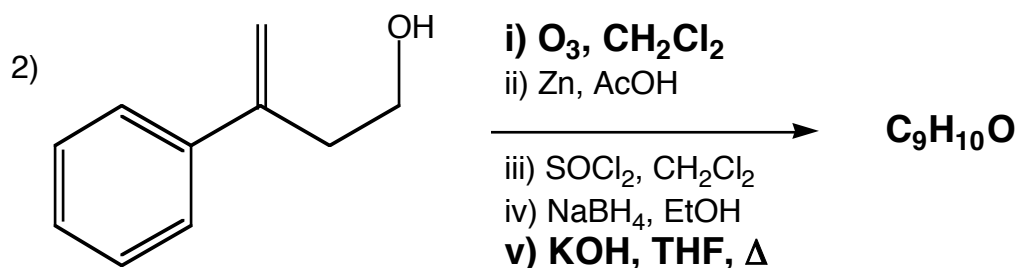
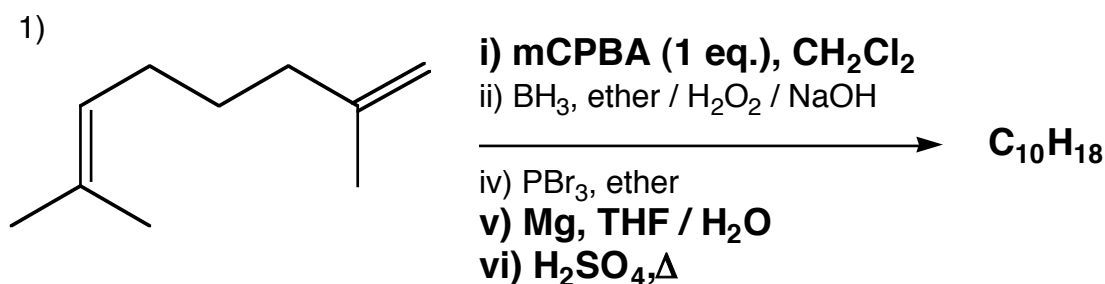


Name: \_\_\_\_\_

Final Exam – Principles of Organic Chemistry II – CH 212  
May 1<sup>st</sup> 2003 – Noon to 3:00+ PM

**Look over the whole exam and work on what you feel more comfortable FIRST!**  
**Show all your work if you want to receive partial credit. Use front and back of each page to write your answers. Be clear and concise, and use PENCIL to avoid making a big mess...**

1) (30 points) Consider the following reaction schemes:

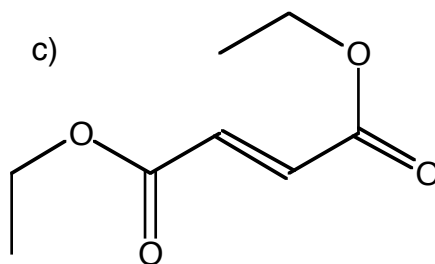
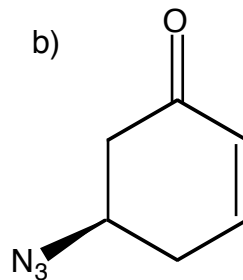
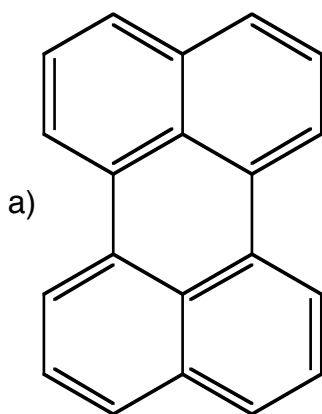


- a) Provide the structures of all the intermediates and products.
- b) Write detailed reaction mechanisms for the steps highlighted with bold/oversized letters.

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

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

2) (30 points) For each of the following three compounds:

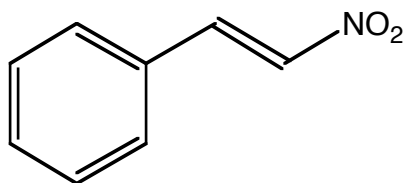


- Calculate their degree of unsaturation, and show in the structure what gives rise to this number (i.e., double bonds, rings, etc...).
- Determine how many  $^1\text{H}$ - and  $^{13}\text{C}$ -NMR signals you will find in their spectra (i.e., identify magnetically equivalent and non-equivalent nuclei).
- For each magnetically equivalent set of protons, specify their multiplicity, assuming that all coupling constants are equal.
- To which of the three compounds shown above do the  $^1\text{H}$ - and  $^{13}\text{C}$ -NMR spectra provided in the following page belong to?

