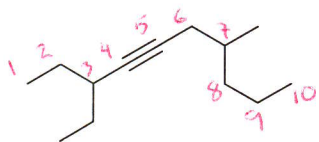
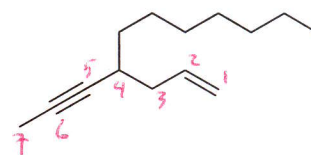


1. Provide the complete IUPAC name for the following compounds:

3-ethyl-7-methyl-4-decyne

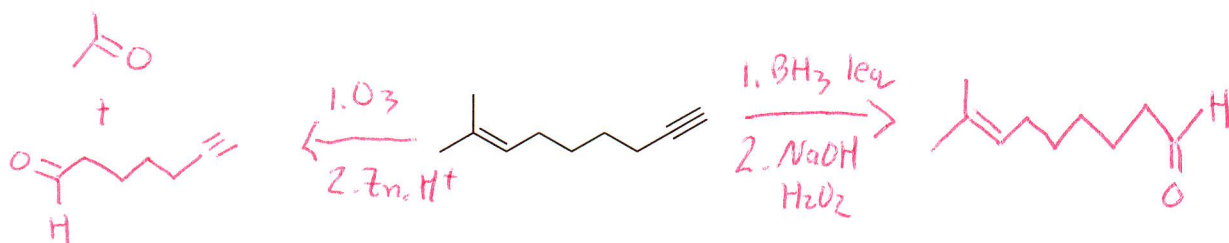


4-heptyl-1-hepten-5-yne



(Z) 4-butyl-7-methyl-3-nonen-5-yne

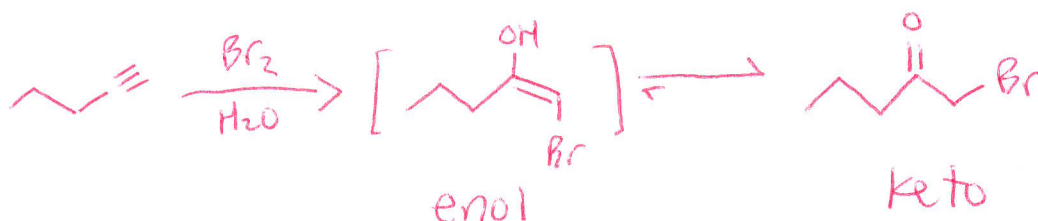
2. When the compound below is treated with one equivalent of BH_3 , where does it react? Explain. Where would one equivalent of O_3 react? Explain.



alkene more sub, so more electron rich

alkyne is less hindered

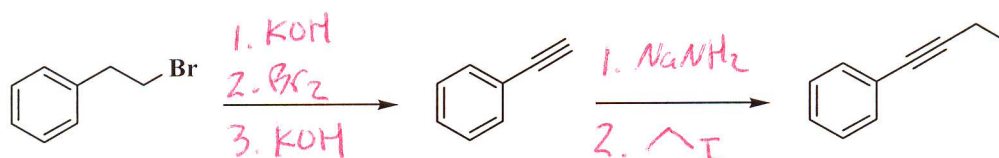
3. We did not cover the reaction of a terminal alkyne with Br_2 , H_2O (in class or in text) like we did for an alkene. What product do you think would form under these conditions?



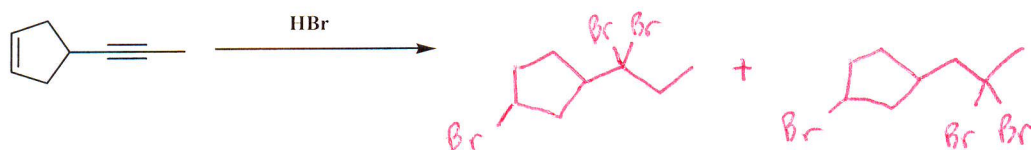
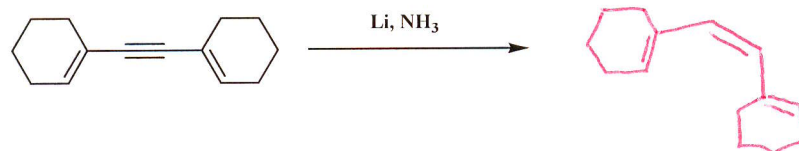
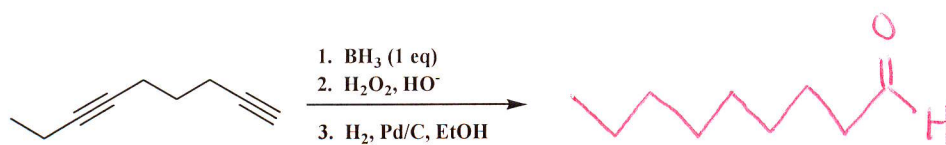
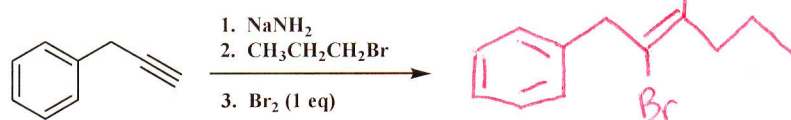
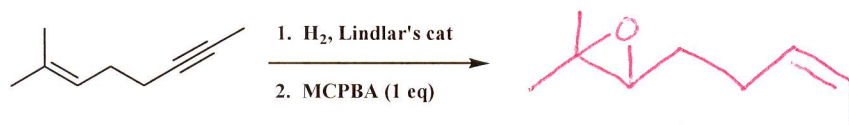
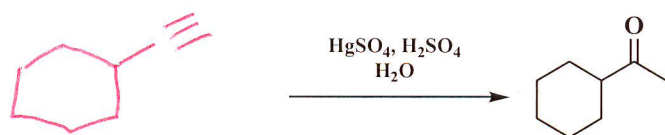
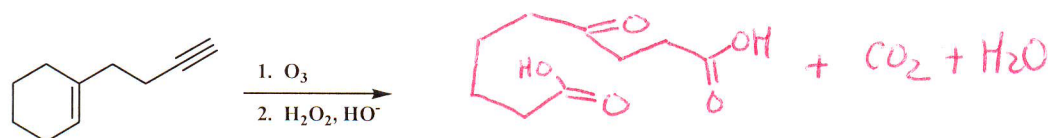
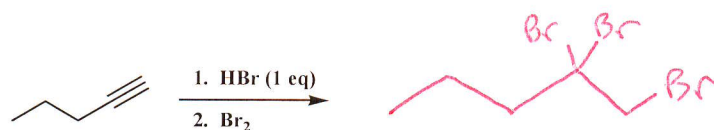
4. Alkynes do not react with MCPBA or carbenes, why?

