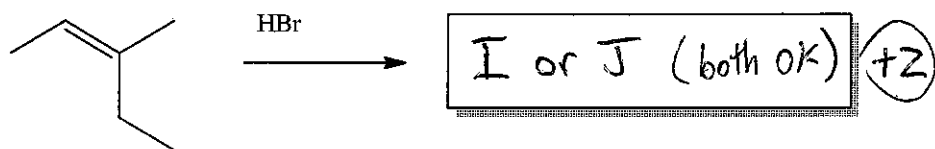
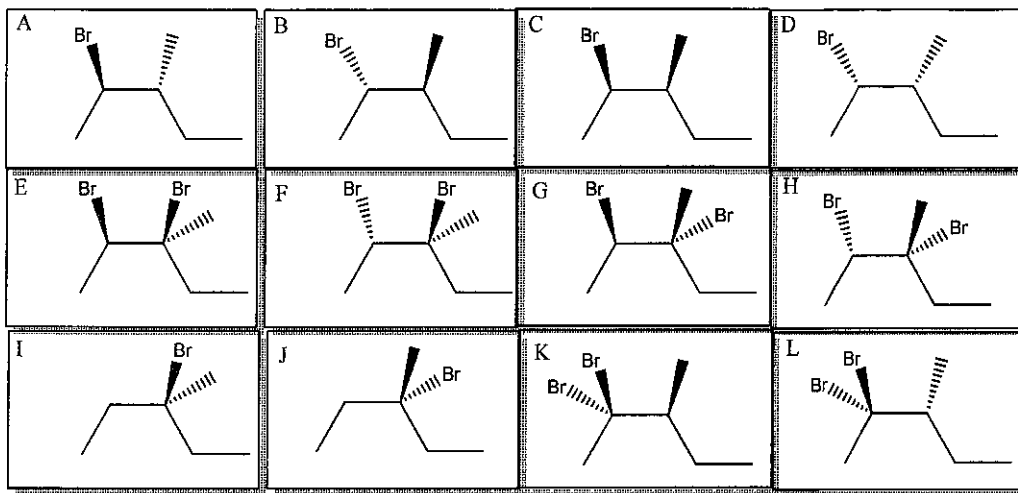
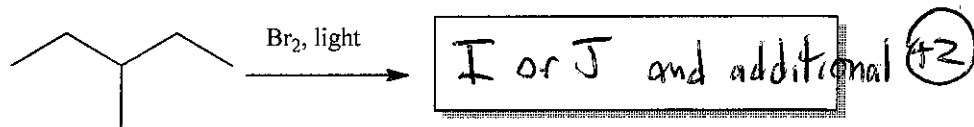
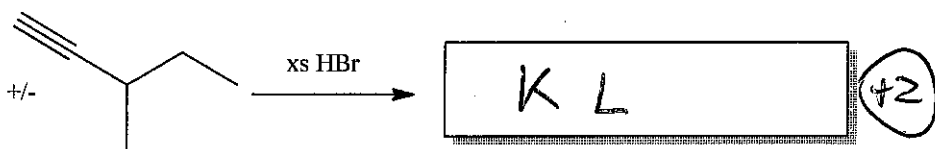
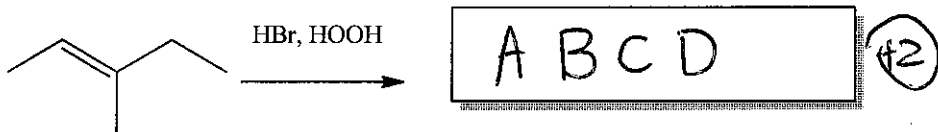


# White Key

1. (10pts) Fill in the boxes next to the reactions with the **letters of all products** that form from this list below:



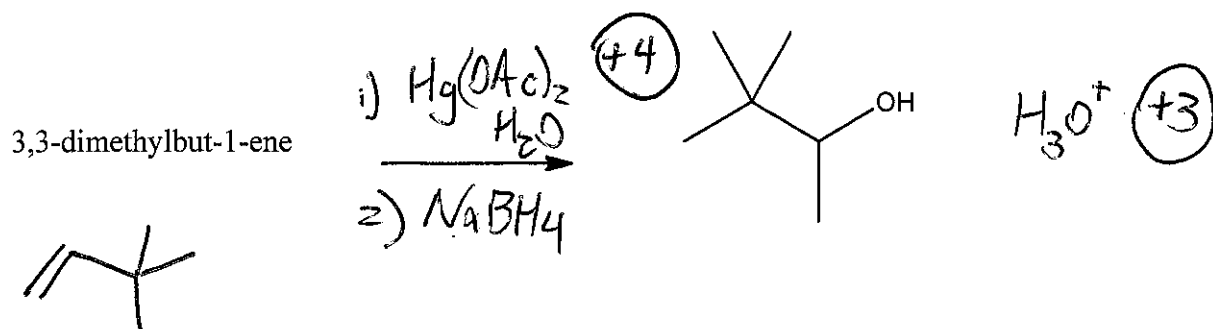
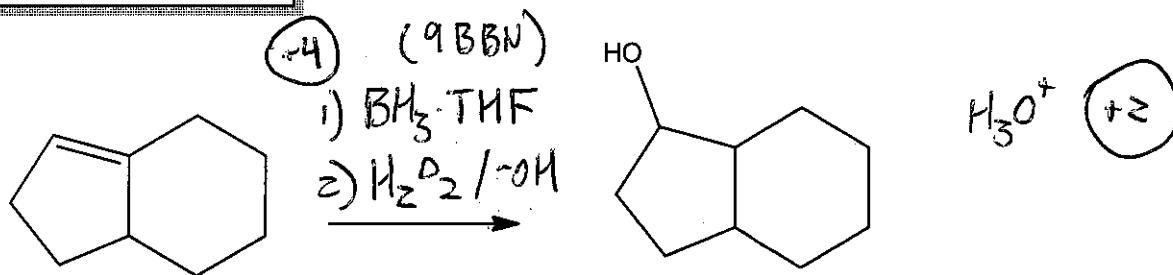
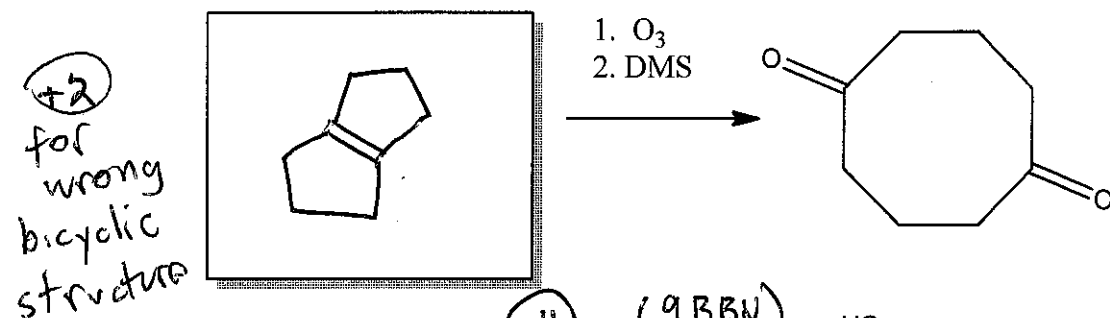
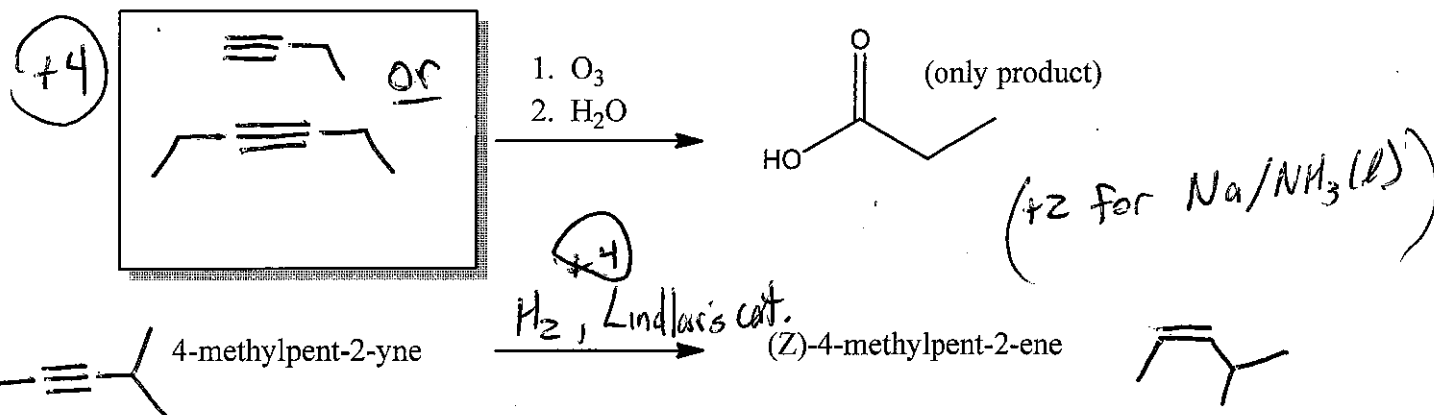
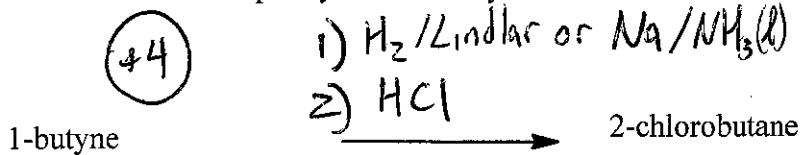
-1 For each missing or extra



