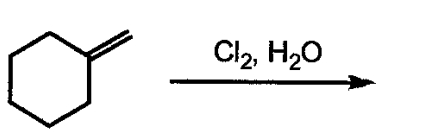
1. Consider the reaction of the alkene shown below.

   a. Show *all* of the products formed in this reaction.
   b. Indicate whether the addition proceeds with *anti* or *syn* addition.
   c. Does the addition follow Markovnikov's rule? Explain (15 points)



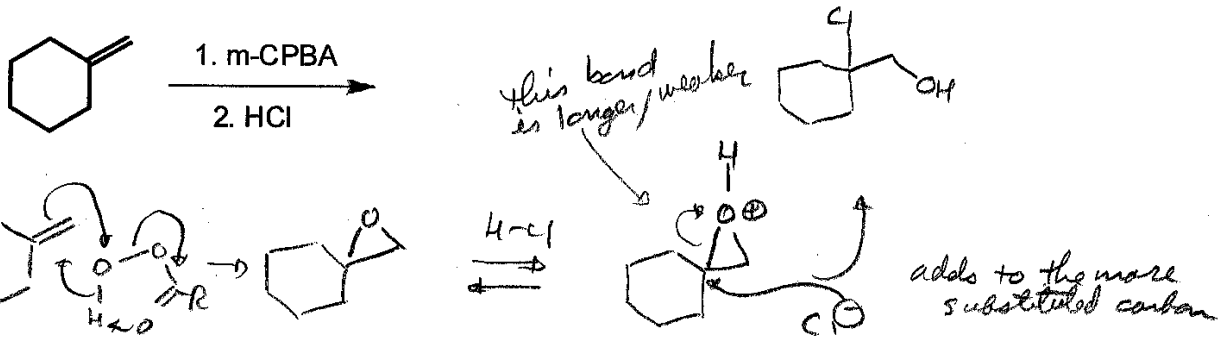
only product a.

b. anti addition, though can't tell by looking at this product

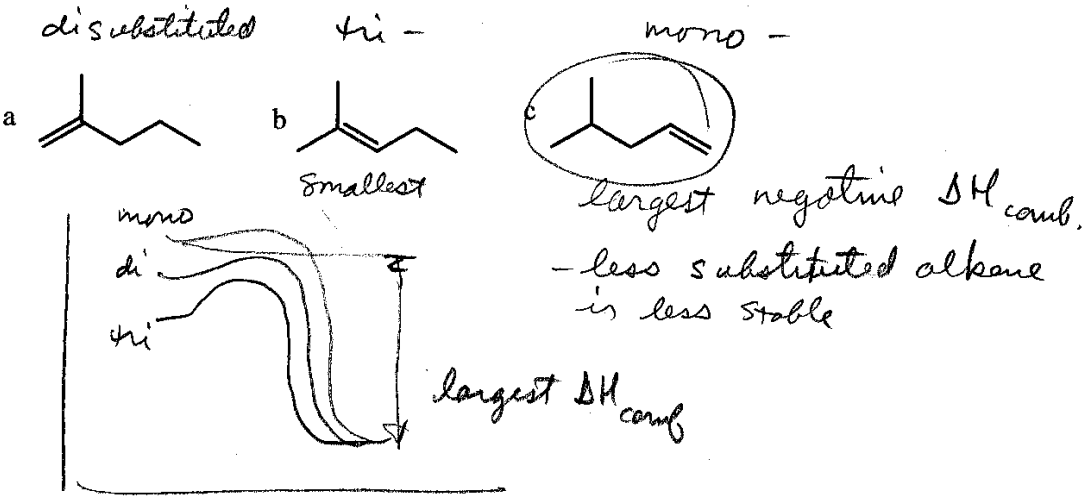
most electronegative element goes on more substituted carbon

c. Mark. $HO-Cl$

2. The following set of condition yields a similar, but different, product as in Question 1. Draw the product and show a mechanism for its formation. (10 points)



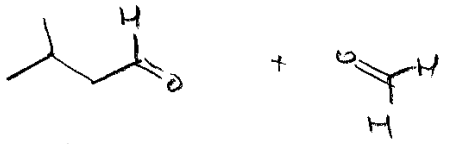
3. Which alkene shown below has the *largest* value for the heat (enthalpy) of combustion (ΔH_{comb}) and which has the *smallest* value? Explain. (Note that the heat of combustions for all three alkenes is negative) (15 points)



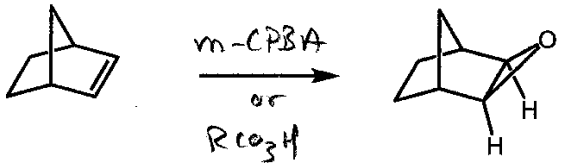
largest negative ΔH_{comb}.

