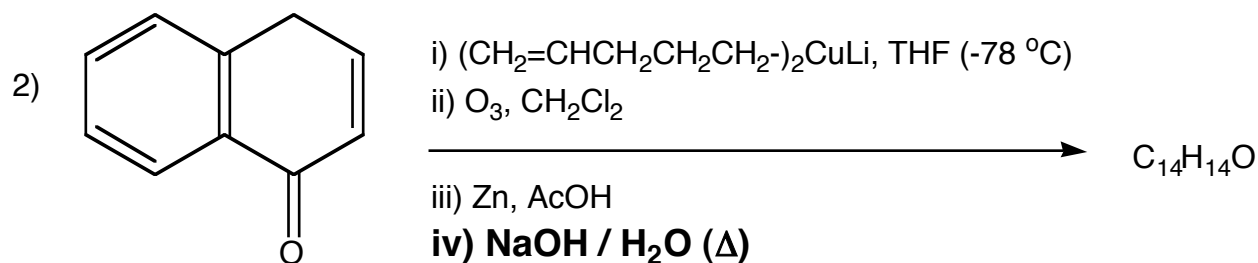
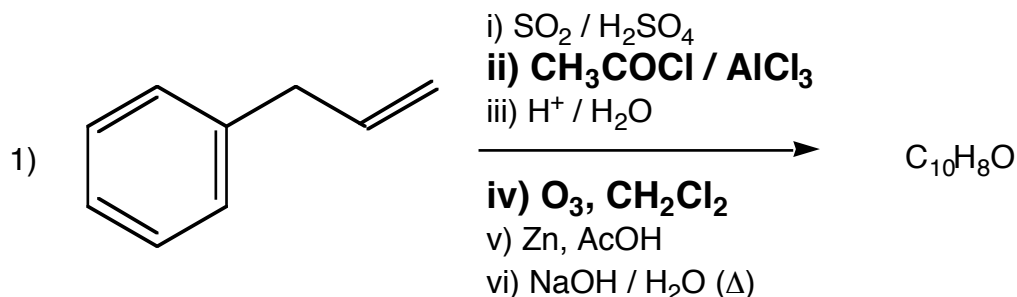


Name: _____

Final Exam – Principles of Organic Chemistry II – CH 212
April 29th 2004 – 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...

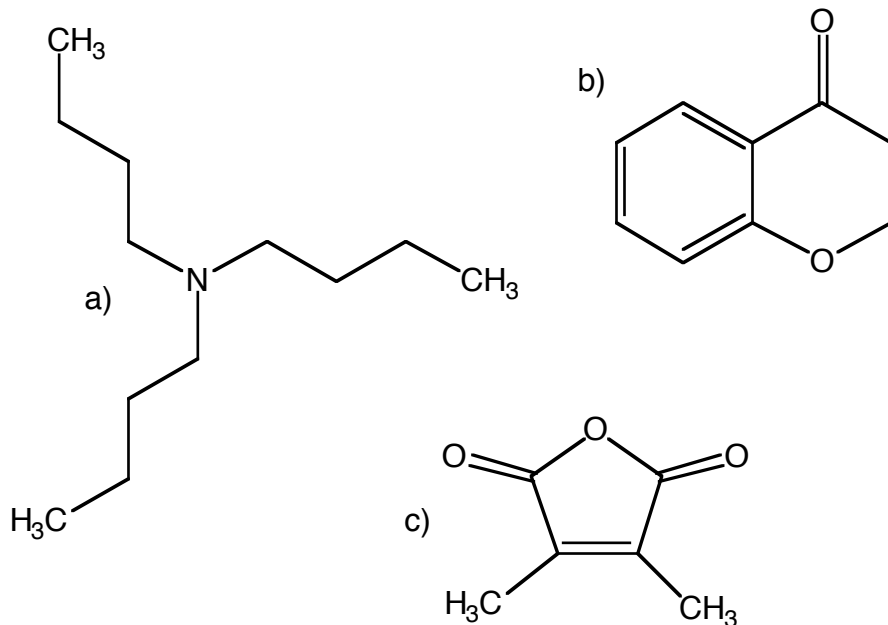
1) (30 points) Consider the following reaction schemes:



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

Name: _____

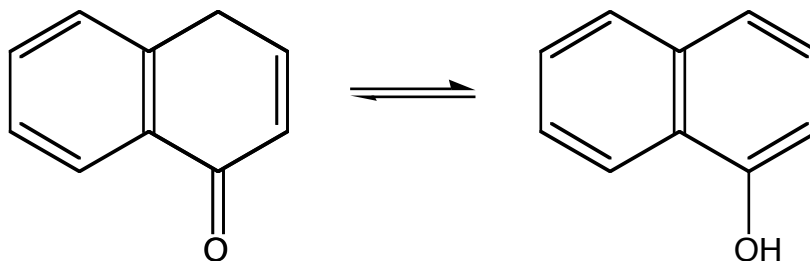
2) (30 points) For each of the following compounds:



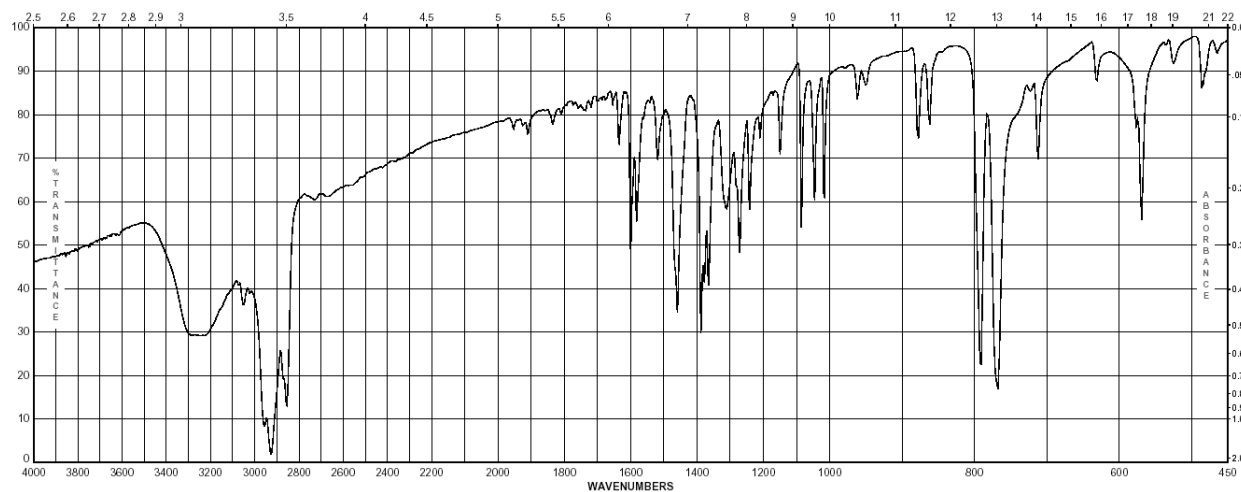
- Calculate their degree of insaturation, and, if appropriate, show in the structure what gives rise to this number (i.e., double bonds, rings, etc...).
- Determine how many ^1H and ^{13}C NMR signals you will find in their spectra (i.e., identify magnetically equivalent and non-equivalent nuclei).
- To which of the three compounds shown above do the ^1H and ^{13}C NMR spectra given in the following pages belong to? Once you found the right compound, assign all the *non-aromatic* ^1H signals in the spectrum as completely as you can (i.e., both chemical shift and multiplicity...).

Name: _____

- 3) (30 points) The starting material for the second reaction scheme of Problem 1 is a conjugated ketone that can exist as two keto/enol tautomers:



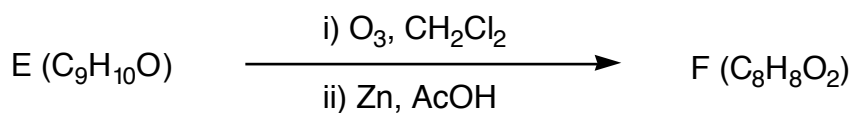
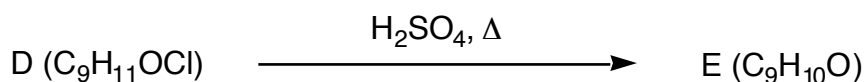
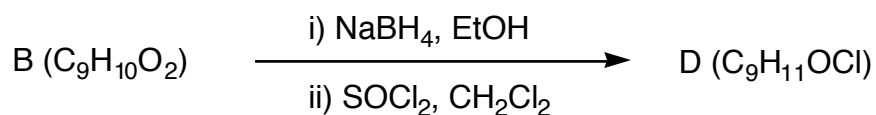
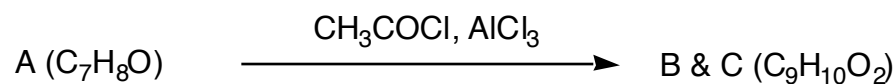
- a) Write the mechanism for the base-catalyzed keto/enolization of this compound. You can use either one, but I suggest you start from the ketone on the left and use a generic base (say, "B:") to pull a certain proton to start things off...
- b) You recorded an IR spectrum for this compound, and got the following:



Based on this IR spectrum and on the structure of the two tautomers presented above, to which side is the keto/enol equilibrium shifted? Make sure to justify your answer for full credit.

