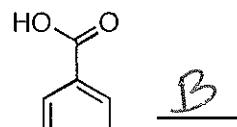


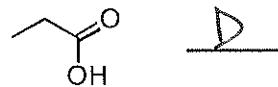
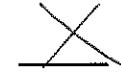
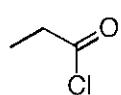
Chem 334, Exam 1
Professor Fox
Spring 2008

Your Name KEY

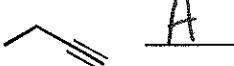
1. Match the following to their IR spectra (24 points) (not all compounds have a match)



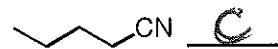
B



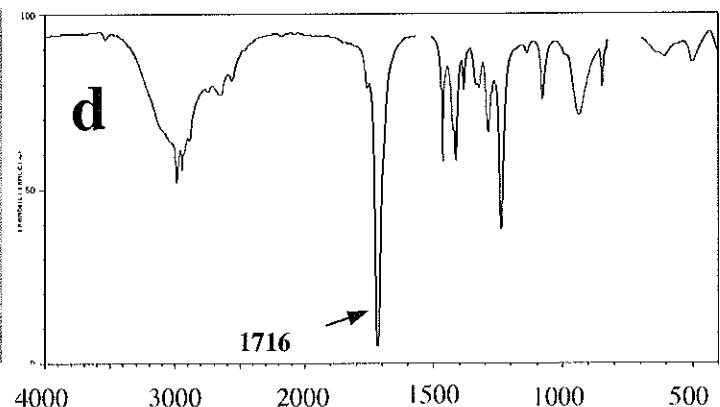
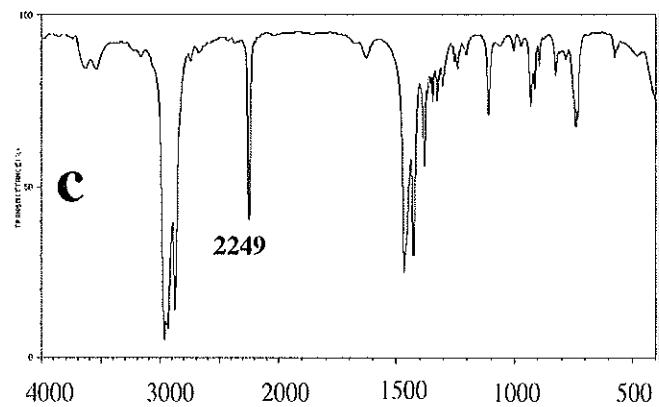
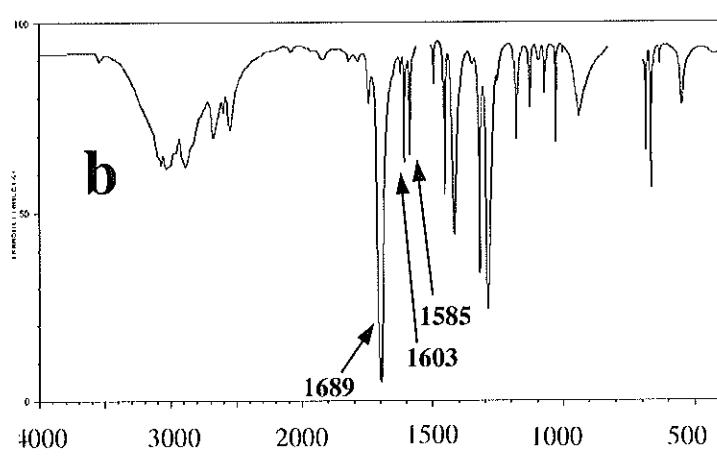
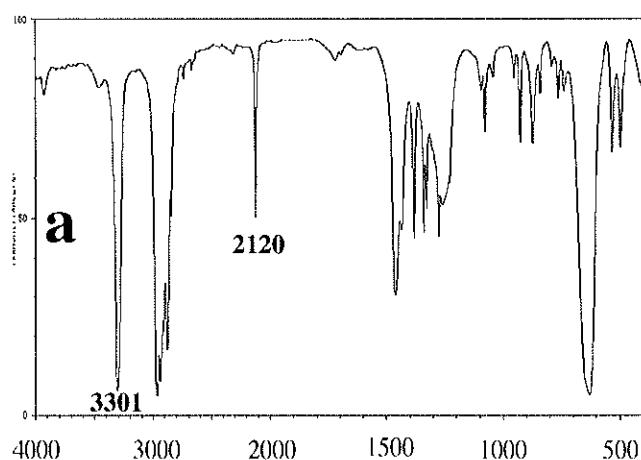
D



