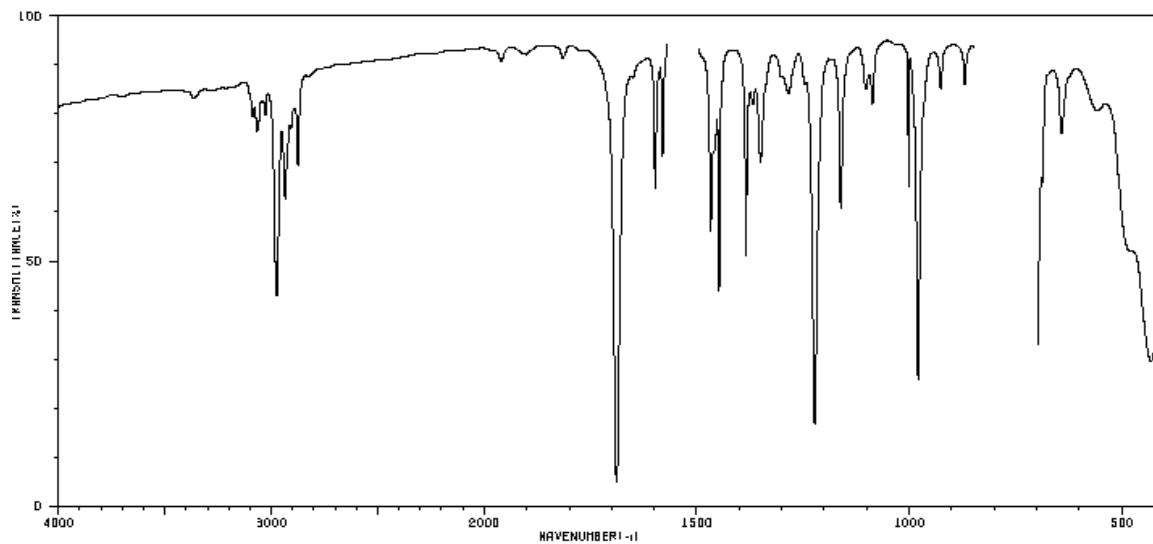
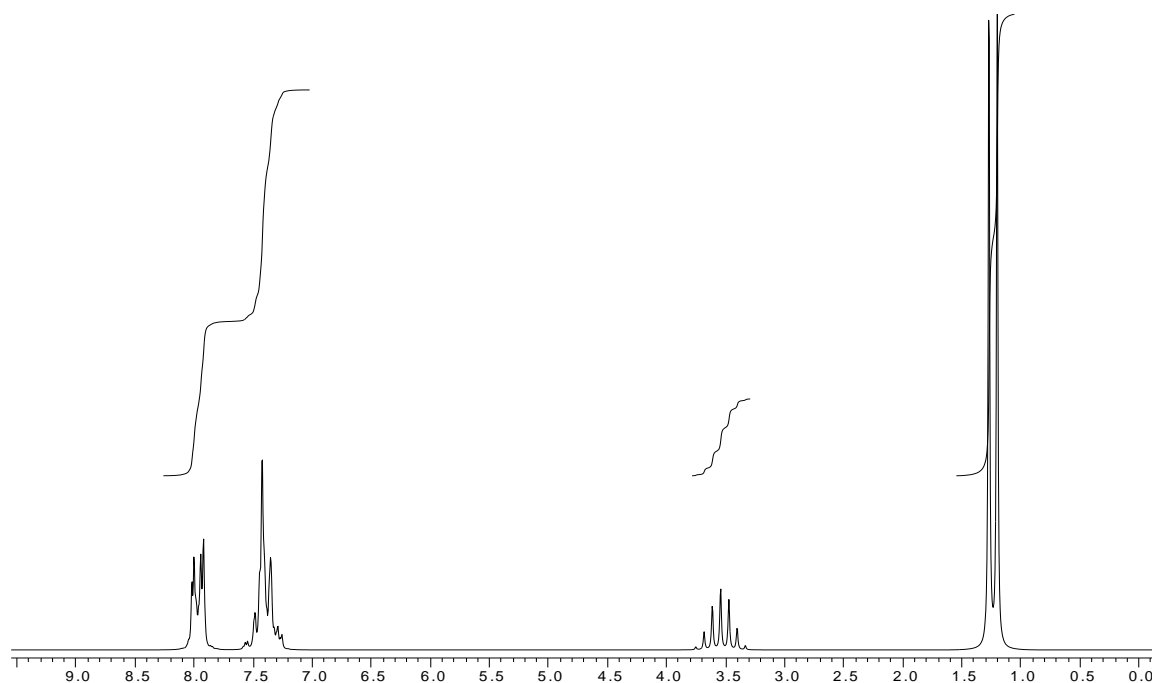


