



**Multiple choice (questions 1-5).** Circle the best answer to each of the following questions. (15 pts)

1. Which of these bases will NOT quantitatively deprotonate both an alcohol and a terminal alkyne?

LDA

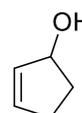
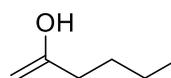
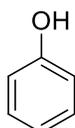
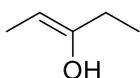
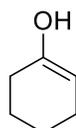
*tert*-butoxide

NaH

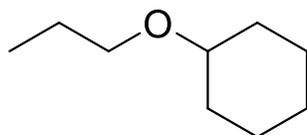
NaNH<sub>2</sub>

BuLi

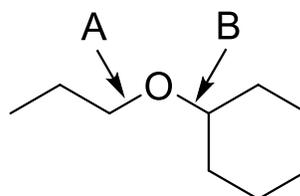
2. Which of these structures is NOT an enol?



3. This ether can be made using a Williamson ether synthesis. The possible bond disconnections are displayed in the structure to the right. Which of the bond disconnections reflects the preferred synthesis of this ether? (The preferred synthesis is the one that produces the ether in higher yields.)



target ether



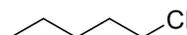
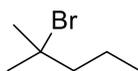
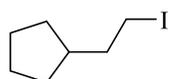
target ether structure  
showing bond disconnections

Circle the bond that would be made in the preferred synthesis: **A**      **B**

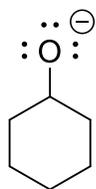
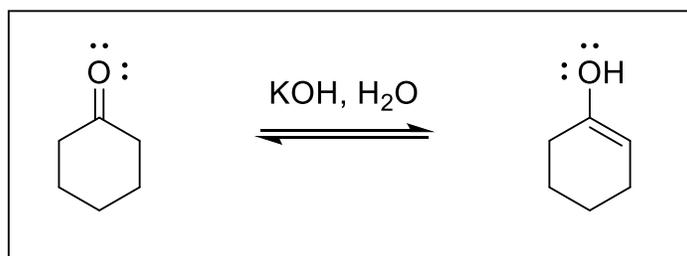
4. A recent incident in the research laboratory of highly esteemed pigeon chemist Professor Burblecoo illustrates the importance of reagent selection. One of the professor's associates, Dr. Cluckpoop, attempted to alkylate an acetylide ion with an electrophile. However, the reaction failed to provide good yields of the alkylation product but instead produced an alkene. Which of these electrophiles did Dr. Cluckpoop use?



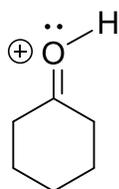
*Professor Burblecoo's research assistant, Dr. Cluckpoop, working in the lab*



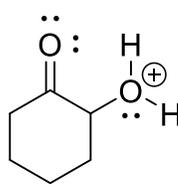
5. Which of these structures is an intermediate in the keto-enol tautomerization occurring in aqueous base?



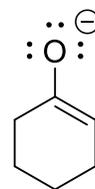
**A**



**B**



**C**



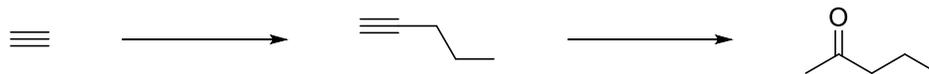
**D**

None of these structures

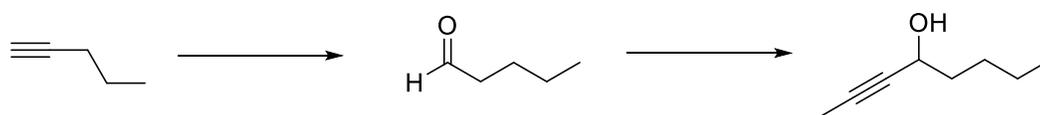
**E**

6. Write the missing reagent(s) over each arrow. Some transformations may require more than one reagent, and some transformations may require that the reagents be numbered. (21 pts)