Too difficult to form a final product containing a 3-membered ring and a double bond due to Ring Strain

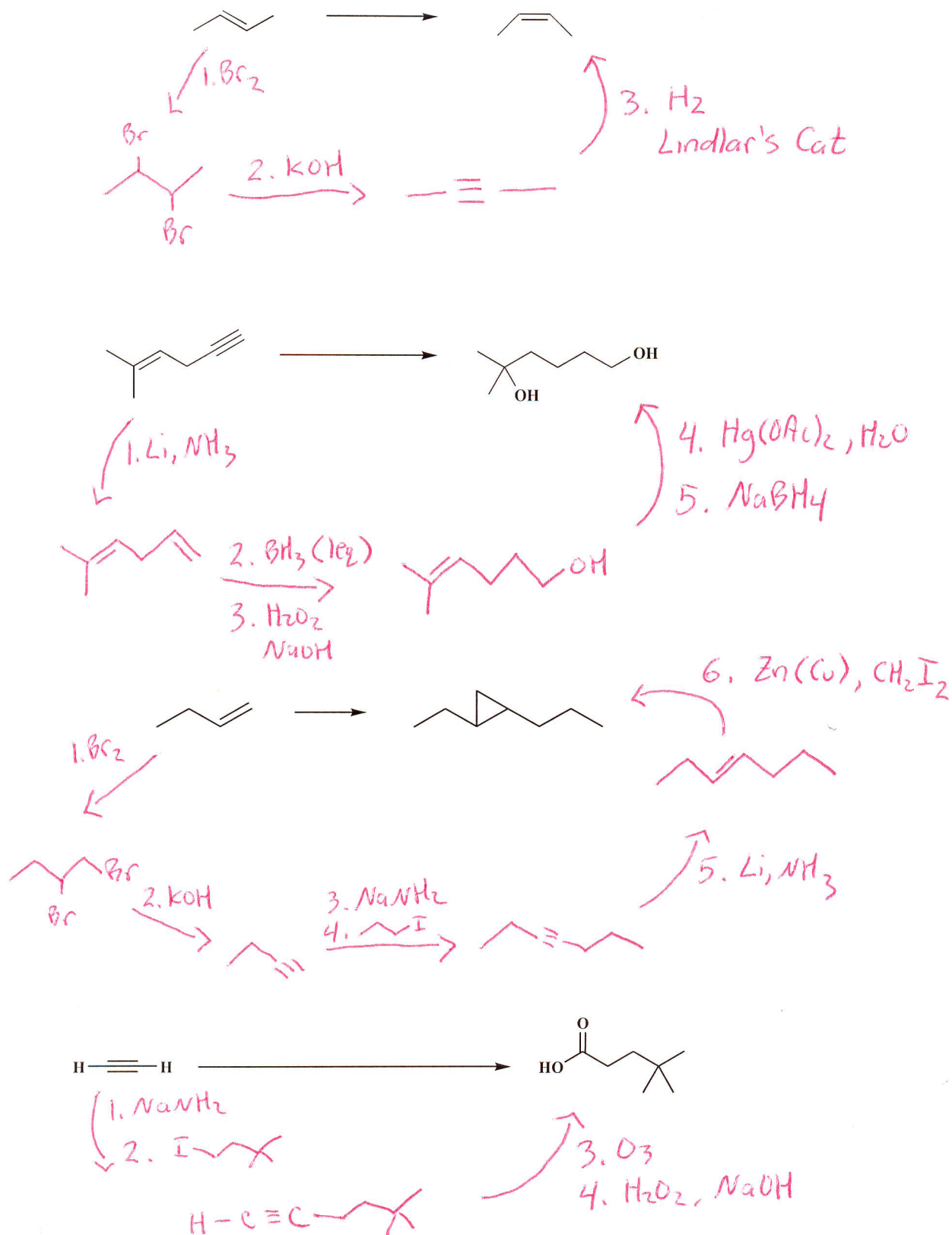
5. Alkyne synthesis. Alkynes are typically prepared from alkenes, which are in turn prepared from an alkyl halide. How would you convert the following alkyl bromide into a terminal alkyne? How would you convert the terminal alkyne into an internal alkyne?



6. **Reactions.** Give the structure of the major organic product(s) expected from each of the following reactions. If necessary, indicate product stereochemistry.

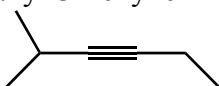


7. **Synthesis.** Show how you would carry-out a synthesis of the following molecules from the indicated starting material. You may use any other organic or inorganic reagent you need. Show your product after each step in the synthesis.

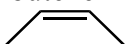


8. Draw the skeletal structure corresponding to each of the following names. Make sure that stereochemistry is clearly indicated.

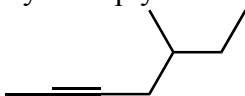
a. 2-methyl-3-hexyne



b. (Z)-2-butene

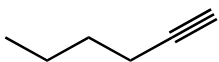


c. 5-methyl-2-heptyne



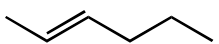
9. Name the following molecules. Make sure to include *E/Z* designations as appropriate.

a.



1-hexyne

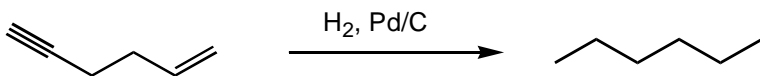
b.



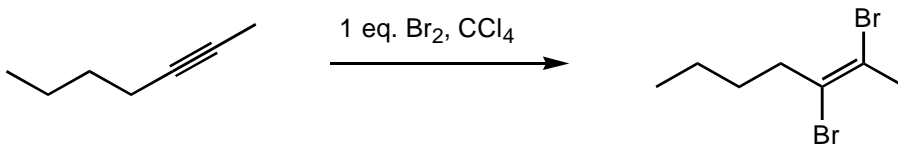
(*E*)-2-hexene can also use trans-2-hexene

10. Give the missing products, reactants, or reagents for the following reactions.

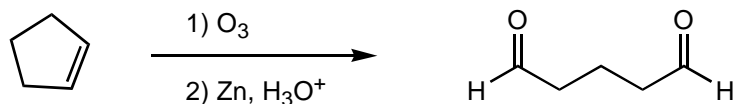
a.



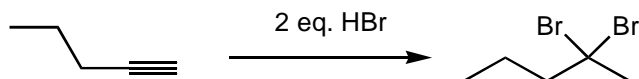
b.



