

Chemistry 3311-100
Organic Chemistry/Dr. Barney Ellison
Thursday: April 15th @ 7:00pm → 9:00/3rd Exam/Math 100)

Name: Key (please print)

1. (10 pts) Identify the correct compound in each case. Explain your choice.

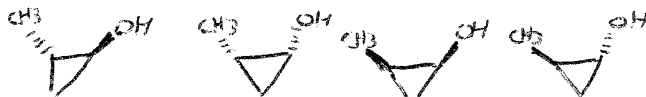
a) Which compound, diethyl ether or propyl alcohol, is miscible in water?

Propyl alcohol, since it can both be an H-bond donor & H-bond acceptor

b) Which compound, allyl methyl ether or propyl alcohol, decolorizes a solution of Br₂ in CH₂Cl₂?

Allyl methyl ether (≡) since its double bond reacts with bromine.


c) Four stereoisomeric compounds, C₄H₈O, all optically active, contain no double bonds & evolve a gas when treated with CH₃MgI.



Each must be an alcohol in order to react with Grignards.

(3 pts)

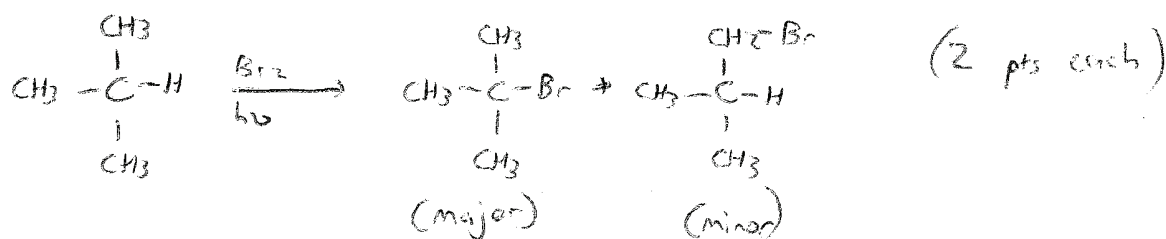
d) A compound believed to be either cyclohexyl methyl ether or 2-methylcyclohexanol evolves a gas when treated with NaH.

2-methylcyclohexanol () since its OH group is reacting with NaH.

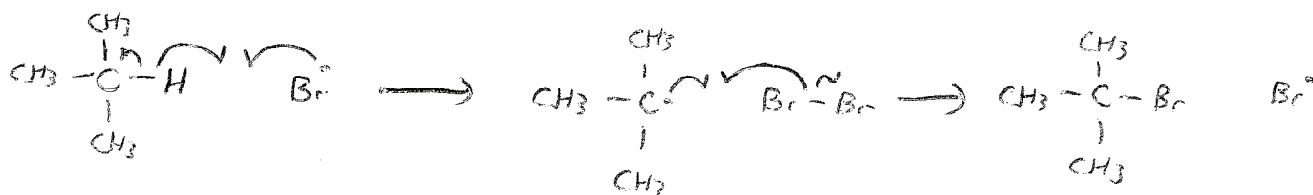
(3 pts)

2. (10 pts)

- a) The bromination of isobutane in the presence of light could give two monobromination products; give their structures.

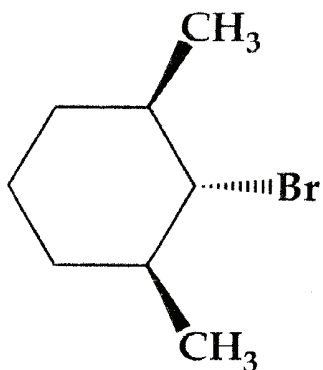


- b) In fact, the products consist of more than 99% of one compound and less than 1% of the other. Show a mechanism for the bromination of isobutane.

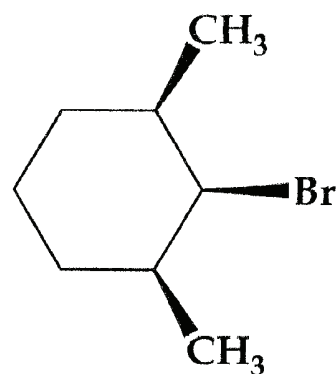


(6 pts)

3. (10 pts) Which one of the following stereoisomers should undergo β -elimination most rapidly with sodium ethoxide in ethanol? Why?

