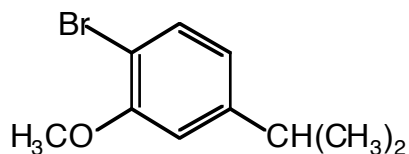
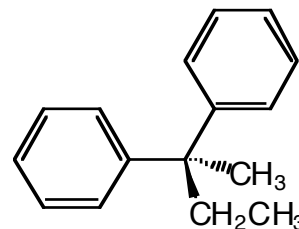


1. Provide an unambiguous name (IUPAC or common) for each of the following molecules. Be sure to indicate stereochemistry where appropriate. (5 points each)

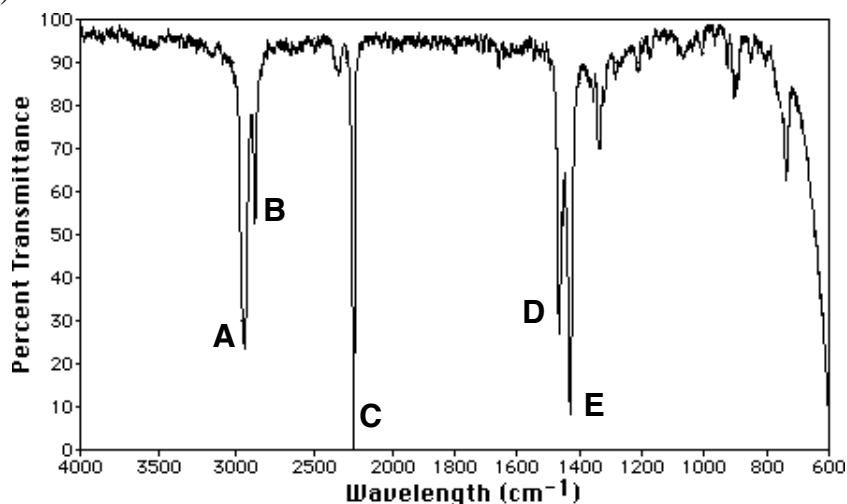


2-Bromo-5-isopropylanisole



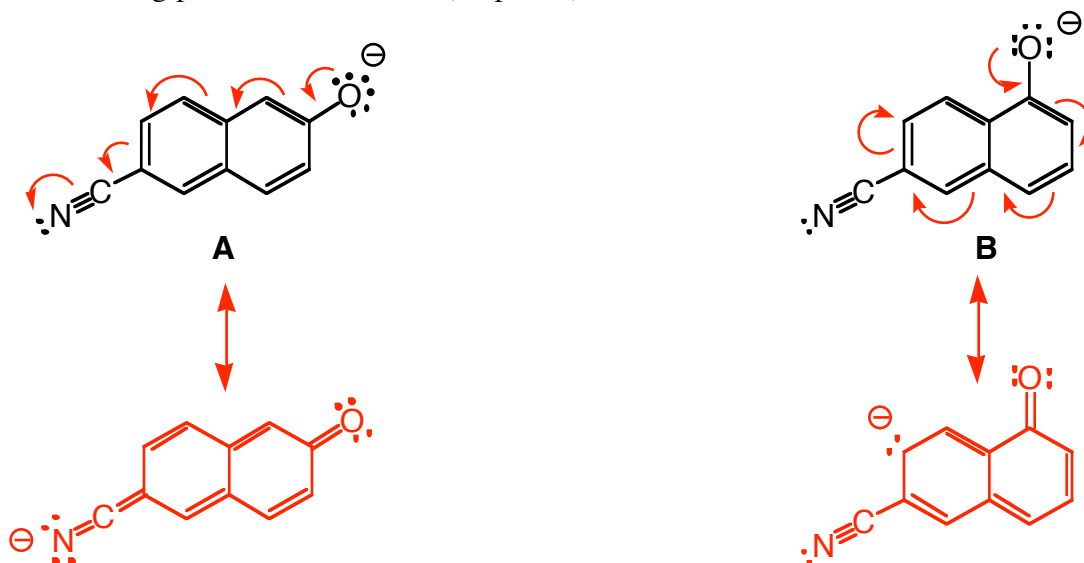
2,2-diphenylbutane

2. The following statements refer to the spectrum below. Place a check next to those that are *positively* true. (26 points)



