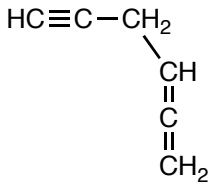
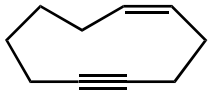
Homework - Chapter 13
Chem 2320

Name _____

1. Give the geometry, bond angles, and hybridization of each carbon atom in the following molecules.

a) 

b) 

2. Label each carbon-carbon bond in the following molecule as a σ or a π bond. Then give the two orbitals from which each was created.

3. Draw each of the following.

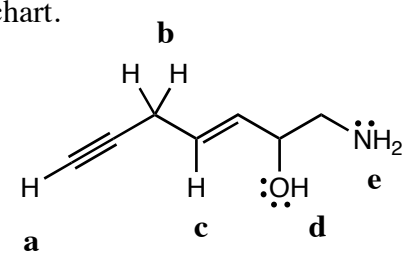
a) two internal alkynes with the formula C_6H_{10} which are constitutional isomers

b) two terminal alkynes with the formula C_6H_{10} which are enantiomers

c) an internal alkyne with the formula $C_{10}H_{18}$ which is a meso compound.

d) two terminal alkynes with the formula C_6H_8 which are diastereomers.

4. Rank the following H's from most acidic to least acidic. Use notes from this chapter as well as your pKa chart.



_____

_____

_____

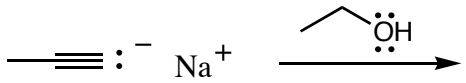
_____

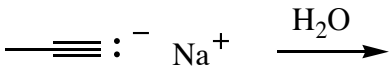
_____

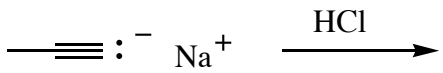
5. Circle any of the following bases which would react with a terminal alkyne to form an acetylide anion.

$NaOH$ $NaNH_2$ CH_3ONa NaH CH_3MgBr

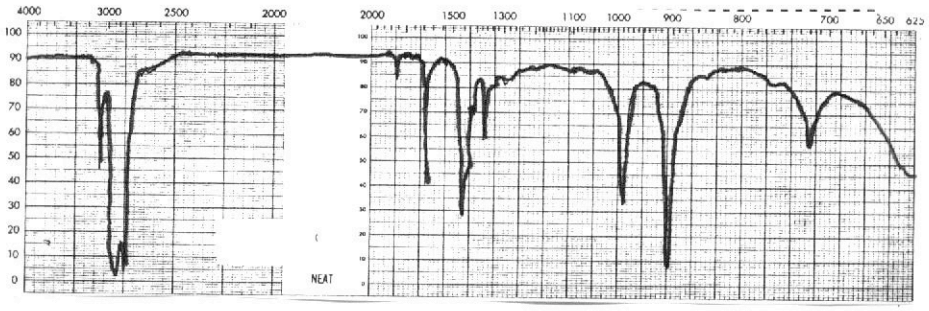
6. Give all products of the following acid/base reactions, if any.

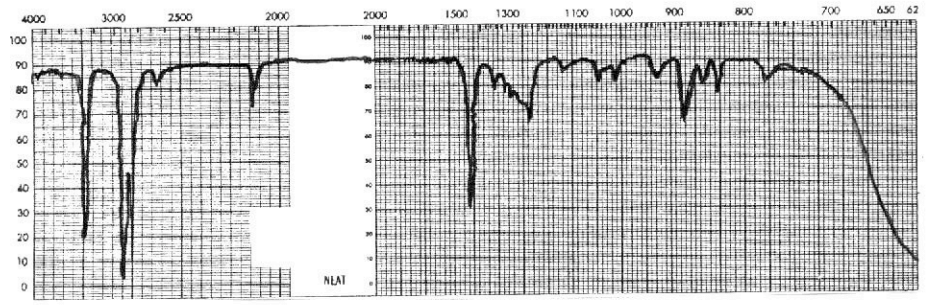
a) 

b) 

c) 