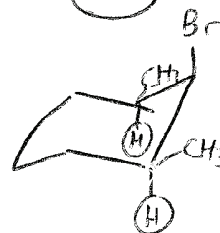


A



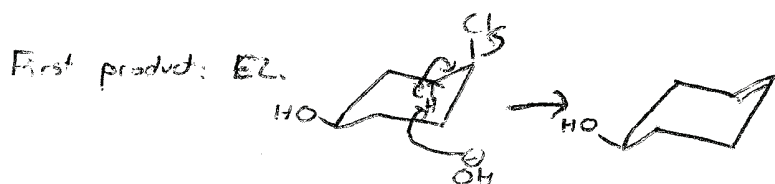
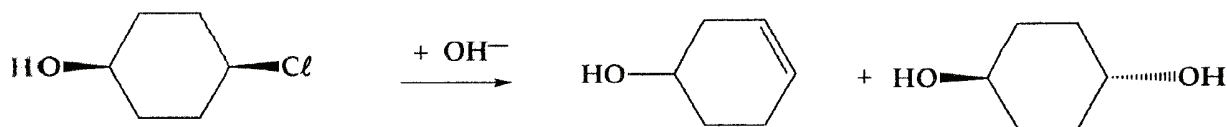
B

(5 pts)



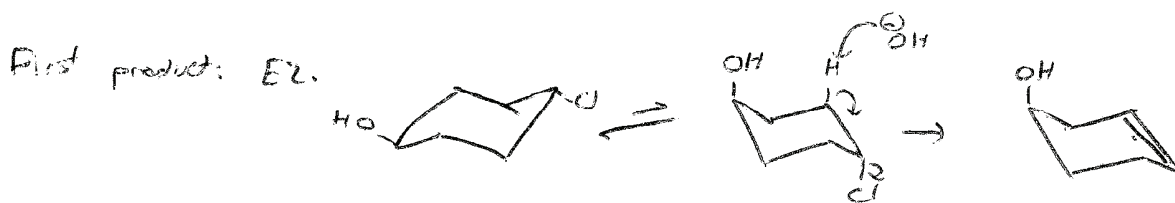
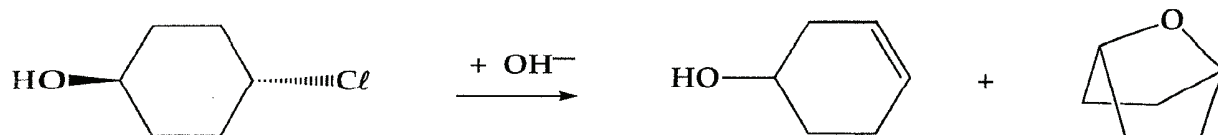
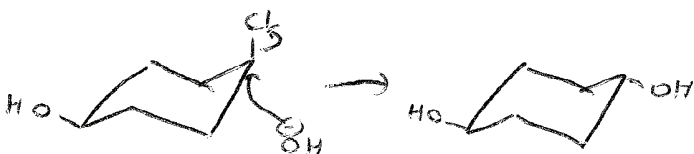
In order for E2 to happen, Br must be anti to an H. (In other words, Br must be axial up & H must be axial down, or vice versa.) This is the case for B, but not A. (5 pts)

4. (10 pt) The cis and trans stereoisomers of 4-chlorocyclohexanol give different products when they react with OH^- . Show a mechanism for each product.

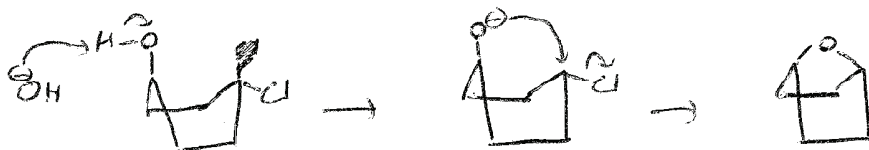


(5 pts for each half;
-1 for each mech without stereochem
-3 for one wrong or no mech.)

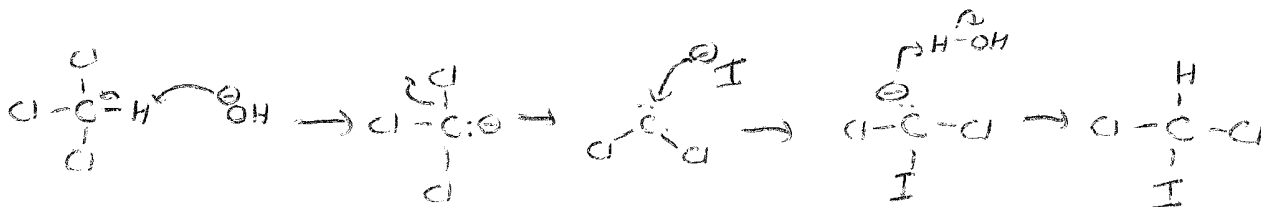
Second product: S_N2:



