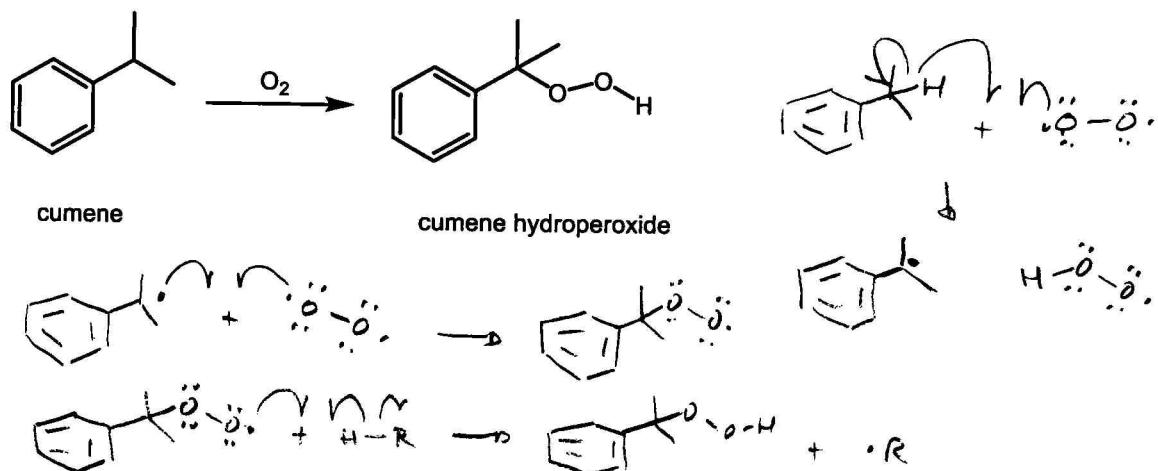


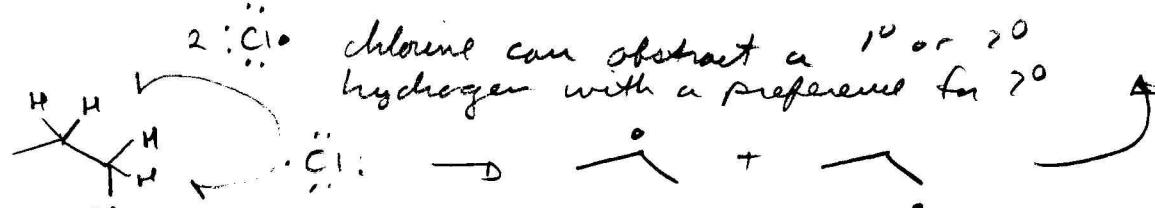
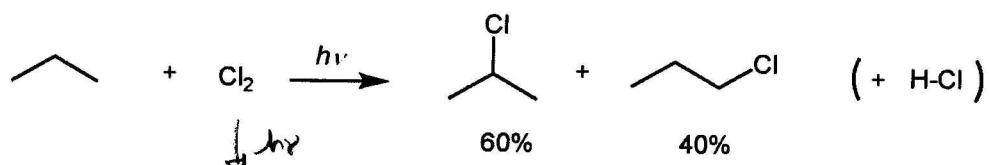
1. Show the complete mechanism for the autooxidation of cumene.

(10 points)



2. Explain why the mixture is obtained in the following halogenation reaction

(10 points)

