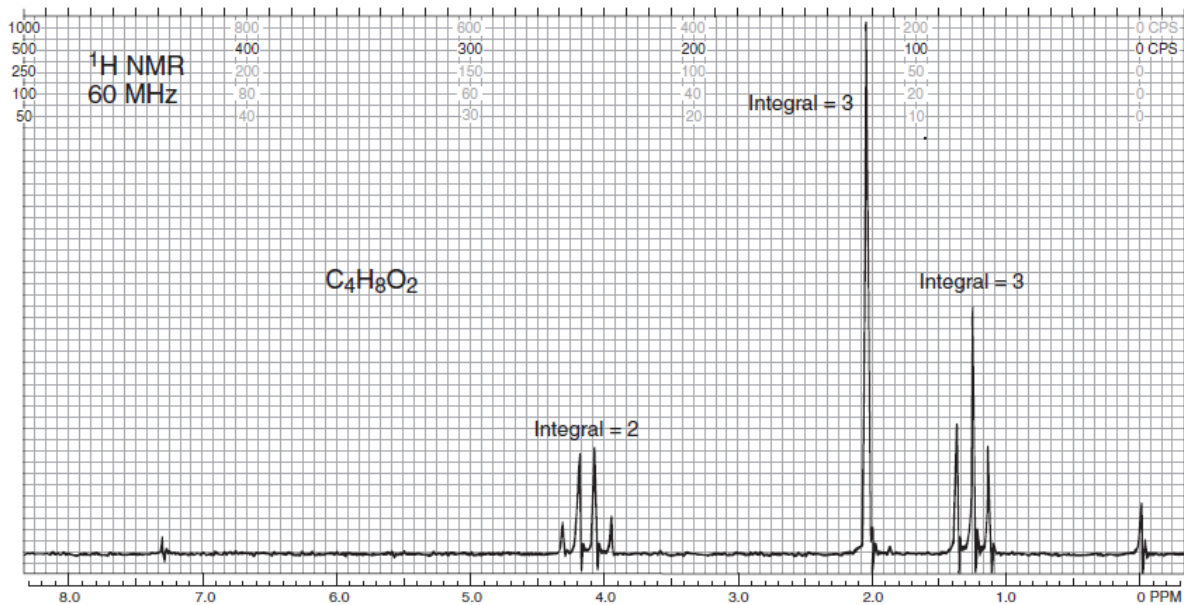


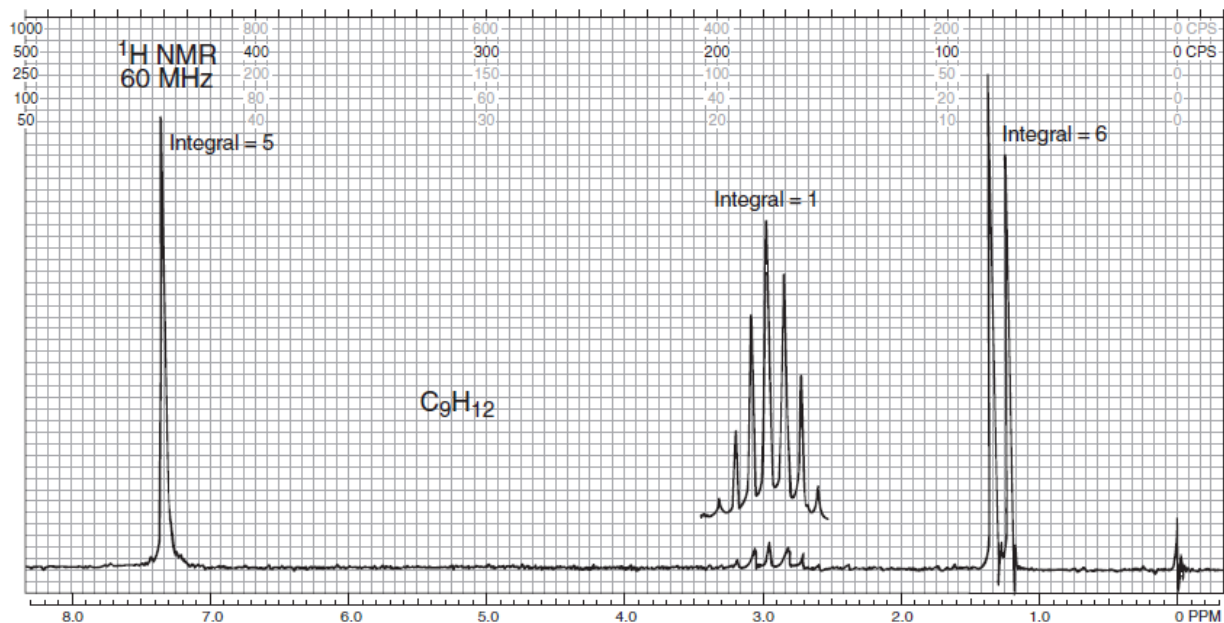
Lecture # 11

Problems

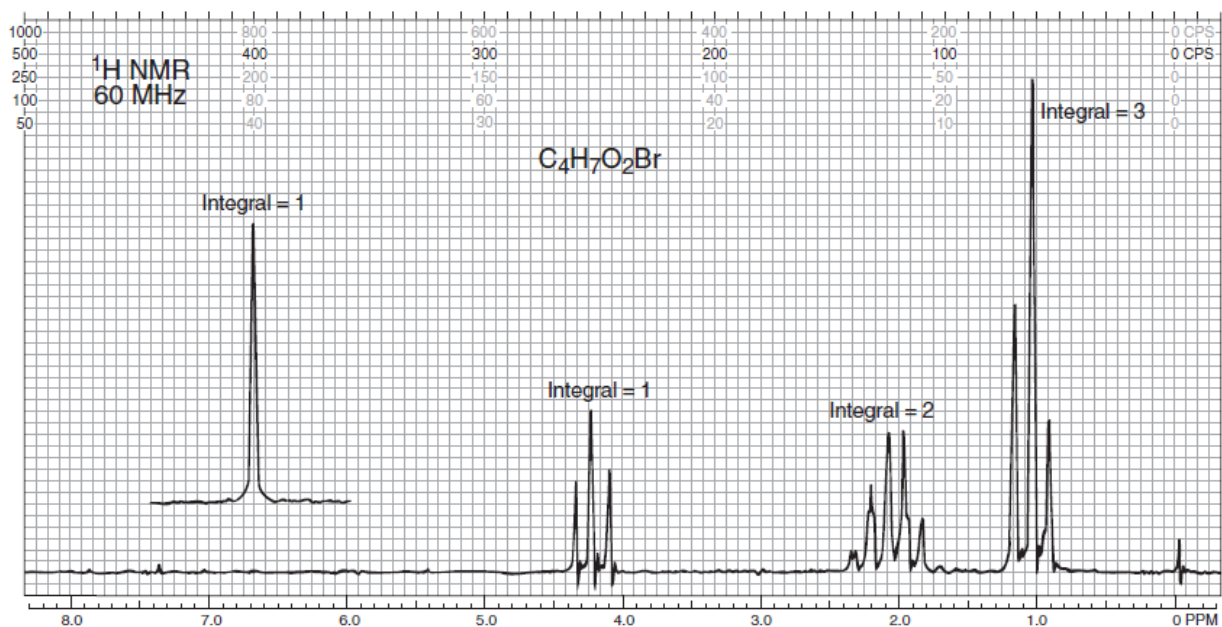
- *14. The following compound, with the formula $C_4H_8O_2$, is an ester. Give its structure and assign the chemical shift values.