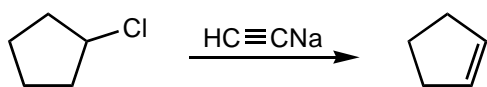
c.



d.

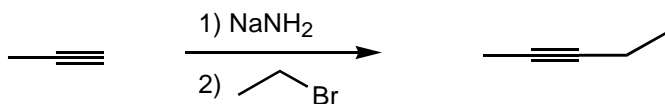


e.

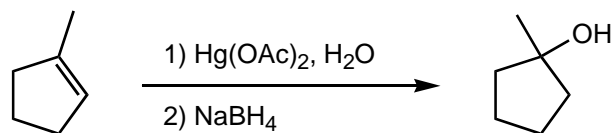


will not get alkylation since not primary alkyl halide

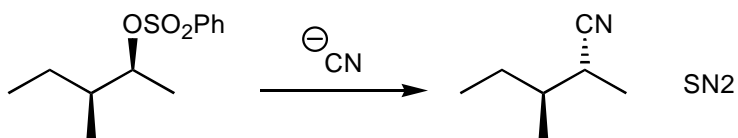
f.



g.

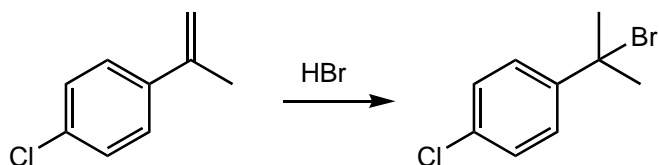


h.

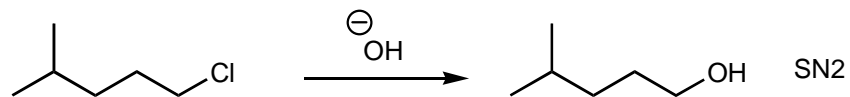


don't worry about this problem

i.

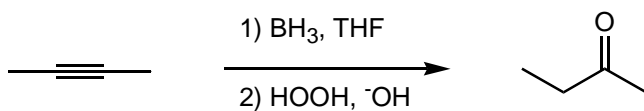


j.

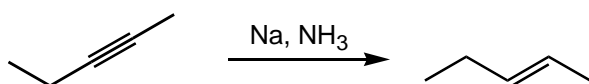


don't worry about this answer, for now we just form the alkene!!

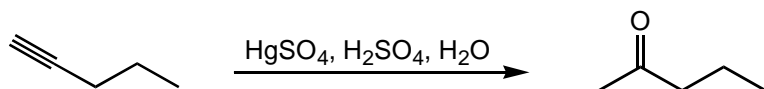
k.



l.

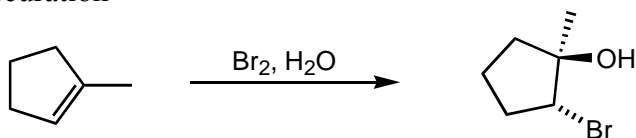


m.

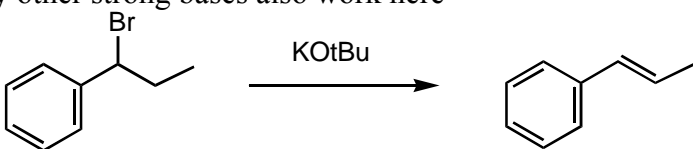


11. Give the missing reagent(s), reactant(s), or product(s) for the following reactions. If more than one product would be formed, provide all expected products, and when possible indicate which would be the major product. Be sure to indicate the stereochemistry and regiochemistry of the products as appropriate.

a. Review: bromohydrin formation, -OH goes to more highly substituted side just like in oxymercuration

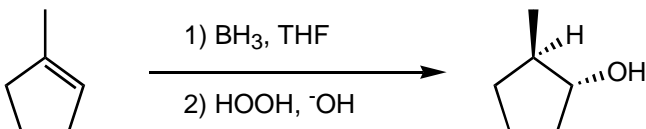


b. many other strong bases also work here

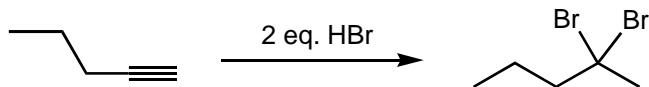


we use NaOH in class

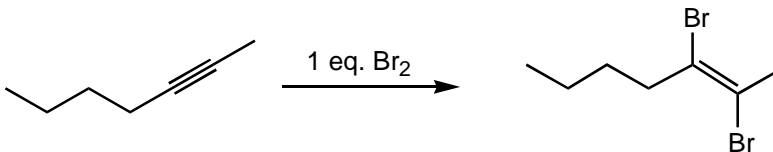
c.



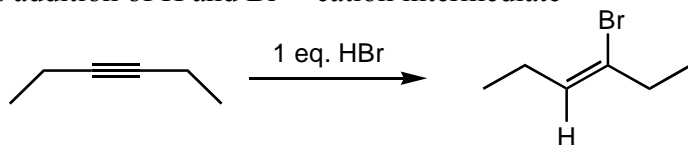
d.



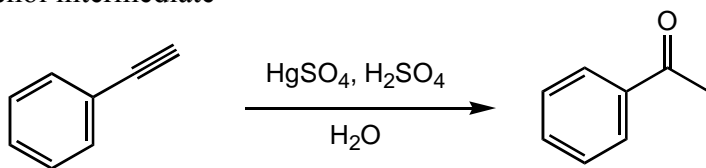
e. Trans addition of Br's



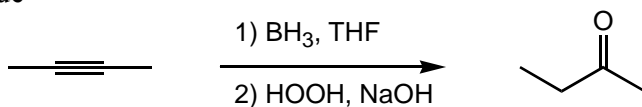
f. Trans addition of H and Br -- cation intermediate



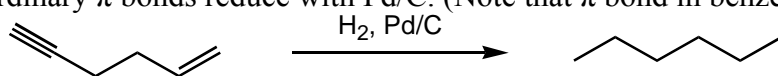
g. Via enol intermediate



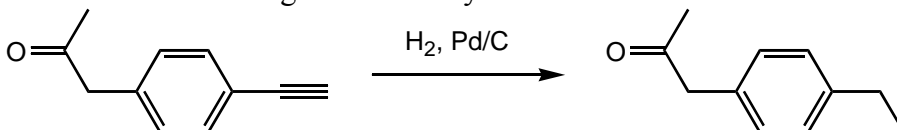
h. Starting material must be internal alkyne, else hydroboration/oxidation would lead to the aldehyde



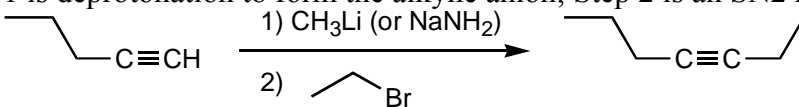
i. All ordinary π bonds reduce with Pd/C. (Note that π bond in benzene rings are **not** reduced.)



j. The π bonds of benzene rings and ordinary ketones are not reduced.