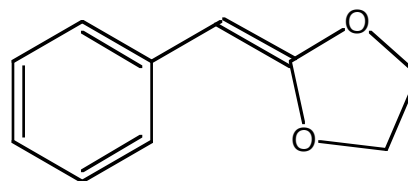
Name: \_\_\_\_\_

3) (20 points) Consider the following aromatic compounds:

**A**



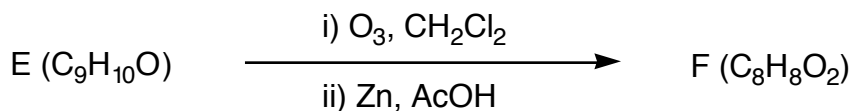
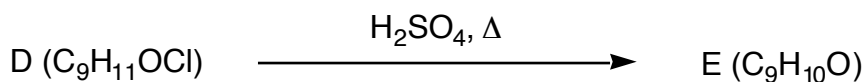
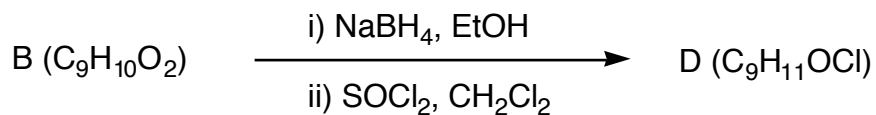
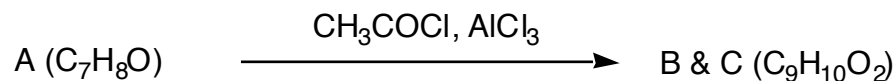
**B**



Based on your knowledge of aromatic electrophilic substitution reactions, predict the major products that will be obtained from the mono-sulfonation of each compound. Make sure to explain the results based on the mechanism of the reaction and the directing properties of each substituent.

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

4) (30 points) A certain aromatic compound, **A**, is subjected to the following reactions:

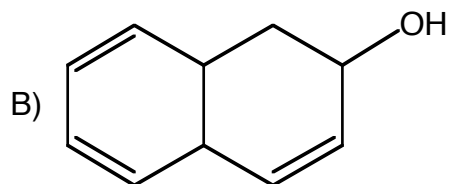
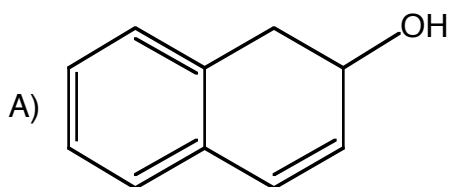


In addition to the information provided above, you recorded NMR spectra for compounds **A**, **B**, **C**, **E**, and **F**, which are provided in the following pages.

With all these data, elucidate the structures of compounds **A** through **F**. You do not need to write detailed mechanisms for the reactions or present extensive spectral assignments. However, it would help if you draw the molecules in the spectra and draw arrows from the protons/carbons to the signals.

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

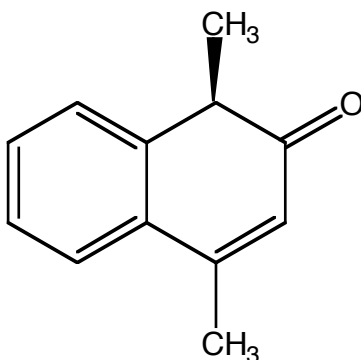
- 5) (20 points) You studied the kinetics of the dehydration with  $\text{H}_2\text{SO}_4$  of the following two compounds:



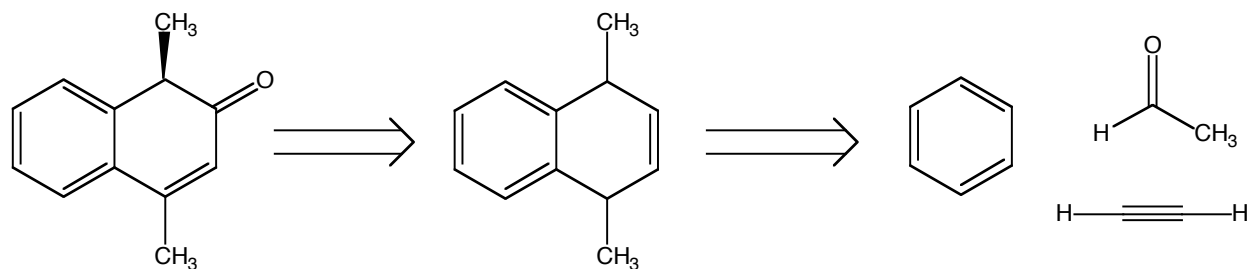
- a) Write the mechanism of the acid-catalyzed dehydration for both compounds.
- b) You measured the rate of dehydration for both compounds, and found that compound **A** dehydrates 10,000 times faster than compound **B**. Explain this observation based on the structure of the two compounds and the structure of the dehydration products.

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

- 6) (30 points) You needed to prepare the following compound from simple precursors as part of your graduate thesis:



You came across a very sketchy retrosynthetic procedure for its preparation, which at least gives you the structure of one intermediate of the reaction scheme:

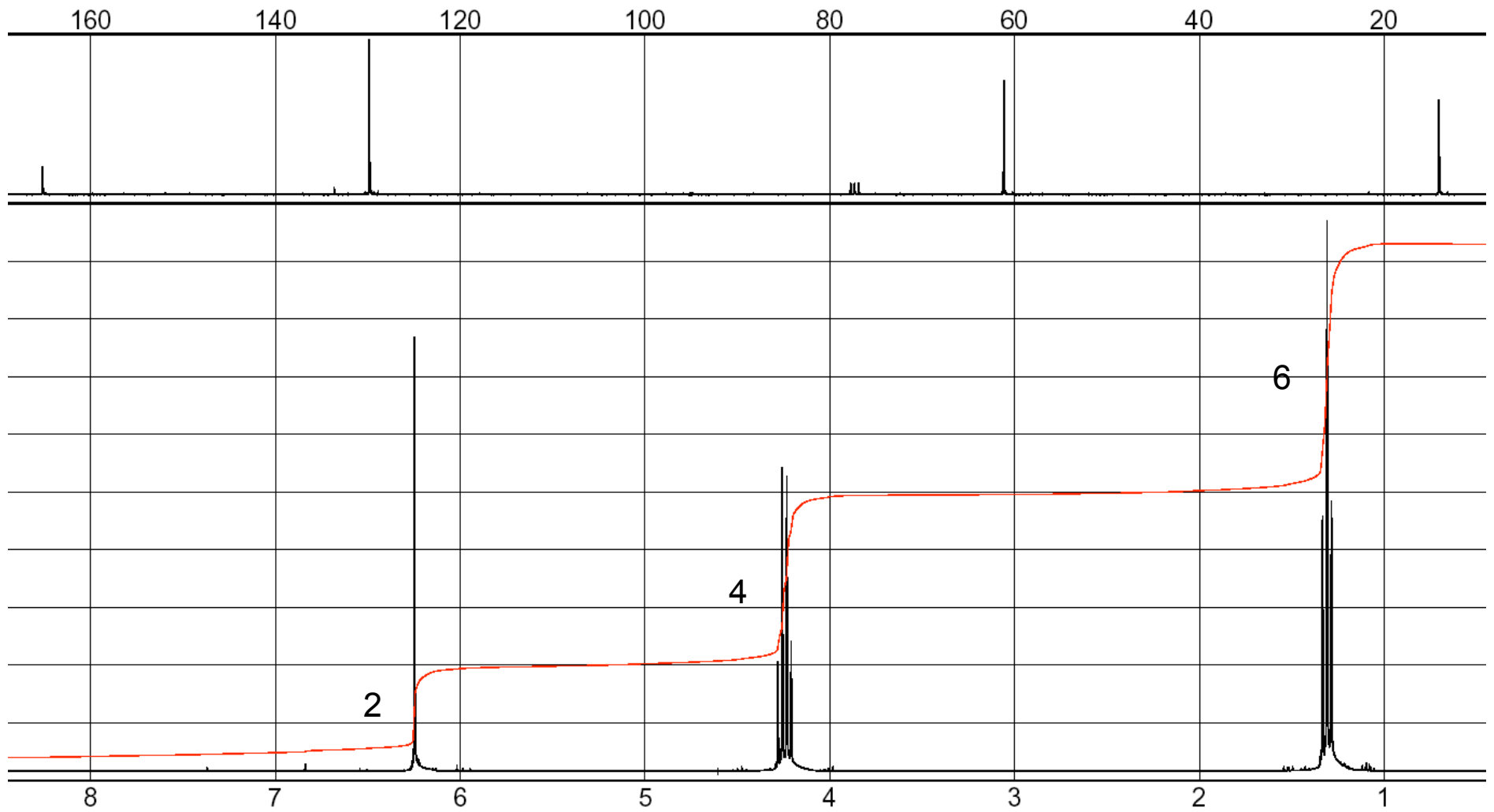


Apart from benzene, acetaldehyde, and ethyne, you have the following reagents: PCC, mCPBA, NaOH, AlCl<sub>3</sub>, Lindlar catalyst, NaBr, PBr<sub>3</sub>, n-BuLi, and any solvent you may require.