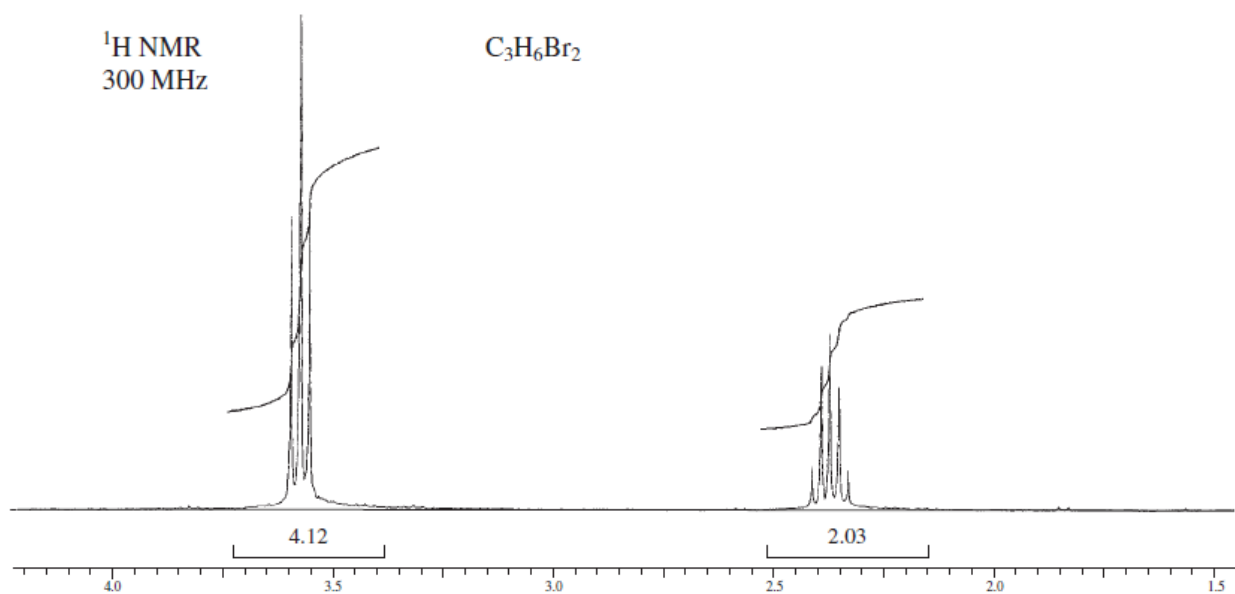
- *15. The following compound is a monosubstituted aromatic hydrocarbon with the formula C_9H_{12} . Give its structure and assign the chemical shift values.



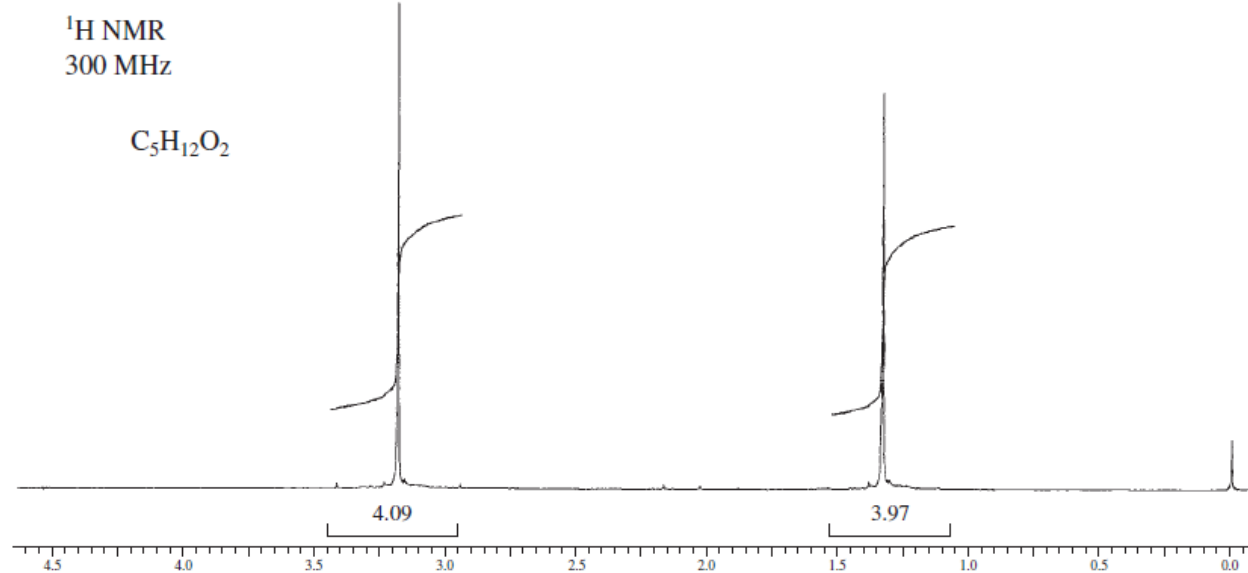
- *16. The following compound is a carboxylic acid that contains a bromine atom: $C_4H_7O_2Br$. The peak at 10.97 ppm was moved onto the chart (which runs only from 0 to 8 ppm) for clarity. What is the structure of the compound?