Problem Set 1 – ^1H NMR Spectra

1. The IR and ^1H NMR spectra of a compound of molecular formula $\text{C}_{10}\text{H}_{12}\text{O}$ are given below.

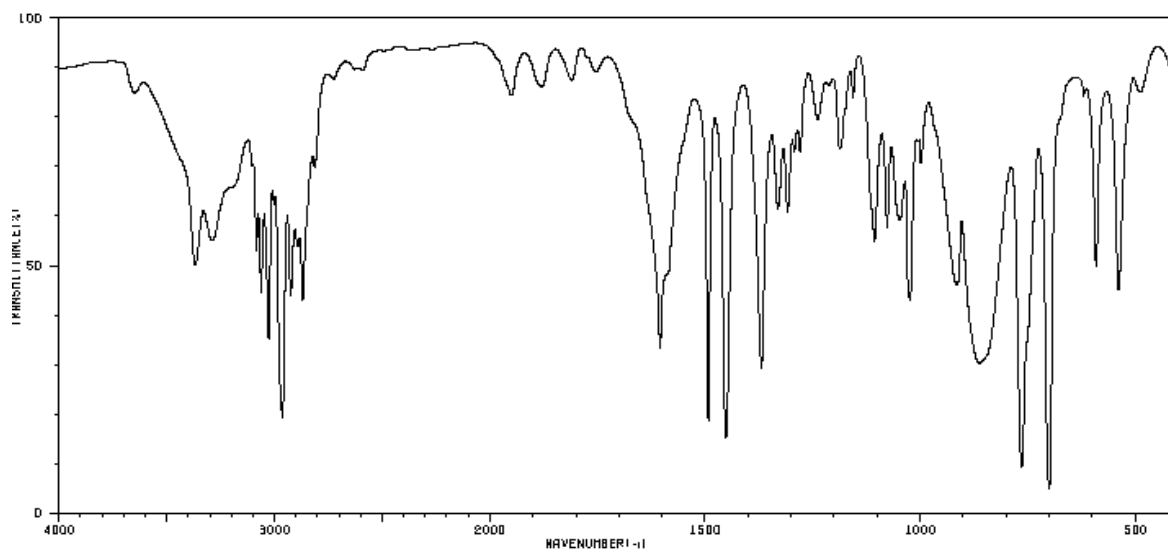


SDBSWeb: <http://www.aist.go.jp/RIODB/SDBS/> (22-12-09)