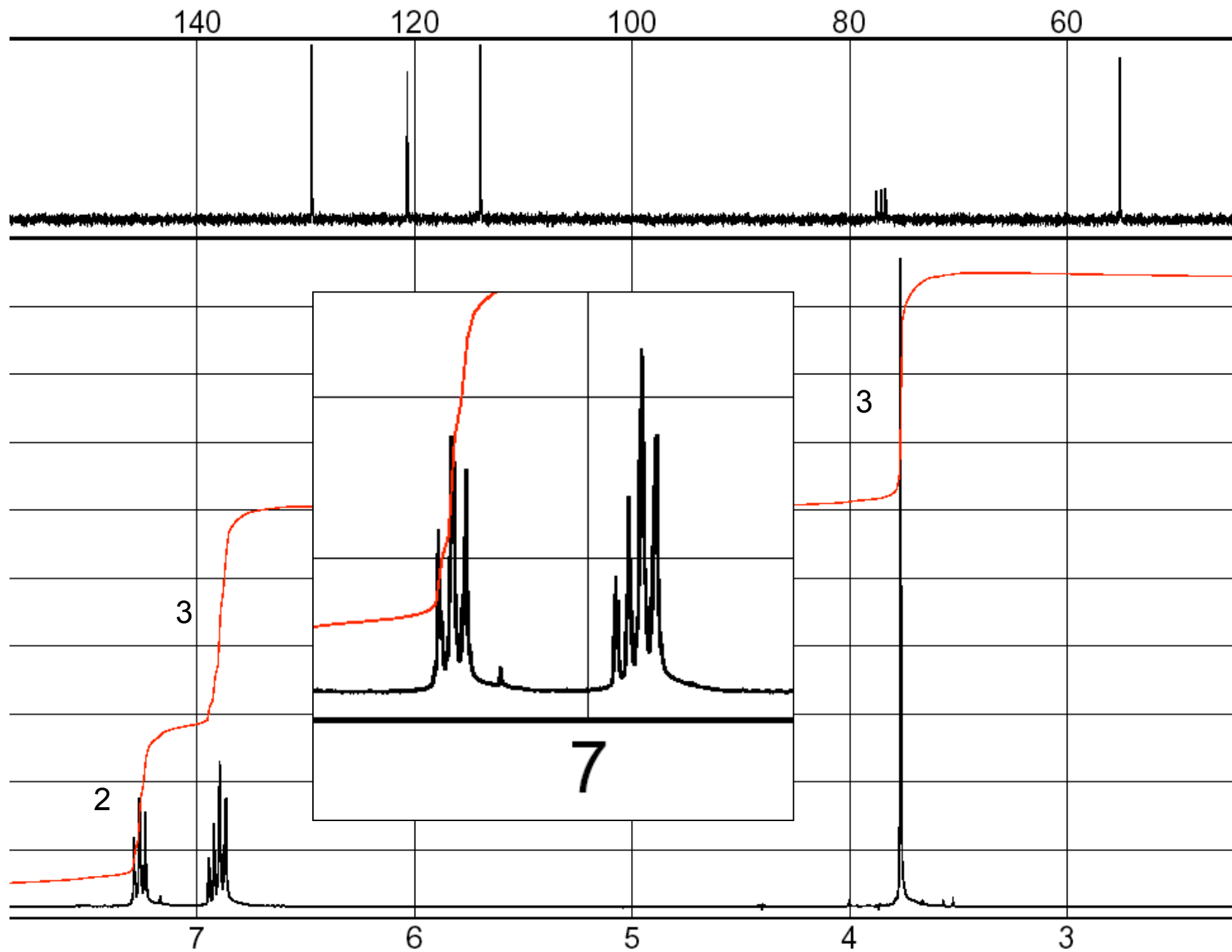
Propose a synthesis for the above compound. **You don't need to write the reaction mechanisms, just the structures of the intermediates after each reaction step.**

