Chem 2100, "Organic Chemistry I"
WS07, Dr. Rainer Glaser

Exam #4 – The Final
"Unsaturated Hydrocarbons & Oxygen Chemistry"

Friday, May 11, 2oo7, 10:30am-12:30pm

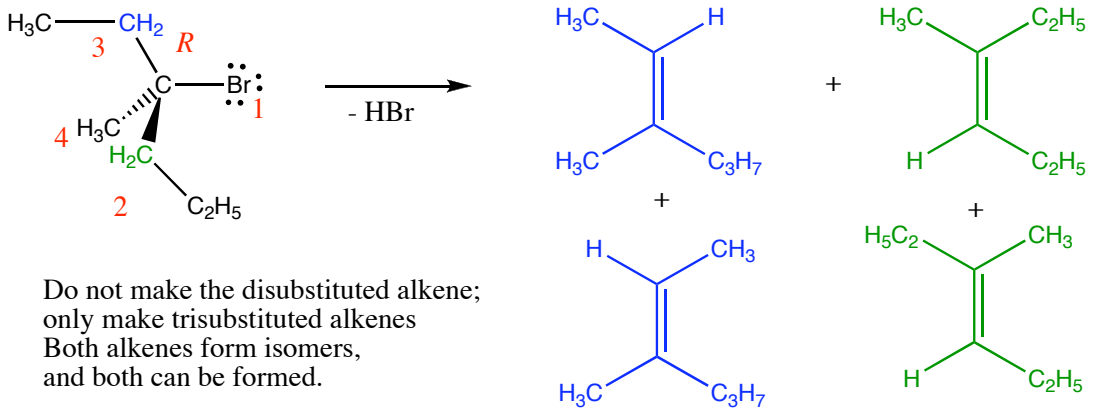
Name:

Answer Key

Question 1. Elimination Reactions.	20	
Question 2. Alcohol Synthesis via Alkenes.	20	
Question 3. Alcohol Synthesis via Carbonyls.	20	
Question 4. Alkene & Alkyne Synthesis.	20	
Question 5. Carbenes and Peroxyacids.	20	
Question 6. Oxidations.	25	
Question 7. Reductions.	25	
Total (your score will be multiplied by 4/3).	150	

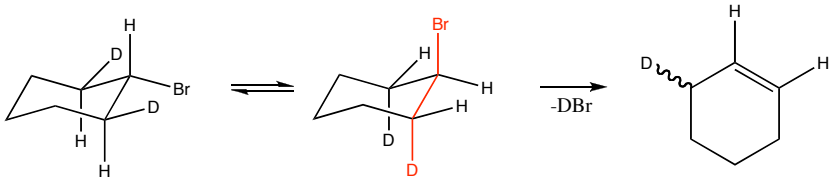
Question 1. Elimination Reactions – A Case of Deja-Vu? (20 points)

(a) Provide a perspective drawing of (*R*)-3-methyl-3-bromohexane and structural formulas of the elimination product(s) formed by reaction with sodium ethoxide in boiling ethanol. Briefly explain why that product / those products are formed while other potential products are not formed. (8 points)



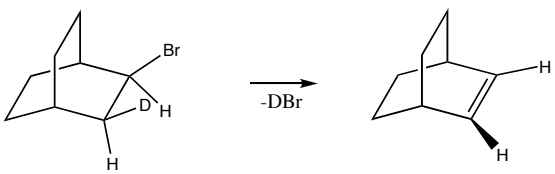
Do not make the disubstituted alkene;
only make trisubstituted alkenes
Both alkenes form isomers,
and both can be formed.

(b) The doubly deuterated bromocyclohexane is subjected to conditions that promote elimination by way of the E2 mechanism. Draw the product of the elimination and indicate clearly any D-atom in the product. Provide a brief explanation for the outcome. (8 points)



Periplanar reaction required and anti-periplanar reaction is possible.