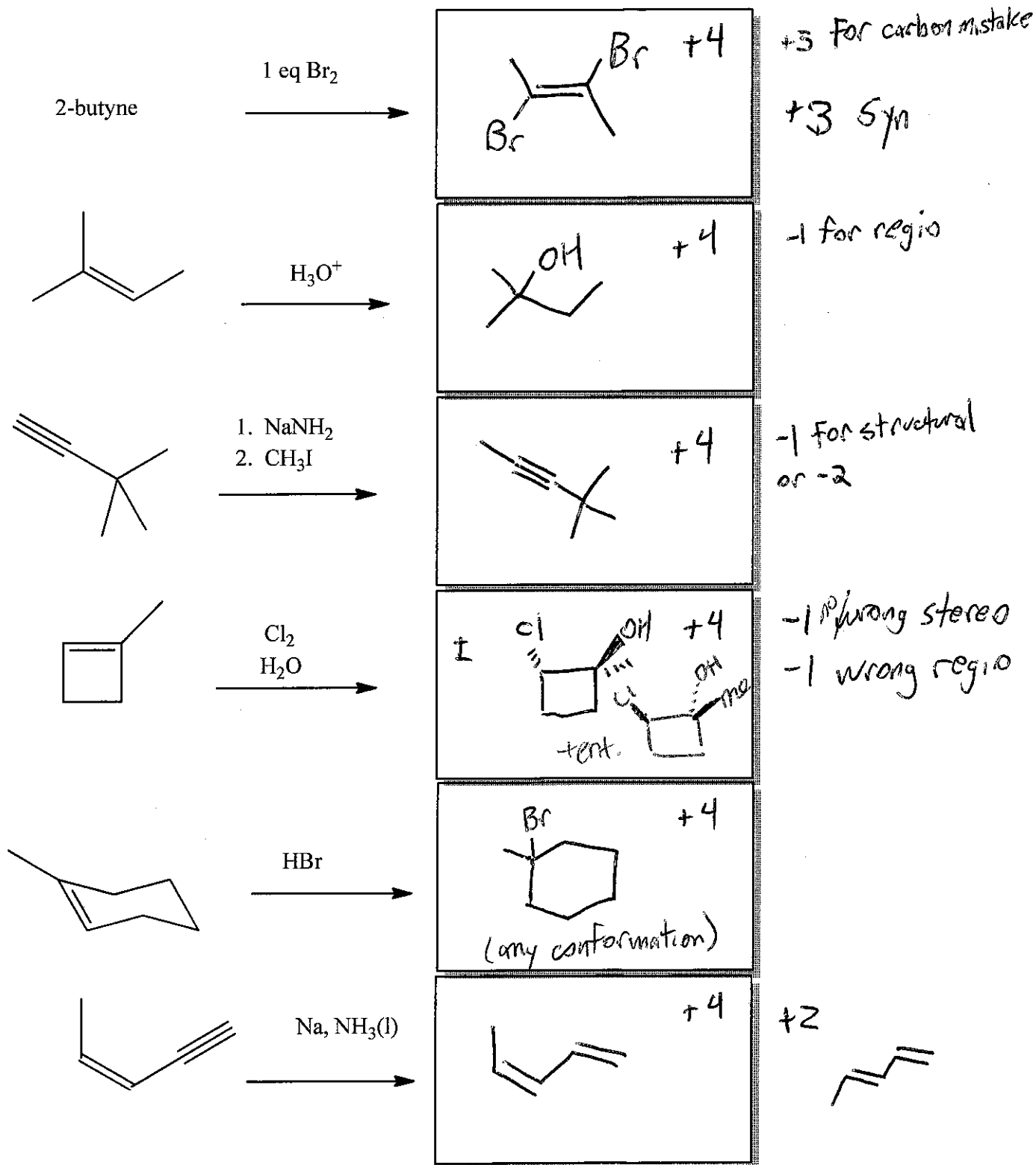
Bonus: Two of the compounds A-L are the same. Which ones are they?

I, J (+2)

2. (20pts) Provide reagents or starting materials necessary for 5 of the following 6 transformations. CLEARLY MARK the one you do not want graded or else the first five will be graded. More than one step may be necessary.