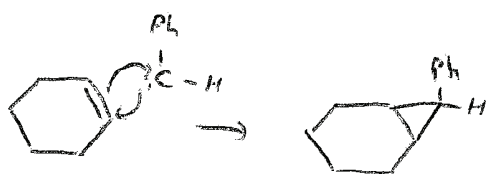
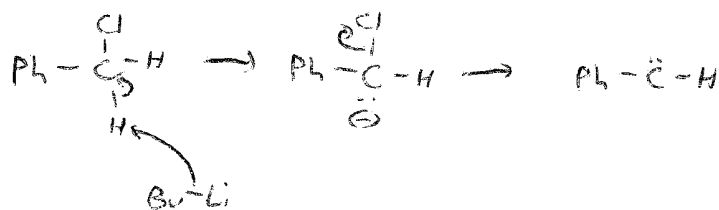
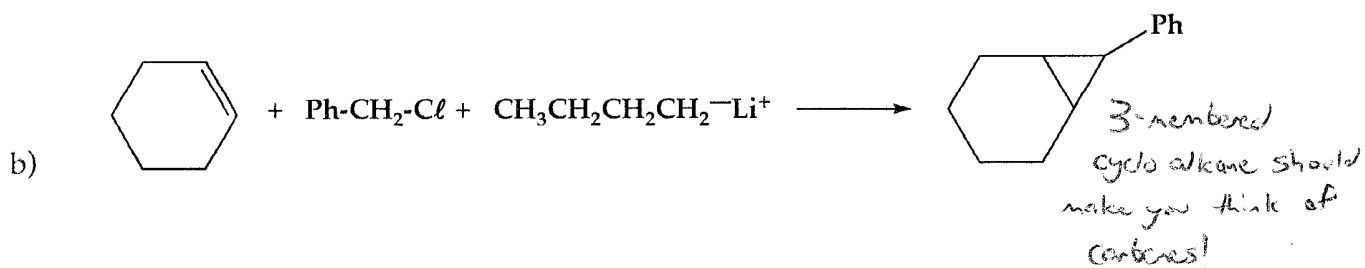
Second product: Intramolecular S_N2.



5. (10 pt) Show a mechanism for each transformation.

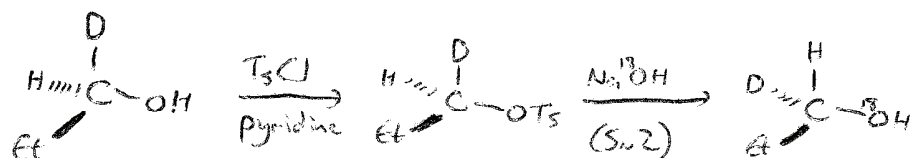


(5 pts each; 2 pts for $\text{S}_{\text{N}}1$ or $\text{S}_{\text{N}}2$.)

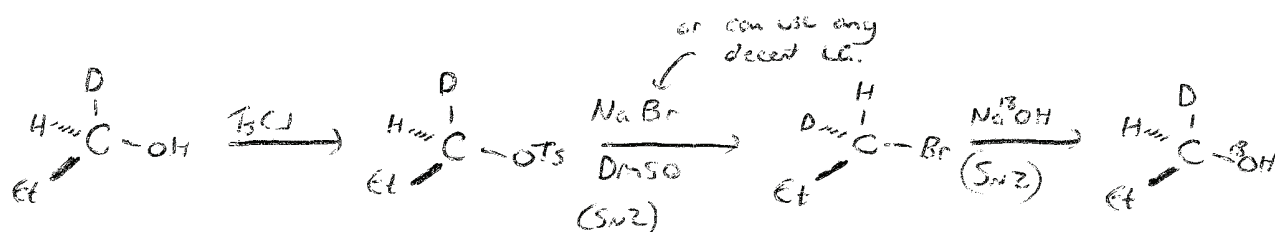


6. (10 pt) Outline a synthesis for the conversion of pure (R)-CH₃CH₂CHD-OH into the following species. You can assume you have Na¹⁸OH and ¹⁸OH₂.

