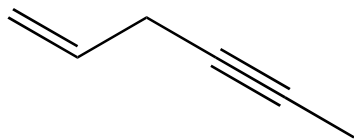
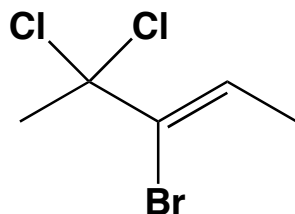


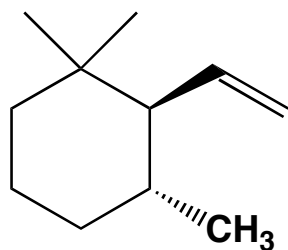
1) Provide an unambiguous name for each of the following structures. (15 points)



hex-1-en-4-yne or 1-hexen-4-yne

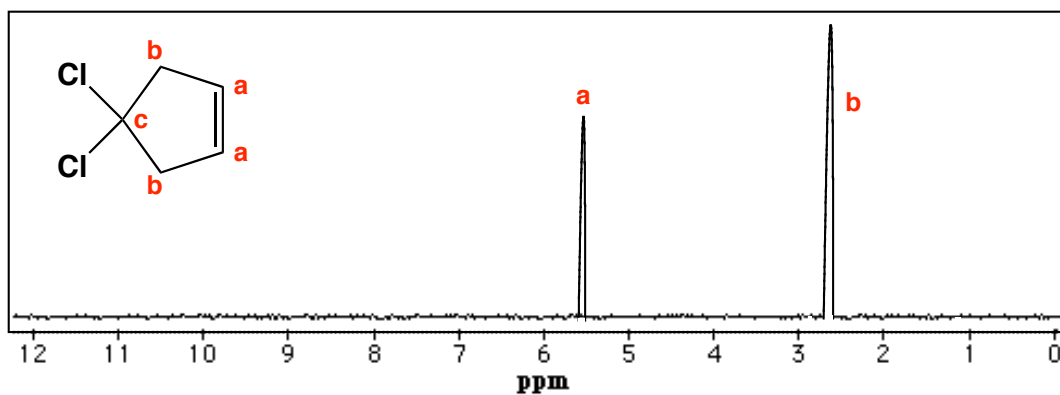
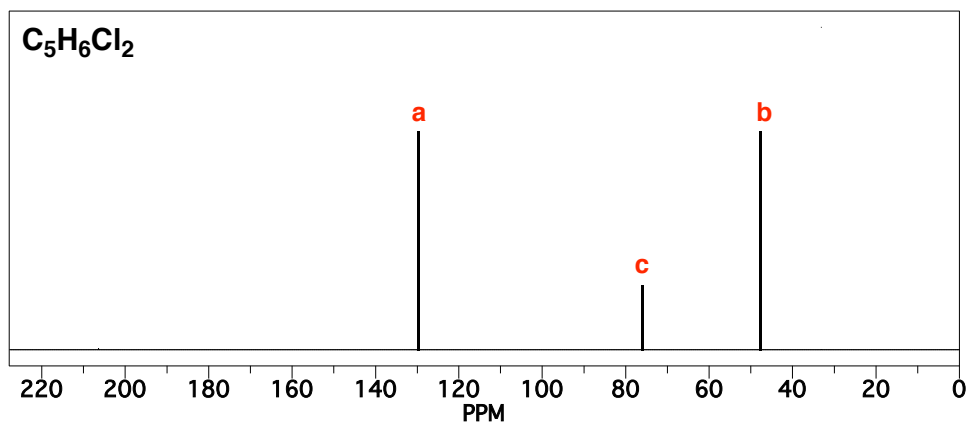


