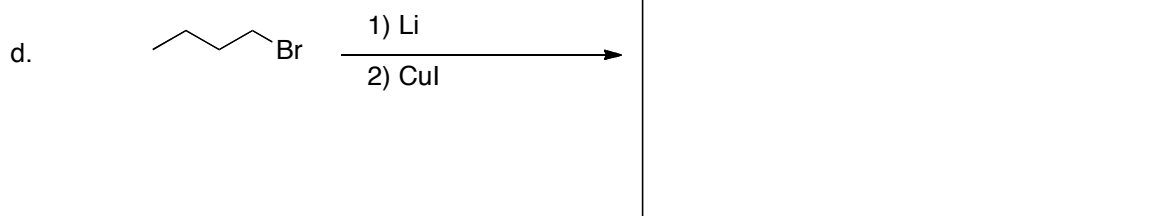
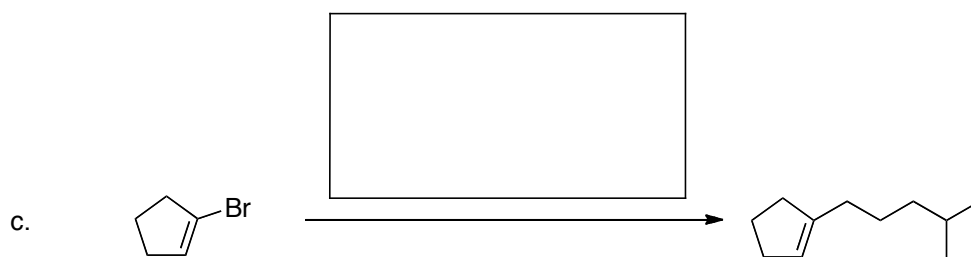
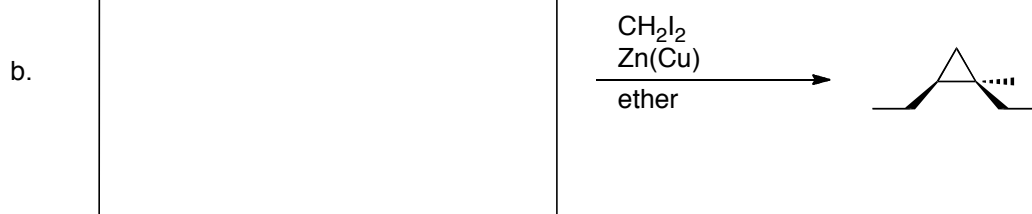
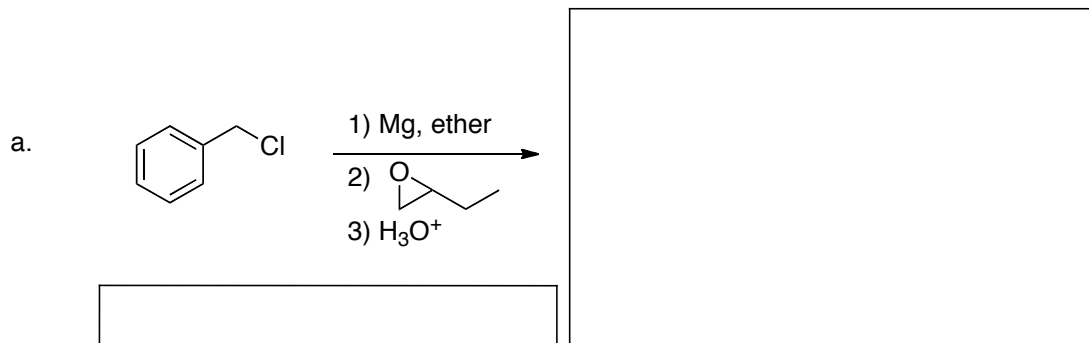
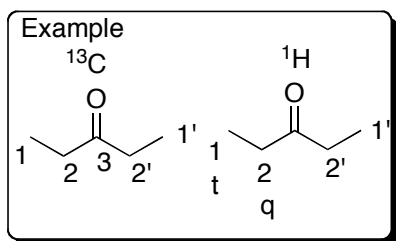


Name: \_\_\_\_\_

1. For each reaction below, provide the missing starting material(s), product(s), or reagent(s). Provide the major product expected for each reaction. If necessary, be sure to indicate the appropriate stereochemistry.

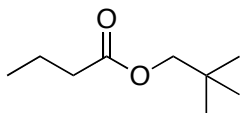


2. For each molecule below, indicate how many different peaks would be observed in the  $^1\text{H}$  NMR and  $^{13}\text{C}$  NMR spectra for these compounds. Indicate the splitting pattern expected for each set of inequivalent hydrogens (see example).

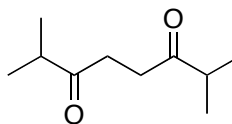


s = singlet  
 d = doublet  
 t = triplet  
 q = quartet  
 p = pentet  
 sext = sextet(6)  
 sept = septet(7)  
 dd = doublet of doublets  
 dt = doublet of triplets  
 etc

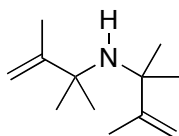
a.