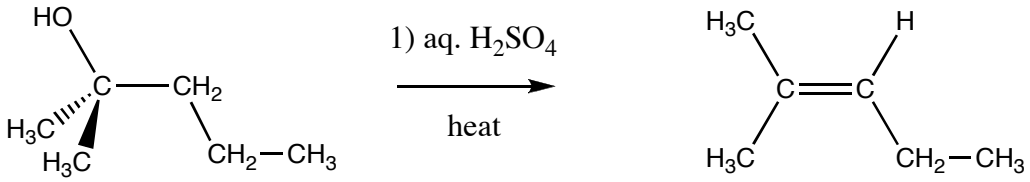
(c) The deuterated bicyclic bromide is subjected to conditions that promote elimination by way of the E2 mechanism. Draw the product of the elimination and indicate clearly any D-atom in the product. Provide a brief explanation for the outcome. (4 points)



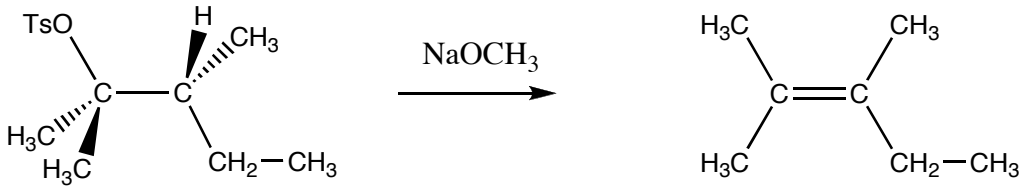
If anti-periplanar is not possible, try syn-periplanar!

Question 2. Alkene and Alkyne Synthesis. (20 points)

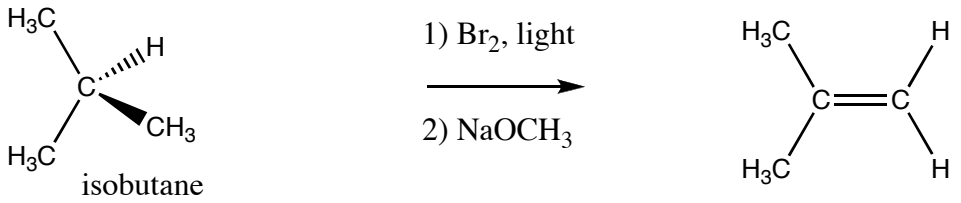
Provide the major final product.



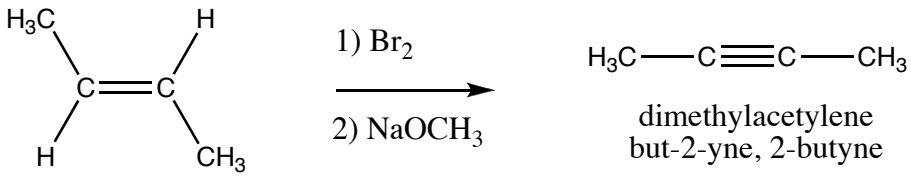
Provide the reagent(s) for the alkene formation and the structure of the major product alkene.



Provide the reagent(s) for the reaction step(s) and provide the structure and the name of the substrate.

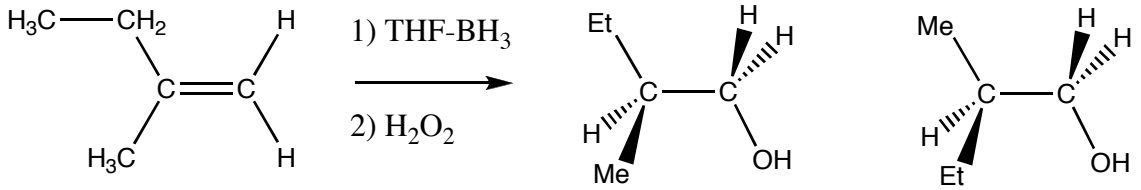


Provide the reagent(s) for the reaction step(s) necessary to accomplish the synthesis and provide two names for product alkyne (systematic and trivial).



