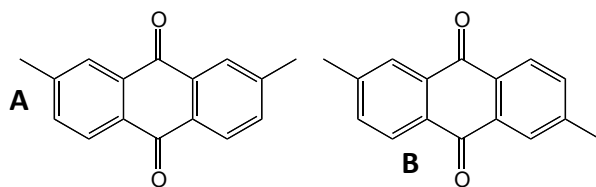


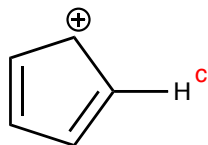
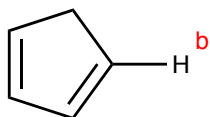
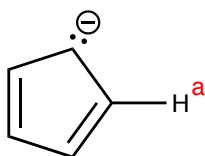
Chem 380 Practice Exam

Note: this exam is intended as a 50 minute exam. The actual exam will be longer.

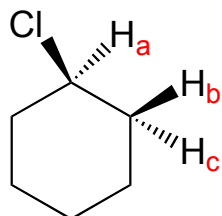
1. The two isomers **A** and **B** below exhibit similar splitting patterns in their $^1\text{H-NMR}$ spectra. Explain how $^{13}\text{C-NMR}$ can be used to unambiguously distinguish between the two compounds. (5 marks)



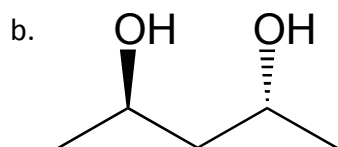
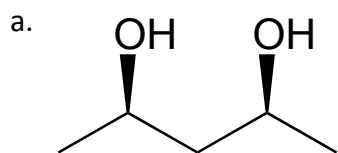
2. Compare the chemical shifts of protons **a**, **b** and **c**. Briefly justify your answer. (5 marks)



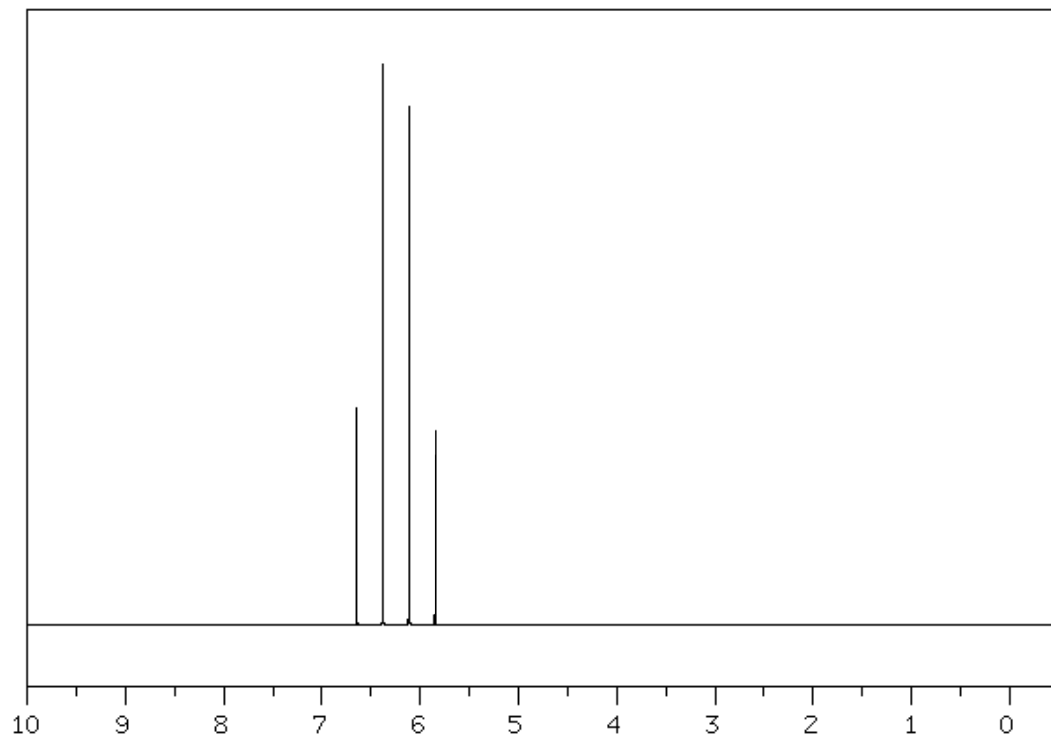
3. Which coupling constant is larger: J_{ac} or J_{ab} ? Briefly explain your reasoning. (5 marks)



