Name _____ Test 4
PHYS 0201 (Organic) Fall 2004

1. (8 pts. ea.) Describe the orbitals using in forming the triple bond in 2-butyne; that is,

a. What is the hybridization of the two carbons involved in the triple bond?

sp

b. What how many σ□bonds and how many π-bonds join the two carbons in the triple bond?

1 σ-bond and 2 π-bonds

c. What atomic orbitals are used to form the π-bond(s)?

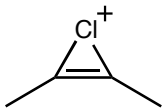
2 p orbitals on each C are used to make the π-bonds

1. _____
2. _____
3. _____
4. _____
5. _____

2. a. (8 pts.) The addition of Cl_2 to an alkyne occurs by a syn or an anti addition?

anti

b. (8 pts.) Draw the intermediate in the reaction of Cl_2 with an alkyne and explain why the reaction occurs as you predict in question 2.a.



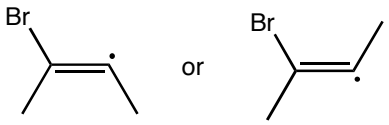
Since the Cl is sitting on one face of the intermediate, the Cl^- must attack from the other side. Thus, the addition is anti.

6. _____
7. _____
8. _____

3. a. (8 pts.) In the presence of peroxide, the reaction of HBr and 2-butyne produces *Z*- or *E*-2-bromo-2-butene or both?

both

b. (8 pts.) Draw the intermediate in the reaction and explain your choice in question 3.a.

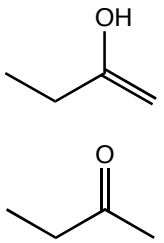


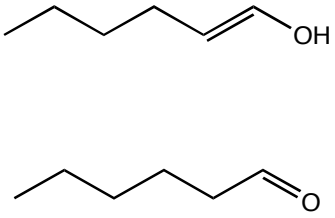
Since the intermediate is a radical, the H atom can add to either side during the second step.

4. (8 pts.) When an alkyne reacts with HCl is the alkyne acting as a nucleophile or an electrophile?

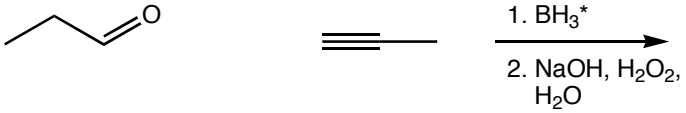
nucleophile

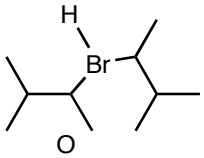
5. (8 pts. ea.) Two enols are drawn below. Draw the carbonyl tautomers for the enols drawn below.

a. 

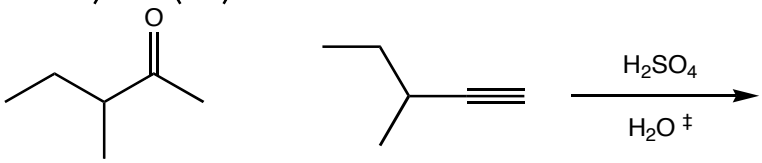
b. 

6. (12 pts. ea.) List the reagents and the alkyne that you would you use to make the following carbonyls.

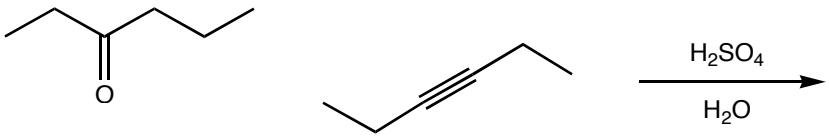
a. 



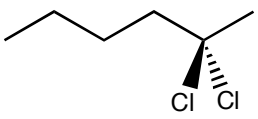
*A sterically hindered borane is actually more appropriate.

b. 

‡$HgSO_4$ is also required for this reaction.

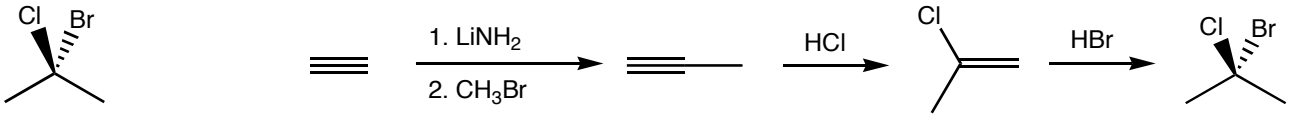
c. 

7. (12 pts.) List the reagents and alkyne that you would use to make the following molecule. The reaction can be accomplished in one step.

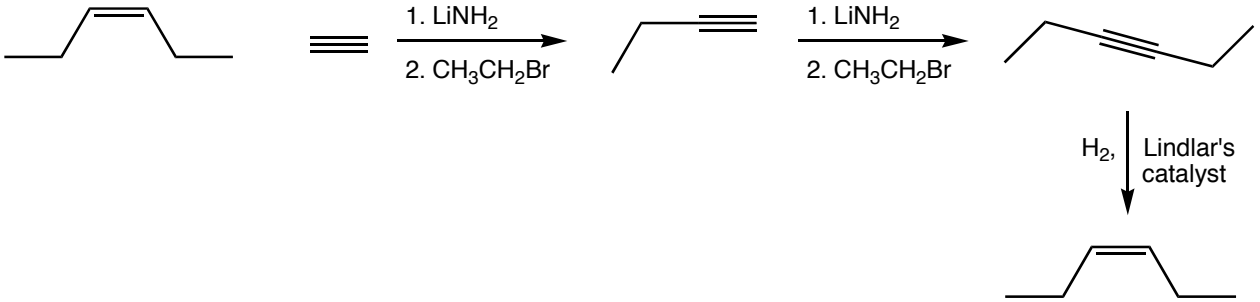


8. (12 pts. ea.) Starting from acetylene (HC≡CH) and any other reagents that you need, make the following molecules.

a.



b.



c.