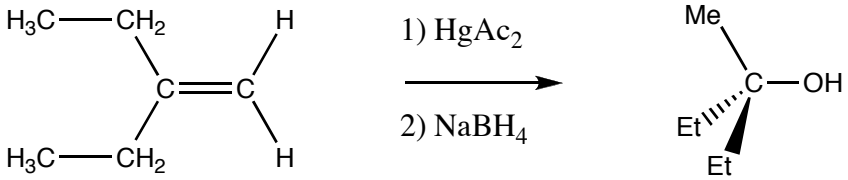
Question 3. Alcohol Synthesis via Alkenes. (20 points)

Provide the reagent(s) for the second reaction step and provide the final product(s).

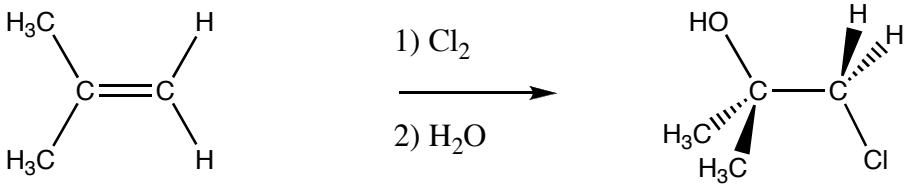


racemate

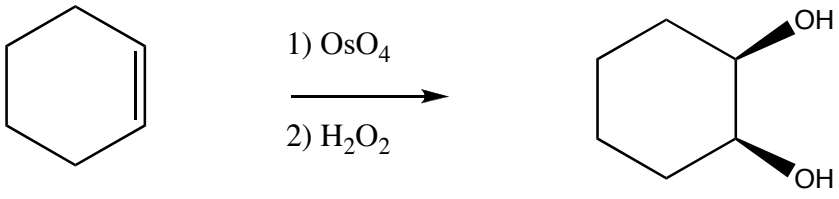
Provide the reagent(s) for the first reaction step and provide the final product(s).



Provide the reagent(s) for the reaction step(s) and provide the structure and the name of the substrate.

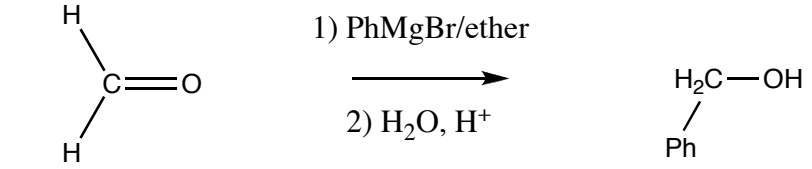


Provide the reagent(s) for the second reaction step and provide the final product(s).

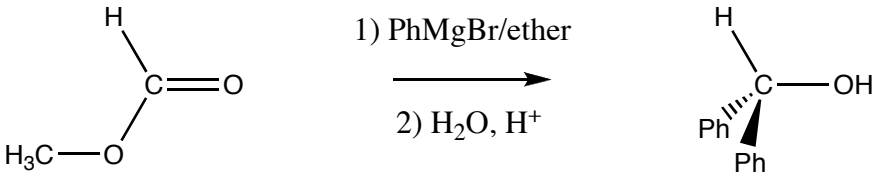


Question 4. Alcohol Synthesis via Carbonyls. (20 points)

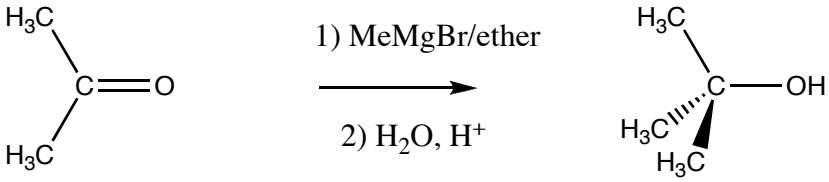
Provide the reagent(s) for the second reaction step and provide the final product.