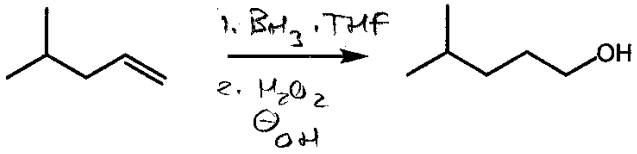
- less substituted alkene is less stable

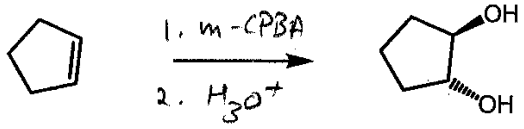
4. Show the product (or products) from the ozonolysis O_3 (1. O_3, then 2. CH_3SCH_3) of compound b in Problem 5. (5 points)



5. Fill in the *reagents* required to accomplish the following reactions. (15 points)

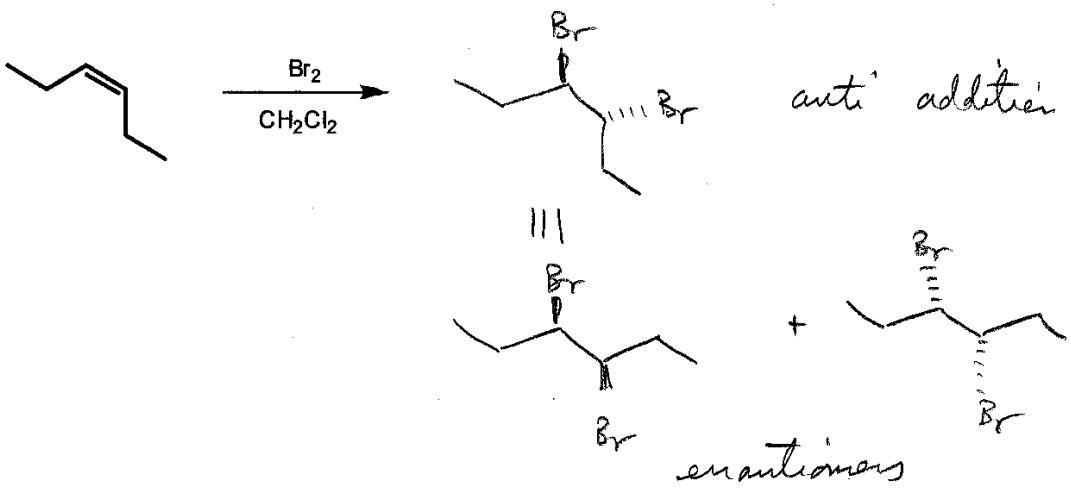
a 

b 

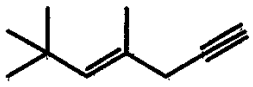
c 

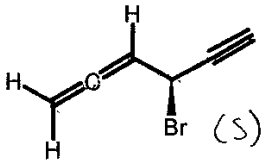
6. Reaction of *cis*-3-hexene with bromine (Br_2) gives a dibromide. Is the addition *syn* or *anti*? Show the resulting stereochemistry using the correct notation (line, dash or wedge) and any stereoisomers (if produced).

(10 points)