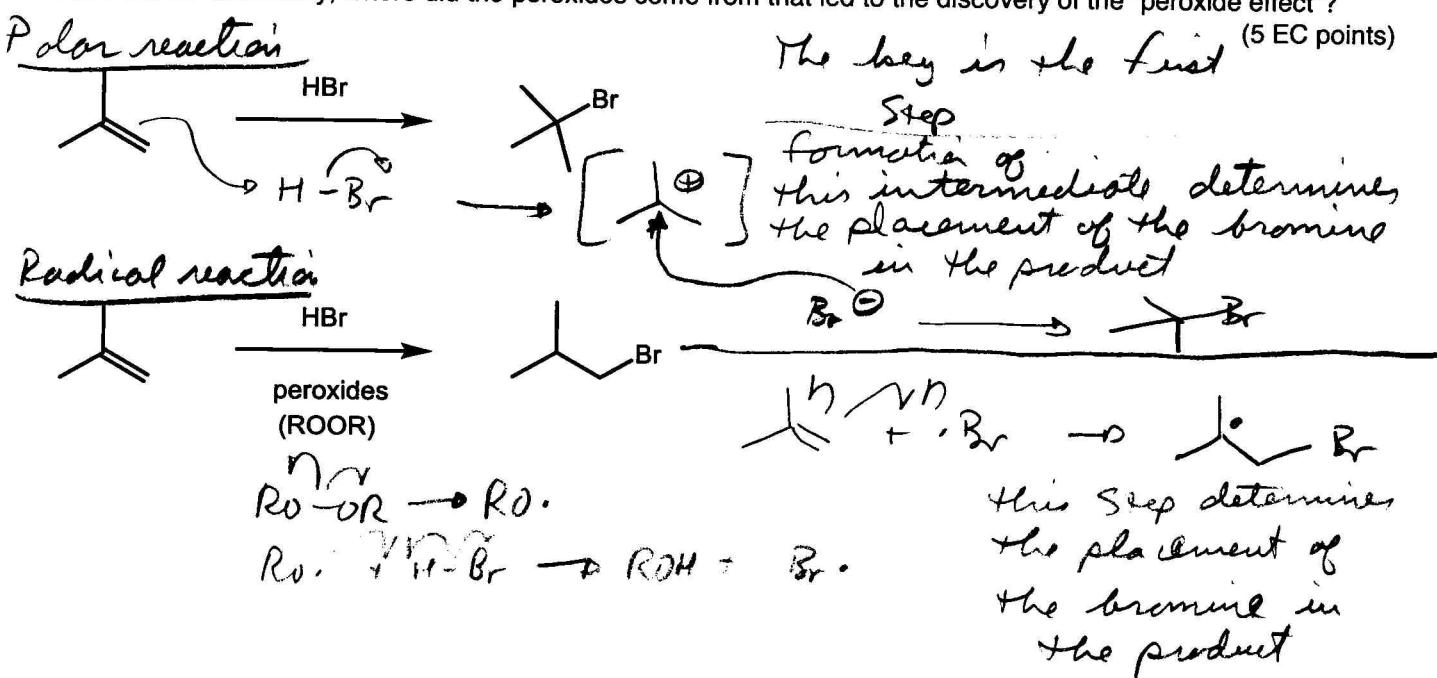


3. In terms of the mechanism of the reaction explain why the addition of peroxides changes the course of the addition reaction shown below. (12)

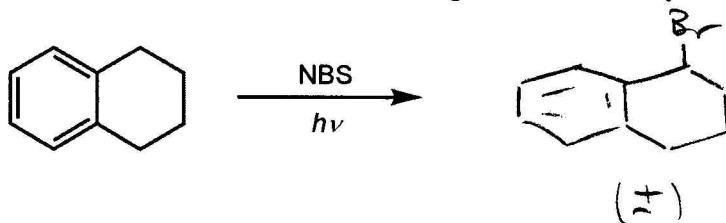
(10 points)

formed by autoxidation of alcohols
Extra Credit Historically, where did the peroxides come from that led to the discovery of the "peroxide effect"?