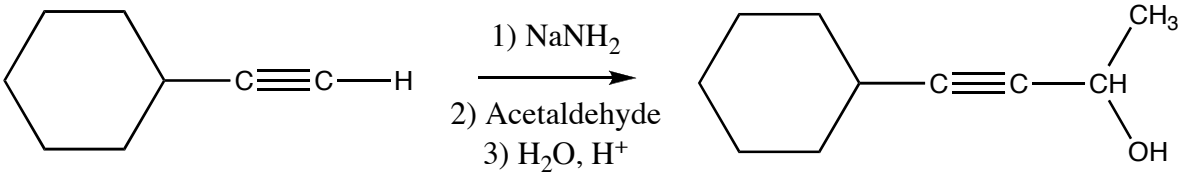
Provide the reagent(s) for the second reaction step and provide the final product.



Provide the reagent(s) for the reaction step(s) and provide the structure of the carbonyl substrate.

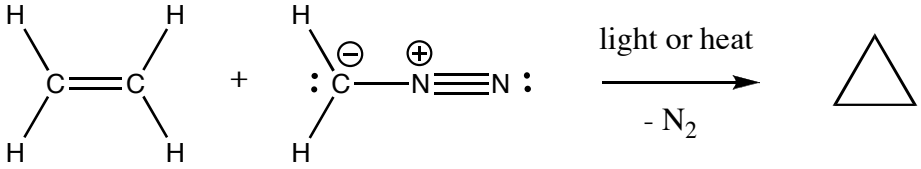


Provide the reagent(s) for all the reaction steps that are necessary to prepare the final product.

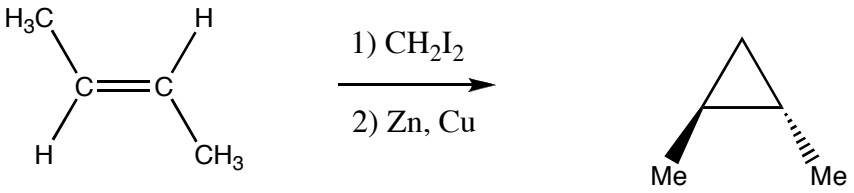


Question 5. Carbenes and Peroxyacids. (20 points)

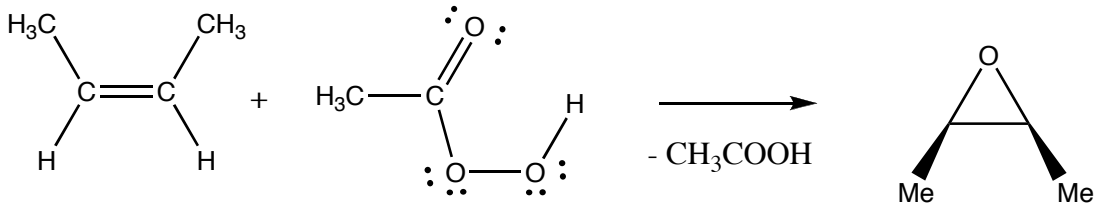
Provide a complete Lewis-Kekule structure of the reagent needed to prepare cyclopropane.



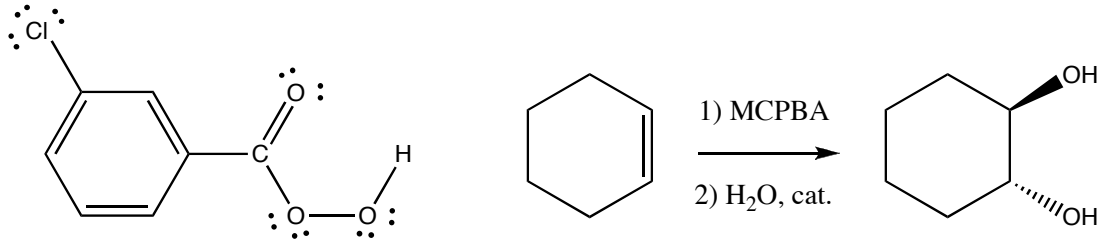
Provide the missing reagent for the cyclopropanation and complete the perspective structure of the dihalogenated product. The methyl groups are ____ (*cis*, ***trans***) in the product. Every cyclopropane formed _____ (**is**, is not) chiral and the product _____ (**occurs**, does not occur) as a racemate.