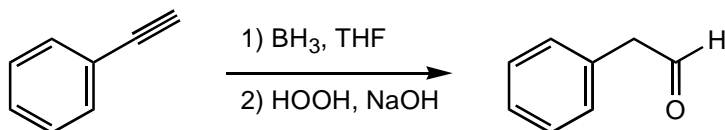


k. Step 1 is deprotonation to form the alkyne anion; Step 2 is an $\text{S}_{\text{N}}2$ reaction.

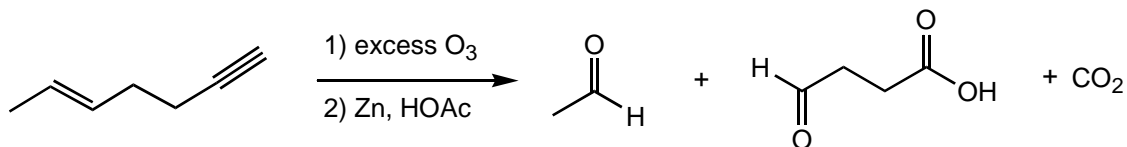


12. Give the missing reagent(s), reactant(s), or product(s) for the following reactions. For stereoselective reactions, indicate the relative stereochemistry of the products.

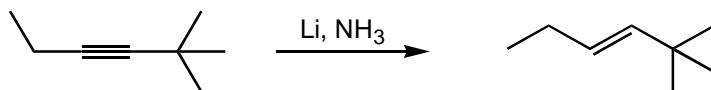
a.



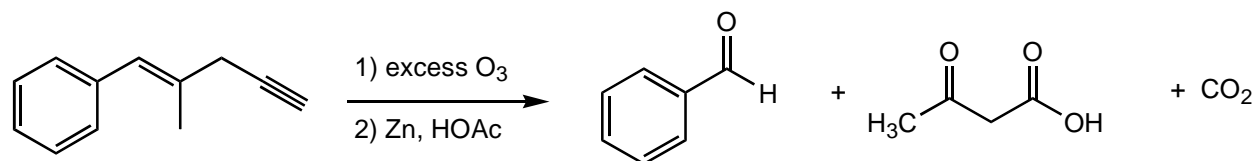
b.



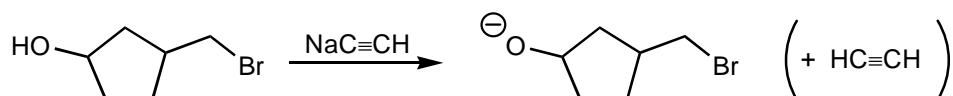
c.



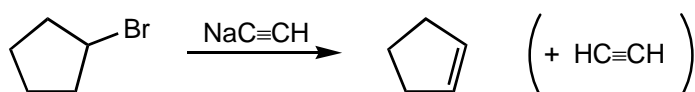
d.



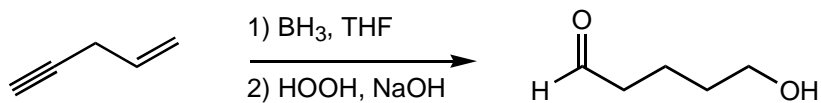
e.



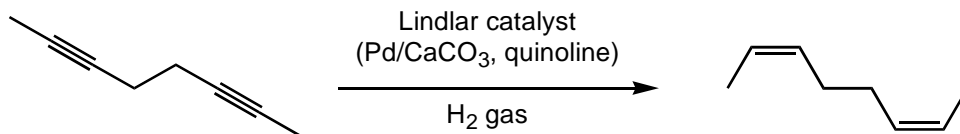
f.



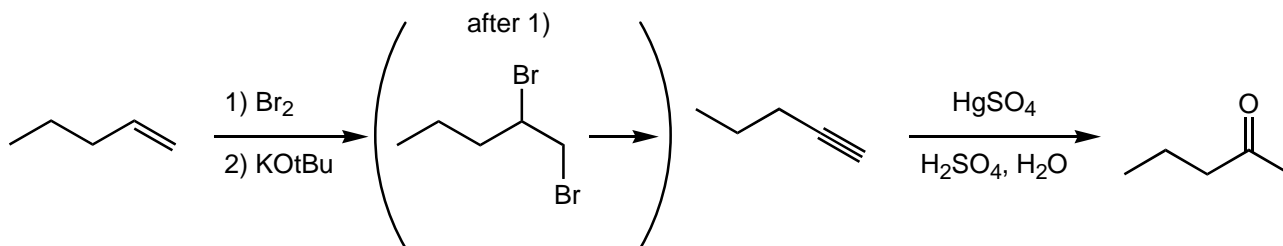
g.



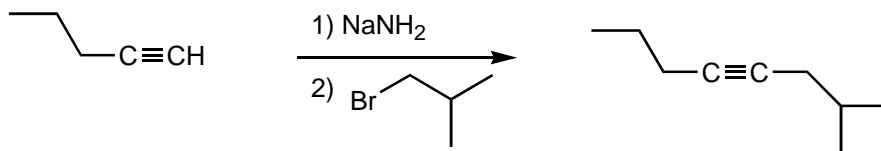
h.