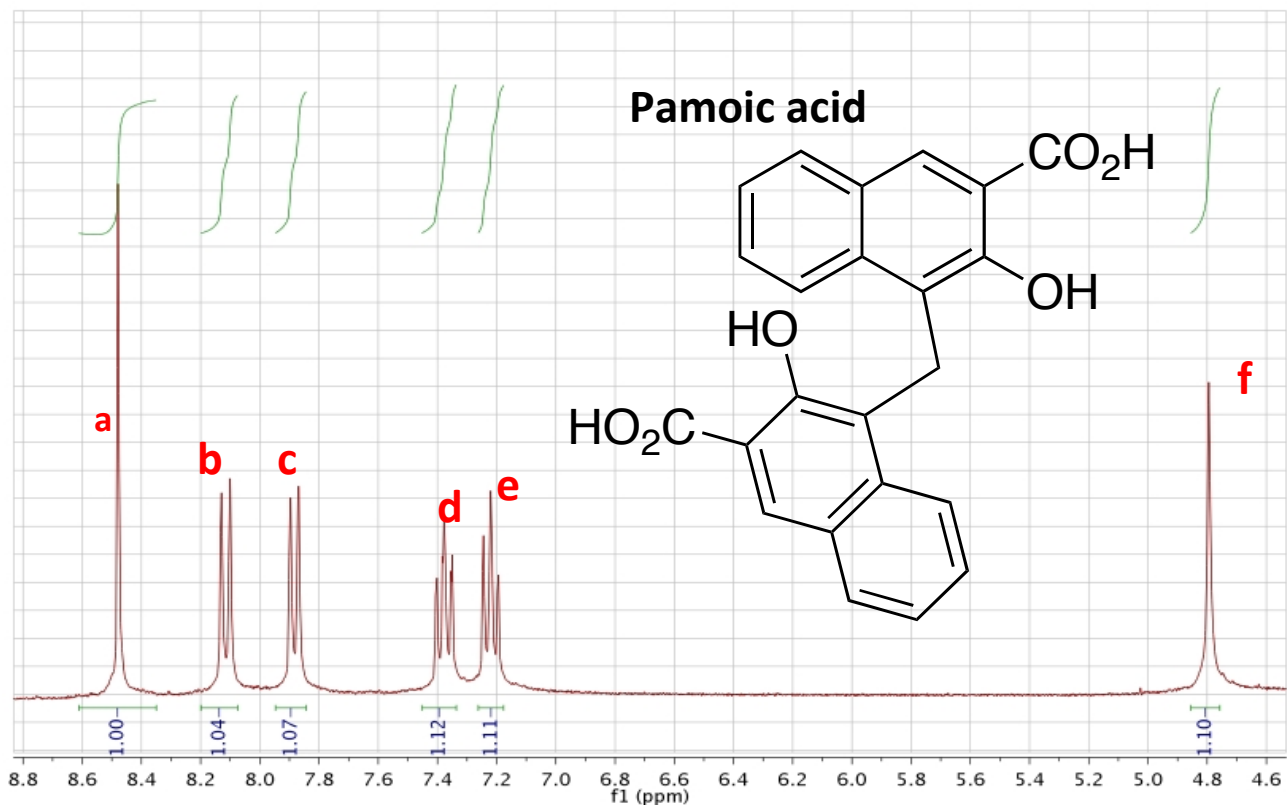
4. For the two molecules shown below, indicate which pairs of protons are homotopic, enantiotopic, diastereotopic or equivalent by exchange. Indicate the splitting pattern for each proton/set of protons. (10 marks)