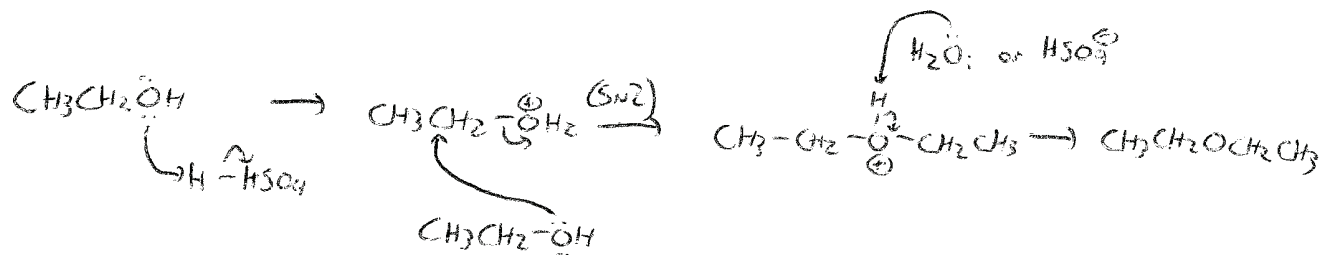
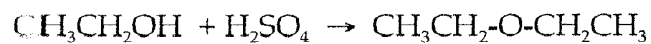
a) (S)-CH₃CH₂CHD-¹⁸OH



b) (R)-CH₃CH₂CHD-¹⁸OH



7. (10 pt) When sulfuric acid is added to ethyl alcohol, diethyl ether is formed. What is the mechanism for this reaction?



(If OH^- deprotonates, -4,
If $\text{S}_{\text{N}}1$, -4)

8. (10 pt) Give the major product of the following reactions.

a) dibutyl sulfide with 1 equivalent of $\text{H}_2\text{O}_2 \rightarrow ?$

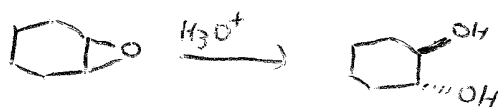


(3 pts; -1 if $\begin{array}{c} \text{O} \\ \parallel \\ \text{S} \\ \parallel \\ \text{O} \end{array}$)

b) cyclohexene with *meta*-chloro-perbenzoic acid $\rightarrow ?$



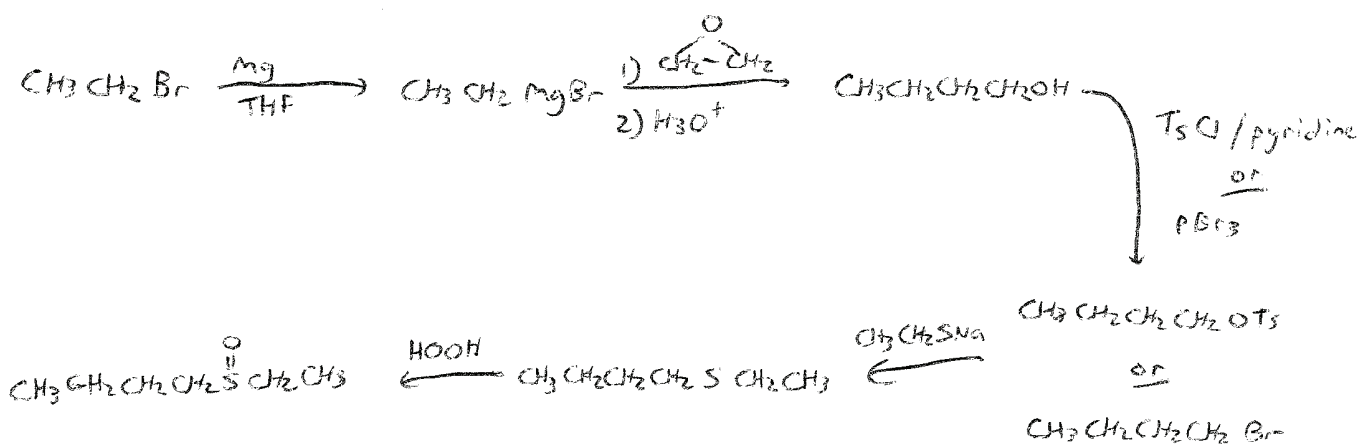
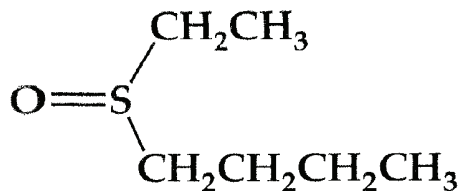
c) product of b) with $\text{H}_3\text{O}^+ \rightarrow ?$



(4 pts;
 -3 if add an H instead of OH;
 -1 if stereochem is incorrect
 No points deducted if no stereochem)