Name: _____

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

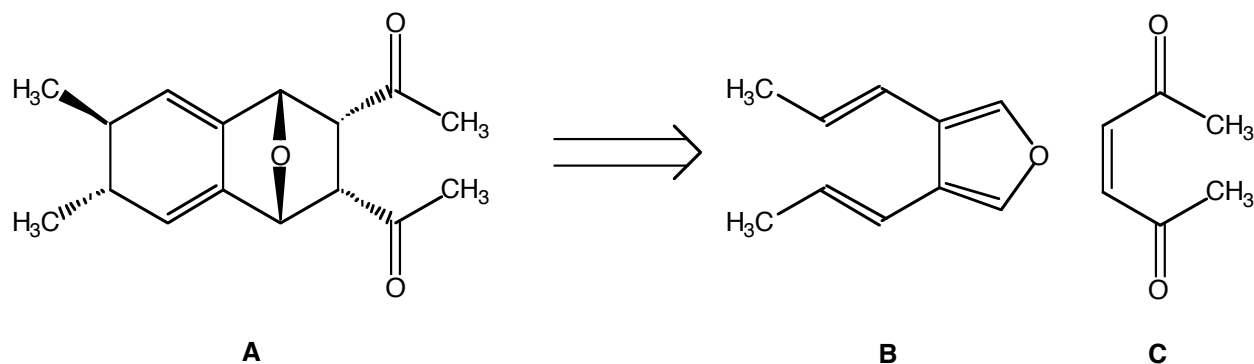


In addition to the information provided above, you recorded NMR spectra for compounds **A**, **B**, **C**, **E**, and **F**, which are provided in the following pages.

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) (30 points) Compound **A** can be prepared in two steps starting from compounds **B** and **C**:

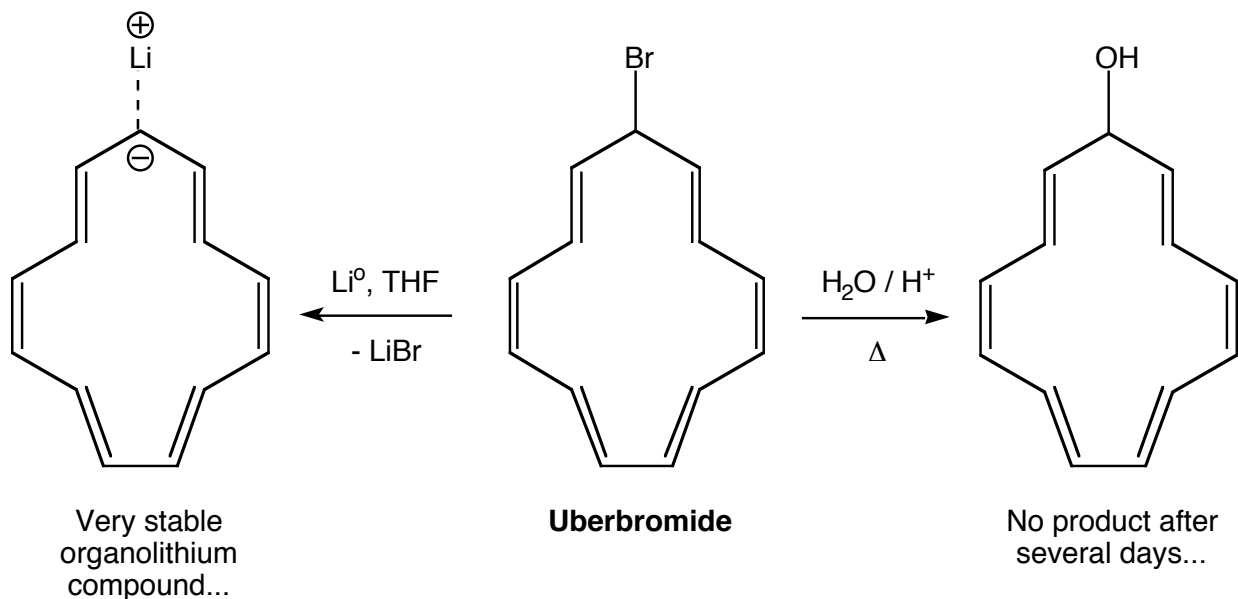


Propose the synthetic approach you would follow to obtain **A** starting from **B** and **C**, including detailed mechanisms for the two reactions. Make sure to pick the appropriate conditions to get the stereochemistry indicated in the final product.

NOTE: You do not need any additional reagents than those given...

Name: _____

6) (30 points) After years of careful planning you were able to successfully synthesize **Uberbromide**, the bromide of all bromides (center of the diagram below):



Despite your excitement, you decided to proceed cautiously and gathered kinetic and thermodynamic data for Uberbromide. You found the following:

- Upon reaction with lithium metal (Li^0) in THF, Uberbromide forms a remarkably stable organolithium compound (shown to the left in the diagram).
- Even after prolonged boiling in acidic water, Uberbromide does not convert to the expected solvolysis product (shown to the right in the diagram).