8. Label the following bands on the IR spectra on this page and the next.
   a) C-C double bond
   b) C-C triple bond
   c) C-H bond next to the C-C double bond
   d) C-H bond next to the C-C triple bond



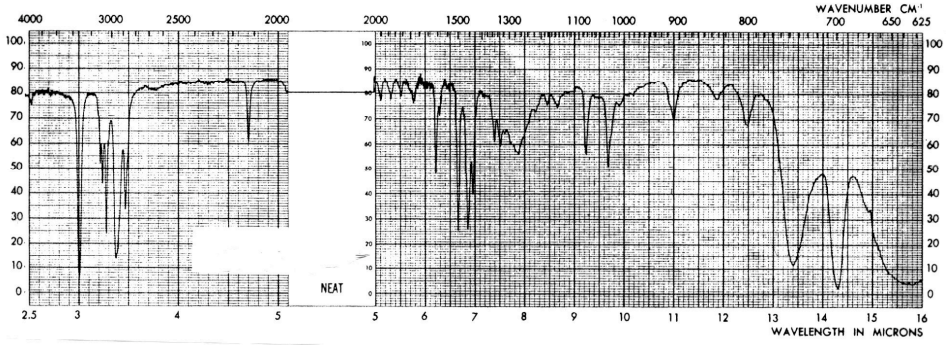


e) Which occurs at a higher frequency, the double or triple bond? Why?

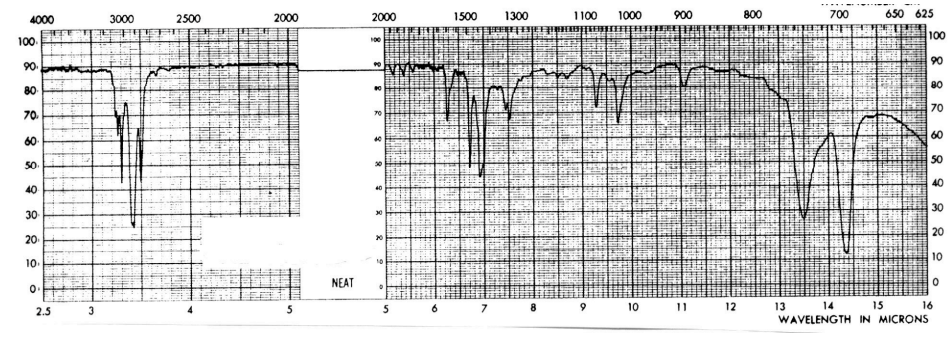
f) Which occurs at a higher frequency, the C-H bond next to the double or triple C-C bond?

9. Choose the best compound from the list below for each of the following spectra. Explain your answer!

5-cyclohexyl-1-pentyne
5-phenyl-1-pentyne
6-phenyl-2-hexyne
6-cyclohexyl-2-hexyne

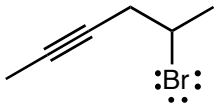


name: _____
explanation:

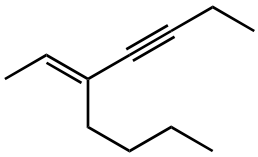


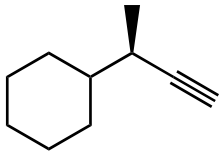
name: _____
explanation:

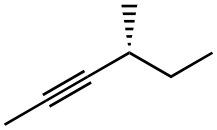
10. Name the following alkynes. Be sure to specify stereochemistry where needed.

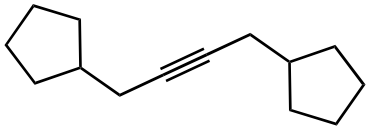
a) 

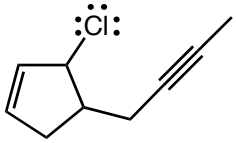
b) 

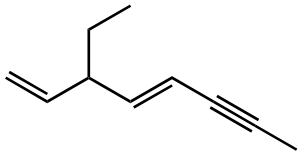
c) 

d) 

e) 

f) 

g) 

h) 