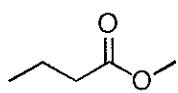
A



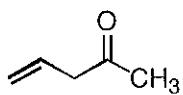
C



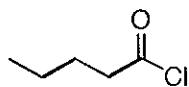
2. Match the following ^{13}C NMR spectra with one of the following substances. Write your answer in the box along side the spectrum



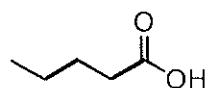
A



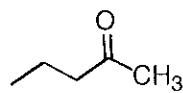
B



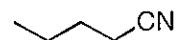
(18 points)



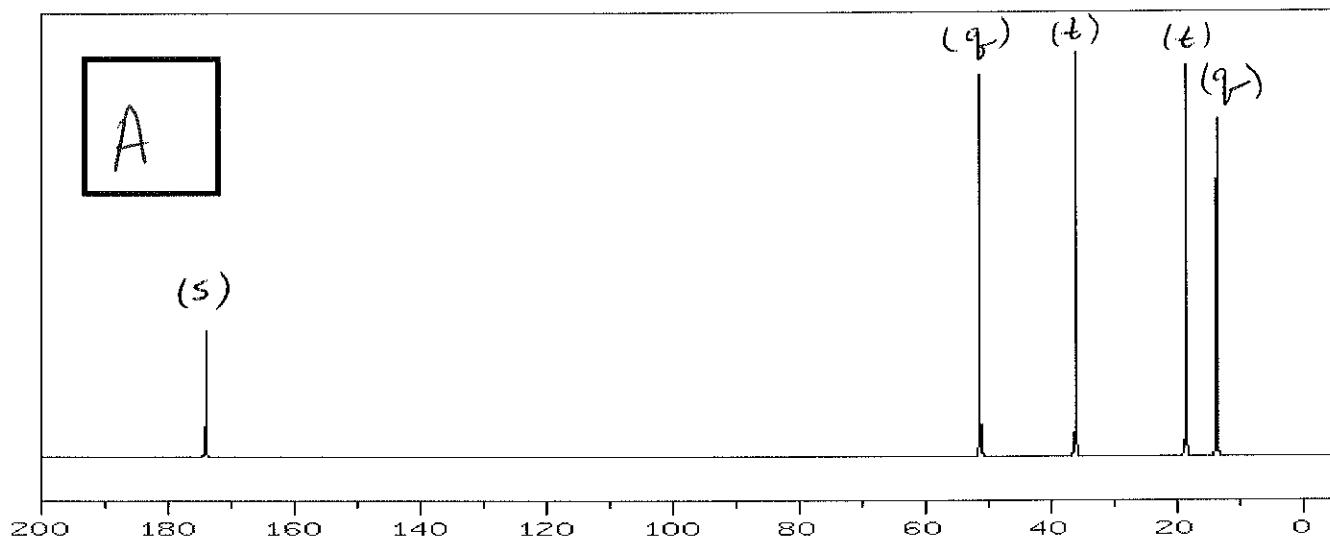
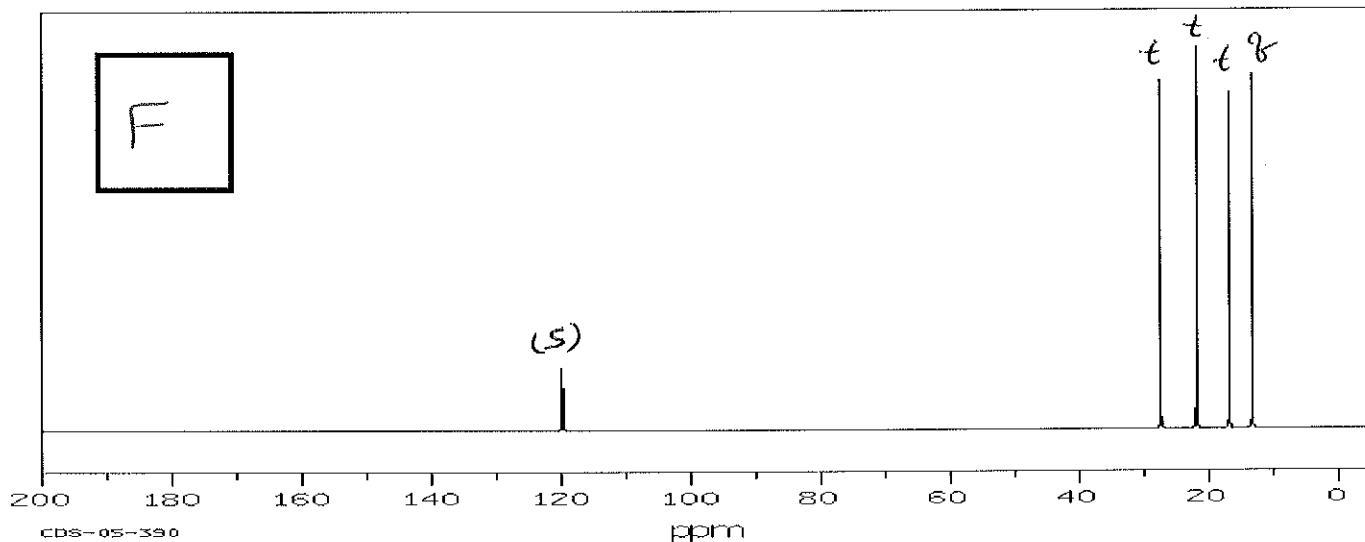
D