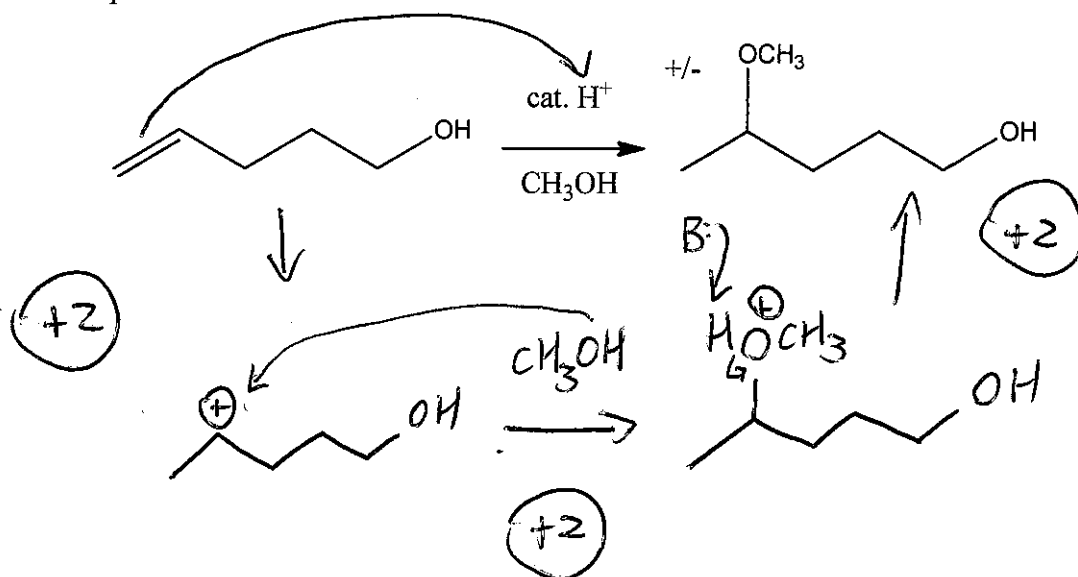


3. (20pts) Predict the MAJOR product(s) of 5 of the following 6 reactions. CLEARLY MARK the one you do not want graded or else the first five will be graded. Include proper stereochemistry, and indicate if the enantiomer also forms.