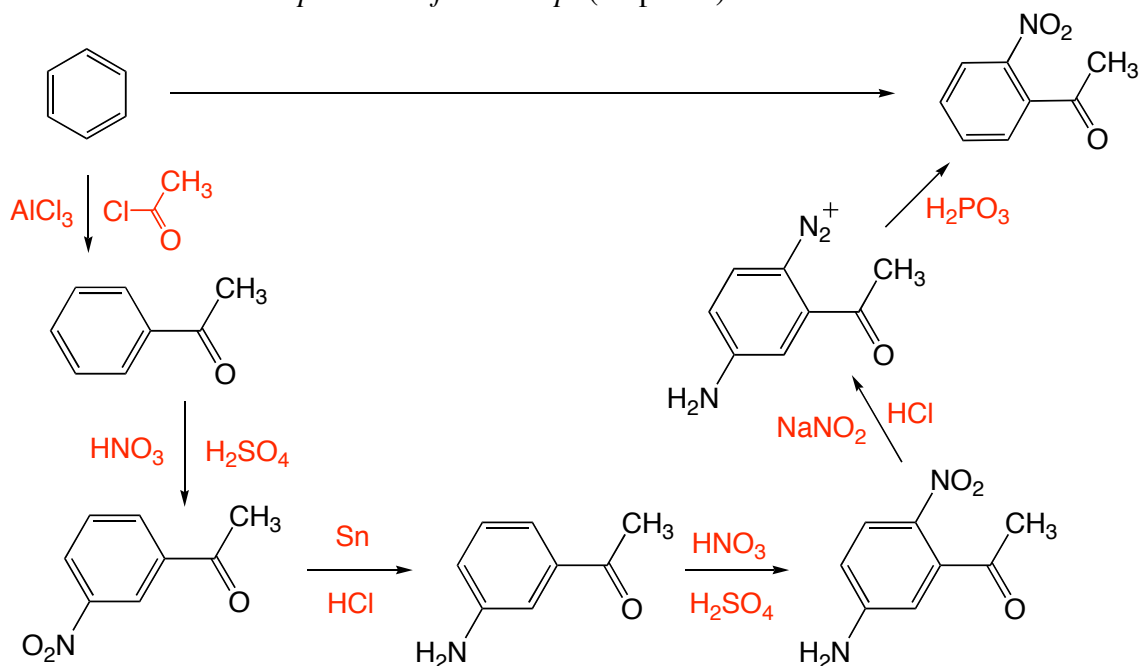
- The molecule that produced this IR spectrum *must* contain an alkene.
- The molecule that produced this IR spectrum *must* contain a terminal alkyne.
- The molecule that produced this IR spectrum *must* contain an internal alkyne.
- It is probable that an ether is present in this molecule.
- It is probable that an aldehyde is present in this molecule.
- Peak **A** is due to a bending vibration.
- Peak **E** is due to a stretching vibration.
- Peak **D** absorbs higher *frequency* light than peak **E**.
- Peak **C** indicates that no light is passing through the sample at that wavelength.
- The functional group of peak **B** absorbs more light than the functional group of peak **D**.
- The spectrum shows that peak **A** is more polar than peak **E**.
- The position of peak **A** on the x-axis is dependent on the number of C-H bonds in the molecule.
- The intensity of peak **A** is dependent on the number of C-H bonds in the molecule.

3. Indicate which of the following two bases is strongest by circling it. Provide a thorough rationale for your decision using pictures *and* words. (10 points)