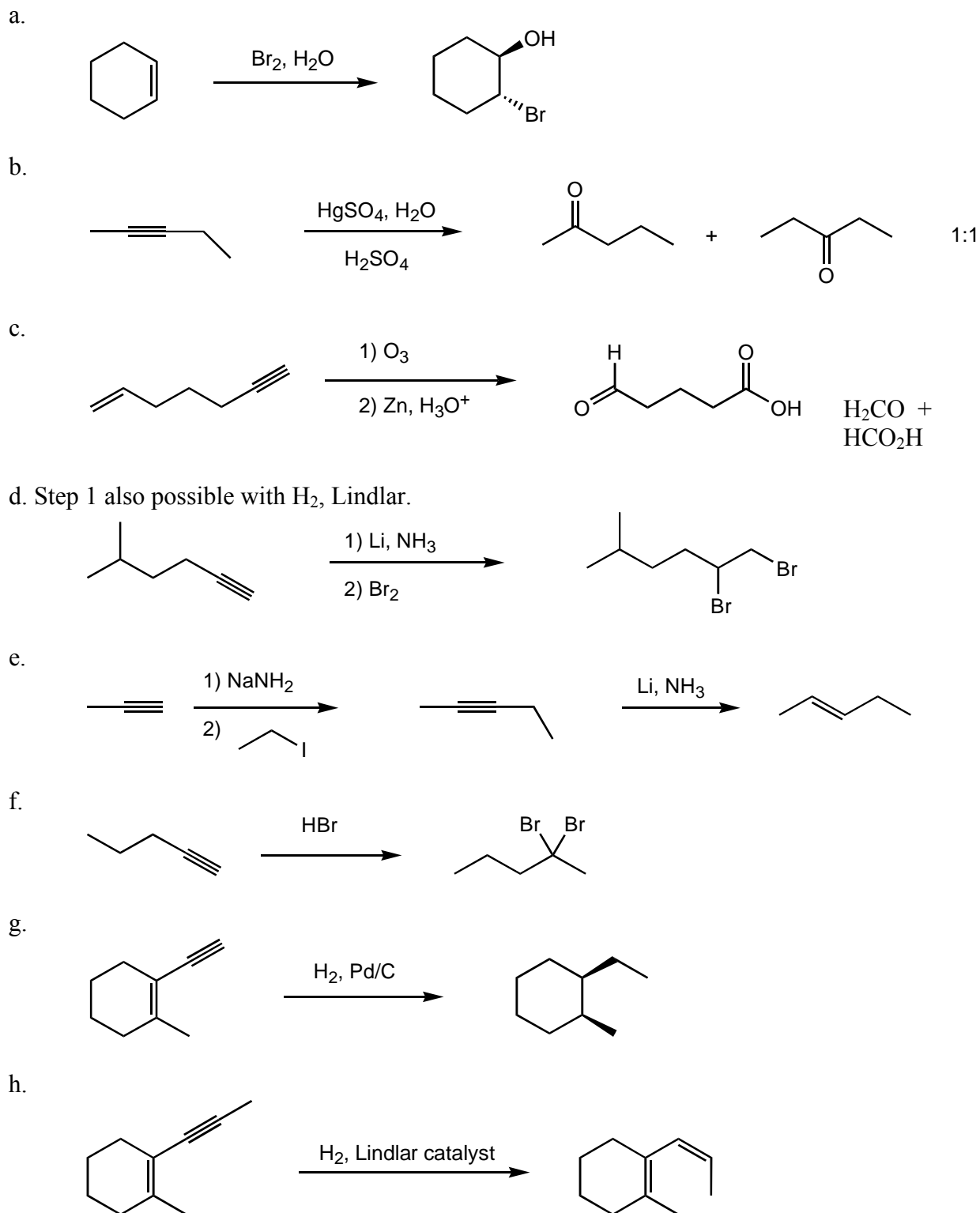
i.



j.

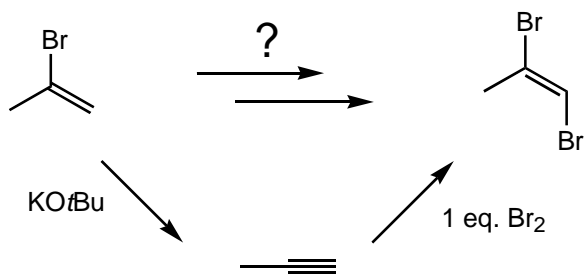


13. Supply the missing reagents, products, or starting materials for each of the reactions shown below. Make sure to indicate stereochemistry and regiochemistry when appropriate.



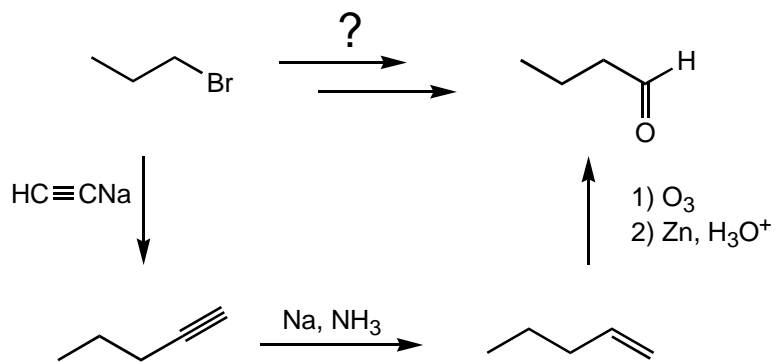
14. Provide a synthetic sequence to go from the given starting material to the desired product. Show all reagents and synthetic (not reaction) intermediates. All these syntheses can be accomplished in two or three steps.

a.

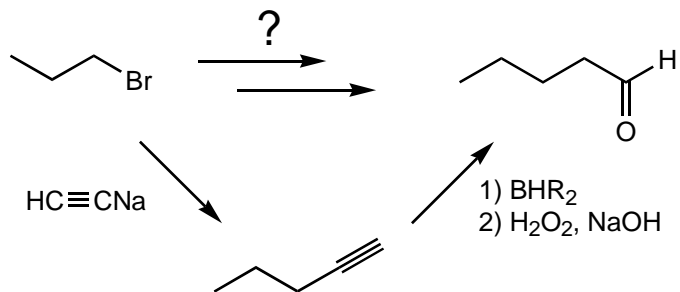


we used NaOH for step 1

b.

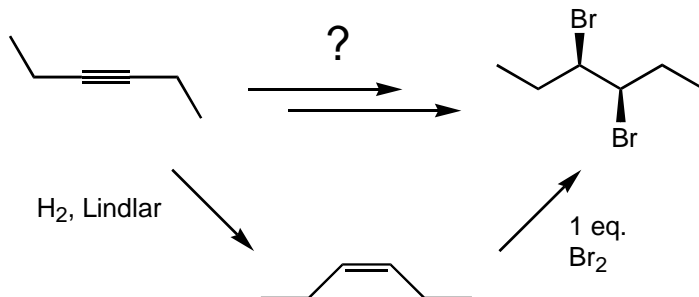


c.