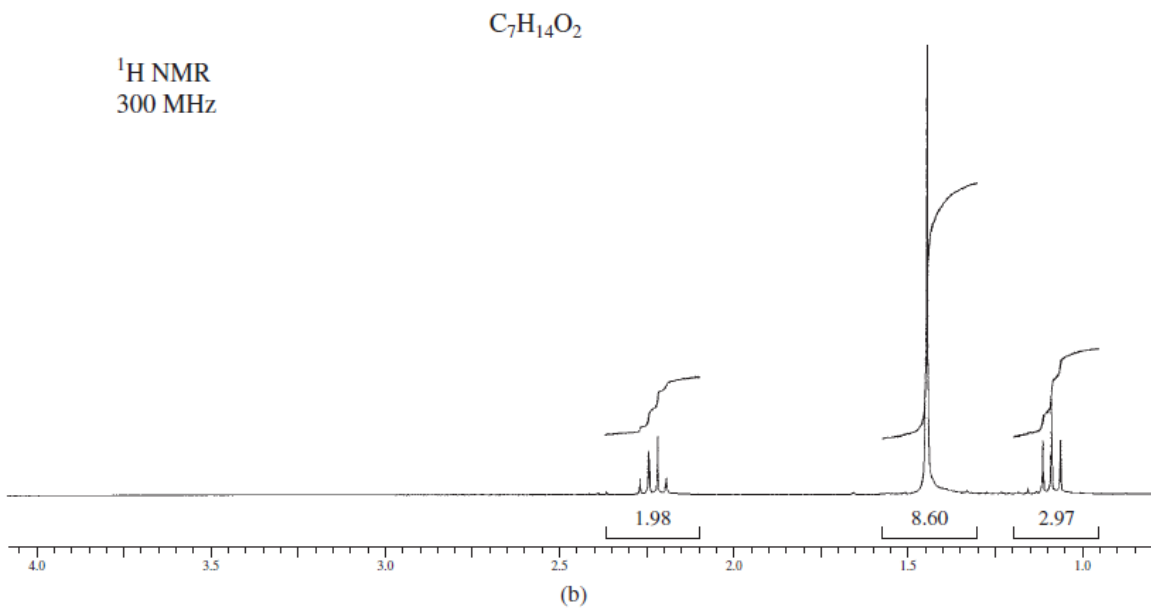
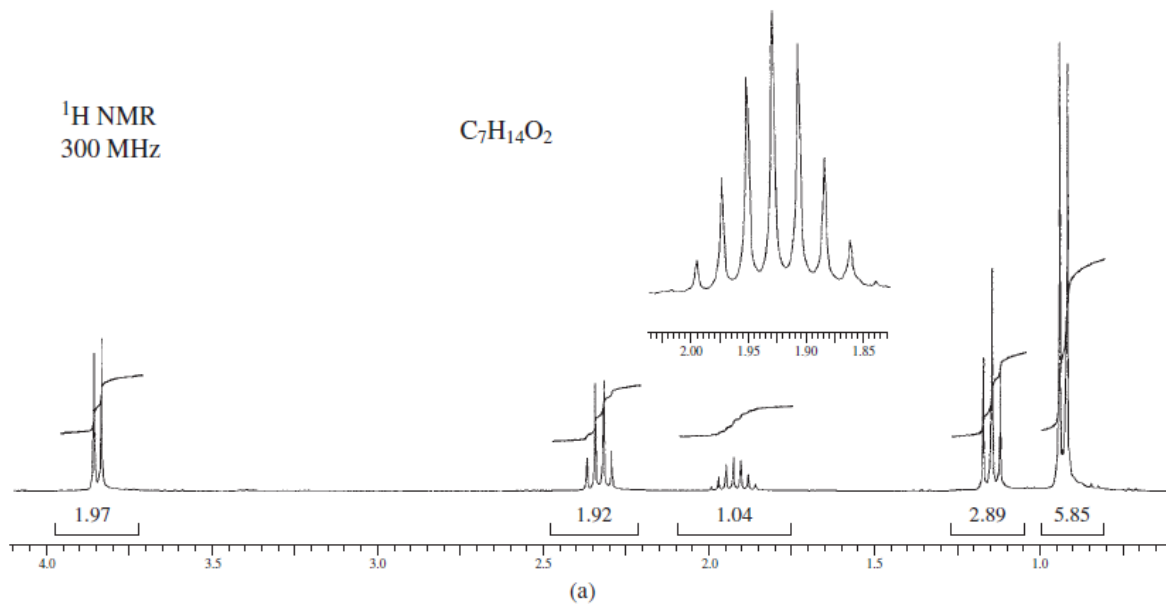
- *17. The compound that gives the following NMR spectrum has the formula $C_3H_6Br_2$. Draw the structure.



