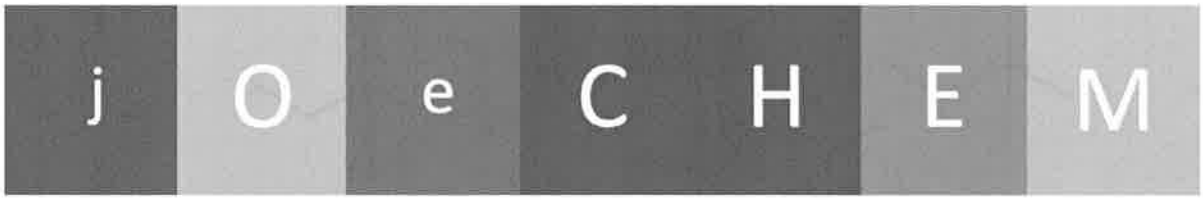
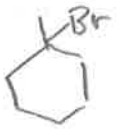
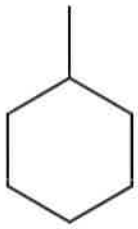
Organic Chemistry I

Final Exam

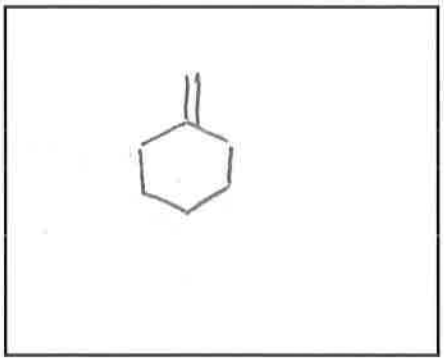


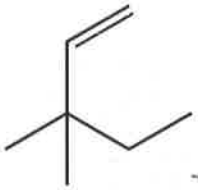
1.) The many reactions below are shown missing their **final product**. For each problem below, correctly predict the final product. If you believe no product is formed/no reaction occurs, write "**NR**".



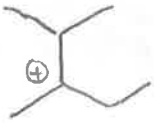


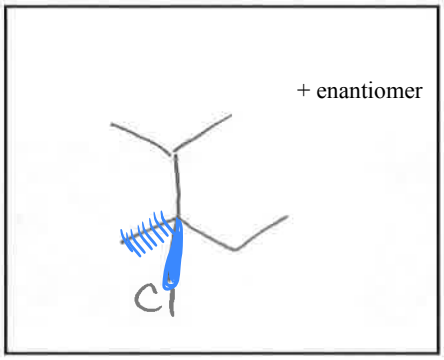
1.) Br_2, hv, heat
2.) LDA

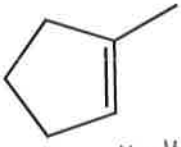




HCl

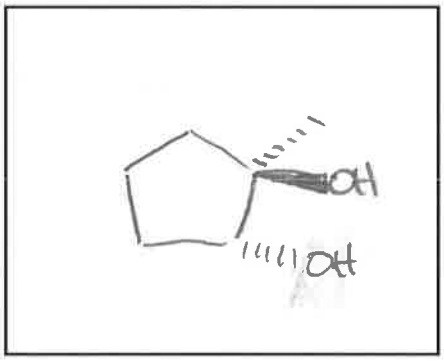




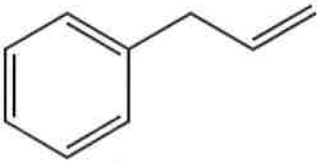


1.) mCPBA
2.) OH^-, H_2O

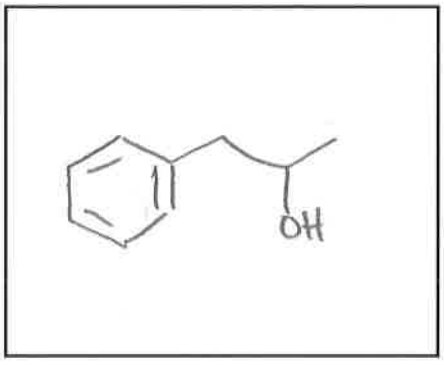
* attack least sterically hindered *



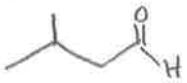
+ enantiomer

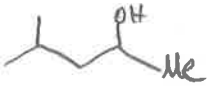


1.) $Hg(OAc)_2$, H_2O
2.) $NaBH_4$

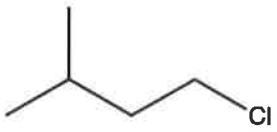


1.) 