from autoxidation of alcohols

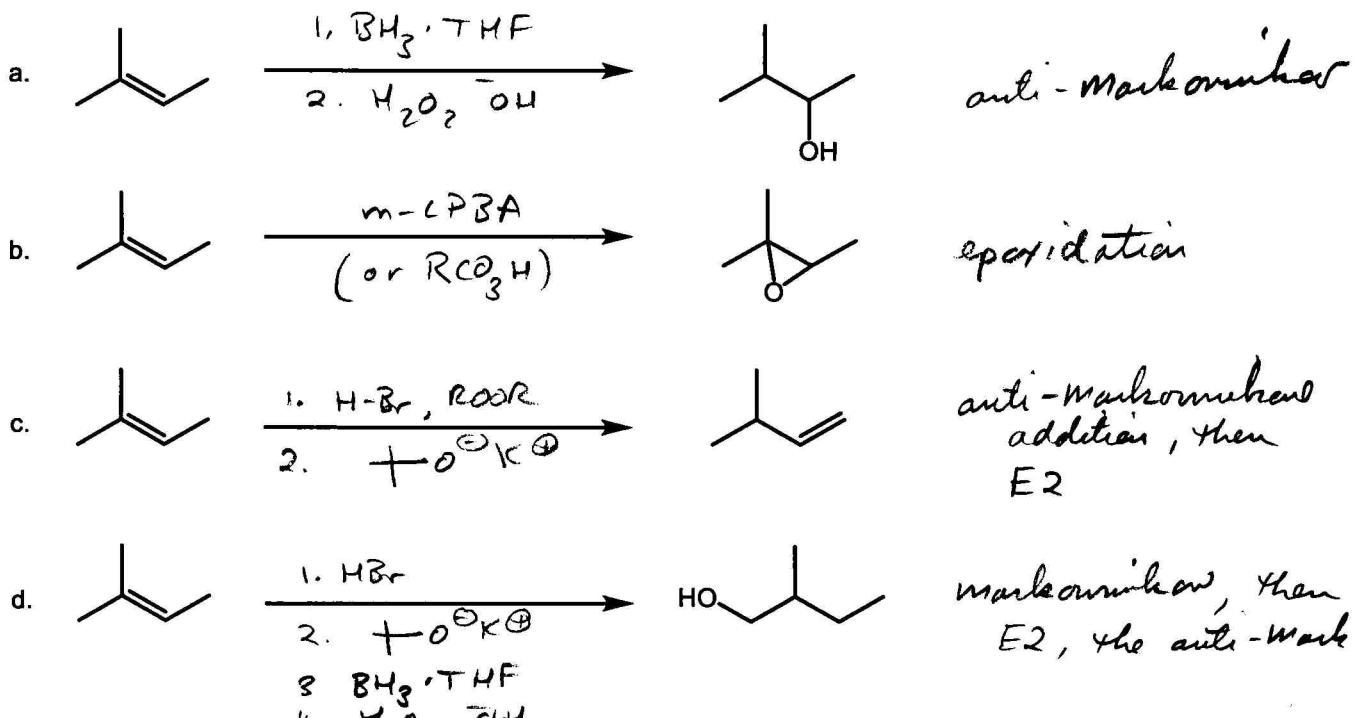


4. Show the product(s) from the following reaction. Be very clear about the stereochemistry of the product(s). (10 points)

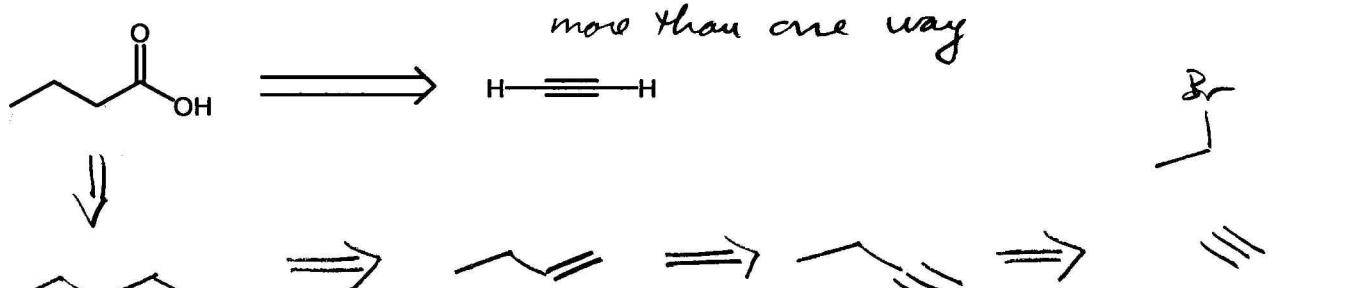


no reaction products,
where the aromatic
ring is not intact

5. Show how to make the following compounds from the given starting materials. Some of the transformations require more than one step. (20 points)