(Z)-3-bromo-4,4-dichloro-2-pentene

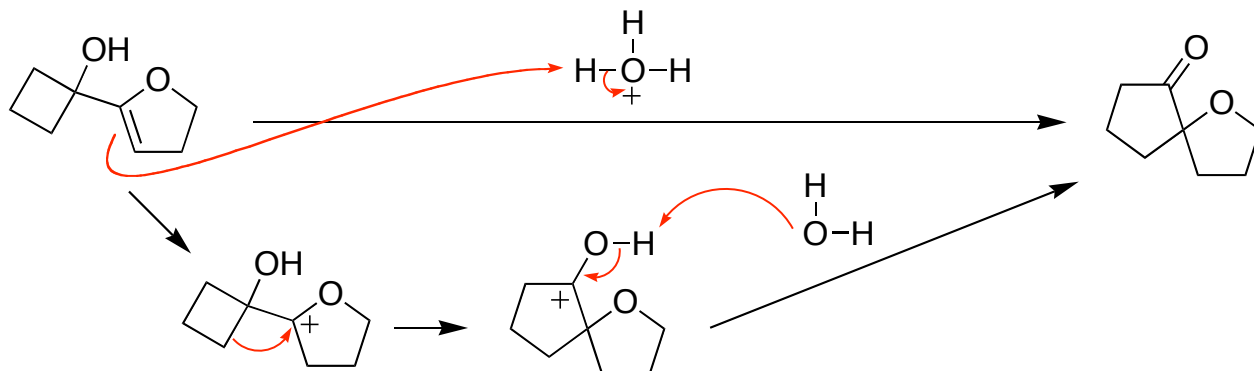


(2S,3R)-1,1,3-trimethyl-2-vinylcyclohexane

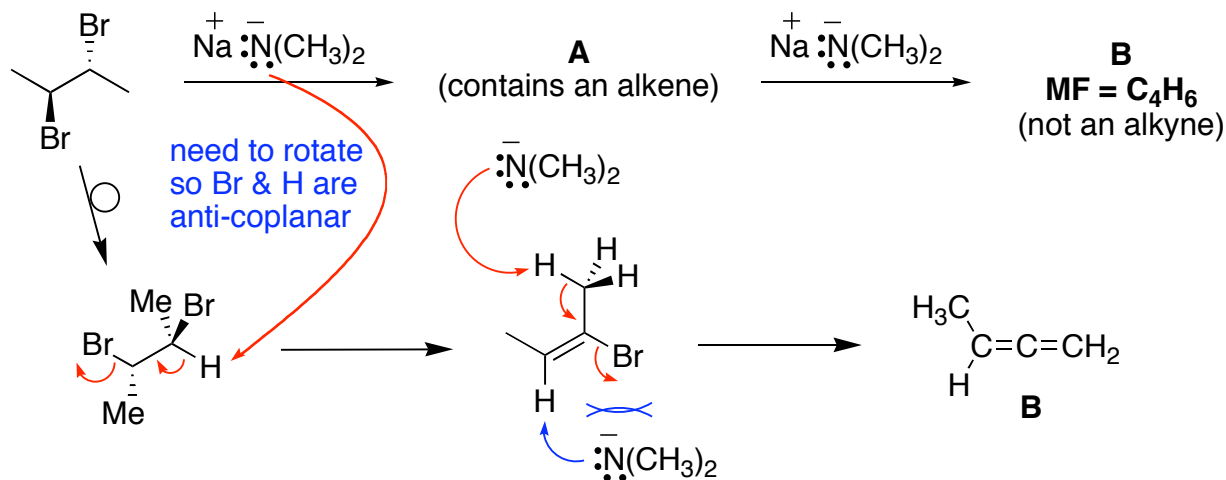
2) Determine the structure of the compound that produces the following spectra. For full credit, assign all peaks in each spectrum. (7 points) Note: ^1H NMR signals do not show splitting.



- 3) The alkene below reacts with a strong acid such as H_3O^+ to yield the carbonyl product shown. Using your knowledge of alkene addition reactions, provide a mechanism for this transformation. For full credit, you need to show all steps, intermediates, and formal charges in your mechanism. (8 points)