*18. Draw the structure of an ether with formula $C_5H_{12}O_2$ that fits the following NMR spectrum:

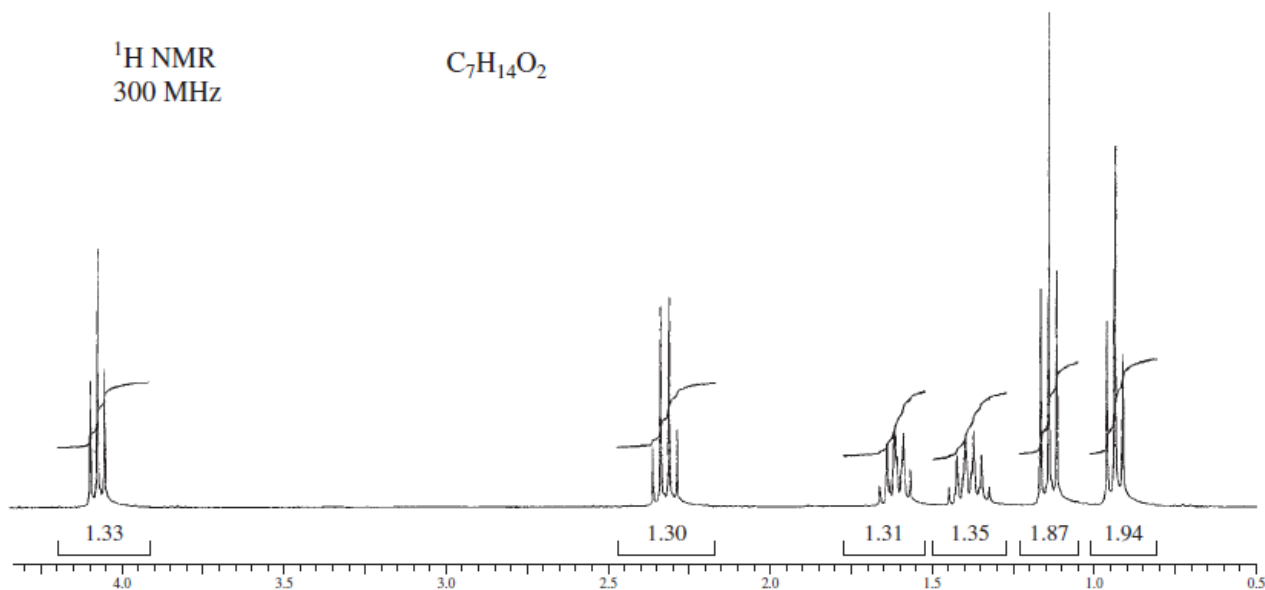


*19. Following are the NMR spectra of three isomeric esters with the formula $C_7H_{14}O_2$, all derived from propanoic acid. Provide a structure for each.