6. Show the retrosynthetic analysis for how to prepare the product shown below starting from acetylene. (20 points)

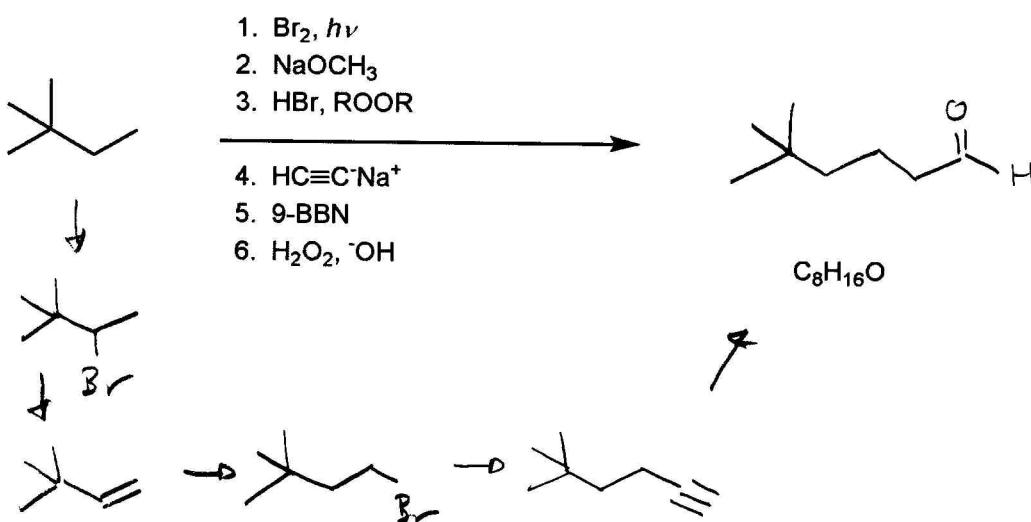


Alternatively,



7. What is the final product? Show each intermediate compound.

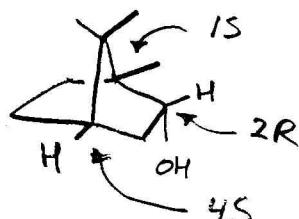
(20 points)



8. Provide structures for the following compounds.

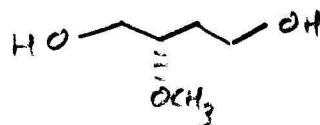
(15 points)

a. $(1S,2R,4R)-1,7,7\text{-trimethylbicyclo}[2.2.1]\text{heptan}-2\text{-ol}$

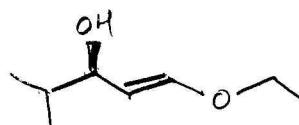


note, this impossible for the geometry of the bicyclic ring

b. $(S)\text{-2-methoxybutane-1,4-diol}$



c. $(1E,3R)\text{-1-ethoxy-4-methylpent-1-en-3-ol}$



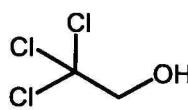
9. Explain the two trends in acidity for the following compounds

(10 points)