E



F



3. Elucidate the following structure

C₁₀H₉O₂Cl

¹H NMR

7.71 (dd, *J*=7.7, 2.2 Hz, 1H)
 7.44 (dd, *J*=8.1, 2.2 Hz, 1H)
 6.95 (dd, *J*=8.1, 7.7 Hz, 1H)
 4.81 (dd, *J*= 10.5, 8.9Hz, 1H)
 4.20 (dd, *J*= 8.9, 7.3Hz, 1H)
 3.60 (m, 1H)
 1.34 (d, *J*= 9.2Hz, 3H)

¹³C NMR

165.7 (s)
 160.6 (s)
 135.4 (s)
 130.2 (d)
 128.9 (d)
 120.5 (d)
 113.5 (s)
 79.5 (t)
 35.9 (d)
 19.2 (q)

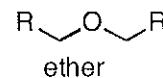
IR: 1775 cm⁻¹

a) Circle the functional group that is associated with

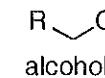
note: "Ar" refers to aryl, or an aromatic ring

(i) IR: 1775 cm⁻¹ (8 points)

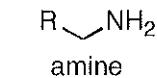
alkane



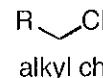
ether



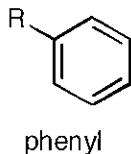
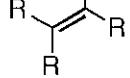
alcohol