11. Draw structures for the following compounds. (Make sure to show the correct alkyne geometry!)

a) 4-methyl-1-pentyne

b) <u>cis</u>-2-hexen-4-yne

c) 1,3-hexadiyne

d) 2-methyl-3-heptyne

e) diphenylacetylene

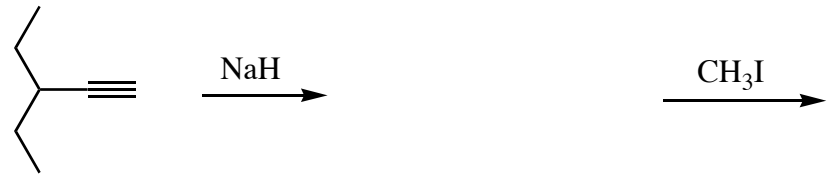
f) 3,3-diethylcyclononyne

12. Fill in the products in each reaction sequence.

a) 

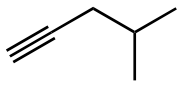
b) 

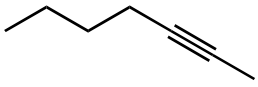
c) HC≡CH 

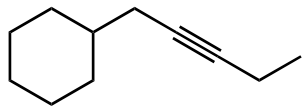
d) 

e) 

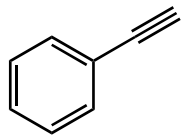
13. Synthesize the following compounds from acetylene. Show all reactions with starting materials and reagents.

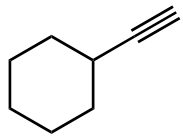
a) 

b) 

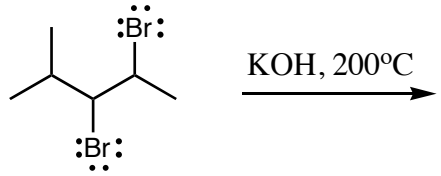
c) 

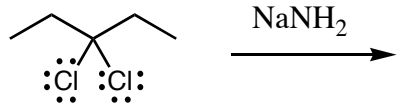
14. Neither of the following compounds can be synthesized cleanly by S_N2 substitution of acetylene. Show what would happen if you tried it, and explain why it won't work.

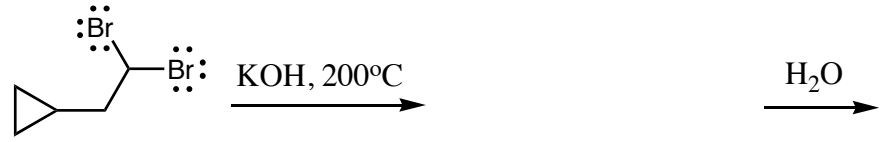
a) 

b) 

15. Give the product of the following reactions.

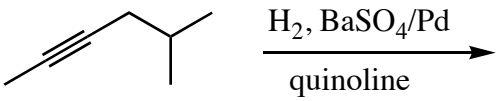
a) 

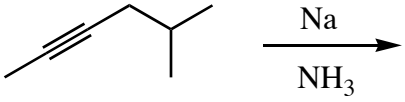
b) 

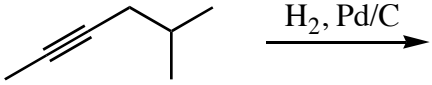
c) 

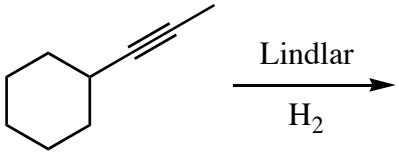
d) 

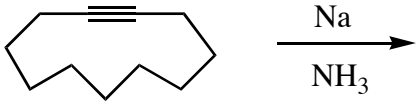
16. Give the products of the following reactions.

a) 

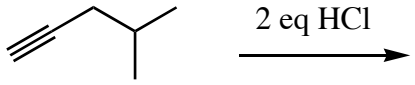
b) 

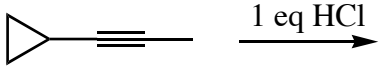
c) 

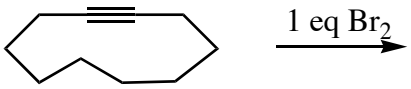
d) 

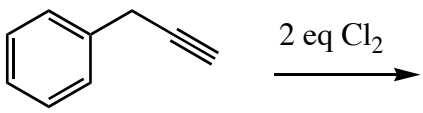
e) 

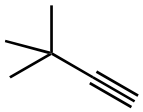
17. Give the products of the following reactions.