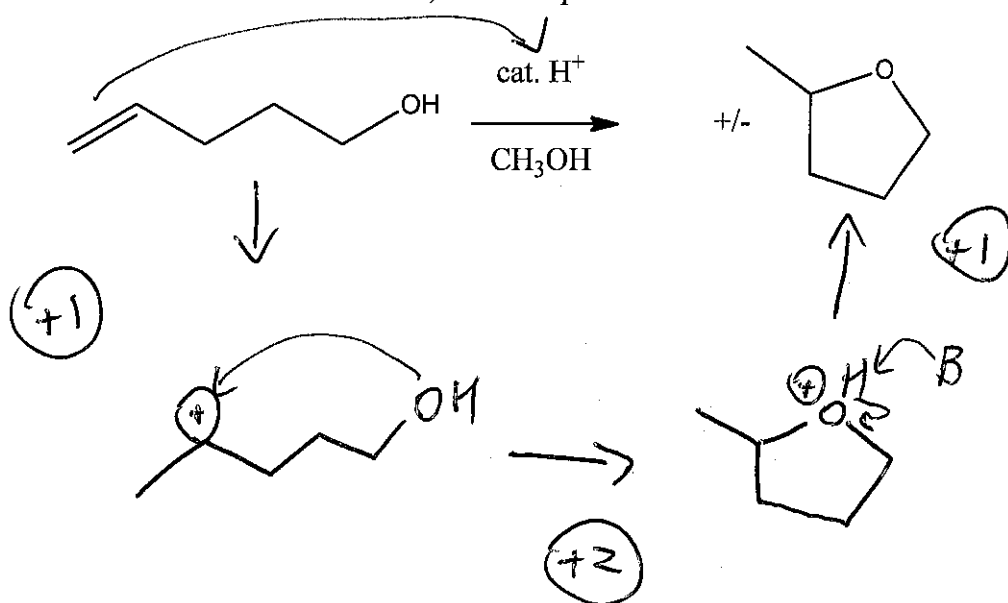


4

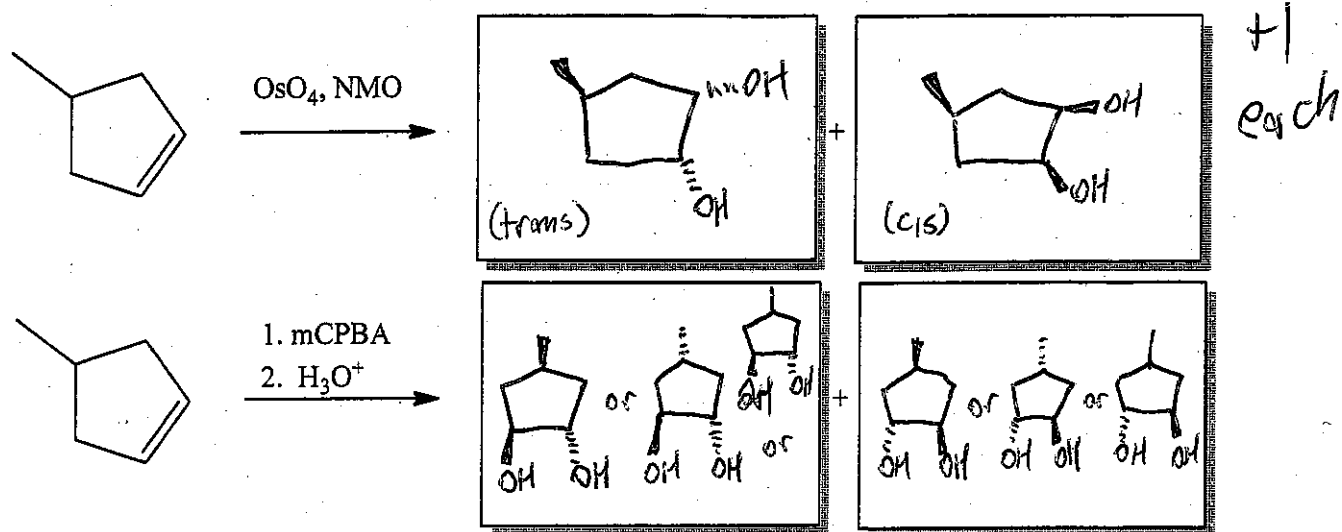
4. (10pts) Provide arrow mechanisms, including all intermediates, for the formation of this product:



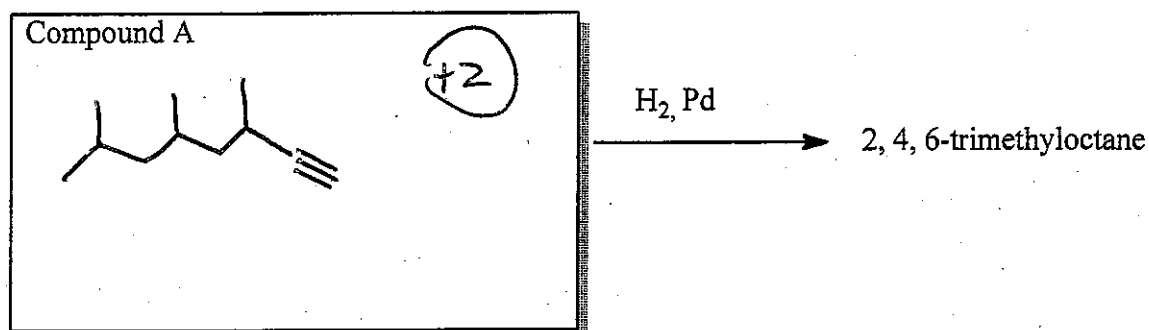
Under these same conditions, a second product also forms. Provide a mechanism.



5. (4pts) Treating 4-methylcyclopentene with  $\text{OsO}_4/\text{NMO}$  forms two optically inactive products, while treating 4-methylcyclohexene with mCPBA followed by hydronium leads to two optically active products. Draw their structures.