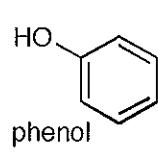
amine



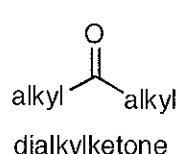
alkyl chloride



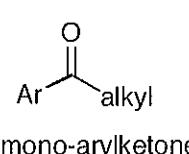
phenyl



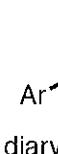
phenol



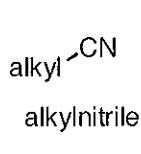
dialkylketone



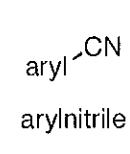
mono-arylketone



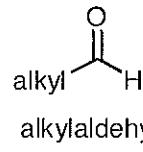
diarylketone



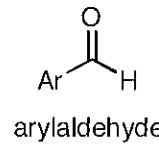
alkylnitrile



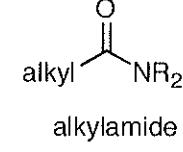
arylnitrile



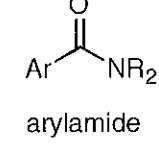
alkylaldehyde



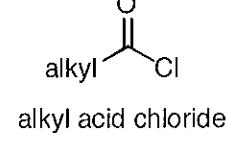
arylaldehyde



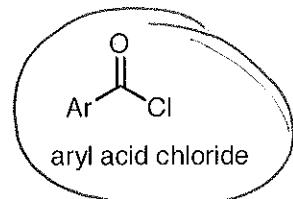
alkylamide



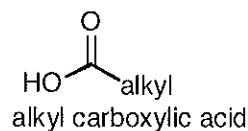
arylamide



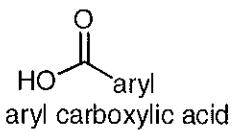
alkyl acid chloride



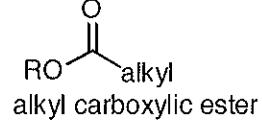
aryl acid chloride



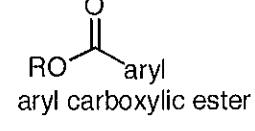
alkyl carboxylic acid



aryl carboxylic acid



alkyl carboxylic ester



aryl carboxylic ester

3. Elucidate the following structure continued

C₁₀H₉O₂Cl

¹H NMR

- 7.71 (dd, $J=7.7, 2.2$ Hz, 1H)
- 7.44 (dd, $J=8.1, 2.2$ Hz, 1H)
- 6.95 (dd, $J=8.1, 7.7$ Hz, 1H)
- 4.81 (dd, $J=10.5, 8.9$ Hz, 1H)
- 4.20 (dd, $J=8.9, 7.3$ Hz, 1H)
- 3.60 (m, 1H)
- 1.34 (d, $J=9.2$ Hz, 3H)

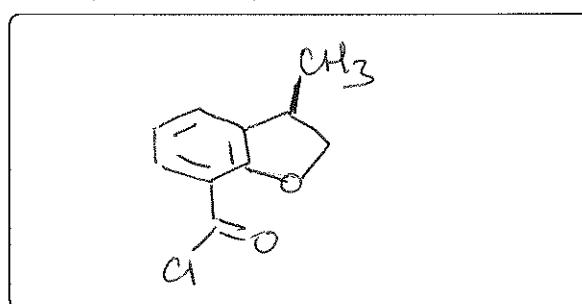
¹³C NMR

- 165.7 (s)
- 160.6 (s)
- 135.4 (s)
- 130.2 (d)
- 128.9 (d)
- 120.5 (d)
- 113.5 (s)
- 79.5 (t)
- 35.9 (d)
- 19.2 (q)

IR: 1775 cm⁻¹

b) draw the structure of the product (no partial credit)

(20 points)

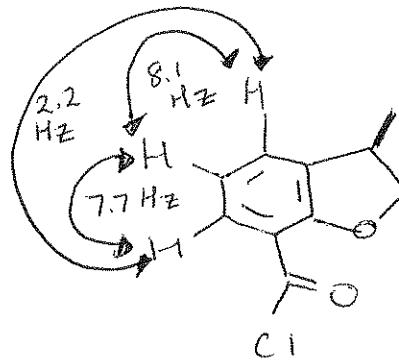


also accepted



c. Assign the following coupling constants: (15 points)

- 7.71 (dd, $J=7.7, 2.2$ Hz, 1H)
- 7.44 (dd, $J=8.1, 2.2$ Hz, 1H)
- 6.95 (dd, $J=8.1, 7.7$ Hz, 1H)



d. Assign the following coupling constants: (15 points)

- 4.81 (dd, $J=10.5, 8.9$ Hz, 1H)
- 4.20 (dd, $J=8.9, 7.3$ Hz, 1H)
- 3.60 (m, 1H)
- 1.34 (d, $J=9.2$ Hz, 3H)

HINT: the peak at 3.60 is coupled to the peaks at 4.81, 4.20 and 1.34