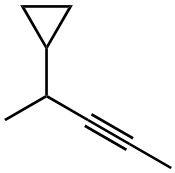
a) 

b) 

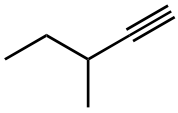
c) 

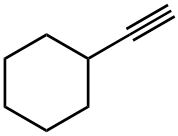
d) 

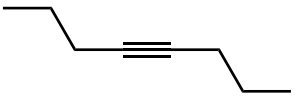
e)  1 eq HI →

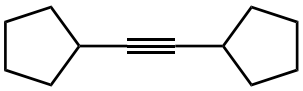
f)  2 eq HBr →

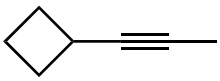
18. Give the products of the following reactions, showing the intermediate and final products.

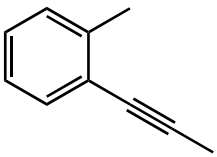
a)  1. disiamylborane → 2. H_2O_2, NaOH

b)  $Hg(OAc)_2$ → H_2O, H_2SO_4

c)  $Hg(OAc)_2$ → H_2O, H_2SO_4

d)  1. BH_3 → 2. H_2O_2, NaOH

e)  1. BH_3 → 2. H_2O_2, NaOH

f)  $Hg(OAc)_2$ → H_2O, H_2SO_4

19. Use a hydration reaction or a hydroboration-oxidation to synthesize each of the following compounds from an alkyne without any side products. Show the starting material, reagents, and intermediate products.

a) 

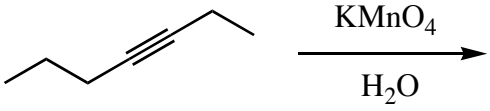
b) 

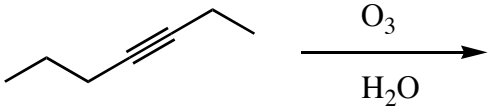
c) 

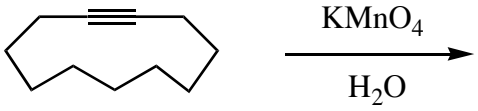
d) 

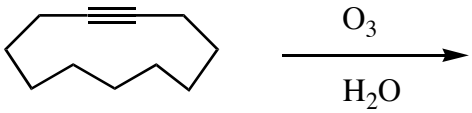
e) 

20. Give the products of each of the following reactions.

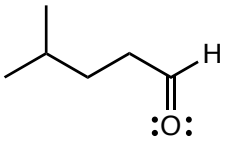
a) 

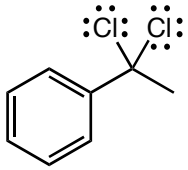
b) 

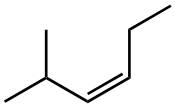
c) 

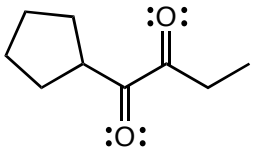
d) 

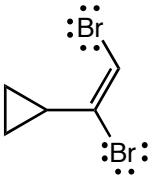
21. What starting material and reagents would be needed to synthesize the following compounds from an alkyne?

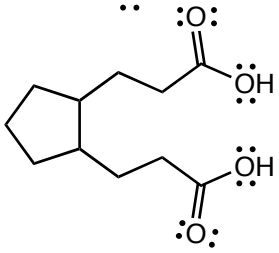
a) 

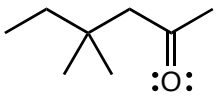
b) 

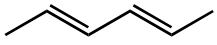
c) 

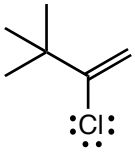
d) 

e) 

f) 

g) 

h) 

i) 

j)