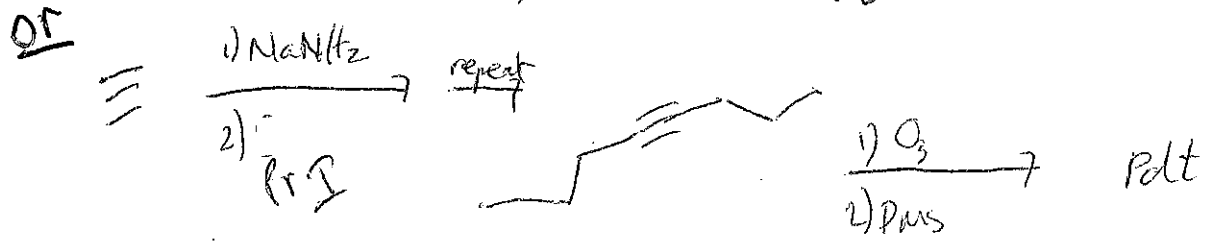
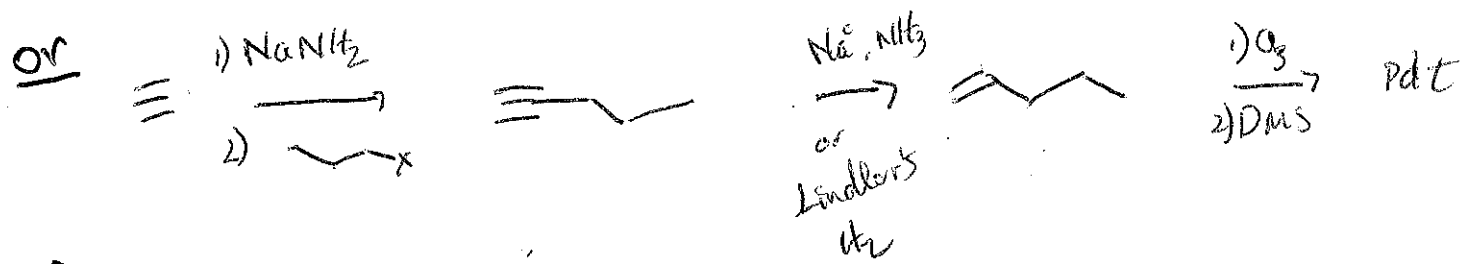
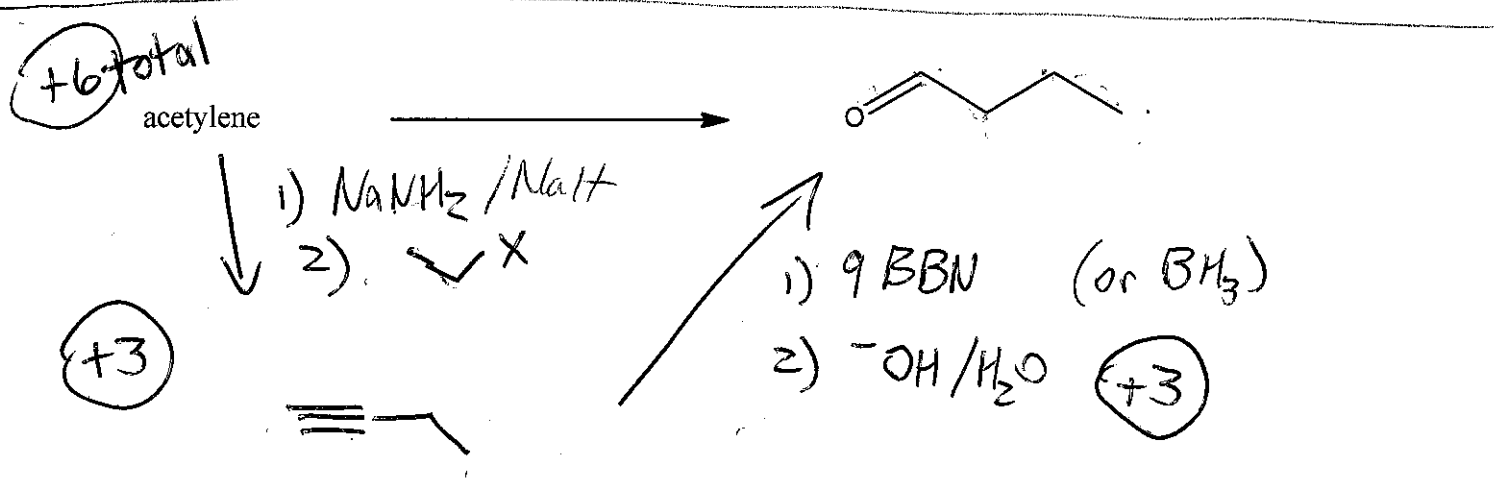
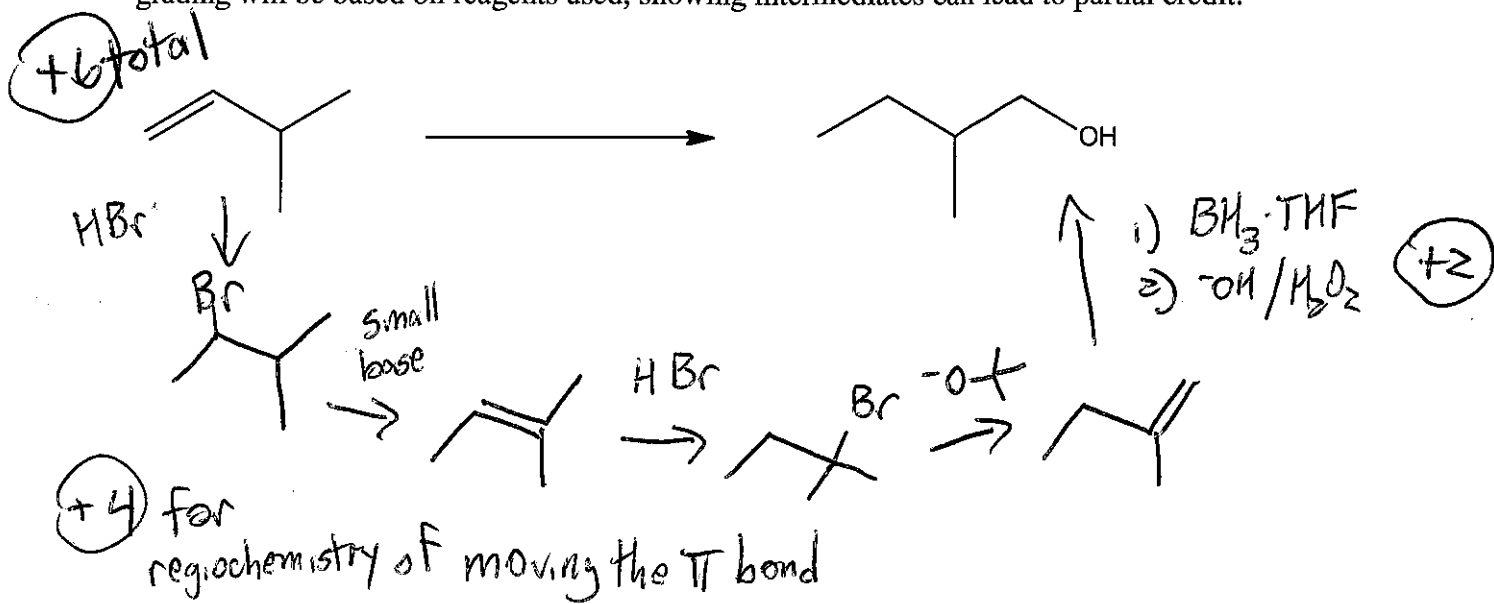
6. (4pts) Compound A is an alkyne that reacts with two equivalents of  $\text{H}_2$  in the presence of Pd to give 2, 4, 6-trimethyloctane. Draw the structure of Compound A, and name it using systematic nomenclature.