^1H NMR
300 MHz

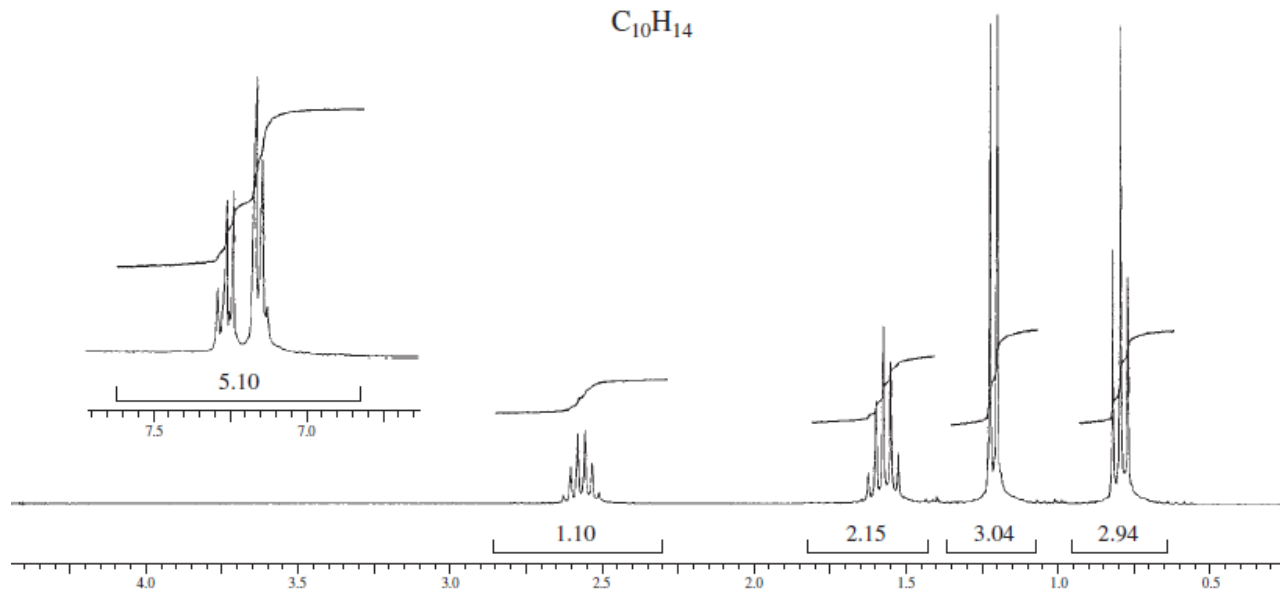
$\text{C}_7\text{H}_{14}\text{O}_2$



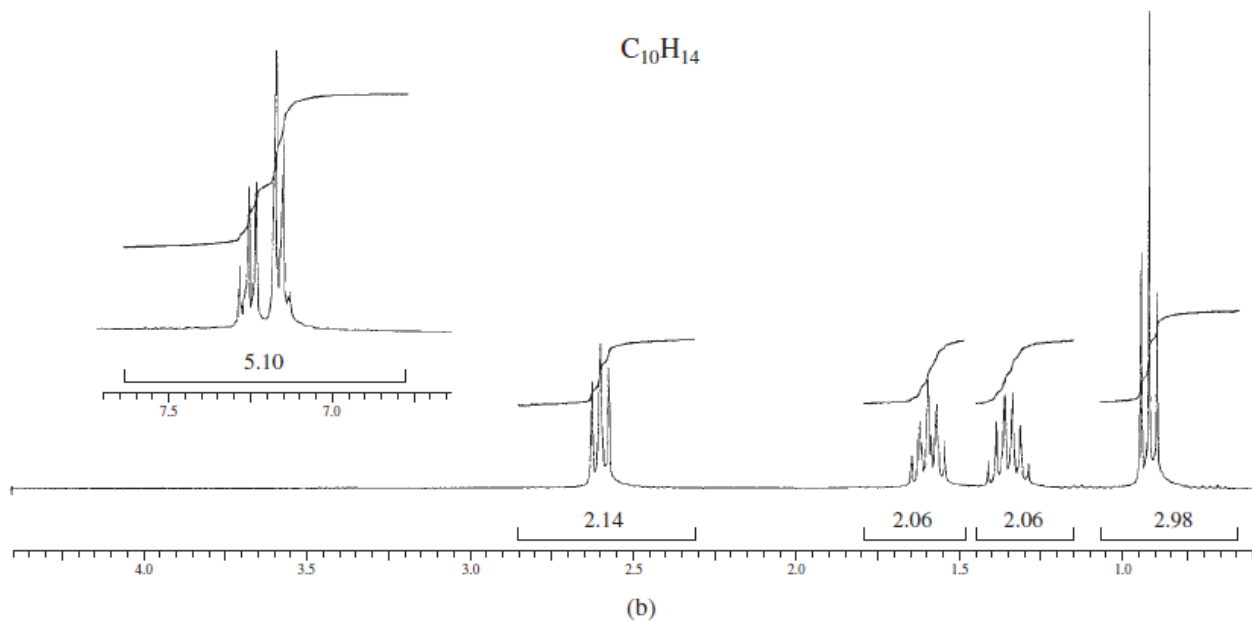
(c)

- *20. The two isomeric compounds with the formula $\text{C}_{10}\text{H}_{14}$ have NMR spectra shown below. Make no attempt to interpret the aromatic proton area between 7.1 and 7.3 ppm except to determine the number of protons attached to the aromatic ring. Draw the structures of the isomers.

$\text{C}_{10}\text{H}_{14}$



(a)



- *21. The compound with the formula $C_8H_{11}N$ has the NMR spectra shown. The infrared spectrum shows a doublet at about 3350 cm^{-1} . Make no attempt to interpret the aromatic proton area between 7.1 and 7.3 ppm except to determine the number of protons attached to the aromatic ring. Draw the structure of the compound.