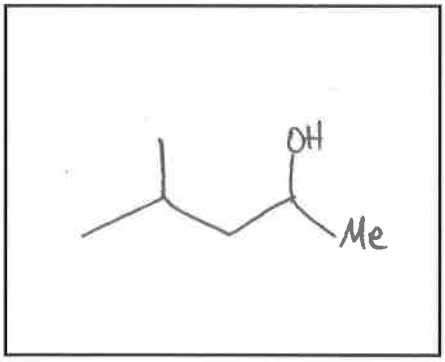
2.) 

3.) 

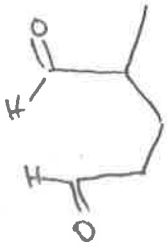
4.)

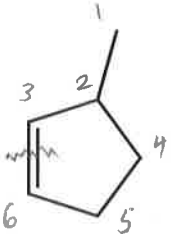


1.) NaOH
2.) PCC
3.) MeMgBr
4.) H_3O^+

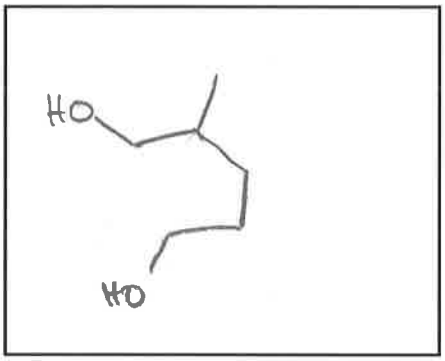


(1,2)

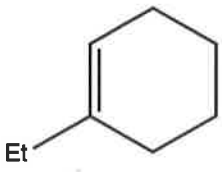




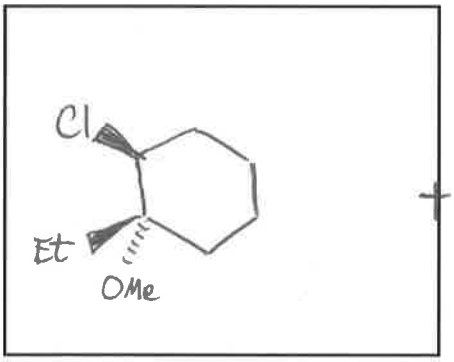
1.) O_3 , CH_2Cl_2
2.) Zn, CH_3COOH
3.) $LiAlH_4$ (excess)
4.) H_3O^+



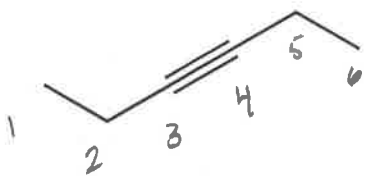
(R)