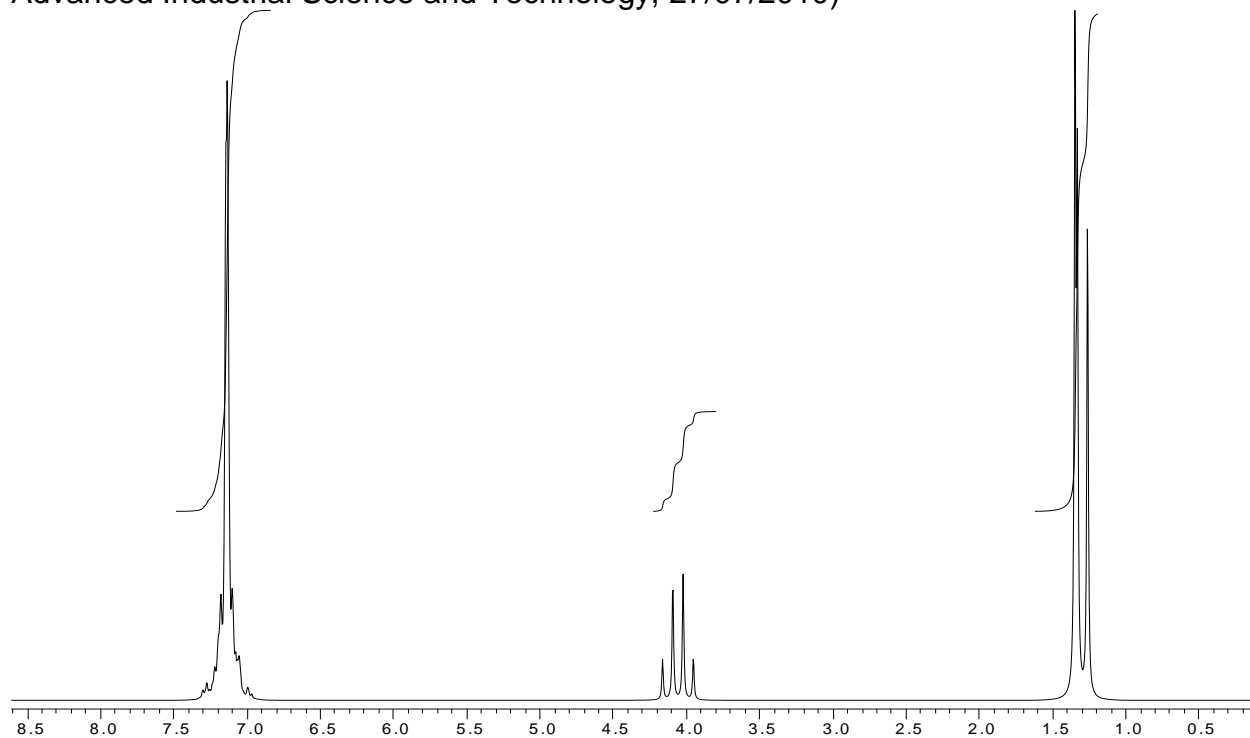


- Calculate the degree of unsaturation.
- List the possible functional groups gleaned from the molecular formula.

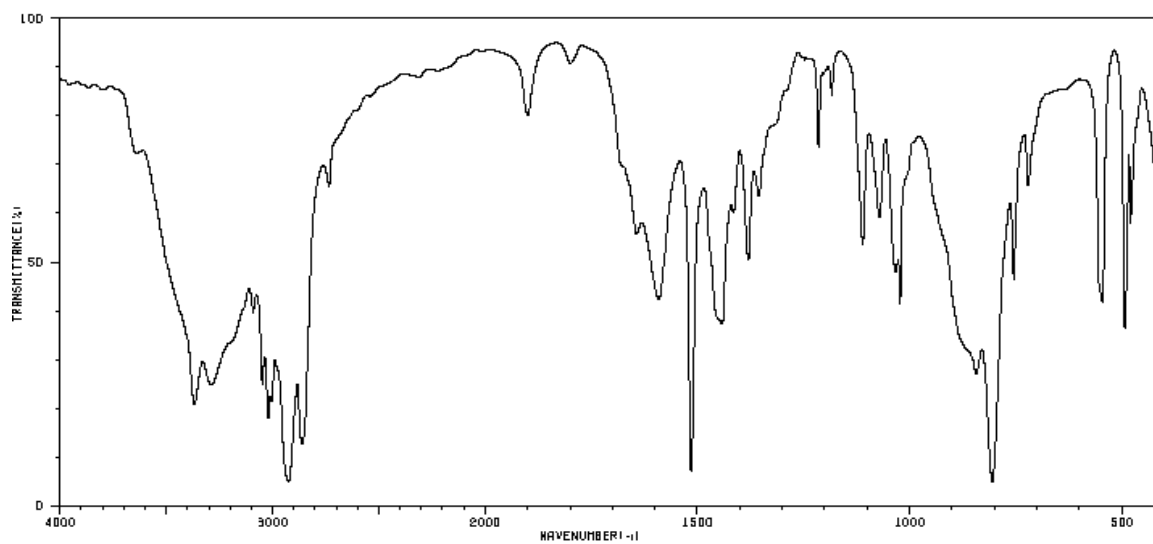
- c. What is the oxygen-containing functional group that the IR spectrum shows to be present in the unknown?
- d. Propose a structure for this compound.
2. The IR and ^1H NMR spectra of a compound of molecular formula $\text{C}_8\text{H}_{11}\text{N}$ are given below.