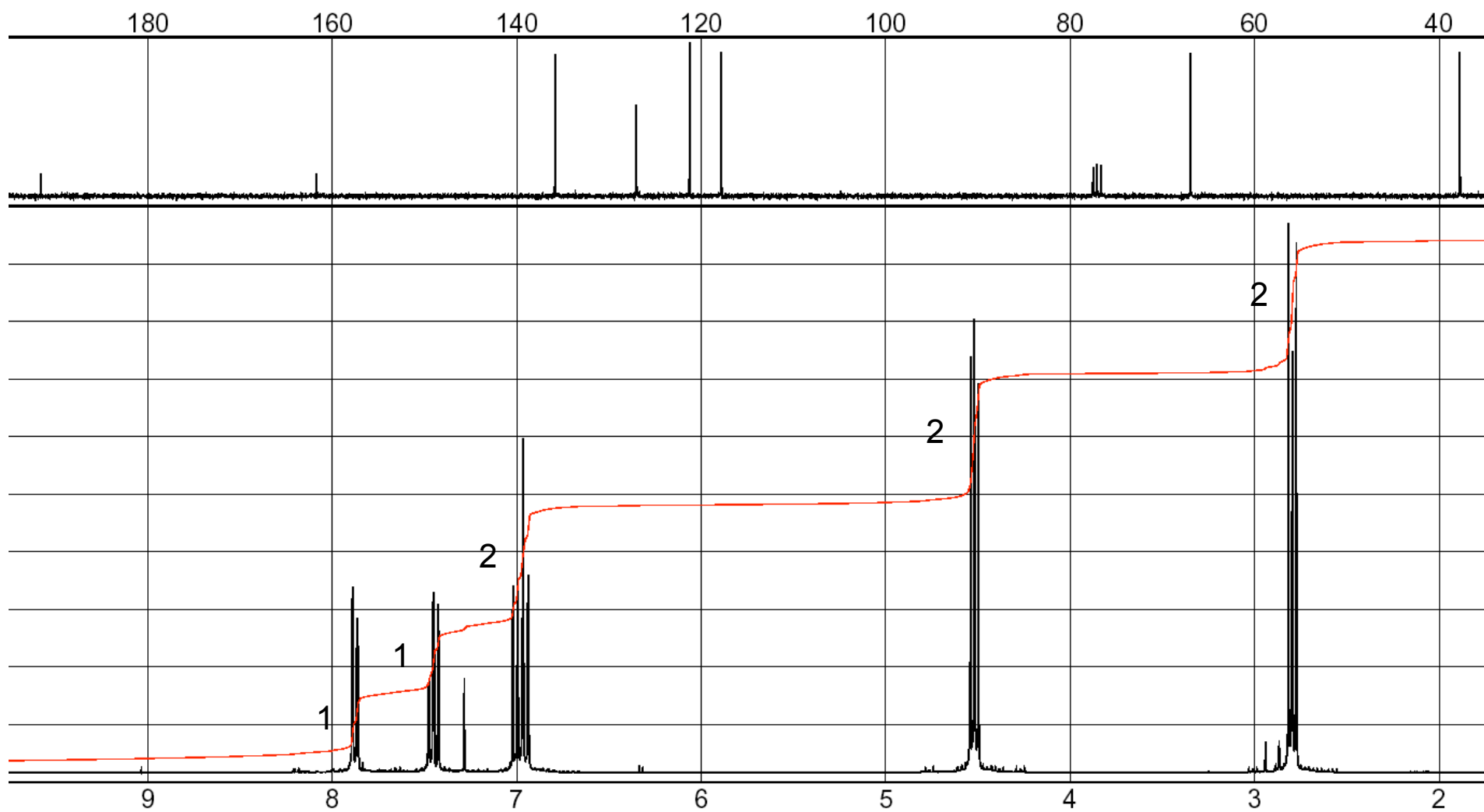
Explain these observations based on the structure of Uberbromide, and the structure of the reaction intermediates and/or products.

Hint: In one case, look at the product. In the other, consider the intermediate that needs to form to get the product...