7. Name the following compounds. Don't forget about stereochemistry. (15 points)

a 

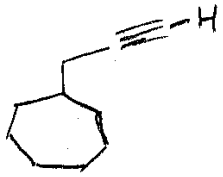
b 

(S)4-Bromohexa-1,2-dien-5-yn

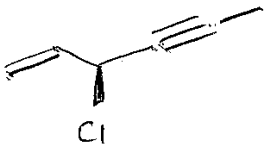
(E)-4,6,6-trimethylhept-4-en-1-yne

8. Draw the structures of the following compounds. (10 points)

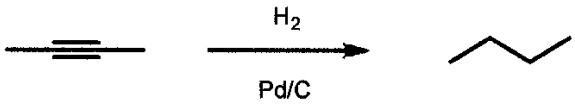
a. 3-cycloheptylprop1-yne

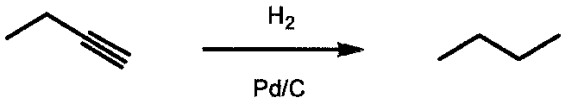


b. (*R*)-3-chlorohex-1-en-4-yne

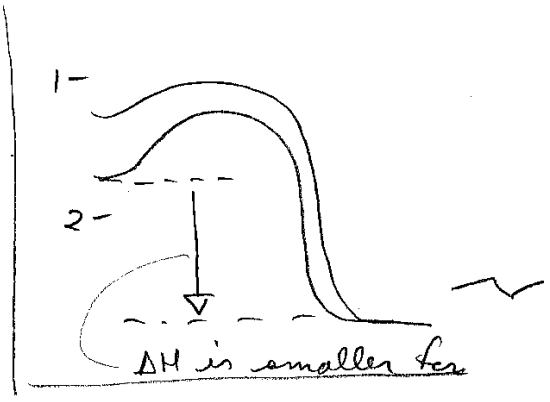


9. Hydrogenation of 2-butyne and 1-butyne are both exothermic, ΔH = -275 kJ/mol and -292 kJ/mol, *respectively*. Which alkyne is more stable and explain how the data indicate this? (10 points)

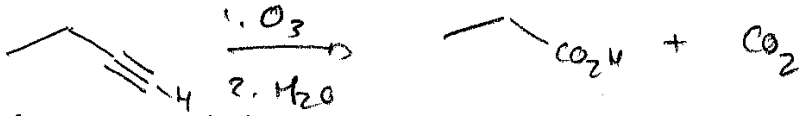
a 

b 

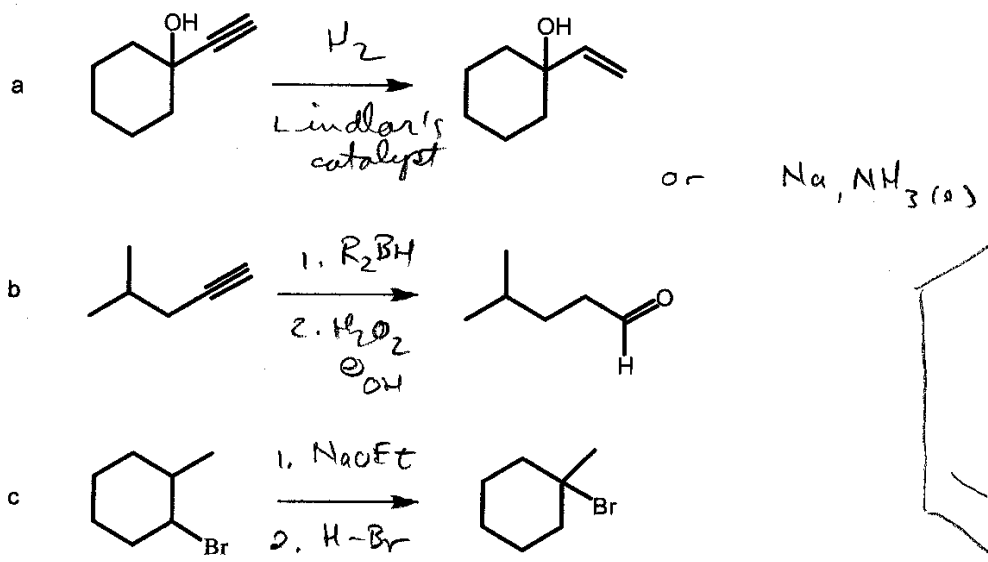
2-butyne is more stable since less heat is given off during hydrogenation