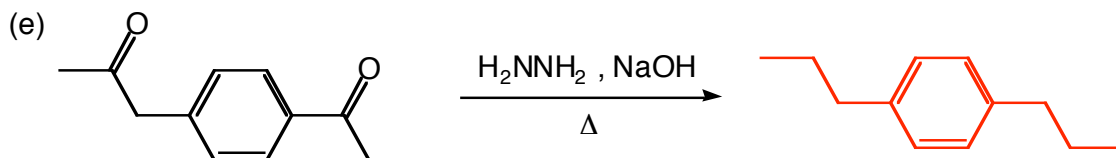
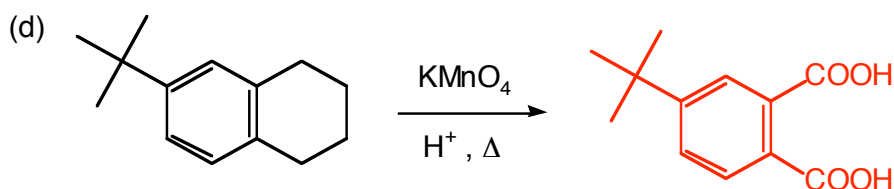
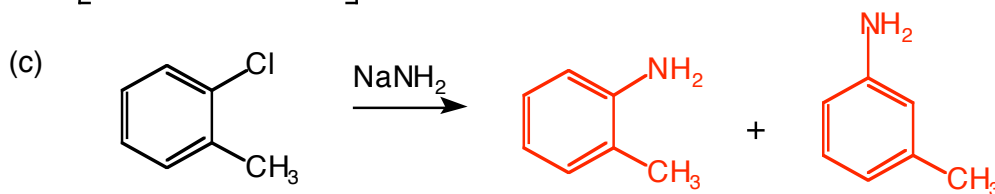
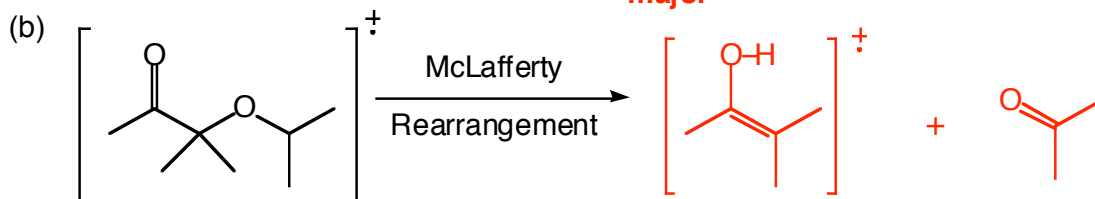
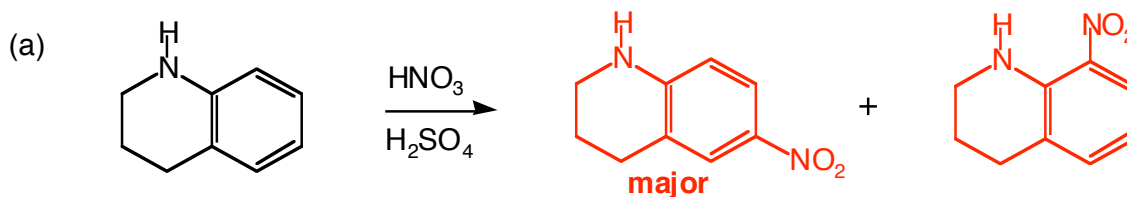


In both cases, the negative charge can be delocalized around the ring via resonance. However, only in case **A** can the charge be delocalized into the cyano group. This added delocalization makes **A** the more stable anion and thus less reactive as a base.

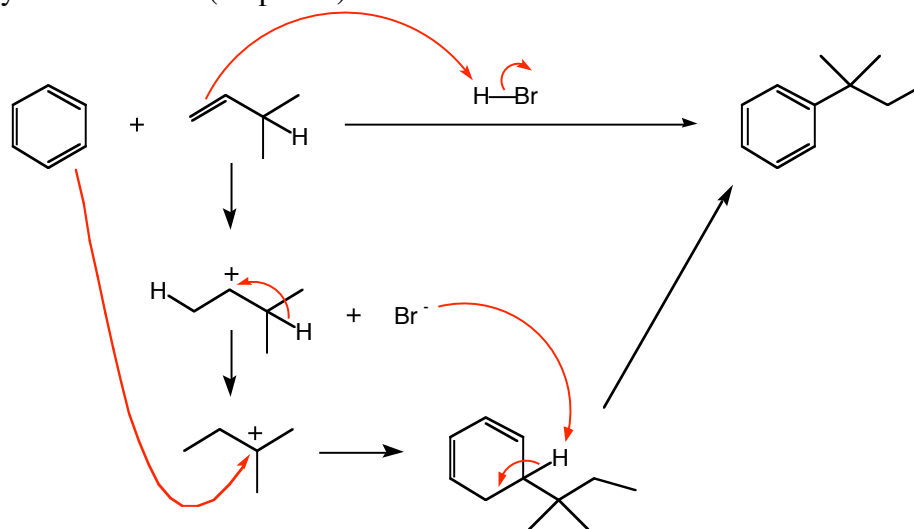
4. Propose a synthesis (sequence of reactions) that will accomplish the following transformation. *Be sure to include the products of each step.* (12 points)