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

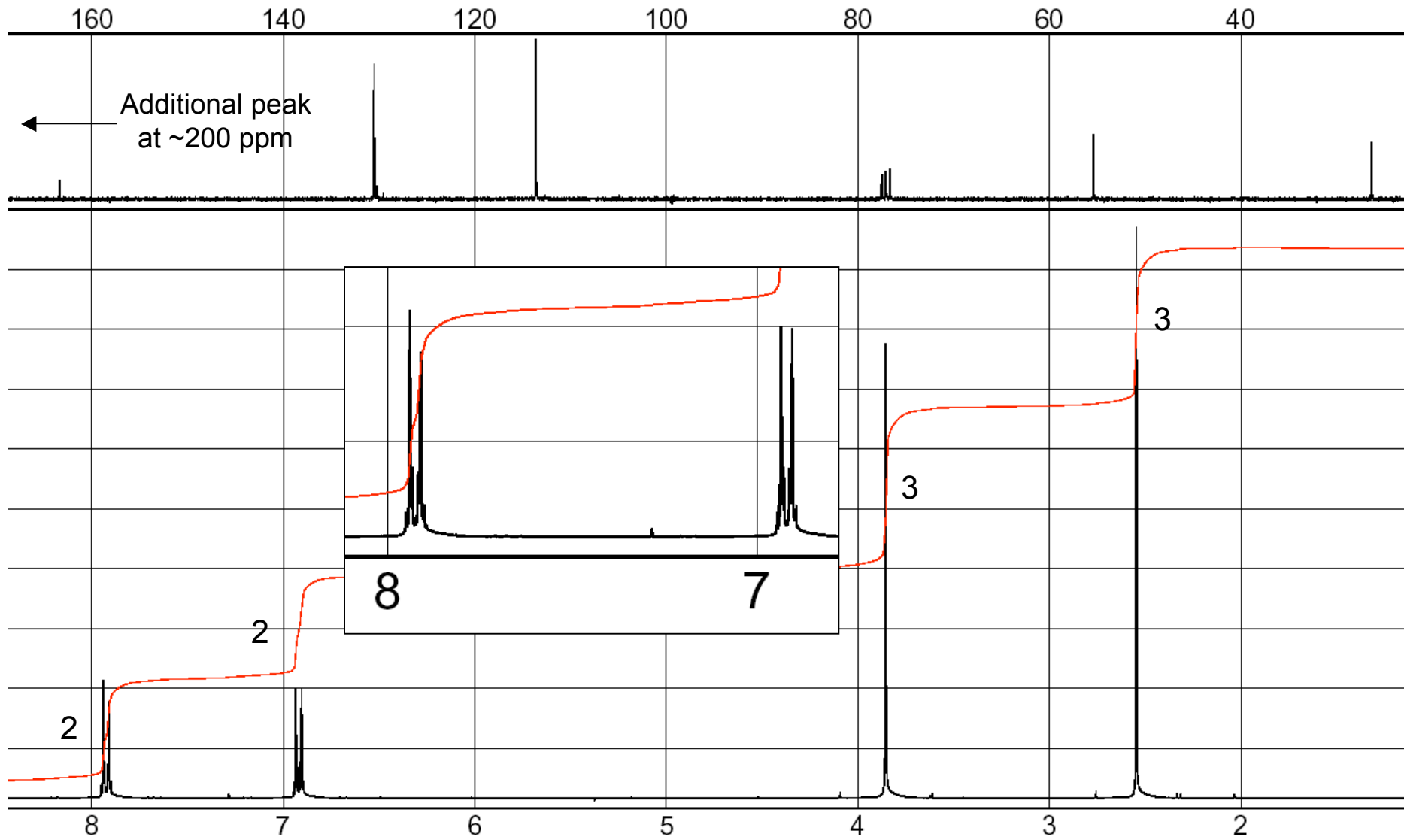
# Problem 2



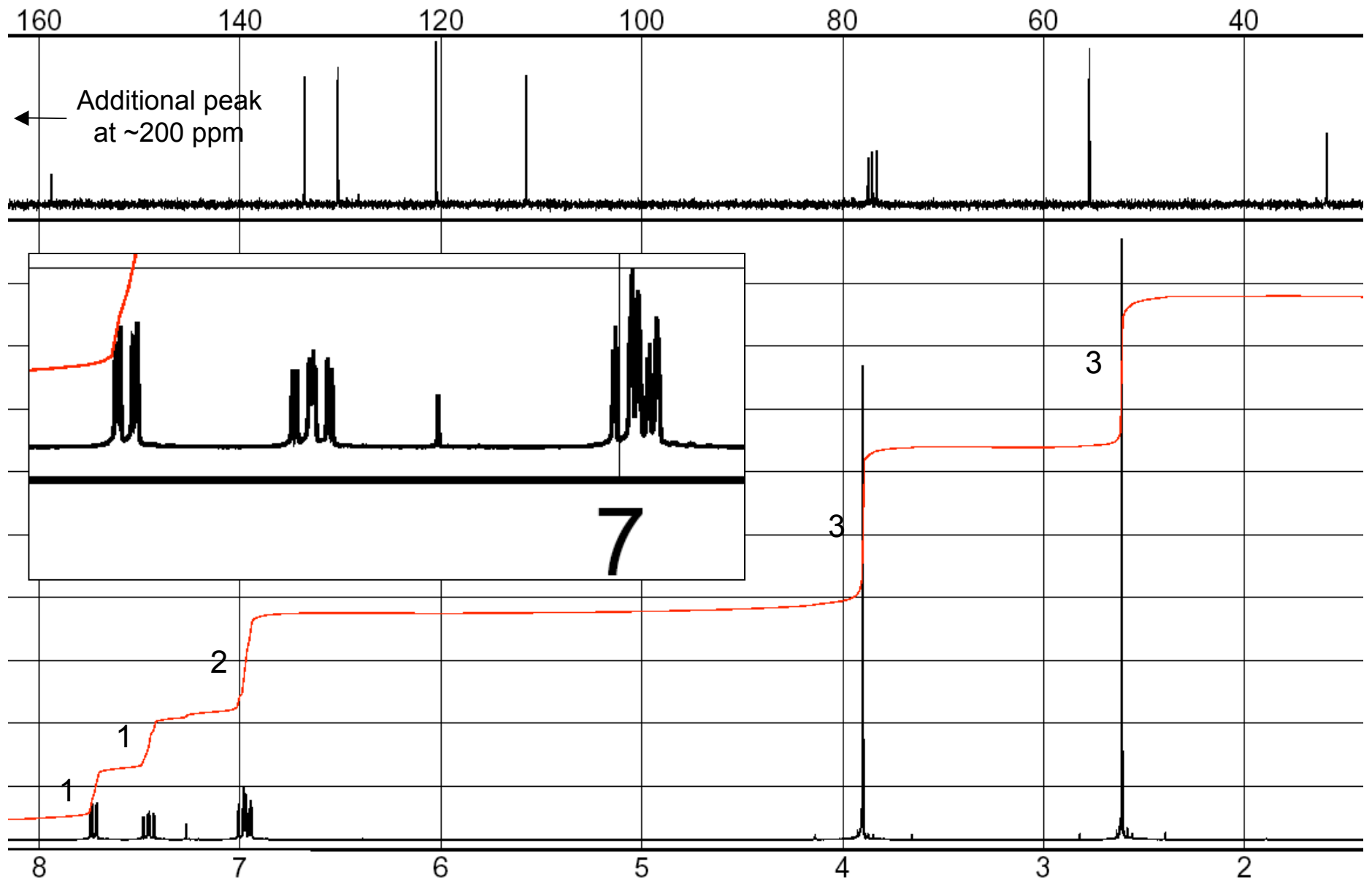