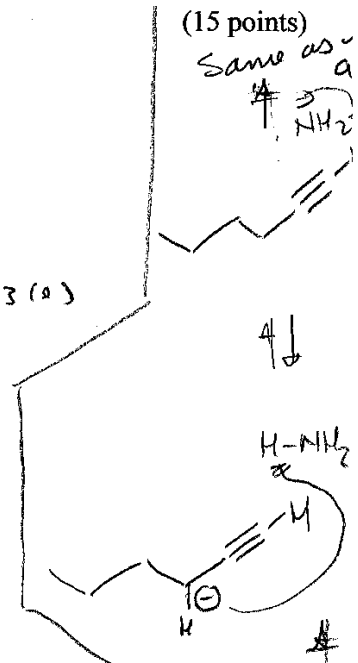


10. Show the product(s) from the ozonolysis (1. O_3, then 2. H_2O) of 1-butyne. (5 points)

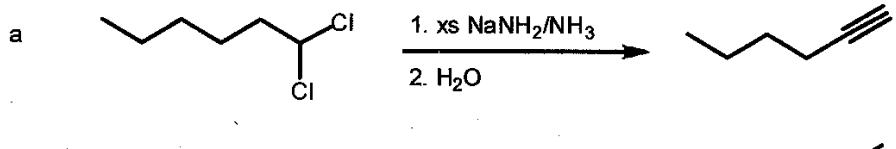


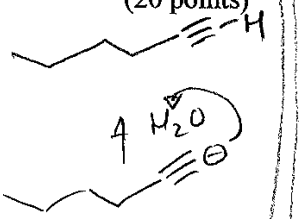
11. Fill in the *reagents* required to accomplish the following reactions. (15 points)

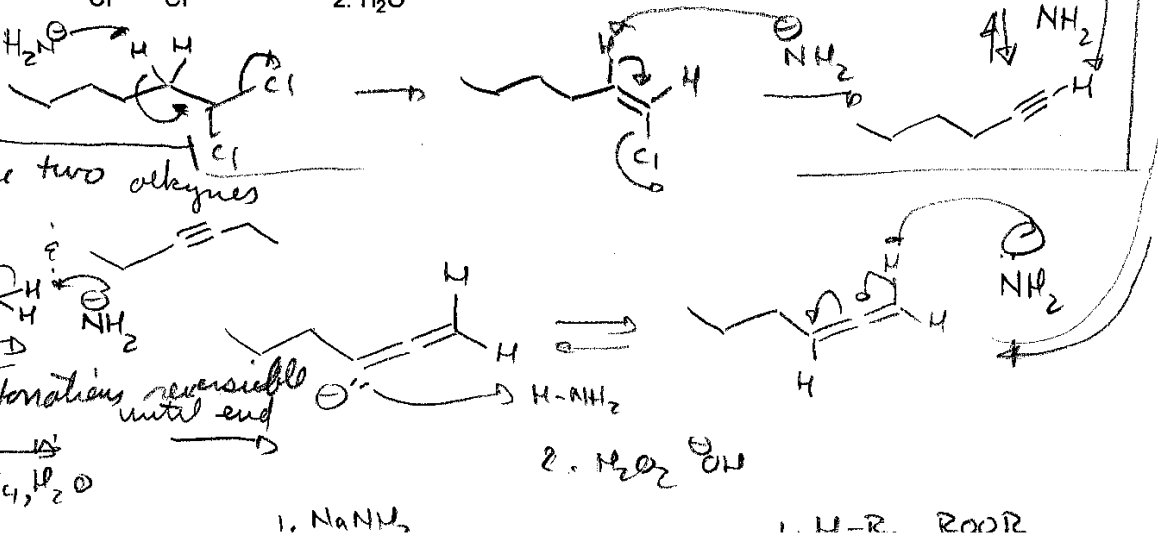




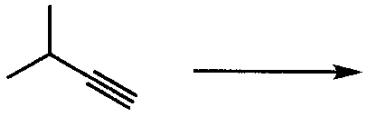
12. Show the mechanism for the formation of the alkyne in a. Explain (in terms of the mechanism) why the the second reaction (b) also yields the same alkyne. (20 points)

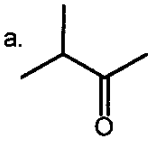




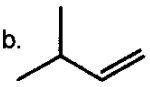


13. Show how to convert the alkyne below to each of the following compounds. List the reagents and conditions below each compound (some of these may require more than one step!). (25 points)

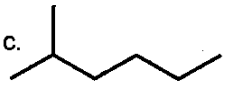


a. 

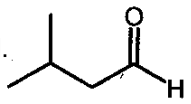
$HgSO_4$
H_2SO_4, H_2O

b. 

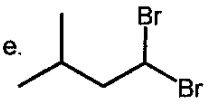
H_2, Lindlar

c. 

1. $NaNH_2$
2. 
3. H_2, Pd/C

d. 

1. R_2BH
2. H_2O_2, $^{\ominus}OH$

e. 

1. H-Br, ROOR
2. H-Br
(no peroxides)