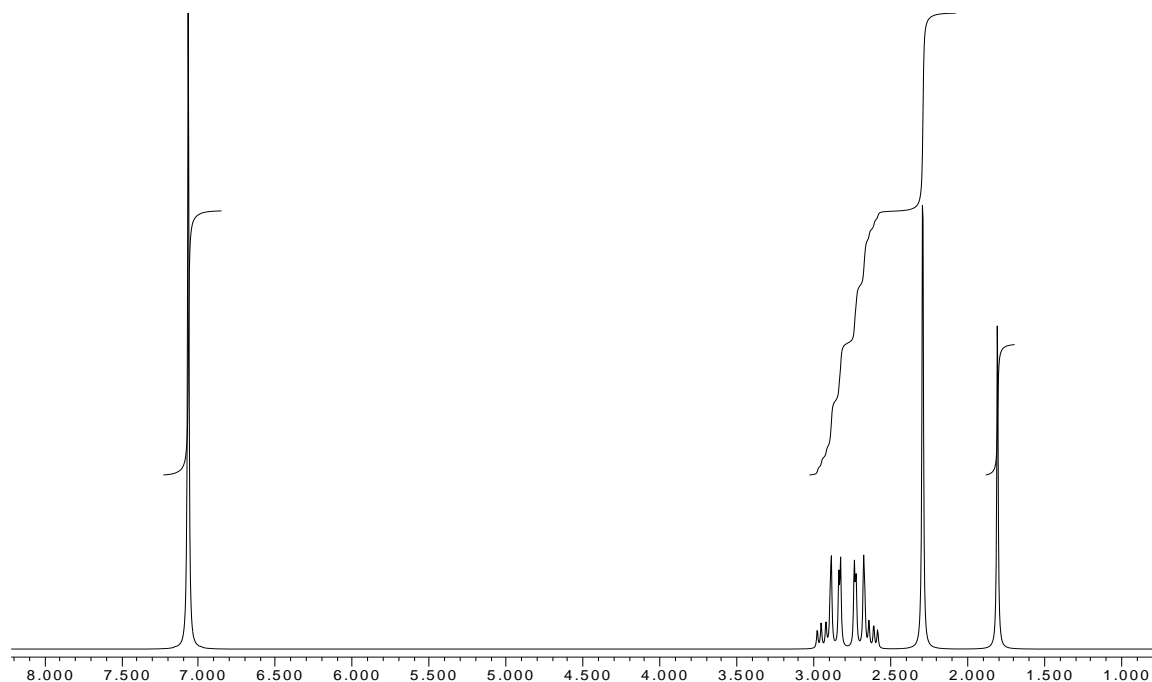
SDBSWeb : <http://riodb01.ibase.aist.go.jp/sdbs/> (National Institute of Advanced Industrial Science and Technology, 27/07/2010)



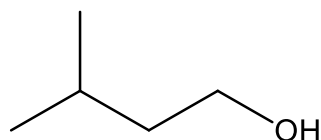
- a. Calculate the degree of unsaturation.
 - b. List the possible functional groups gleaned from the molecular formula.
 - c. What is the nitrogen-containing functional group that the IR spectrum shows to be present in the unknown?
 - d. Propose a structure for this compound.
3. The IR and ^1H NMR spectra of a compound of molecular formula $\text{C}_9\text{H}_{13}\text{N}$ are given below.



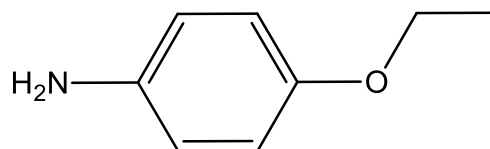
SDBSWeb: <http://www.aist.go.jp/RIODB/SDBS/> (22-12-09)



- Calculate the degree of unsaturation.
 - List the possible functional groups gleaned from the molecular formula.
 - What is the nitrogen-containing functional group that the IR spectrum shows to be present in the unknown?
 - Propose a structure for this compound.
4. Sketch the expected ^1H NMR spectrum of the following compound. Pay attention to multiplicity and approximate chemical shifts:



5. Sketch the expected ^1H NMR spectrum of the following compound. Pay attention to multiplicity and approximate chemical shifts:



6. Propose structures for compounds that fit the following data:

a. $C_5H_{10}O$ $\delta = 0.95$ ppm (6H, doublet)
 $\delta = 2.10$ ppm (3H, singlet)
 $\delta = 2.43$ ppm (1H, multiplet)

b. $C_9H_{11}Br$ $\delta = 2.15$ ppm (2H, quintet)
 $\delta = 2.75$ ppm (2H, triplet)
 $\delta = 3.38$ ppm (2H, triplet)
 $\delta = 7.22$ ppm (5H, singlet)