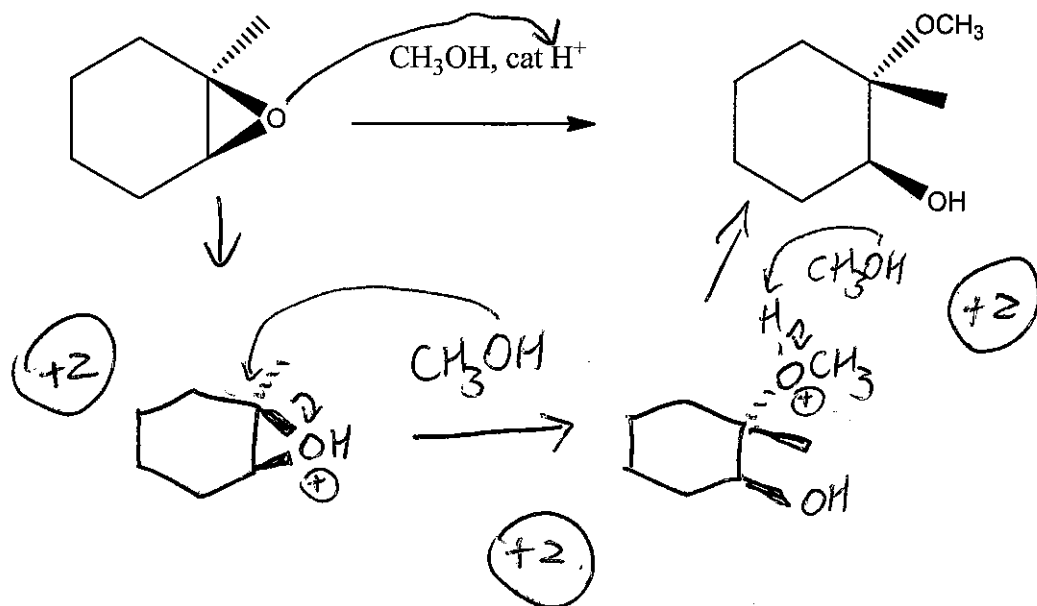
Name: 3, 5, 7-trimethyloct-1-yne (+2)

(-1 for significant error like numbering, etc...)

7. (12pts) Provide all necessary reagents for the following multistep syntheses, starting from the given material. You may use any additional organic or inorganic reagents you need. Although grading will be based on reagents used, showing intermediates can lead to partial credit.