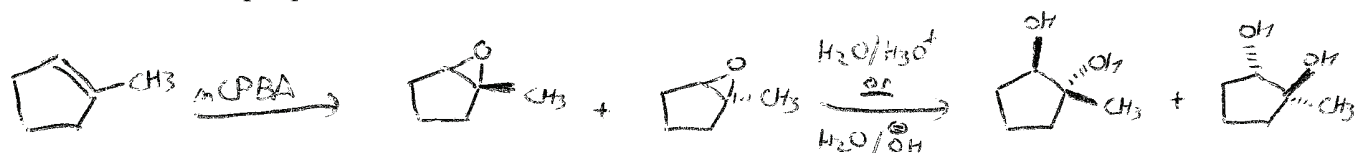
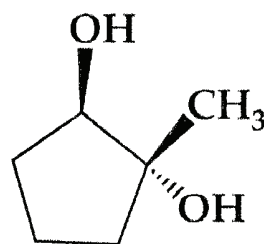
9. (15 pt) Outline a synthesis for each of the following.

a) starting from species with 2 carbons or less prepare:



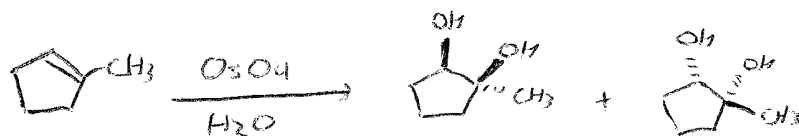
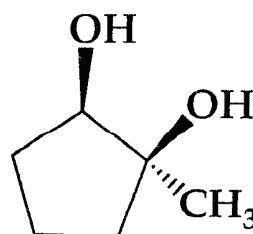
(1 pt per step, but no points deducted for starting at Grignard.)

b) from an alkene, prepare the racemic diol:



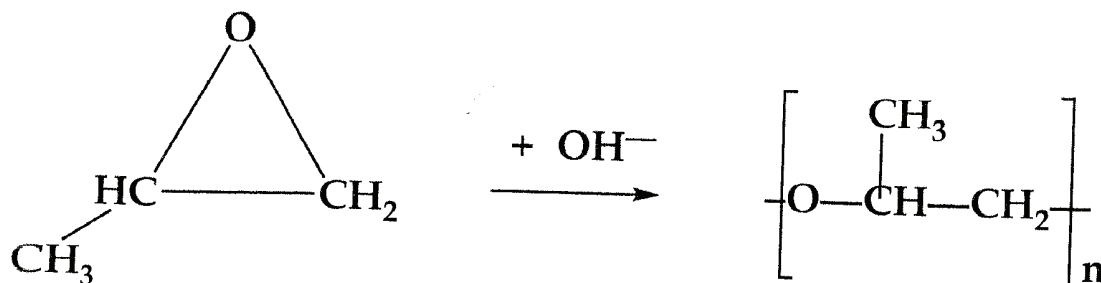
(5 pts, 2 for starting material & 3 for steps.
 -1 for showing stereochem at alkene,
 No penalty for using Sharpless.)

c) from an alkene, prepare the racemic diol:

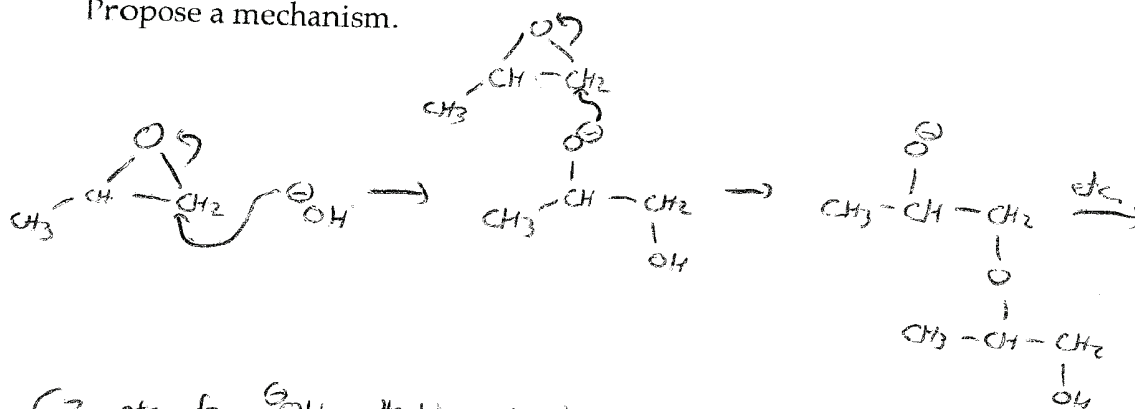


(Same as above, but -1 for not
 having H₂O or OsO₄)

10. (5 pt) One of the side reactions that occur when epoxides react with HO^- is the formation of polymers.



Propose a mechanism.



(2 pts for OH^- attacking epoxide;
 3 pts for RO^- attacking epoxide;
 -1 for attacking more subs. side.)