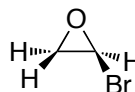
b.



c.

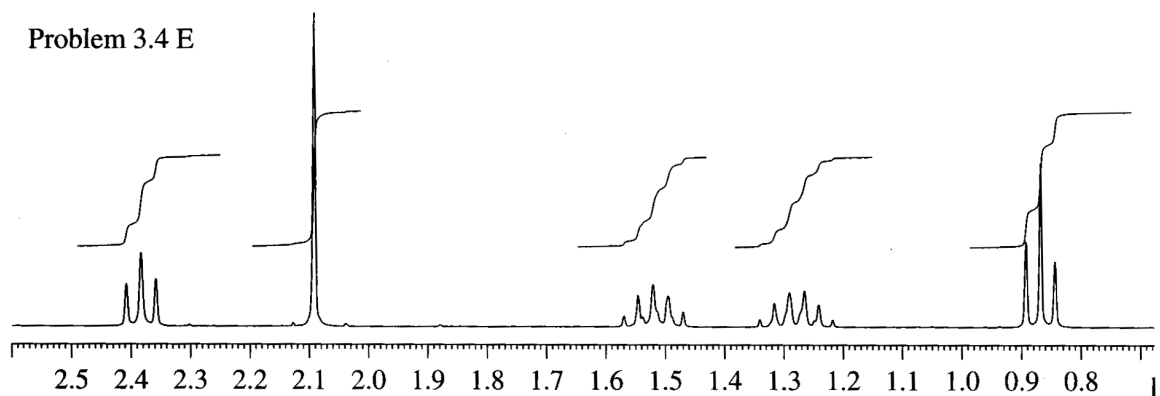


d.

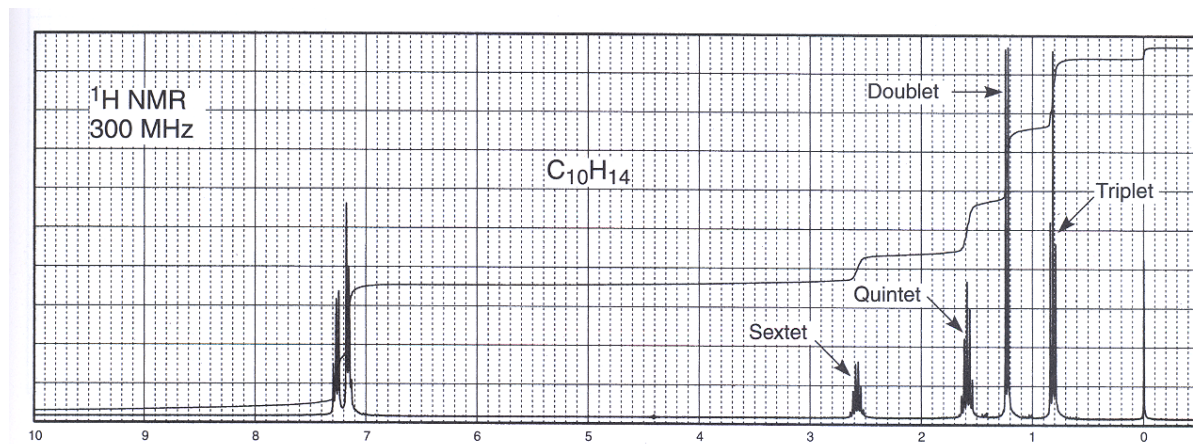


3. For each problem below, provide the correct structure for the molecule based on the spectroscopic information provided. Label the spectrum to show which set of protons goes with each peak. Use a ruler to determine the integral values in the  $^1\text{H}$  NMR spectra.

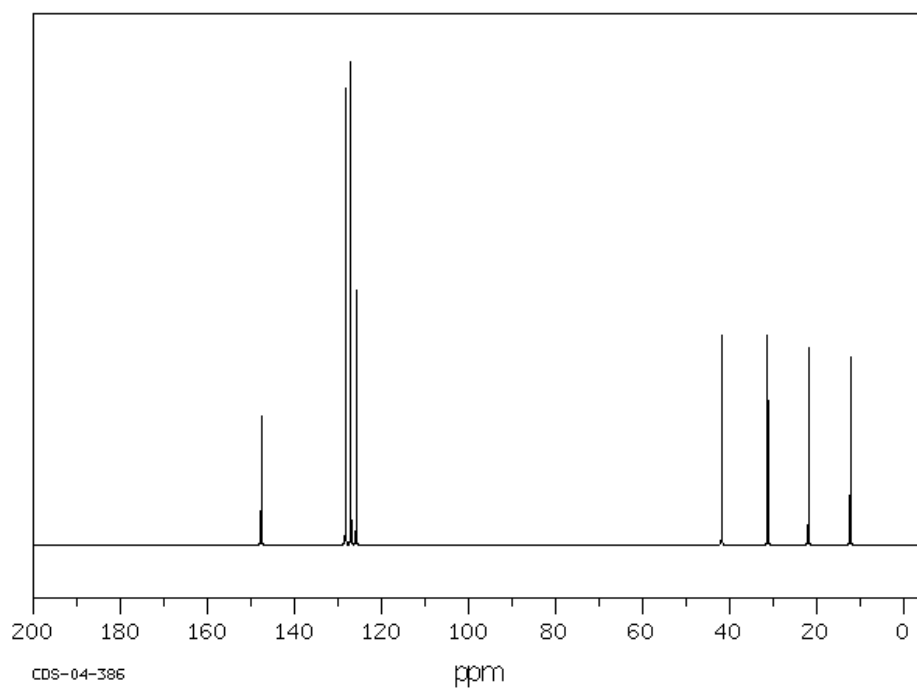
a.  $\text{C}_6\text{H}_{12}\text{O}$ : IR:  $1720\text{ cm}^{-1}$  (s)