Problem 4 - Compound A



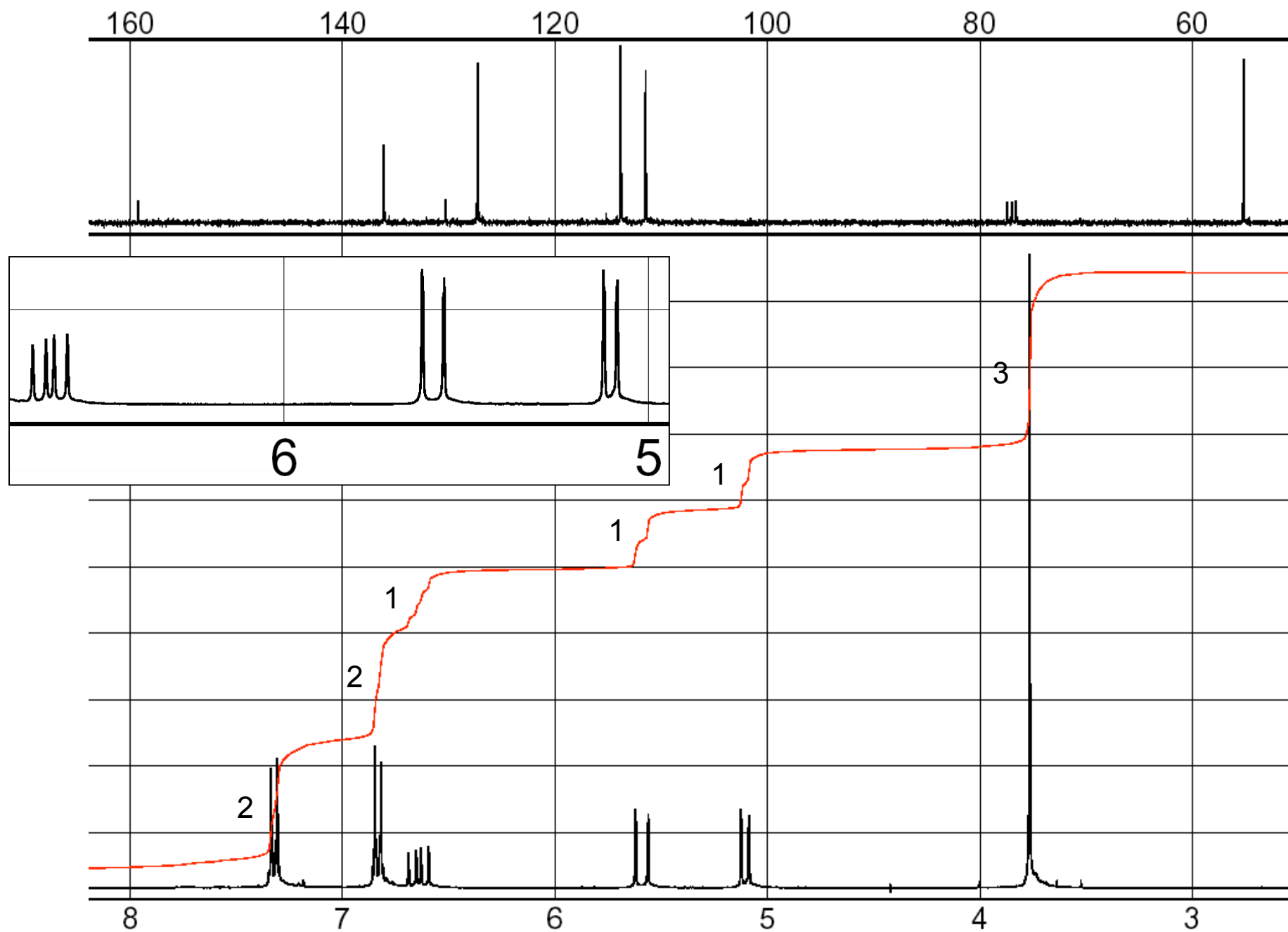
# Problem 4 - Compound B



# Problem 4 - Compound C



Problem 4 - Compound E



# Problem 4 - Compound F