Trend 1



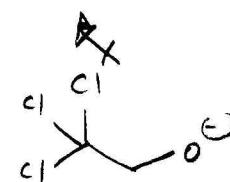
$pK_a = 16$



$pK_a = 12.2$

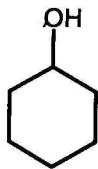


less stable

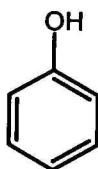


This conjugate is much more stable due to induction

Trend 2



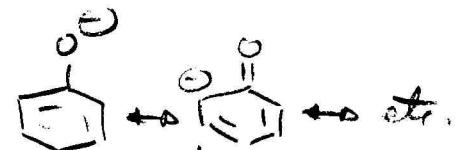
$pK_a = 18$



$pK_a = 10$



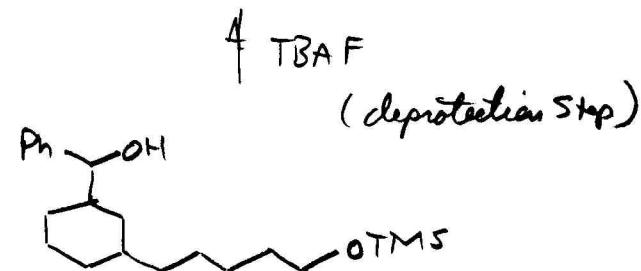
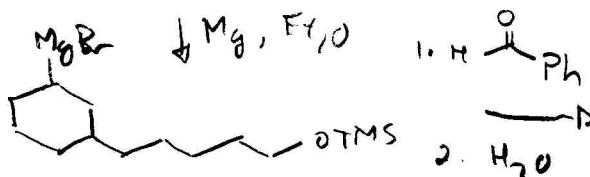
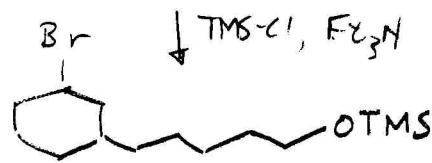
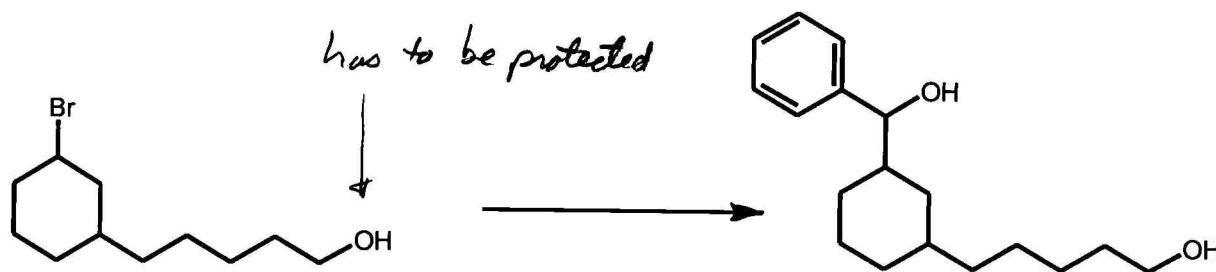
less stable



This conjugate base is much more stable due to resonance

10. Show reagents and conditions to accomplish the following – show all intermediates.

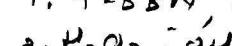
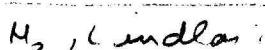
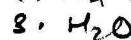
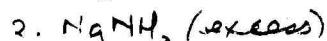
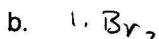
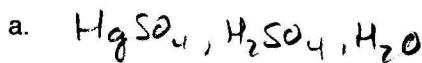
(10 points)



11. For the following diagram of reactions, fill in the reagents necessary to accomplish each transformation (some of them require more than one step – be sure to use numbers (1., 2., etc) to show separate steps when necessary. You do not need to show any intermediates. (Transformation e is possibly the most challenging.)

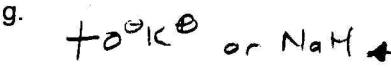
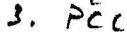
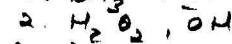
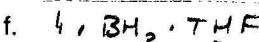
Fill in your answers here:

(70 points)

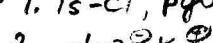
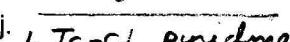
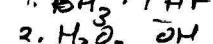
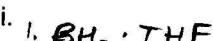
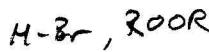


e.

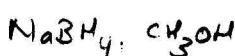
See below



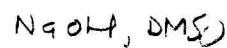
h.