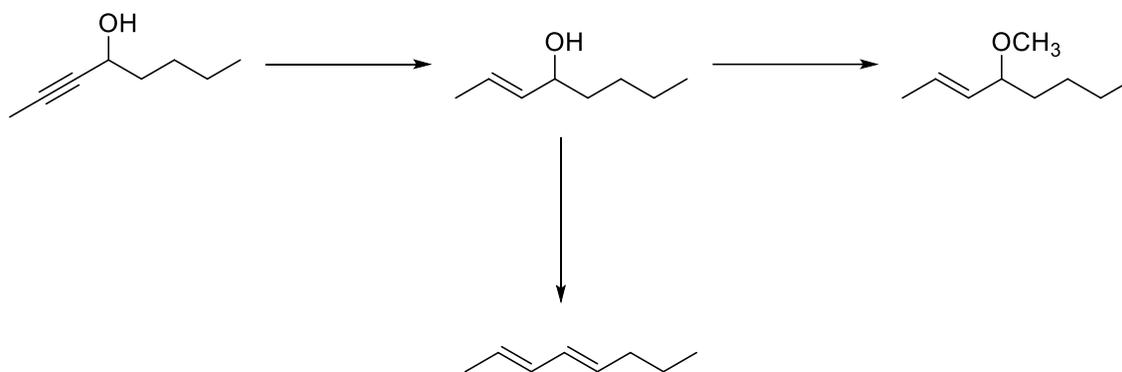
a.



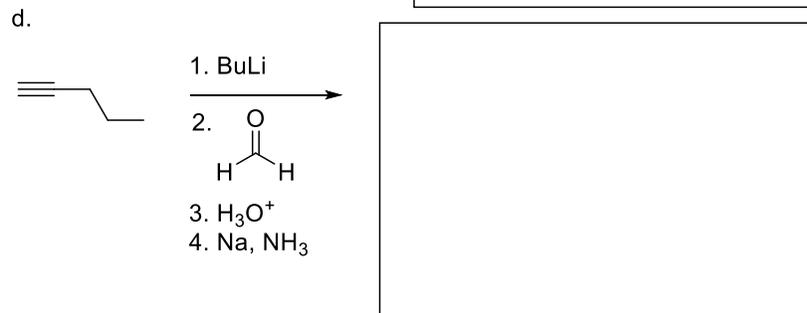
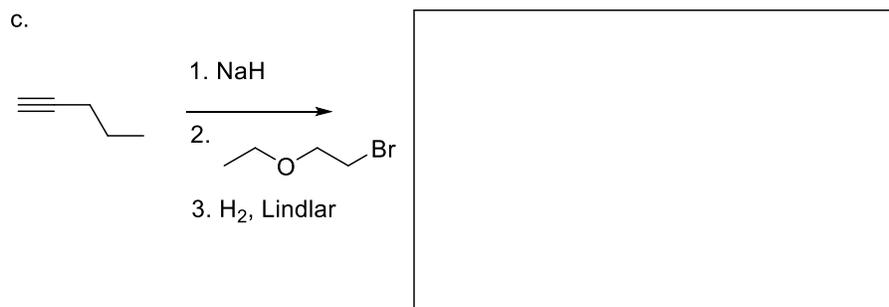
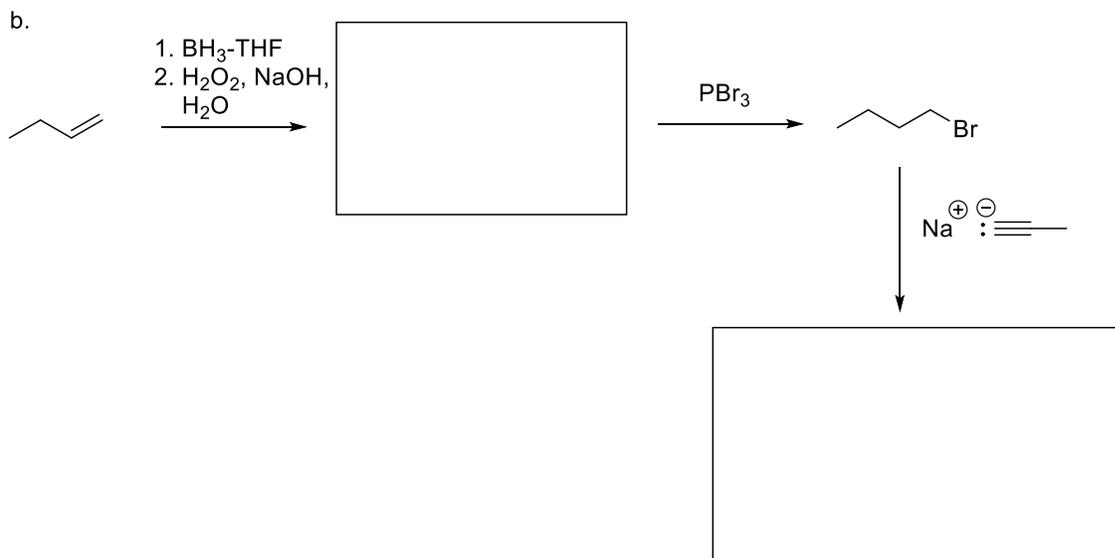
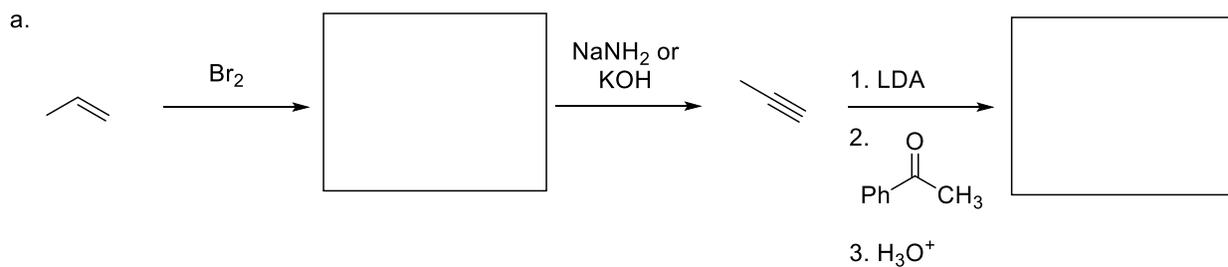
b.