8. (10pts) Starting with this chiral epoxide, only one product is produced. Provide an arrow mechanism, including intermediates, to account for this reaction.



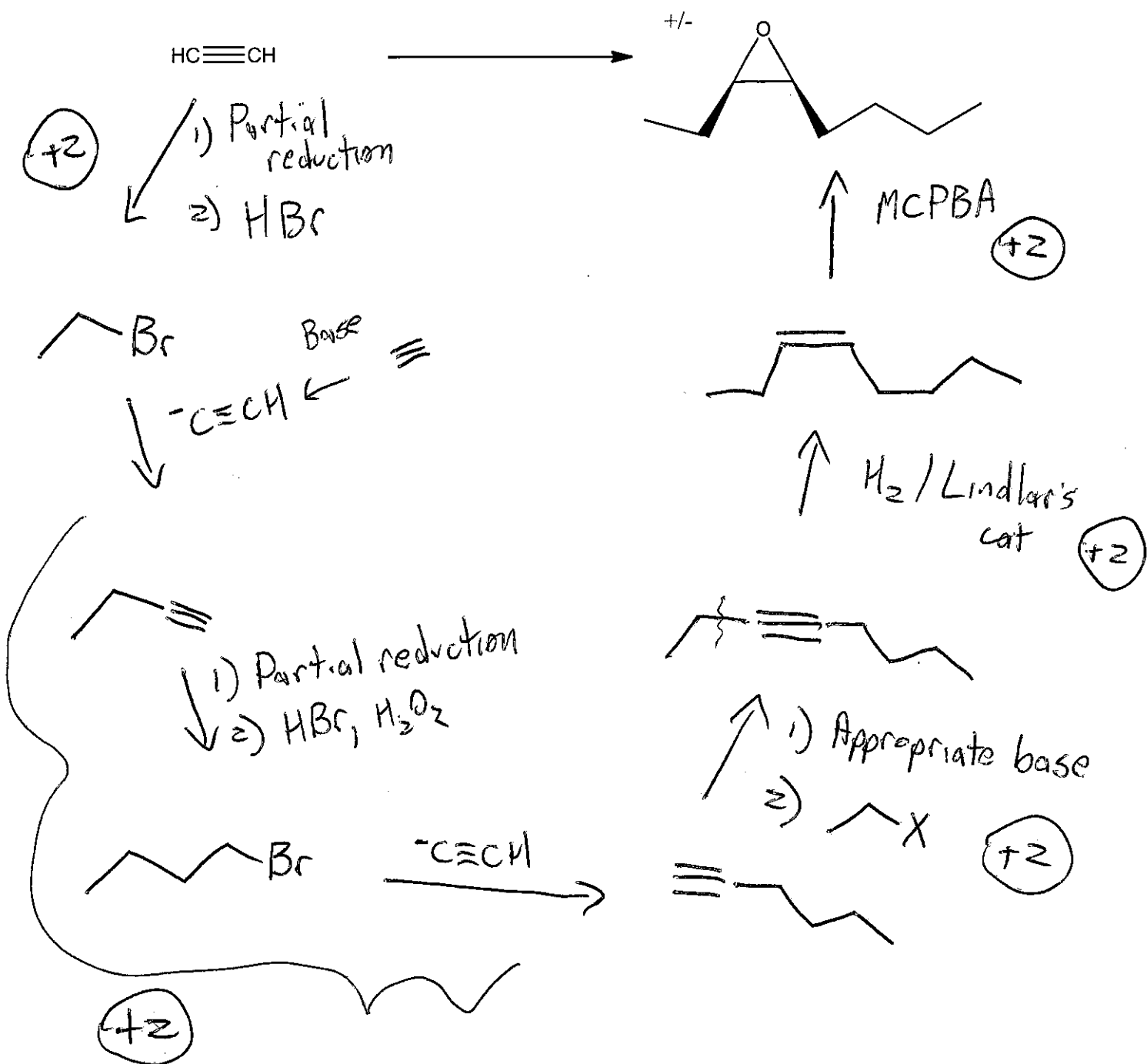
(+2) In ONE SENTENCE, how does your mechanism explain the STEREOCHEMISTRY of the reaction? (+1)

Only anti-addition occurs because the epoxide oxygen blocks the top face (or MO argument etc).

(+2) In ONE SENTENCE, how does your mechanism explain the REGIOCHEMISTRY of the reaction? (+1)

The Nu<sup>-</sup> attacks the more substituted carbon because it bears the greater  $\delta^+$  charge (or further explain by resonance).

9. (10pts) Provide all reagents necessary for this multistep synthesis. You may use acetylene as your only source of carbon, but you may use any other reagents of your choice.



\* +6 maximum if other carbon sources used  
 \* other routes possible