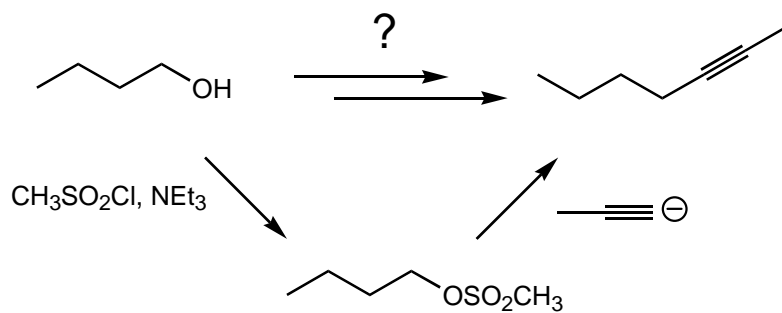


we used BH₃ for step 2

d.

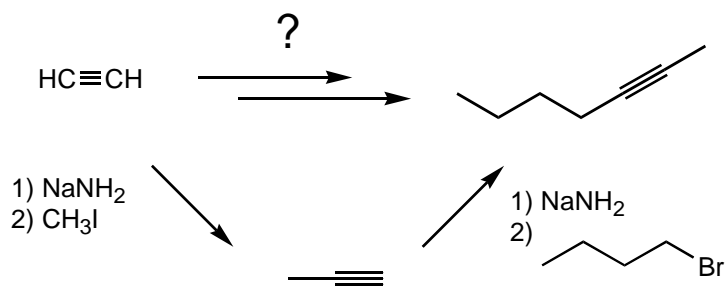


e.

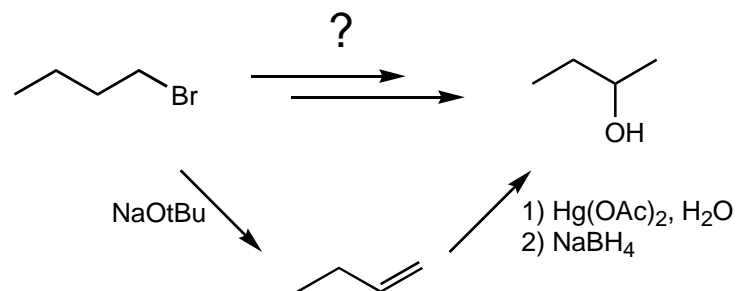


don't worry about this problem

f.

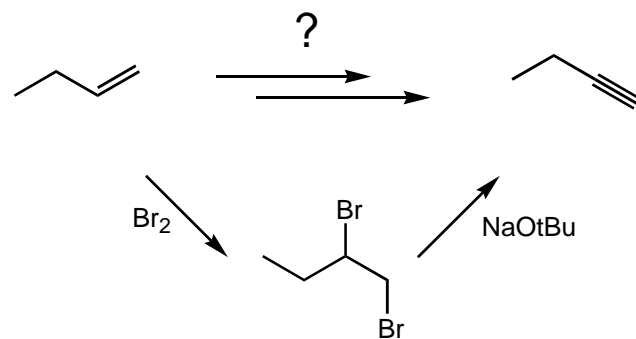


g.



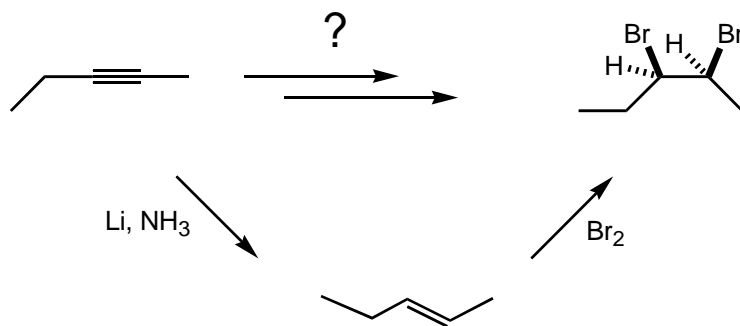
we use NaOH step 1

h.

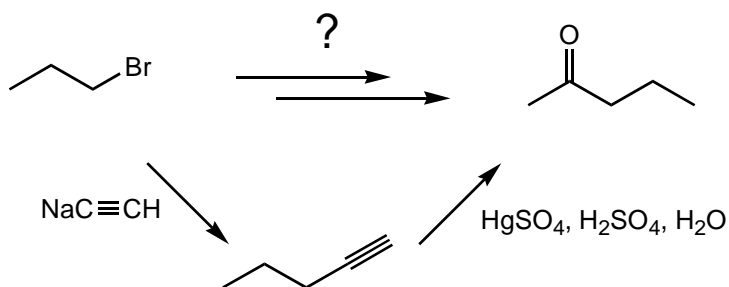


we use NaOH step 2

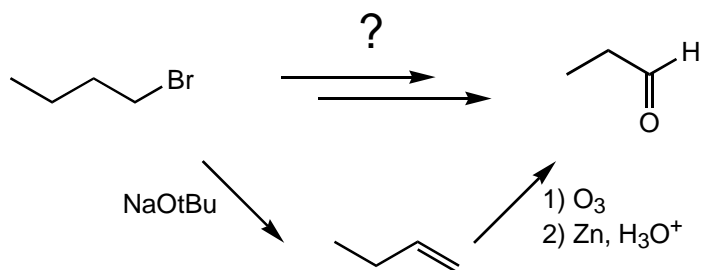
i.



j.



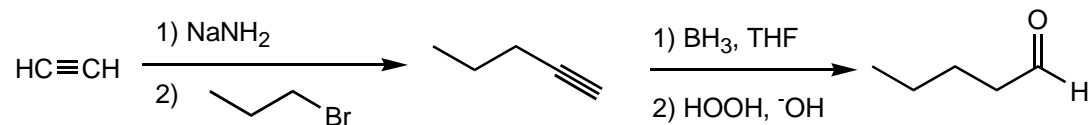
k.

