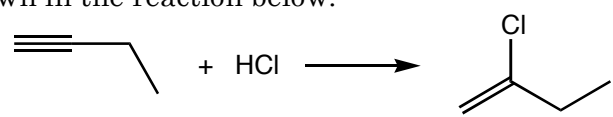


1. (12 pts.) Draw a skeletal structure for each of the following alkynes 1. _____
 a. 4-chloro-2-pentyne b. 3,3-dimethyl-1-butyne

2. _____

3. _____

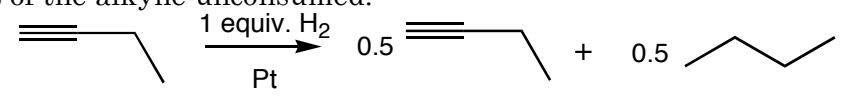
2. (12 pts.) The reaction of 1 equivalent of HCl with an alkyne produces 1 equivalent of a vinyl halide as shown in the reaction below. 4. _____



5. _____

The reaction of the same alkyne with 1 equivalent of H₂ in the presence of a platinum catalyst, on the other hand, produces half an equivalent of butane and leaves half an equivalent of the alkyne unconsumed.

6. _____



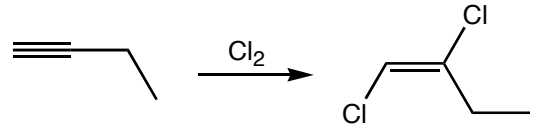
7. _____

Provide an explanation for why one reaction stops once the alkyne has been converted to the alkene whereas the other reaction continues on to form half an equivalent of an alkane.

8. _____

9. _____

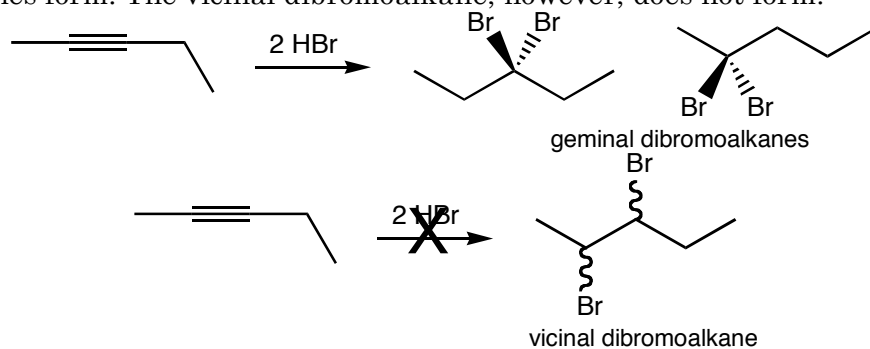
3. (12 pts.) Draw a mechanism that predicts the formation of the following product and explain why the chlorine atoms must be *trans* to each other.



4. (6 pts.) Describe the bonds used to form the triple bond in acetylene. In other words, the σ bond is formed using what kind of orbitals (name them, and I don't mean Bob or George), and the π bonds are formed using what orbitals (name them).



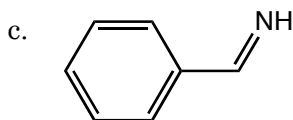
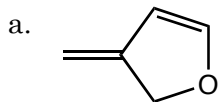
5. (12 pts.) When two equivalents of HBr are added to the following alkyne two possible geminal dibromoalkanes form. The vicinal dibromoalkane, however, does not form.



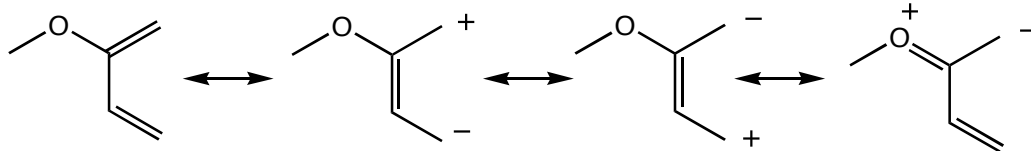
(Squiggly bonds are just a way of saying that the chiral carbon could be either configuration.)

Explain why the geminal dihaloalkanes form but the vicinal dihaloalkanes don't. (Hint: consider the stability of the intermediates that lead to the geminal and vicinal dibromoalkanes.)

6. (6 pts. each) Draw resonance structures for the following molecules.



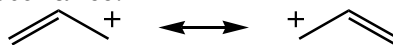
7. (12 pts.) Four resonance structures for a molecule are drawn below.



a. Draw the resonance hybrid for the molecule. Remember to indicate any partial charges that might form (δ^+ and δ^- would be sufficient).

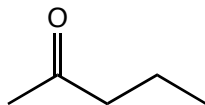
b. Identify the most stable resonance structure of the four drawn above, and explain why the other three are higher in energy.

8. (12 pts.) Describe the orbital arrangement that allows the electron deficiency on the following molecule to be distributed by resonance.

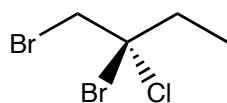


9. (6 pts. each) From what alkynes could you make the following molecules (also indicate the reagents that would be required to complete the transformation).

a.



b.



this reaction requires two steps