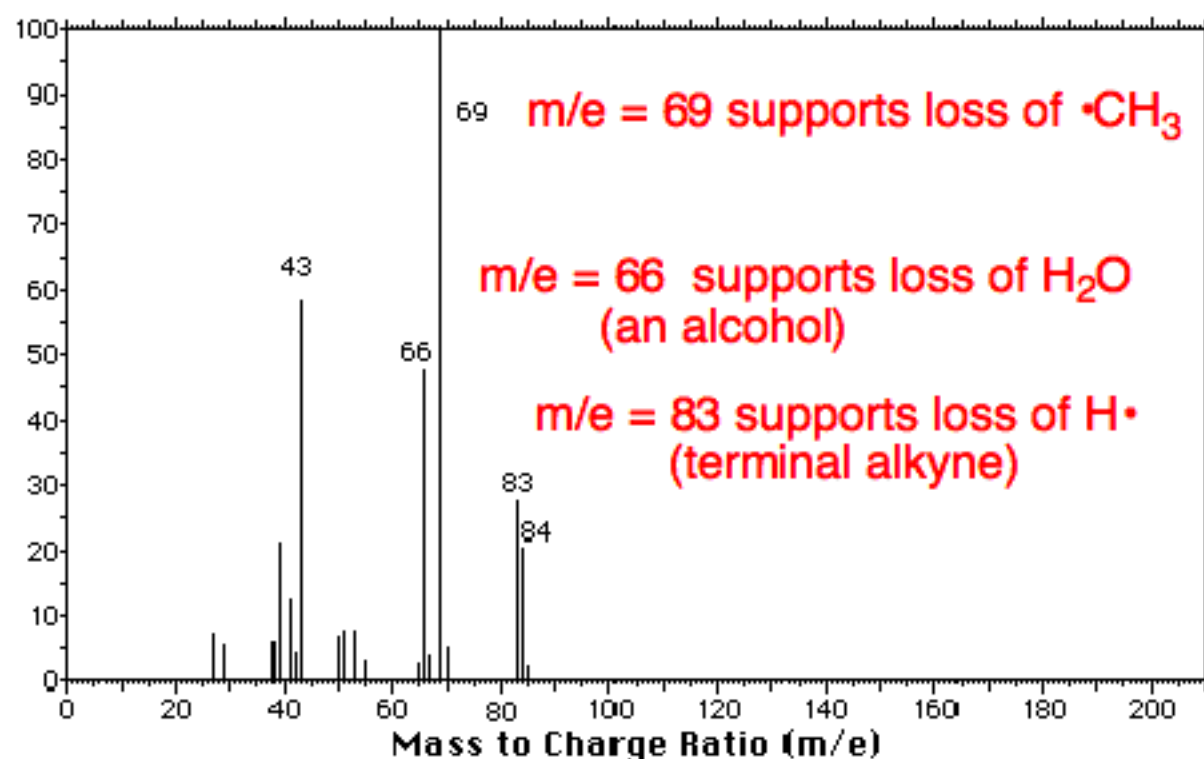
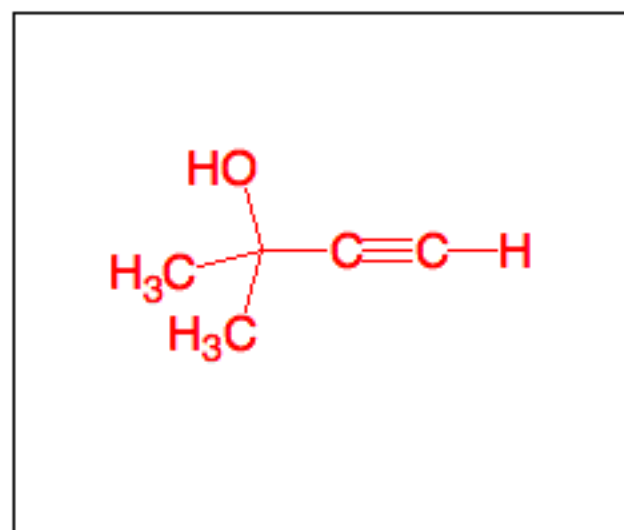
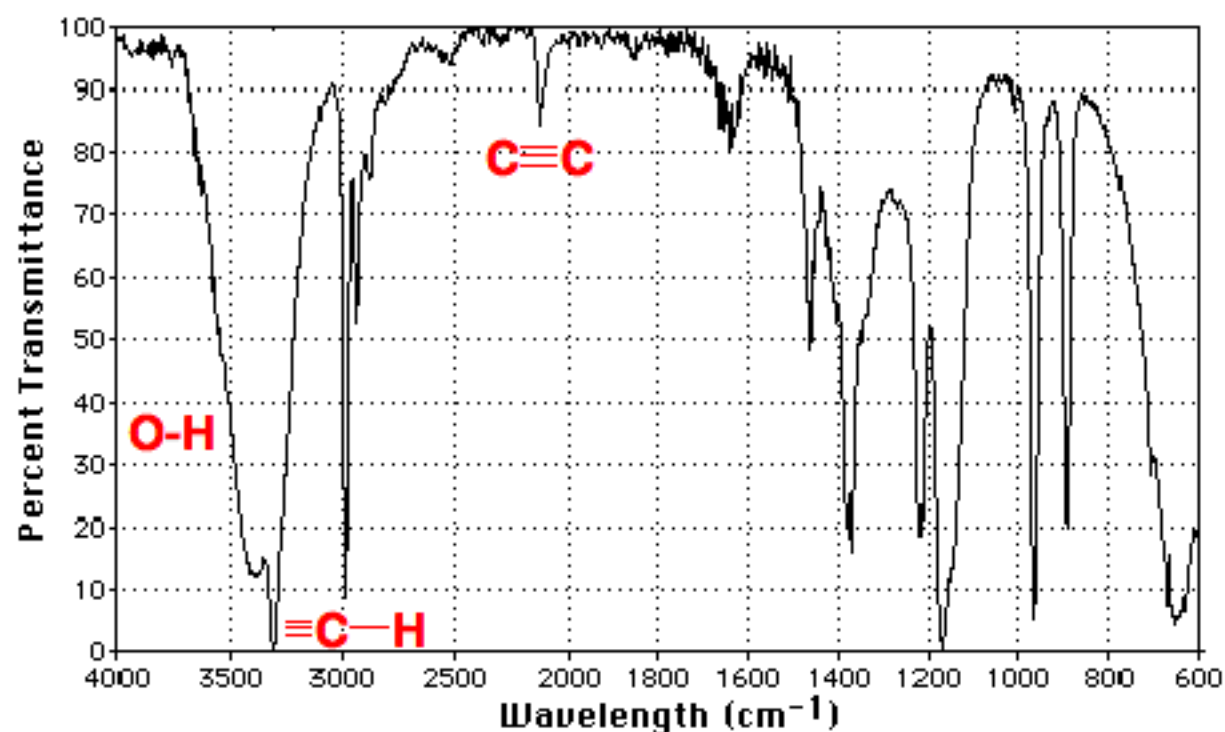
5. Draw the **major product** of each of the following reactions. Circle your answer(s). (20 points)



6. Provide a mechanism for the following reaction. Be sure to show all charges and lone pairs of electrons in your structures. (10 points)



7. An unknown molecule, A, yields the IR and mass spectra shown below. One mole of A can be titrated with two moles of NaNH_2 , but only with one mole of NaOH . Provide a structure for A in the box below. Assign peaks as appropriate and show your work for full and partial credit. (14 points)



From the analysis of the IR spectrum, I know I have 2 C's, 2 H's, and an O. This adds up to a mass of 42. The MS shows that the mass of the unknown is 84. Therefore I need to account for 42 more grams. This is consistent with an additional 3 C's and 6 H's to give a total molecular formula of...



DU = 2

Knowing that I have a terminal triple bond and an alcohol, I can come up with the following possibilities...