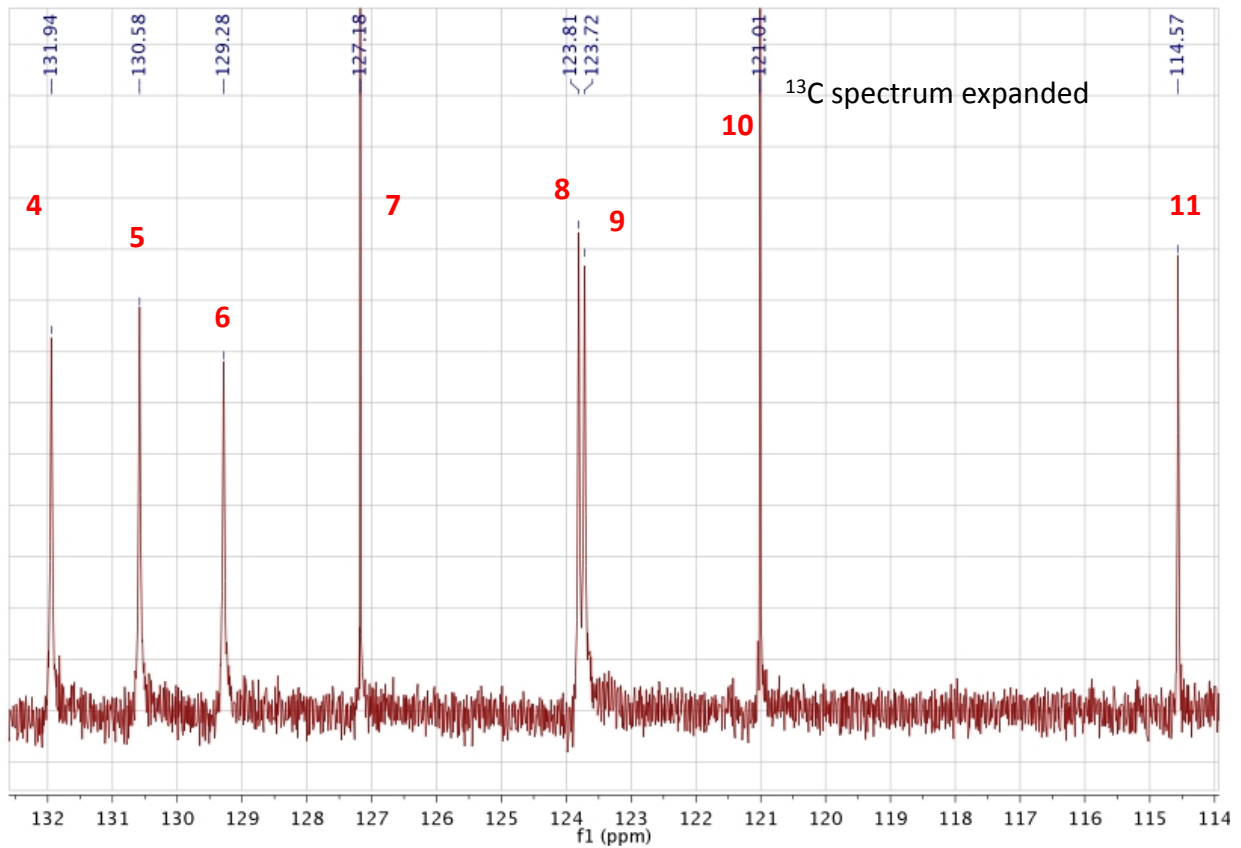
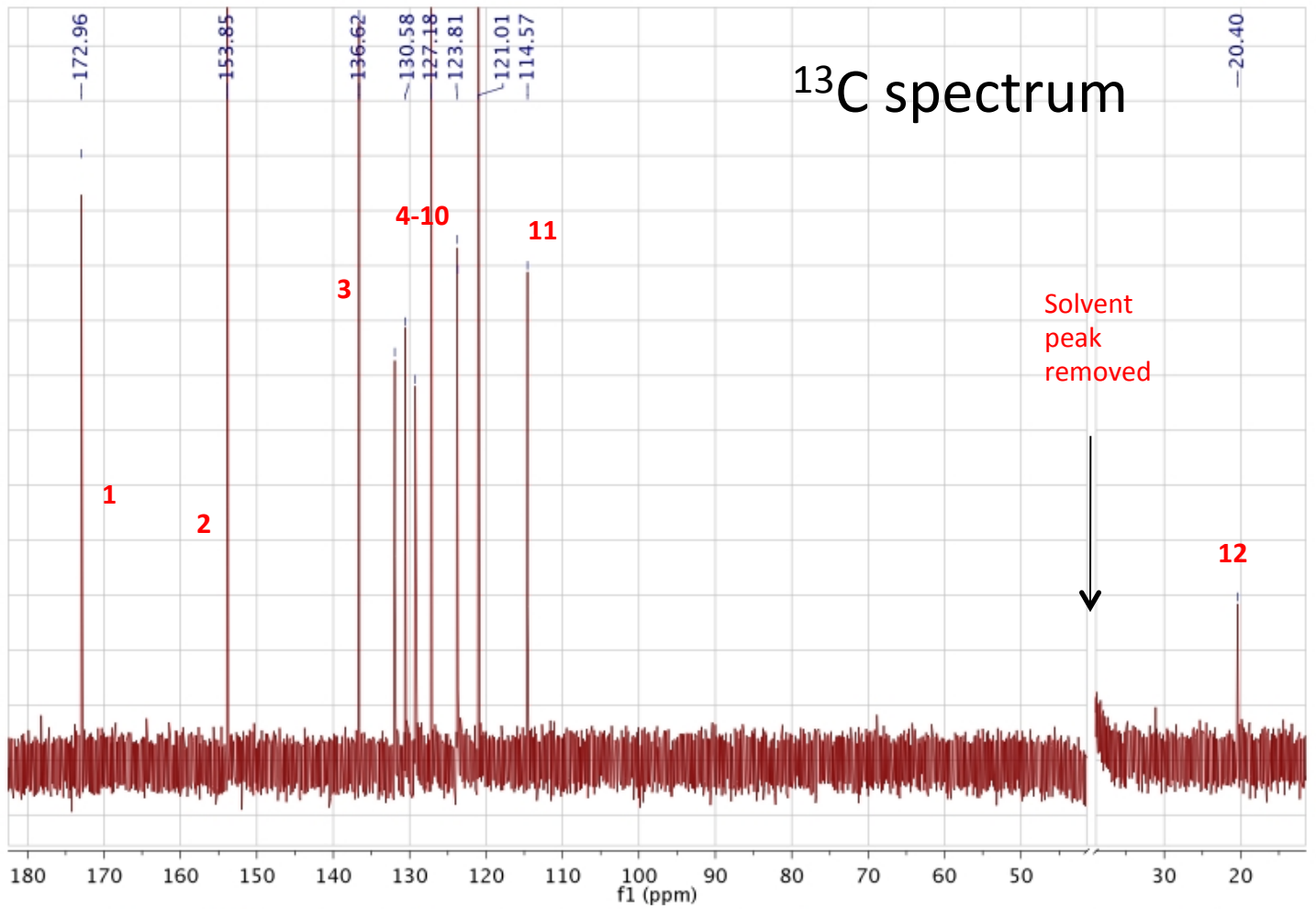
5. The following $^1\text{H-NMR}$ (300 MHz) spectrum was obtained for molecule **X**. The molecular weight of **X** was determined to be 70.0030 by EI-HRMS; elemental analysis indicated a composition of 17.15% C and 1.44 % H by weight. Identify **X** and explain the appearance of this spectrum. (5 marks)