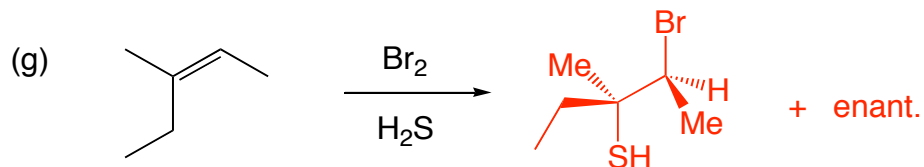
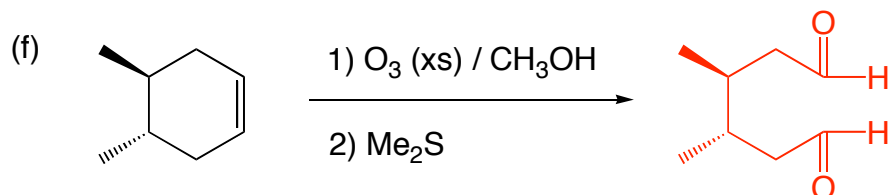
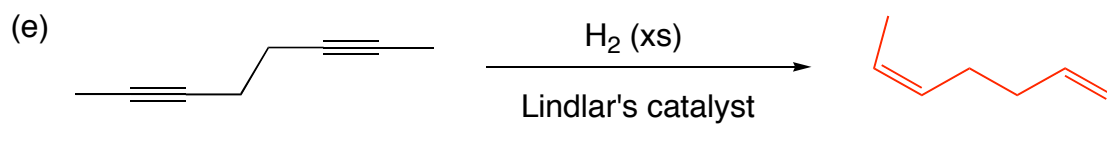
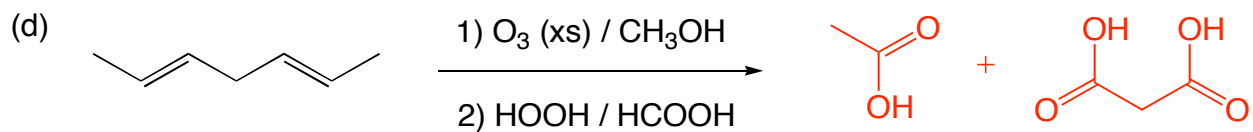
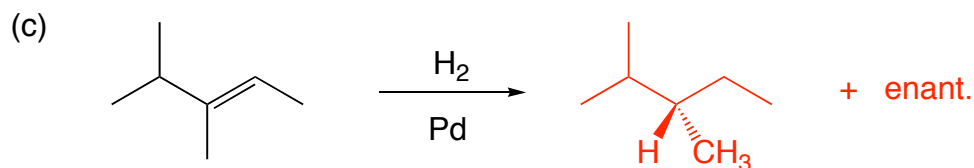
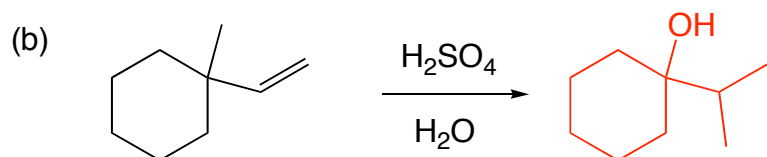
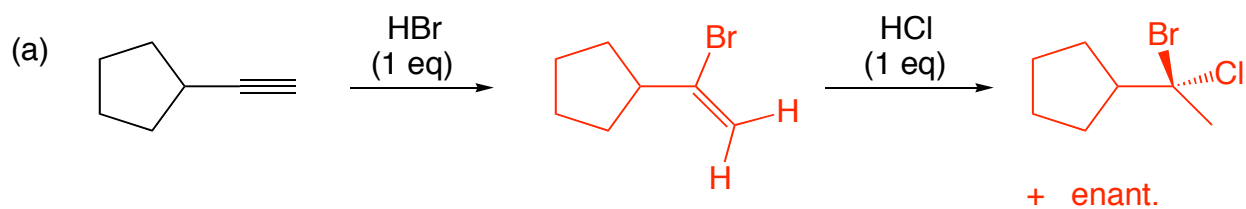
- 4) When the dihalide shown was reacted with one equivalent of sodium dimethylamide, a strong base, the expected alkene (**A**) was formed. However, upon reaction with a 2nd equivalent of base, an unexpected elimination product (**B**) was formed. Propose structures for **A** and **B** and provide a mechanism that accounts for their formation. Provide an explanation for the favored formation of **B** over the expected alkyne product. For full credit, you need to show all steps, intermediates, and formal charges in your mechanism. (11 points)



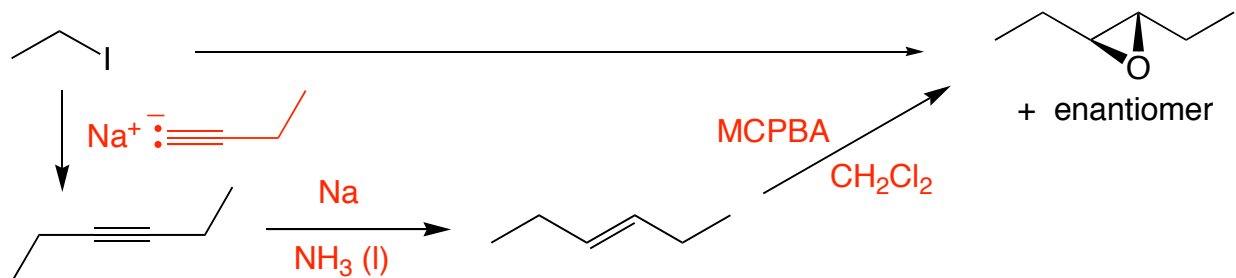
Dimethylamide is a bulkier base than NH_2^- (the usual base used to make an alkyne from a dihalide) and will experience steric strain when approaching the β -hydrogen on the alkene. It has much easier access to the β -hydrogen on the methyl group.

Did you remember to provide an explanation for the formation of **B** over the expected alkyne?

5) Draw and circle the **major product** of each of the following reactions. *Be sure to include stereochemistry in your answers where appropriate.* (35 points)



6) Propose a synthesis (sequence of reactions) that will accomplish each of the following transformations. *Be sure to include the products of each step.* (24 points)



Uncharged hydrocarbons of 4 carbons or less (i.e. show how to make all carbon containing compounds whose carbons end up in your final product)