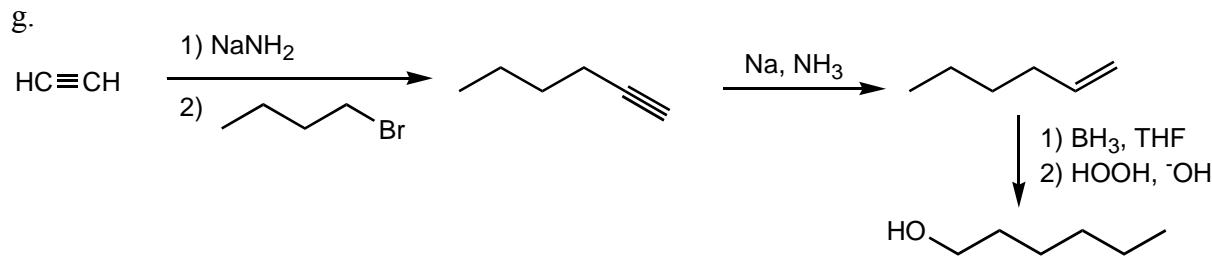
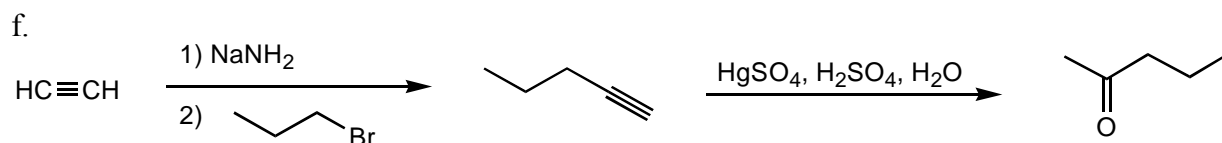
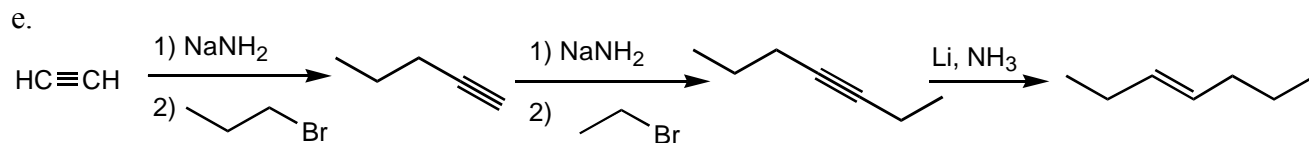
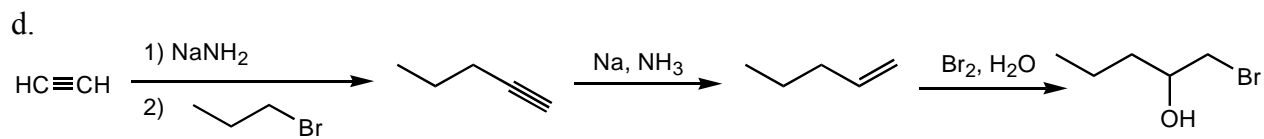
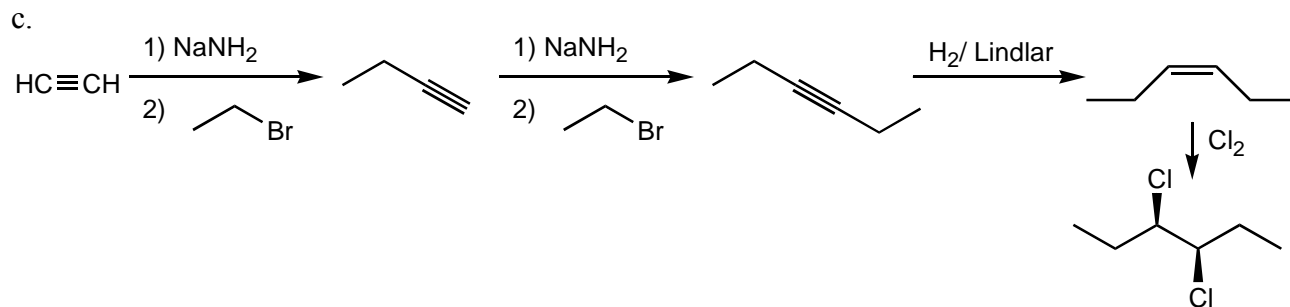
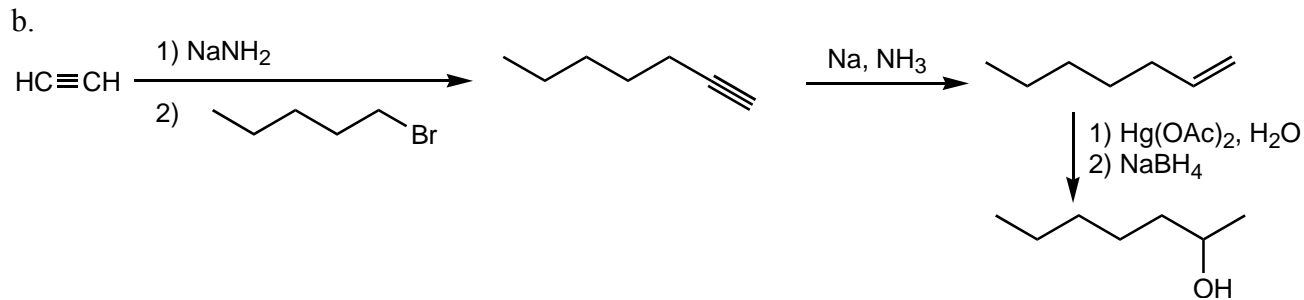


we use NaOH step 1

15. Synthesize the following compounds from acetylene ($\text{HC}\equiv\text{CH}$) and any primary (1°) alkyl halide(s) (RCH_2X , where $\text{X} = \text{Cl, Br, or I}$) you would like to use.

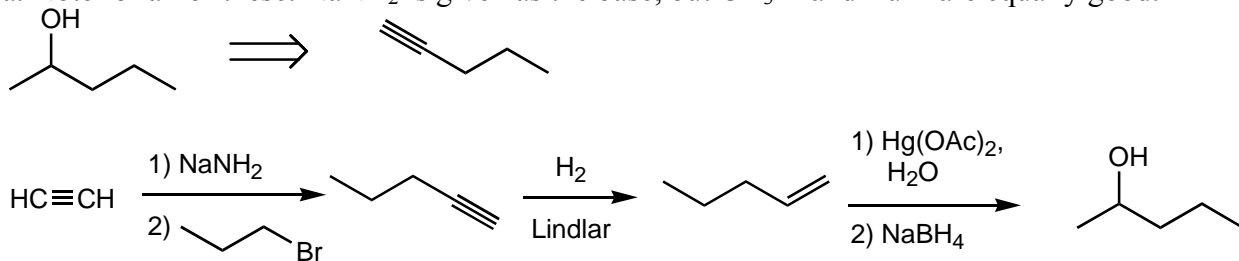
a. Note for all of these: NaNH_2 is given as the base, but CH_3Li and BuLi are equally good.