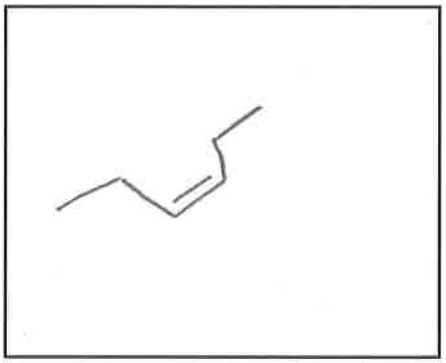
Cl_2
MeOH



+enantiomer

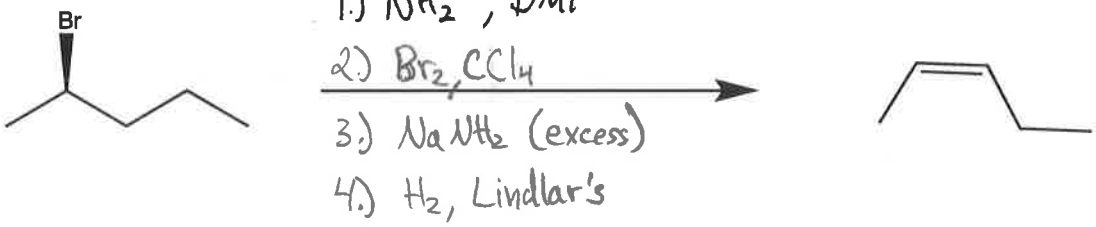


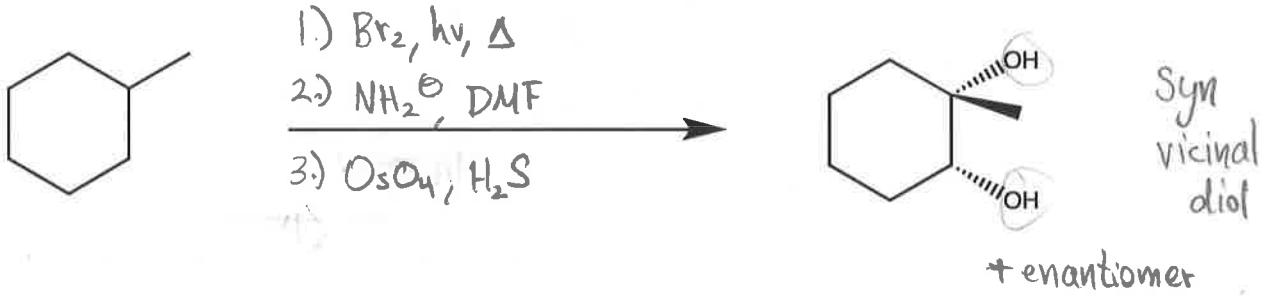
H_2
Lindlar's

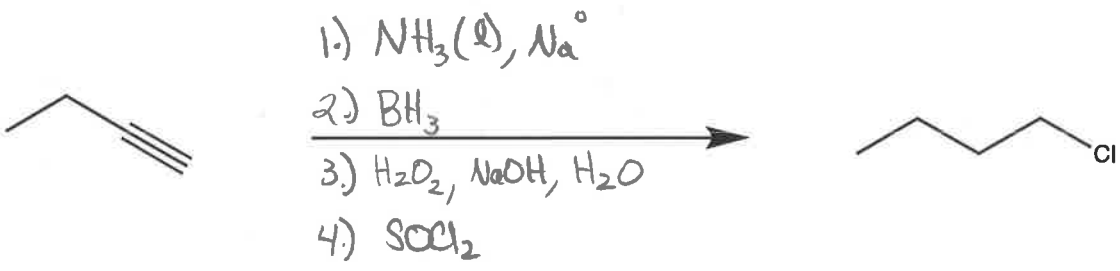


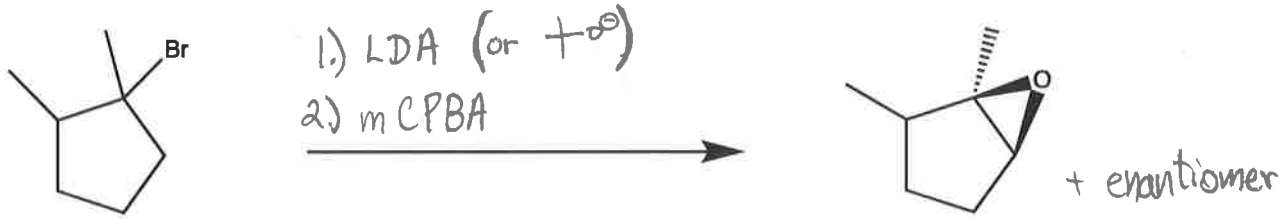
Cis double bond

2.) Below various reactants and products are shown. In each reaction, provide the necessary reagents to make the given transformations occur. **Note:** The reactions can possibly require multi-step reagents.



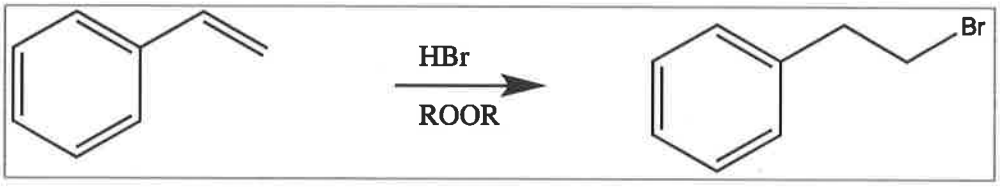






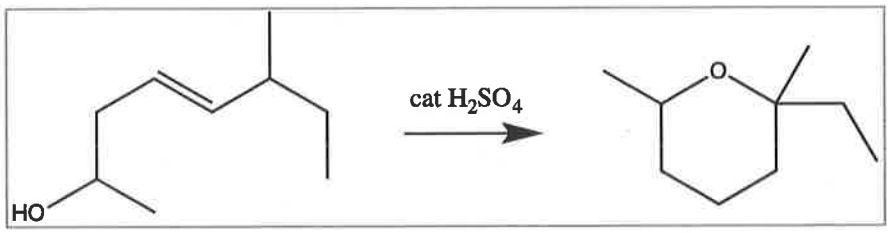
3.) Given the following reaction, draw the complete arrow pushing **mechanism**. Indicate and provide a **BRIEF** explanation as to why this reaction is considered a **chain reaction**.