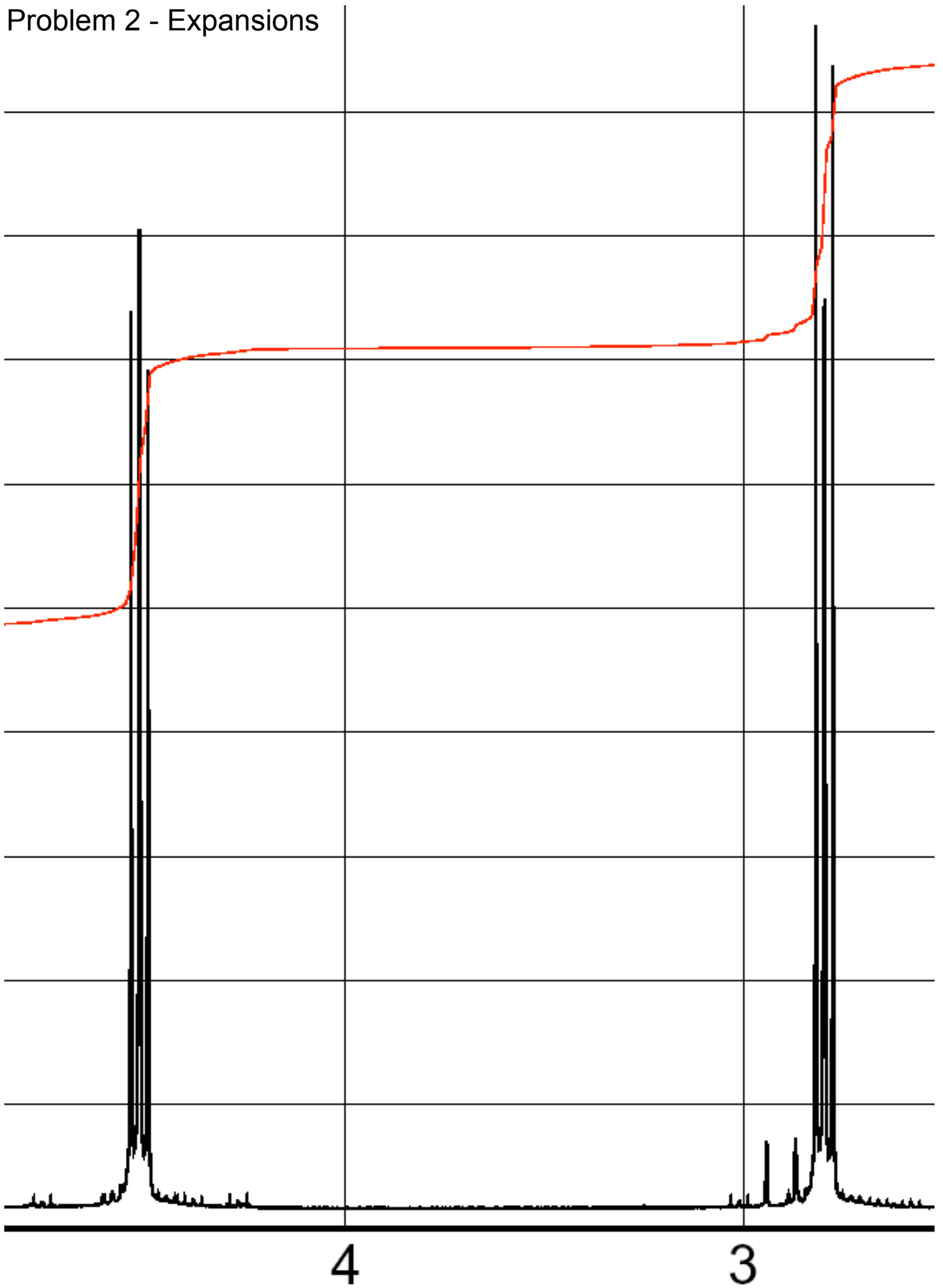
Name: _____

Name: _____

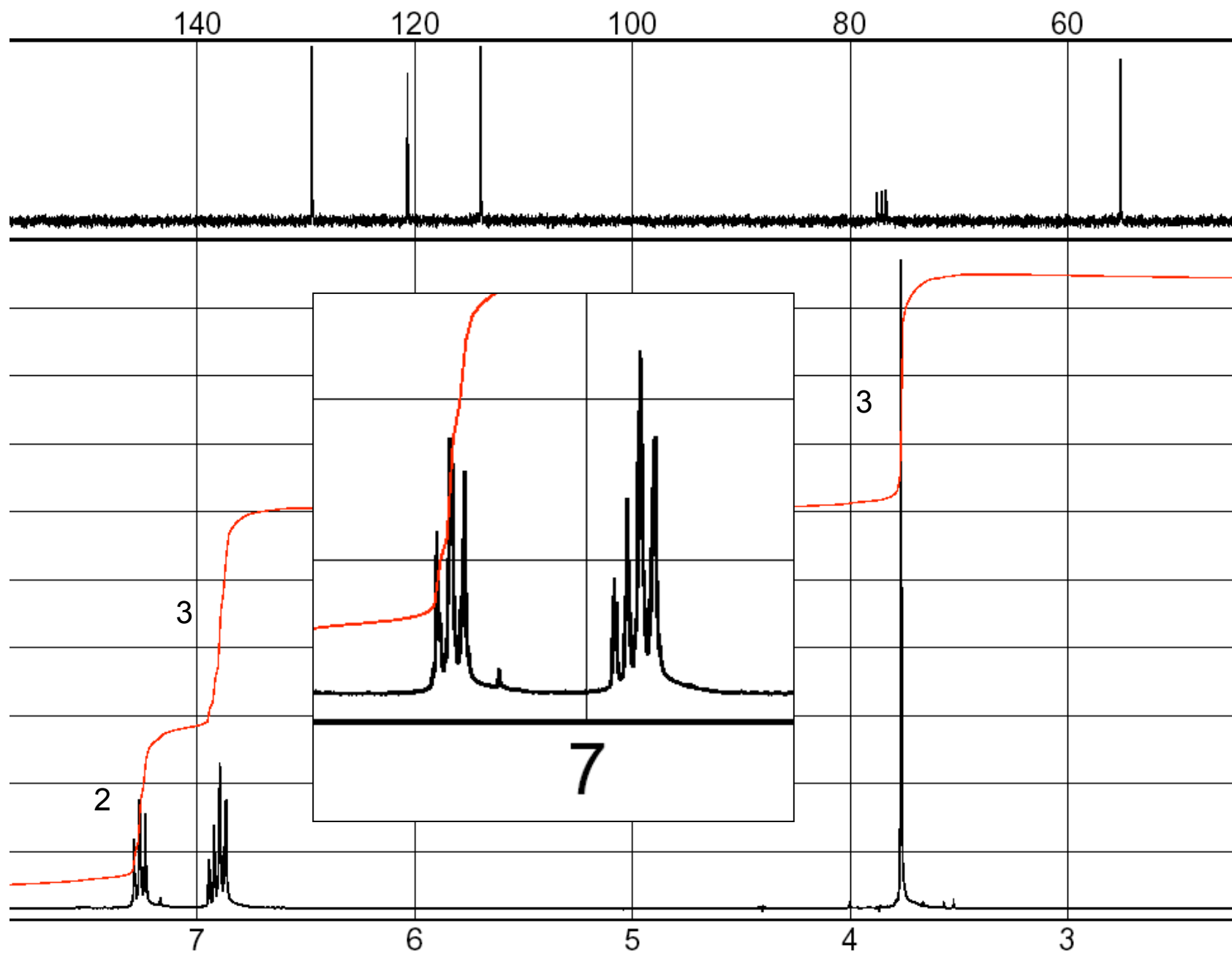