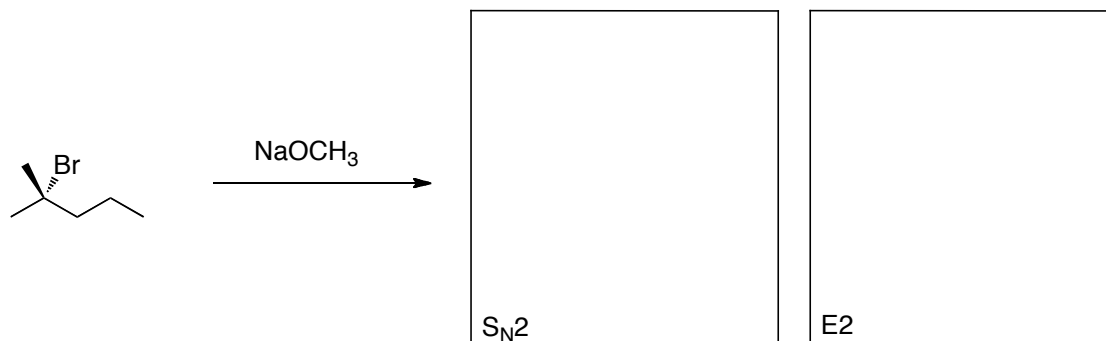
b.  $C_{10}H_{14}$



peaks between 7 and 7.5 ppm are a complex set of overlapping peaks.

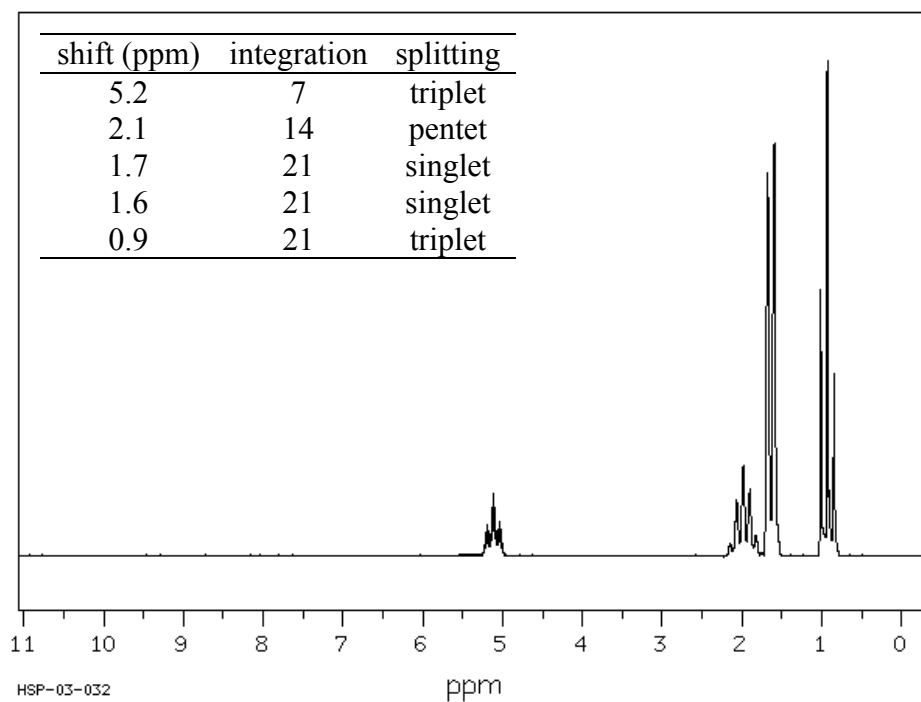


4. In the reaction below, we could expect that either an  $S_N2$  or E2 reaction would occur.
- a. Draw the products that would be formed in each case in the boxes.



- b. For each product, determine how many types of hydrogens are present and the splitting pattern that will be seen for each type of hydrogen (similar to problem 2).

- c. Shown below is the  $^1\text{H}$  NMR spectrum of the product formed in this reaction. Based on the NMR data, determine which product is formed. Briefly explain how you arrived at your answer.



5. For each problem below, propose a synthetic sequence that would convert the given starting material into the product. Show the reagents needed for each step and the product that would be obtained. Your chosen reagents should provide the desired product as the major product in each step. If necessary, your synthesis should provide the correct stereochemistry.