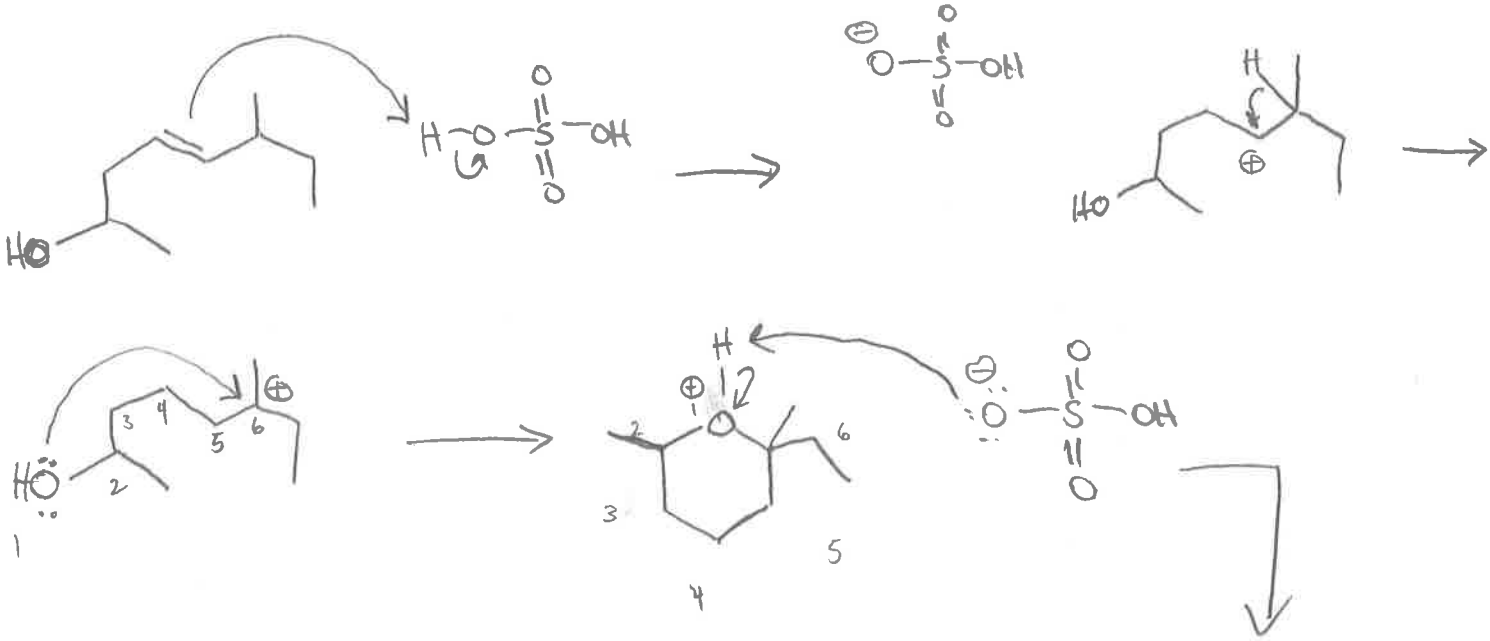
Please include initiation steps



Chain rxn ⇒ The rxn itself produces the bromine radical, the very species that starts the rxn.

4.) Given the following reaction, draw the complete arrow pushing **mechanism**.

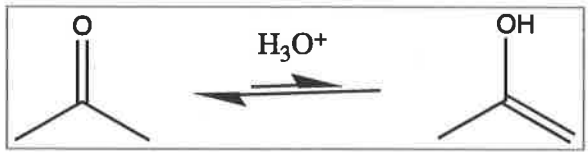




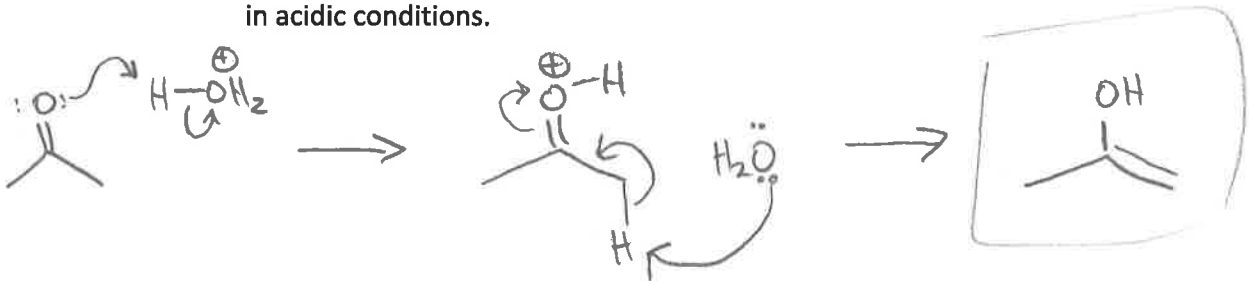
H_2SO_4

(catalyst ⇒ recovered)

5.) It is known that the **keto** form is favored in Keto-Enol Tautomerism. Shown below is the keto-enol equilibrium exhibited by acetone in an **acidic** environment.



a.) Draw the arrow pushing mechanism that illustrates how acetone's keto form tautomerizes to the enol form (aka, show how the ketone transforms into the enol) in acidic conditions.