Provide a complete Lewis-Kekule structure of the reagent needed and draw a perspective structure of the product. The product contains **1** symmetry plane and it thus _____ (is, **is not**) chiral.



Provide a complete Lewis-Kekule structure and the full name of the reagent MCPBA. Draw the reaction diagram for the conversion of cyclohexene to 1,2-cyclohexandiol using MCPBA and whatever else you might need.



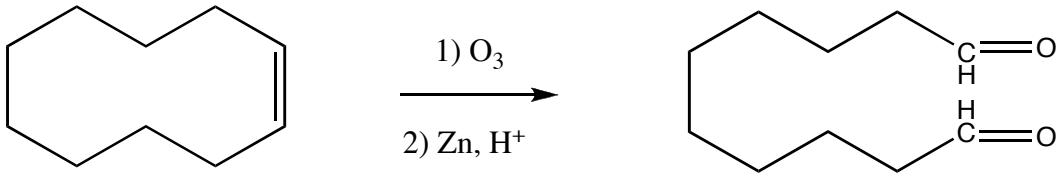
meta-chloroperbenzoic acid

Question 6. Oxidations. (25 points)

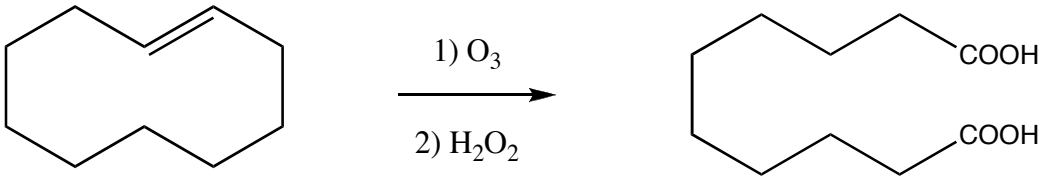
Using molecular formulas, provide a stoichiometric reaction diagram for the complete combustion of glucose $C_6H_{12}O_6$.

$$C_6H_{12}O_6 + 6\,O_2 \rightarrow 6\,CO_2 + 6\,H_2O$$

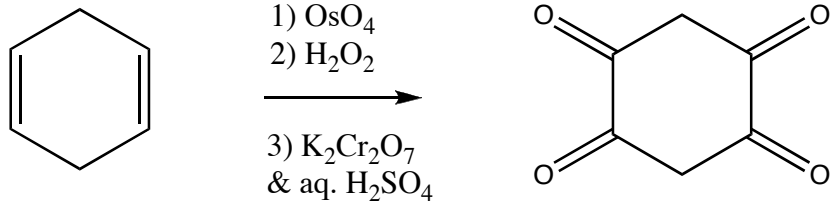
Provide the full name of the alkene: **(*Z*)-cyclodecene.** Provide the structure of the product of ozonolysis after reductive work-up and specify the reagent(s) needed for the reductive workup.



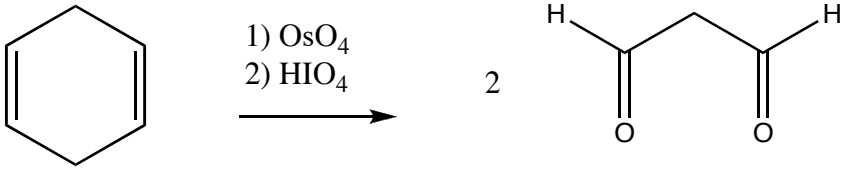
Provide the full name of the alkene: **(*E*)-cyclodecene.** Provide the structure of the product of ozonolysis after oxidative work-up and specify the reagent(s) needed for the oxidative workup.



Provide the full name of the substrate: **1,4-cyclohexadiene.** Provide the structure of the product.



Provide the structure of the product.



Question 7. Reductions. (25 points)