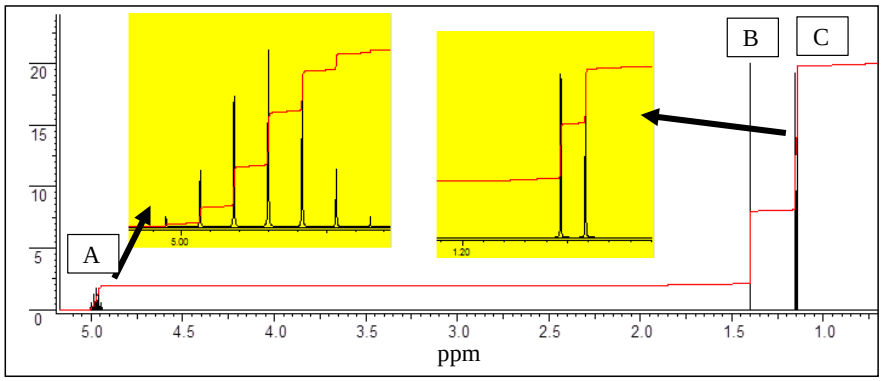
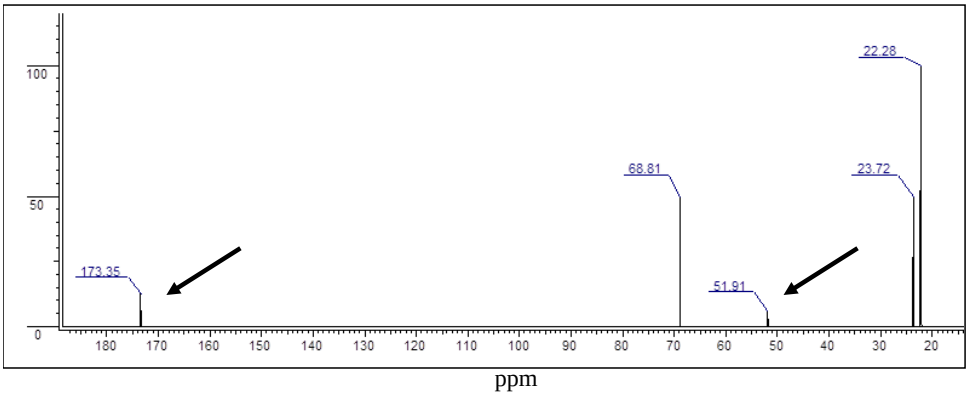
Chemistry 328N Spring 2019
Homework #4

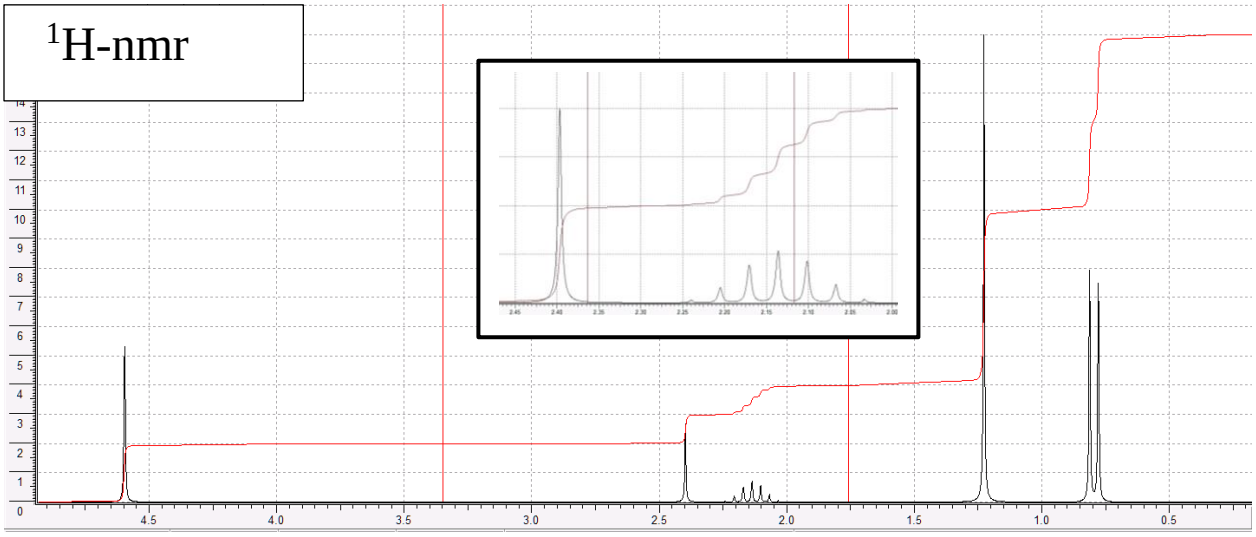
Due: 2/18/19 by 5PM…..in the "box"
Read: Review Chapters 12, 13, 14 and read section 20.3 (pages 904-908).
Do: 12.4, 12.5, and work on the practice tests that are posted on our web site
Supplemental Problems:

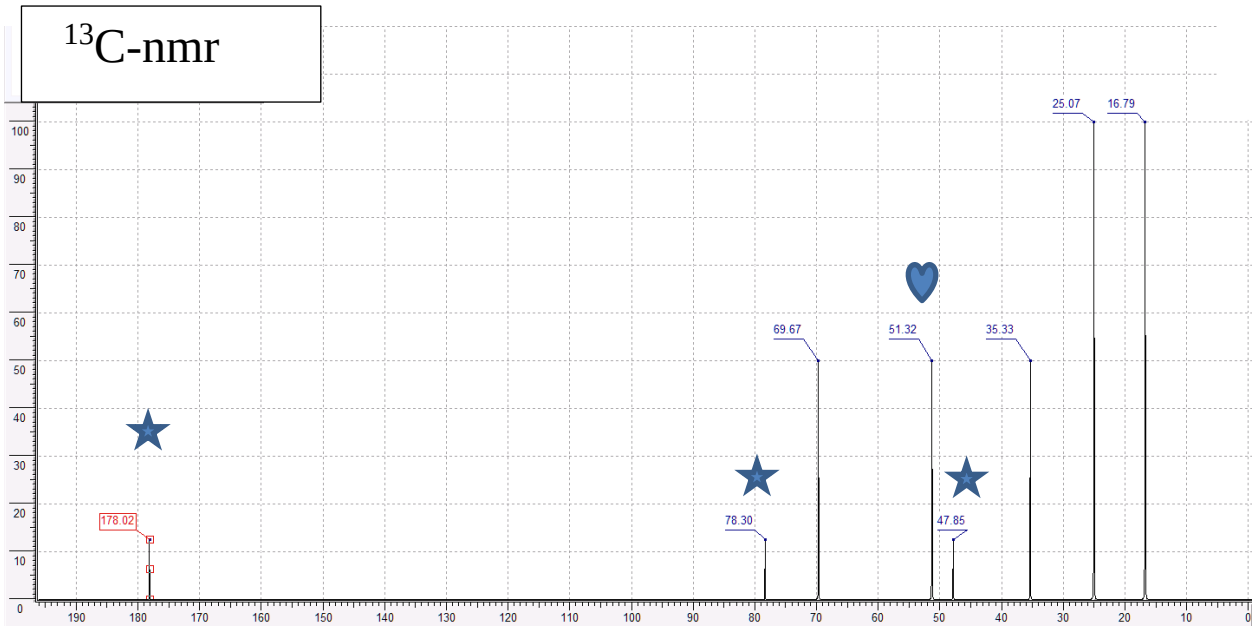
1. Paul and Qingjun have isolated an interesting toxic substance from wipes of the tables at Dirty Dave's Pizza Place. Exposure to even minute quantities of this substance causes malaise, loss of all motivation to study and an intense desire to sleep during daylight hours. There is an unsubstantiated rumor that the effects of this toxin can be reversed in part by treatment with a homeopathic remedy known as Red Bull. Qingjun measured the mass spectrum of the toxin and reports a molecular ion at 216 amu. He ran the IR spectrum and he tells us that the compound has no absorbance above 3000cm^{-1} but does have a very strong, sharp peak at 1737cm^{-1} and another at 1100 cm^{-1}. There were no other particularly strong peaks in the spectrum. Paul ran the ^{1}H-nmr spectrum and that is reproduced below. Qingjun ran the ^{13}C-nmr spectrum, which is also provided below. The peaks marked with arrows disappeared when he ran the DEPT experiment but the other peaks were unchanged. Please list all of the structural elements you can establish from these data and then draw a proposed structure of this horrible stuff. Show the peak assignments for the ^{1}H-nmr by labeling the protons on your structure and with the letters on the ^{1}H nmr spectrum provided below.





2. Another student discovered an unknown substance oozing out of the cracks in the yellow brick road. It contaminated shoes and scooter tires. EHS is anxious to know what this stuff might be. It is a colorless liquid material that smells like cilantro and has a relatively high vapor pressure. The sample has an empirical formula of C_5H_8O and the mass spectrometry shows a strong molecular ion at 168 Daltons. The IR spectrum shows strong absorbances at 3324, 1742, 1256 and 636 cm^{-1}. There is a weak but sharp band at 2126 cm^{-1}. The ^{13}C and ^{1}H nmr spectra are provided below. Please list all of the structural elements you can establish from these data and then draw a proposed structure of this substance. Show the peak assignments for the ^{1}H-nmr.





In the DEPT experiment, the resonances marked with a star disappear and the resonance marked with a heart inverts. All other resonances are unchanged.