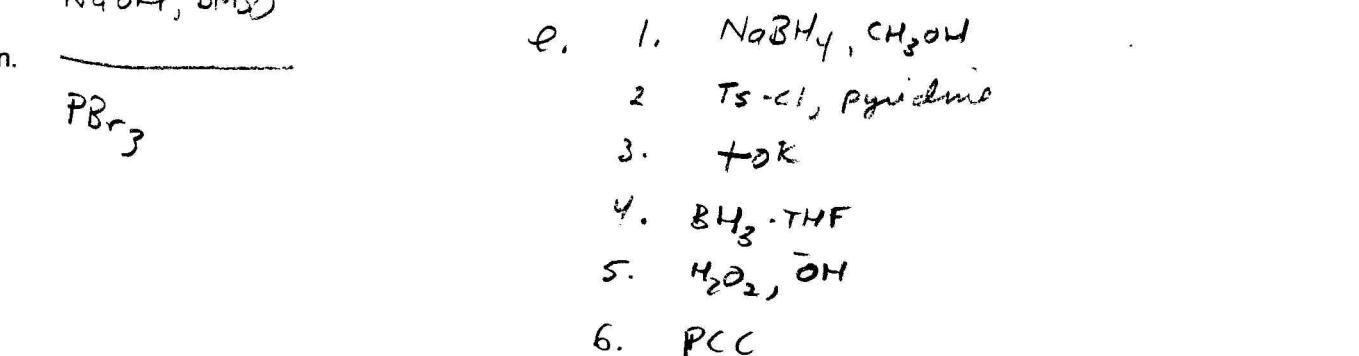
l.



m.

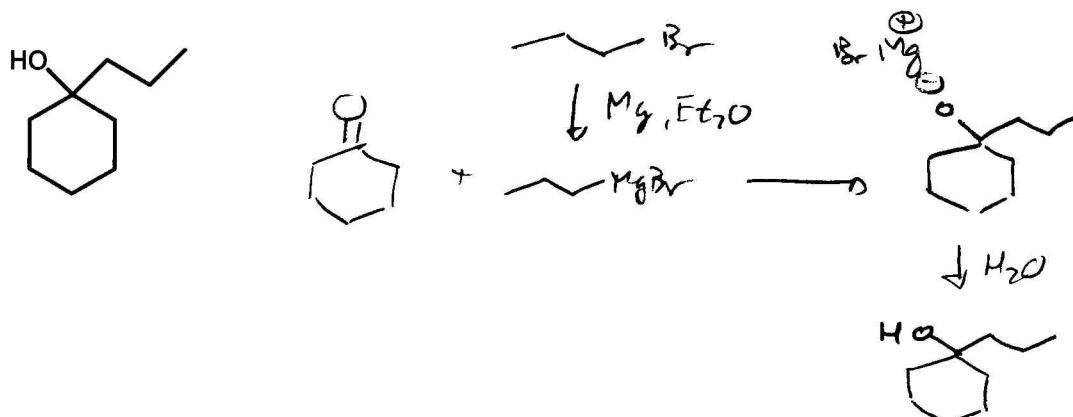


n.

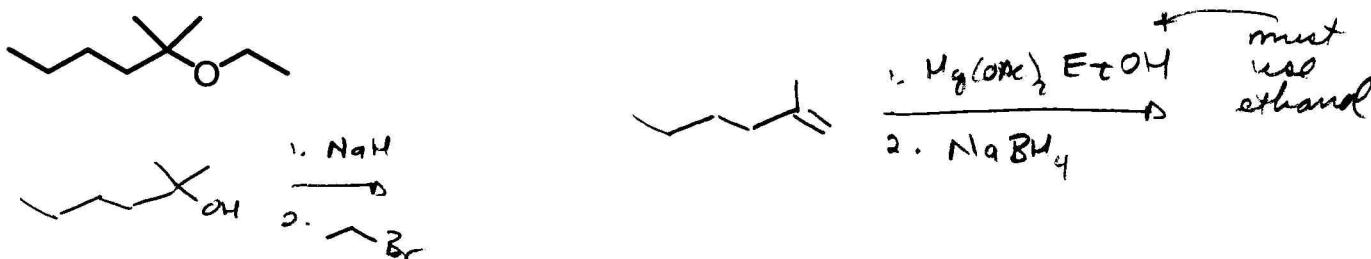


12. Show how to prepare the following alcohol using a Grignard reaction.

(10 points)



13. Show two (2) different syntheses of the following compound. Both of them must start with an alcohol. (10 points)



14. Name the compounds shown in Questions 12 and 13.

(10 points)

1-propylcyclohexanol

2-ethoxy-2-methylhexane

(too complex to use a common name)