Problem 2



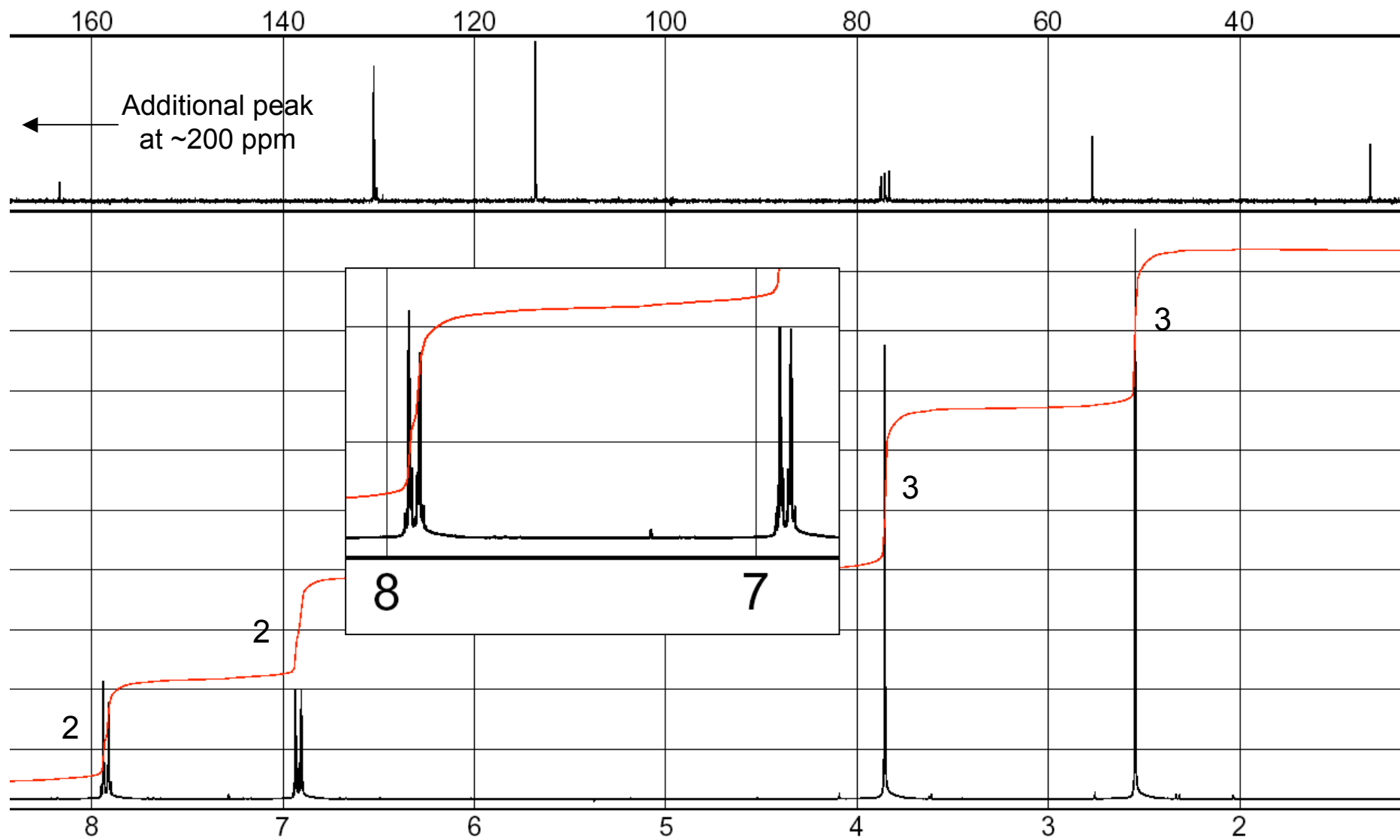
Problem 2 - Expansions