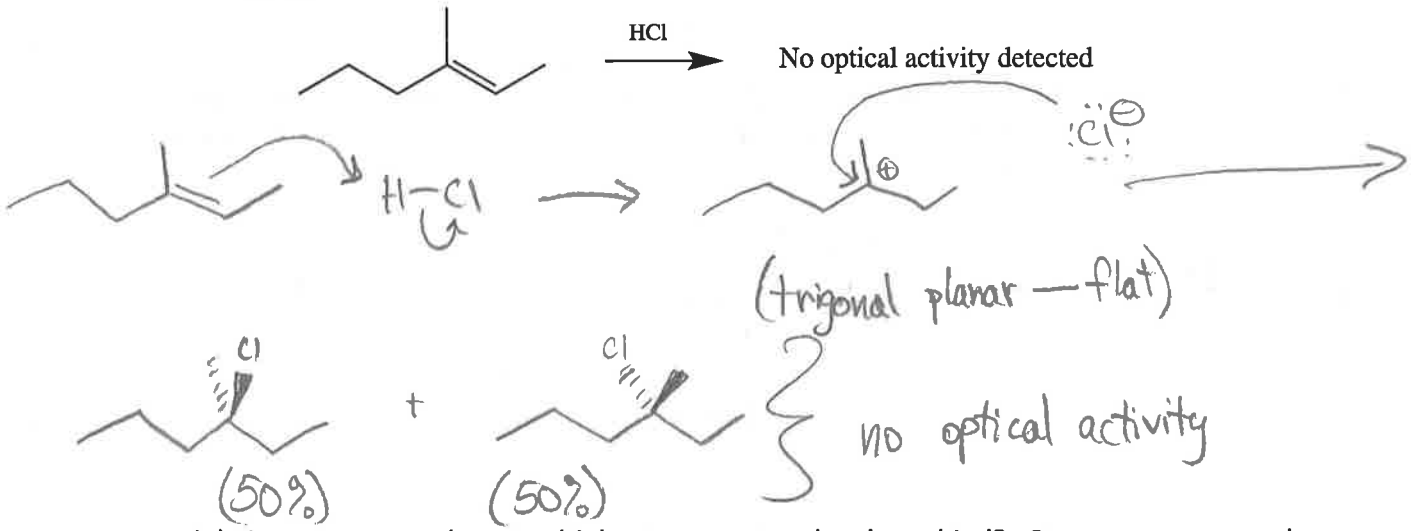


b.) Provide a **BRIEF explanation** as to why the keto form is favored over the enol form.

Enthalpically (ΔH), the keto form is favored cause the carbon-oxygen double bond is more stable than the enol's carbon-carbon double bond.

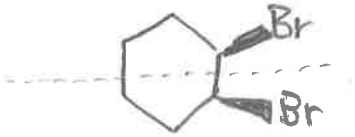
6.) Answer the following questions with your knowledge of stereochemistry:

a.) After performing the Markovnikov Addition of HCl in the reaction below, the product is analyzed with a polarimeter; however, no optical activity is detected. Explain this result.

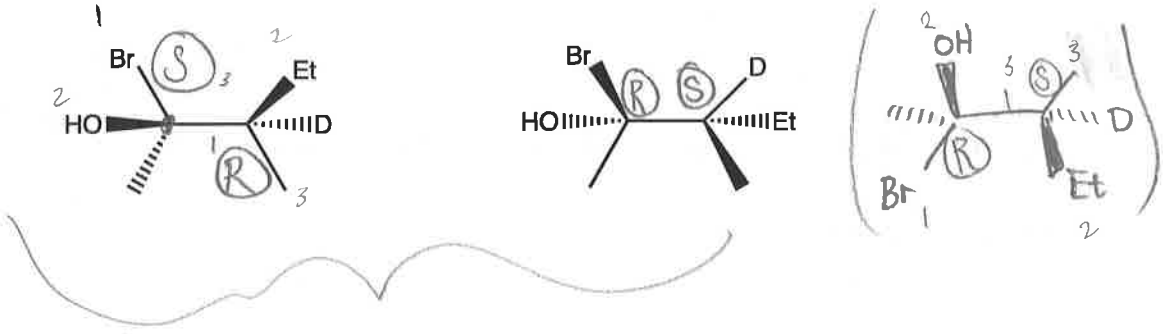


b.) Can a structure have multiple stereocenters but be achiral? State yes or no, and provide a structural example to support your answer.

Yes — just need a plane of symmetry



c.) Determine the relationship between the 2 molecules depicted below. double switch



Enantiomers

7.) Propose an efficient synthesis of 3,4,5-trimethylheptan-4-ol with 2-butene as your only source of carbon. You may use whatever inorganic reagents you may need to complete the transformation.

2 
1 two carbon piece

(4) (9)