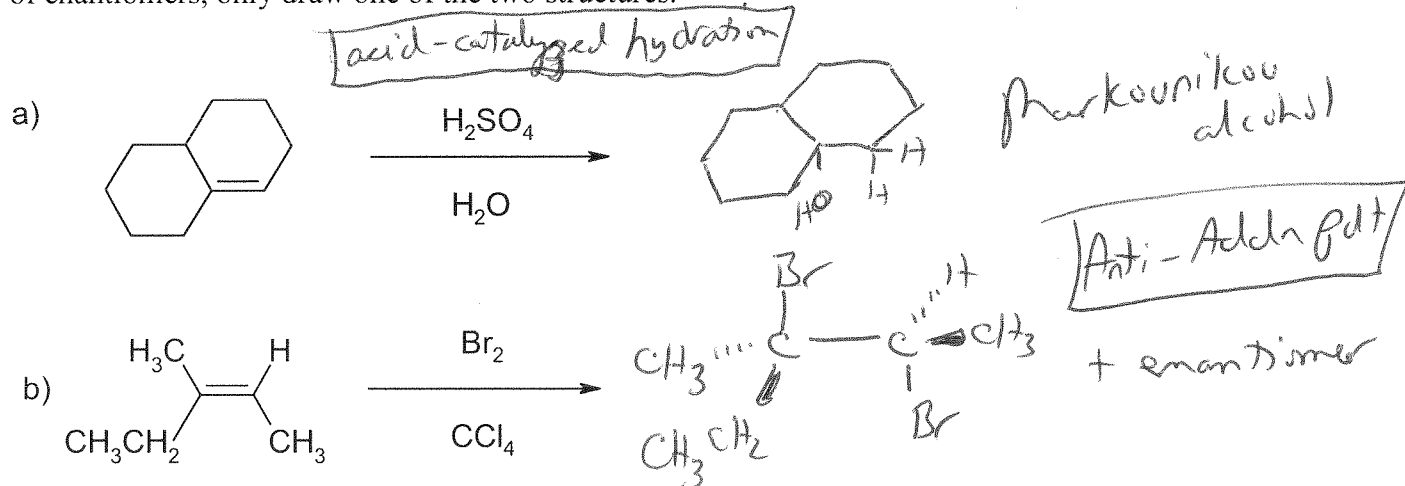
sp^2 hybridized 1° alkyl halide

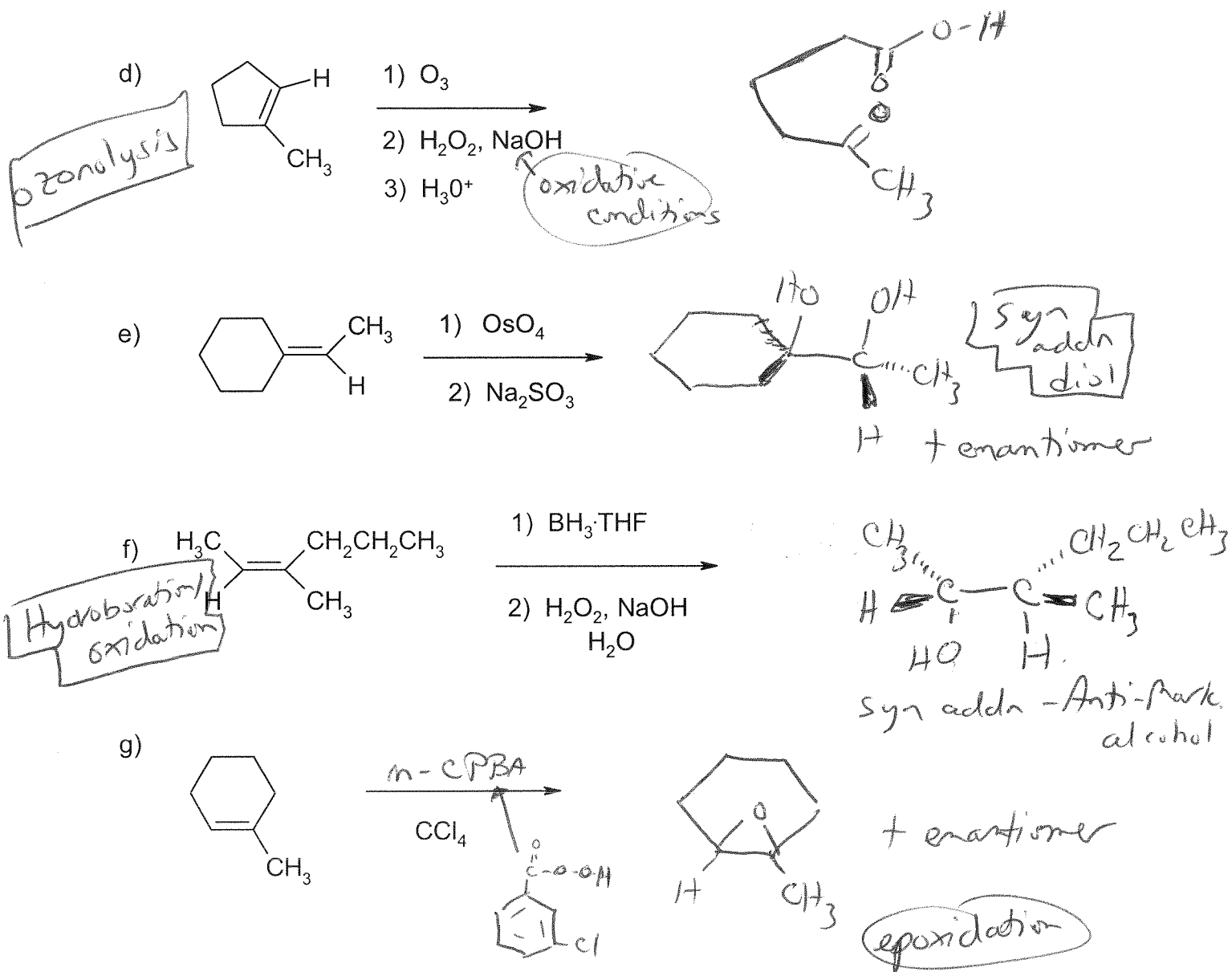
• Can't do S_N2 on sp^2 hybridized carbons. S_N2 best on 1° alkyl halide.

12. (4 pts) The name (E)-1-isopropyl-1-butene is incorrect. Explain why it is incorrect and give the correct IUPAC name.



13. (28 pts, 4 each) Give the structure of the **major** organic product of each of the following reactions. **Clearly indicate stereochemistry where appropriate.** If the major product is a pair of enantiomers, only draw one of the two structures.





14. (3 pts) Draw the bromonium ion intermediate formed when Br_2 reacts with 2-methyl-1-propene.