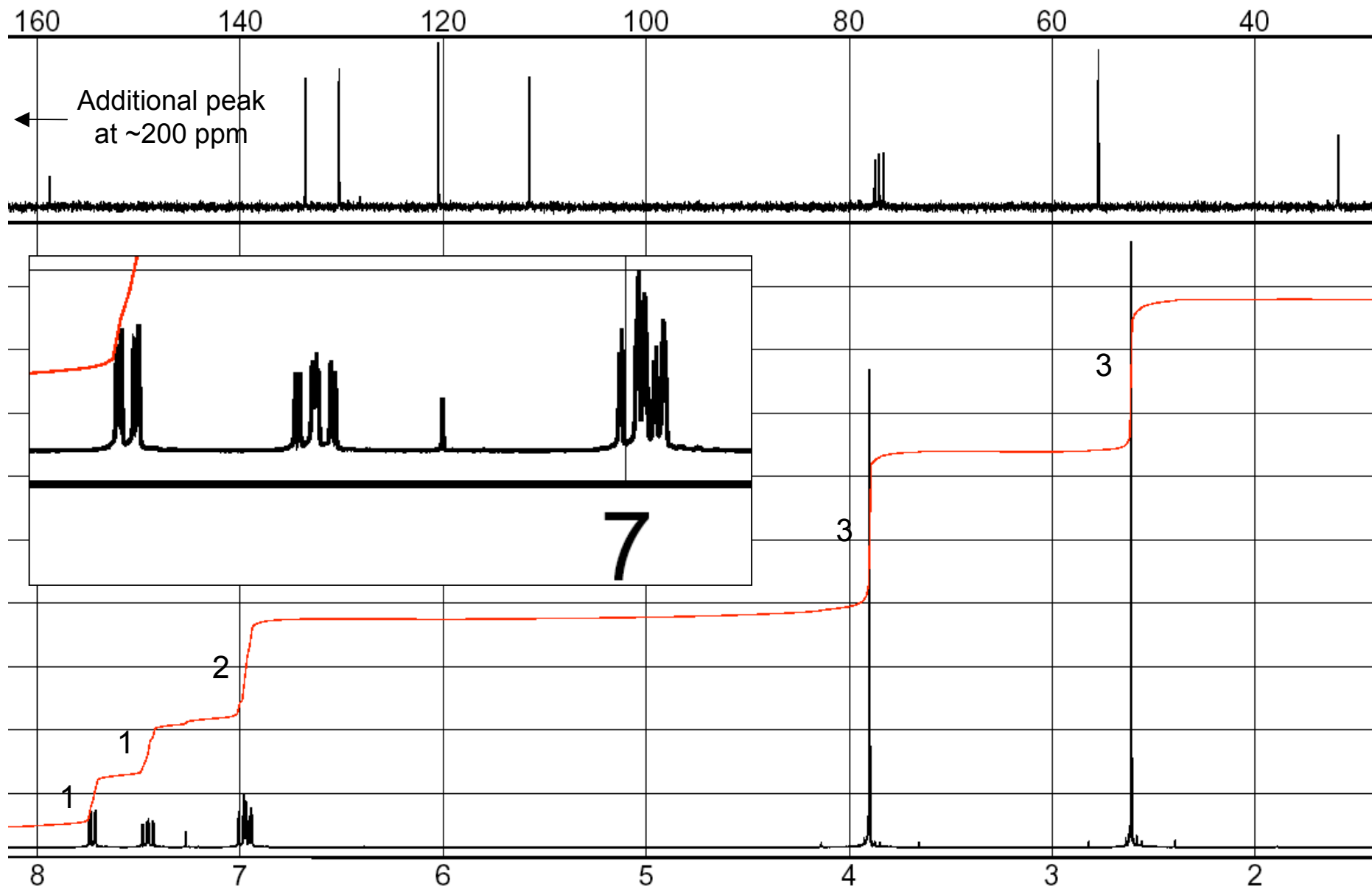
Problem 4 - Compound A



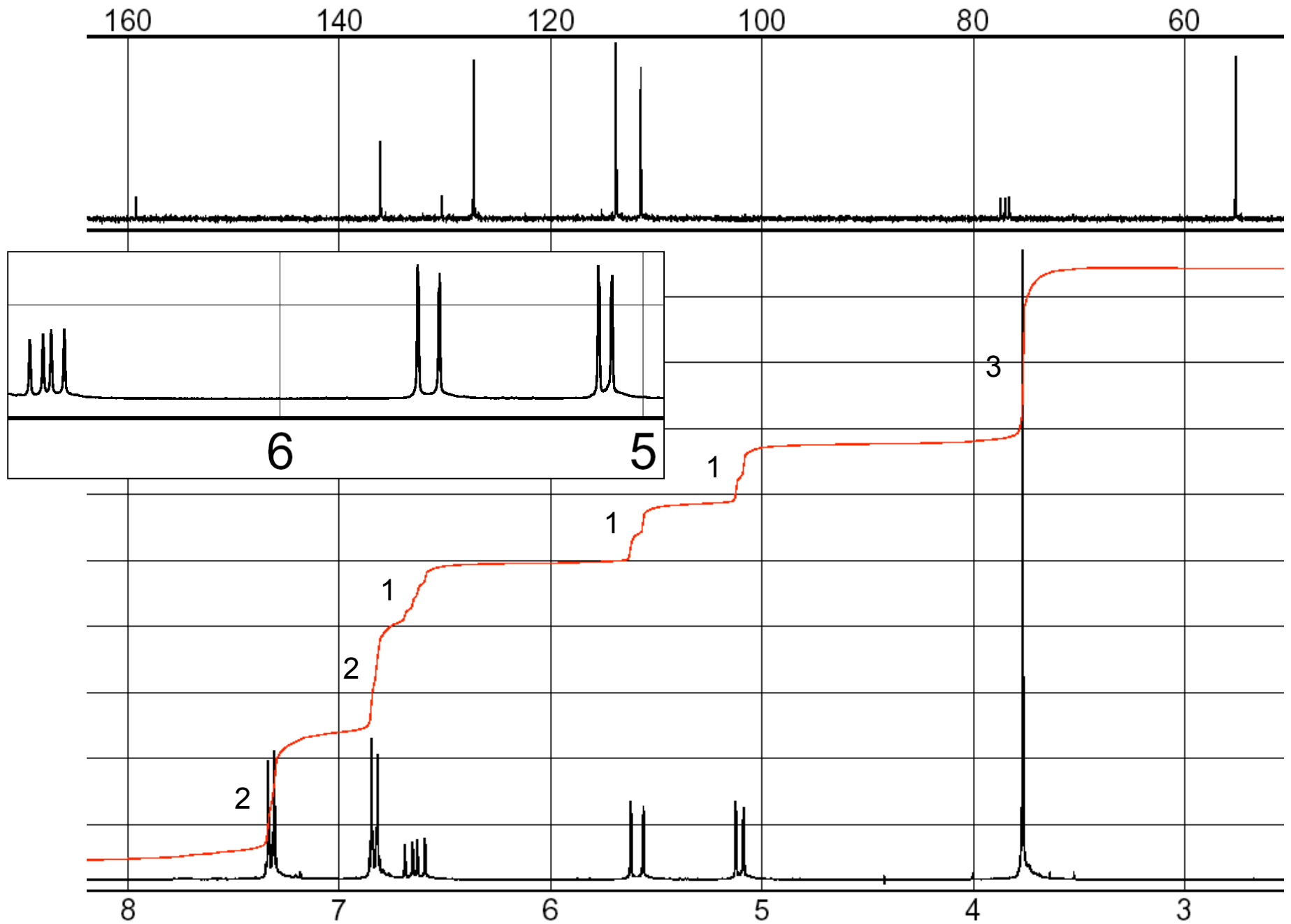
Problem 4 - Compound B



Problem 4 - Compound C



Problem 4 - Compound E



Problem 4 - Compound F