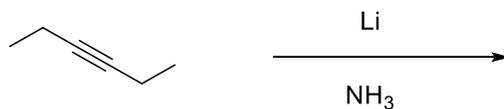
c.



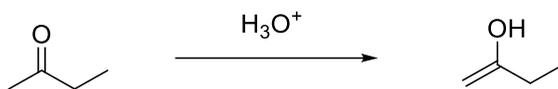
7. Draw the missing products in the boxes for these multi-step syntheses. (30 pts)



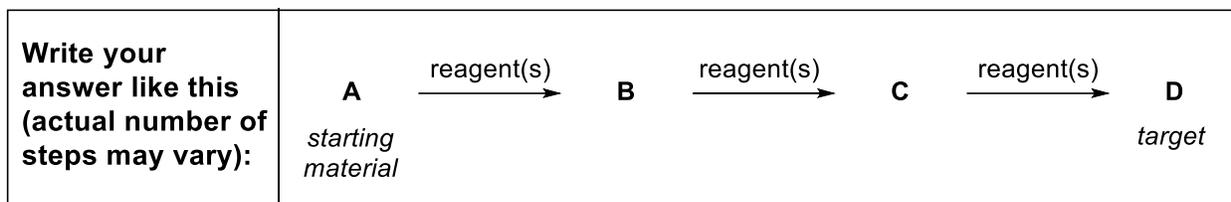
8. Draw the product of the following reaction conditions and draw a mechanism to illustrate its formation. Include all necessary electrons, curved arrows, and nonzero formal charges. (16 pts)



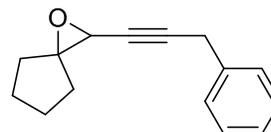
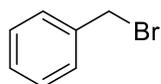
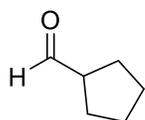
9. Draw a mechanism to illustrate the following transformation. Include all necessary lone pair electrons, curved arrows and nonzero formal charges. (8 pts)



10. Propose a multi-step synthesis of the target molecule shown at the right, using the starting materials on the left and any other reagents you need. Show the reagents needed for each step and the product of each step. Do not show any mechanisms. (12 pts)



Use these starting materials:



target molecule