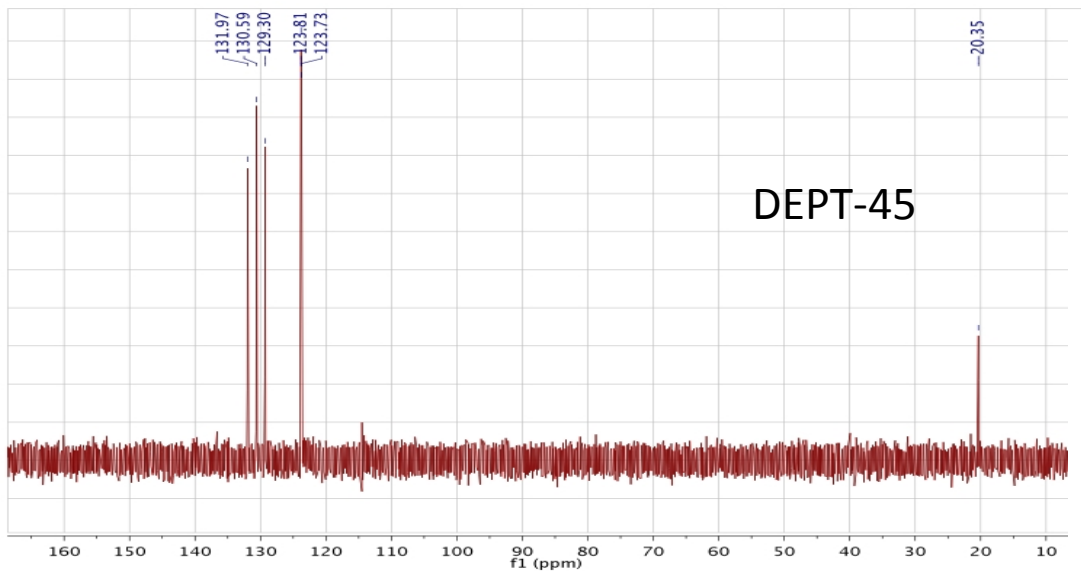


6. Questions (i)-(v) refer to pamoic acid, the ^1H -, ^{13}C - and DEPT spectra of which are shown on the following pages. Peaks in the ^1H -NMR are labeled a, b, etc.; peaks in the ^{13}C are labeled 1,2,3, etc.



- Irradiation of the ^1H -peak **a** gives rise to an NOE for peak **c**. On the basis of this information, assign peaks **b** and **c** to the appropriate protons on the structure. (5 marks)
- Which peak(s) in the ^1H -NMR do you expect to experience an NOE from irradiating **f**? Briefly justify your answer. (5 marks)
- Suggest a method to unambiguously identify which proton gives rise to peak **d** and which gives rise to peak **e**. (5 marks)
- Identify the carbon that gives rise to peak **12**. (5 marks)
- List the quaternary peaks that correspond to quaternary carbons.





No peaks appear outside ranges displayed