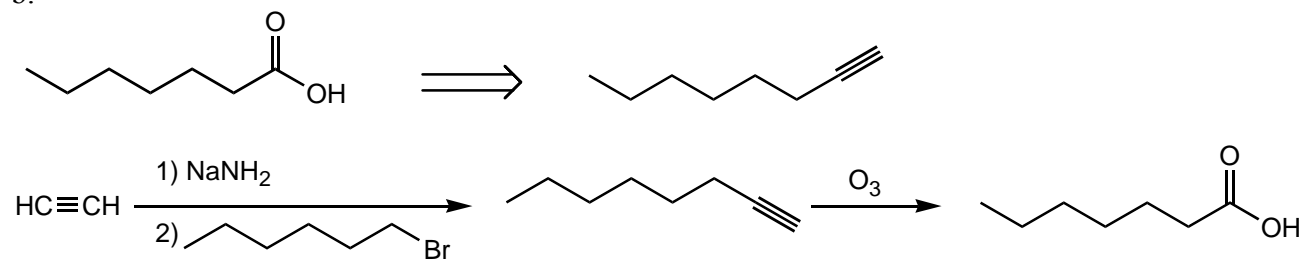


16. Synthesize the following molecules using acetylene and any alkyl halide(s).

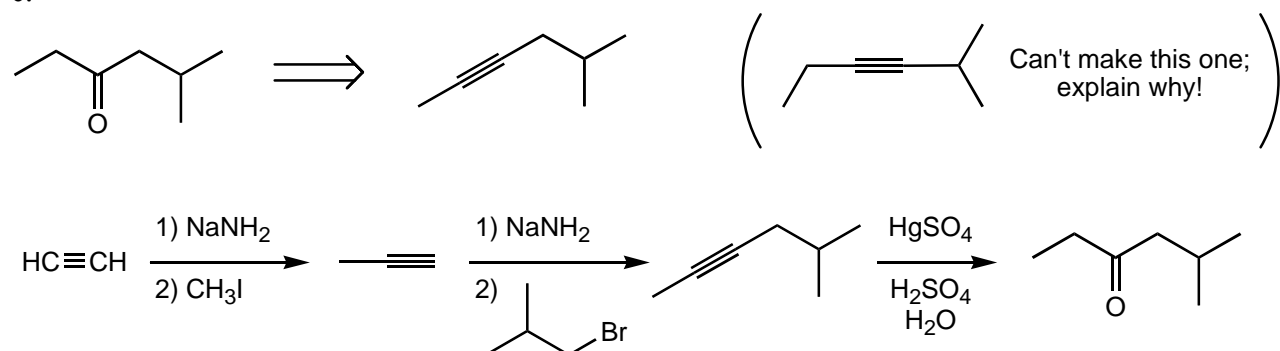
a. Note for all of these: NaNH_2 is given as the base, but CH_3Li and BuLi are equally good.



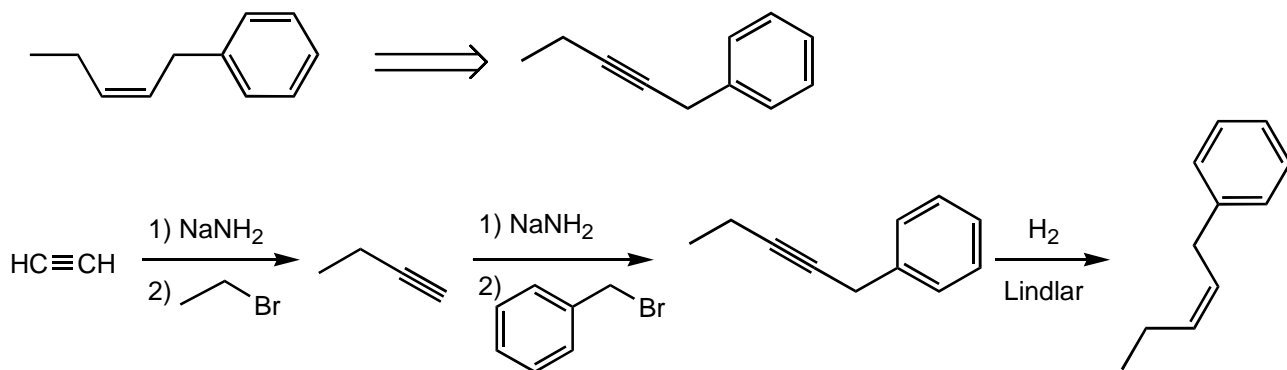
b.

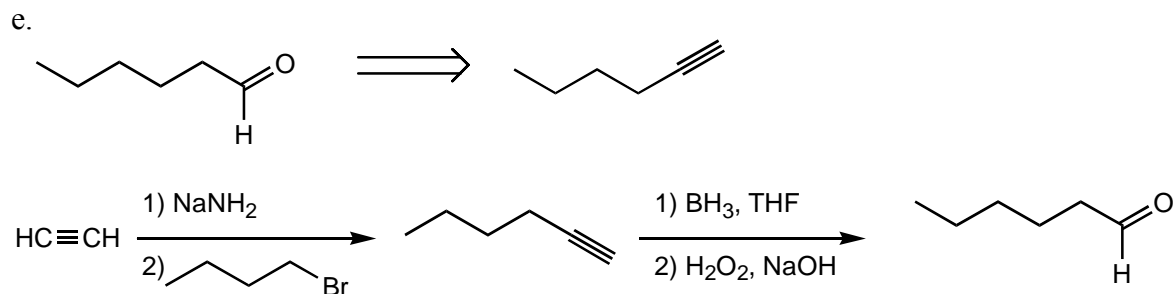


c.



d.

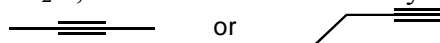




17. Compound **A** (C_4H_6) absorbs two molar equivalents of H_2 gas on catalytic hydrogenation with palladium on carbon. Upon reaction with H_2SO_4 and H_2O , a ketone is formed. Give the two possible structures for compound **A**.

"Compound **A** (C_4H_6) absorbs two molar equivalents of H_2 gas" means there are two π bonds in **A**.

"Upon reaction with H_2SO_4 and H_2O , a ketone is formed." Alkynes hydrate to form ketones!



18. Compound **B** has the molecular formula $\text{C}_4\text{H}_6\text{O}$. When treated with H_2 and a palladium catalyst, **B** absorbs one equivalent of H_2 . Compound **B** also has a strong IR peak at 1715 cm^{-1} . Draw a possible structure for **B** that is consistent with this information.

Compound has one C-C π bond (absorbs one equivalent of H_2) and a carbonyl (IR peak at 1715). A possible structure is:

