Chem 334, Exam 1
Professor Fox
Spring 2009

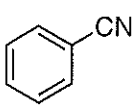
Your Name Key

Your TA's Name_____

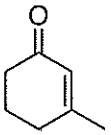
key

(24 points) (not all compounds have a match)

1. Match the following to their IR spectra

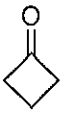


X

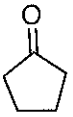


A

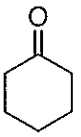
B



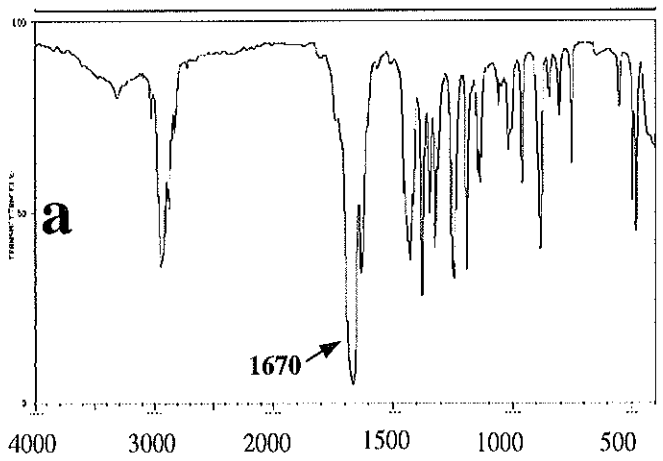
C

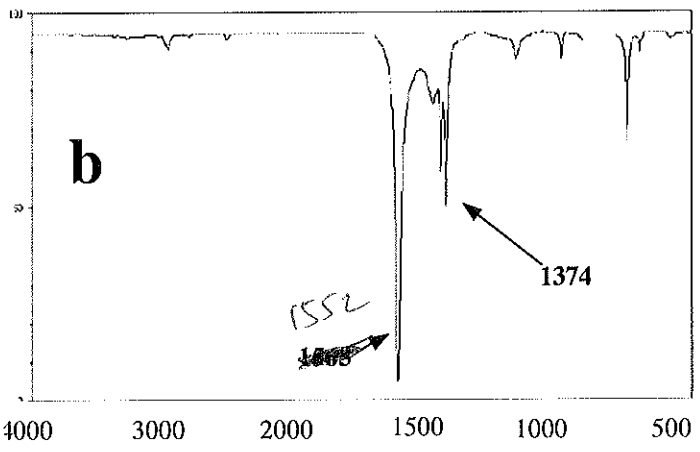


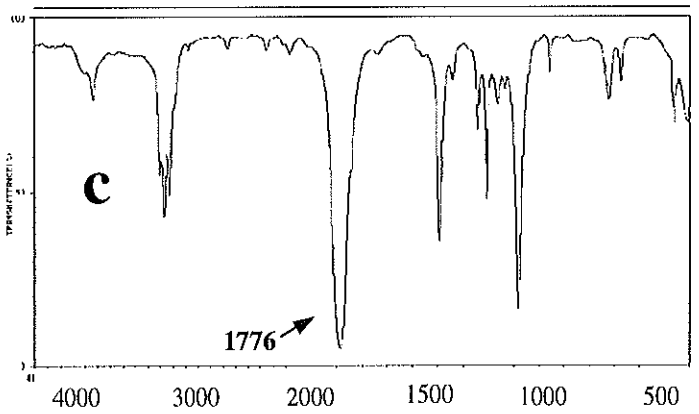
D

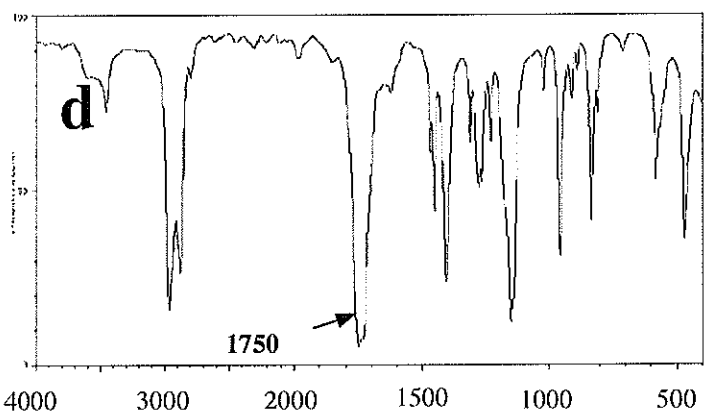


X

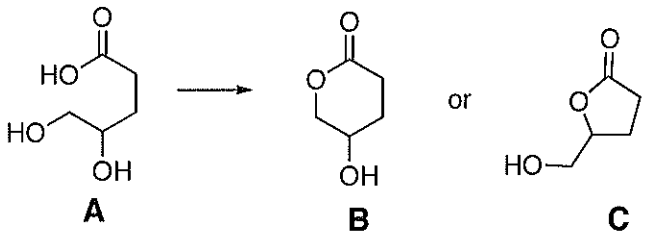








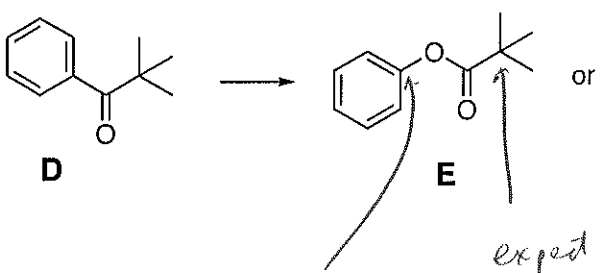
2. Dehydration of **A** could lead to either **B** or **C**. Explain how you would use IR spectroscopy to distinguish these compounds (12 points)



expect C=O stretch at 1730 cm^{-1}

expect C=O stretch at 1770 cm^{-1}

3. Oxidation of **D** could lead to either **E** or **F.** Explain how you would use ^{13}C NMR to distinguish these compounds. (12 points)



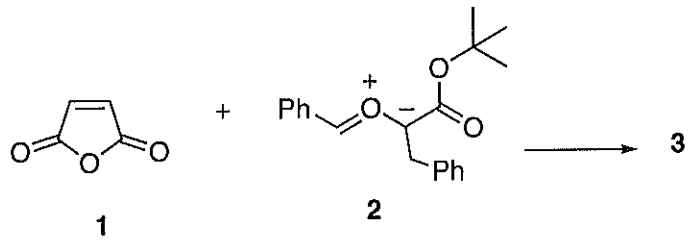
expect ~153 ppm (s)

expect ~40 ppm (s)

expect ~130 ppm (s)

expect ~73 ppm (s)

4. The reaction of compounds **1** and **2** produces compound **3**.



1 **2** **3**

Spectroscopic data for **3**

IR: 1866, 1790, 1743 cm^{-1}

$C_{24}H_{24}O_6$

^{1}H NMR

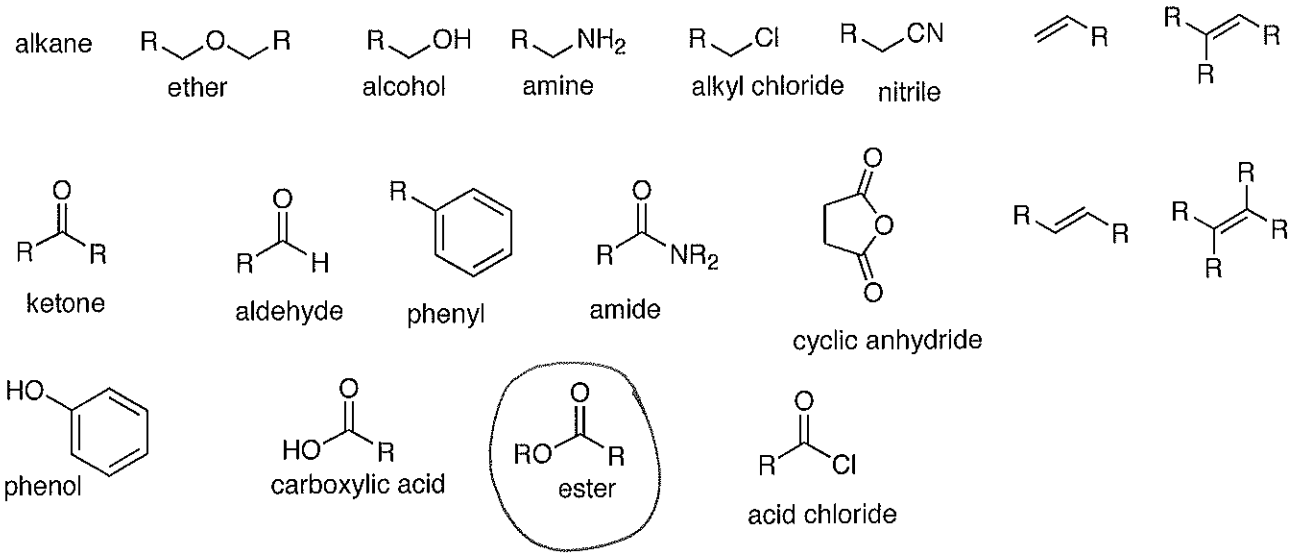
7.34-7.31 (m, 5H)
7.27-7.20 (m, 5H)
5.33 (d, J=8.6 Hz, 1H)
3.79 (d, J=8.9 Hz, 1H)
3.71 (dd, J=8.6, 8.9 Hz, 1H)
3.31 (d, J=14.1 Hz, 1H)
3.21 (d, J=14.1 Hz, 1H)
1.44 (s, 9H)

^{13}C NMR

168.6 (s)
167.4 (s)
167.0 (s)
135.1 (s)
134.5 (s)
130.3 (d, 2 carbons)
129.0 (d, 2 carbons)
128.6 (d, 2 carbons)
128.5 (d, 2 carbons)
127.4 (d)
126.2 (d)
88.9 (s)
84.0 (s)
82.0 (d)
55.2 (d)
52.0 (d)
41.7 (t)
27.7 (q, 3 carbons)

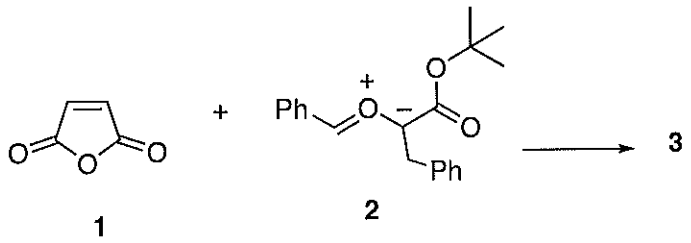
b) Circle the functional group that is associated with (8 points)

(i) IR: 1743 cm^{-1}



4. The reaction of compounds **1** and **2** produces compound **3**.

continued



1 **2**

Spectroscopic data for **3**

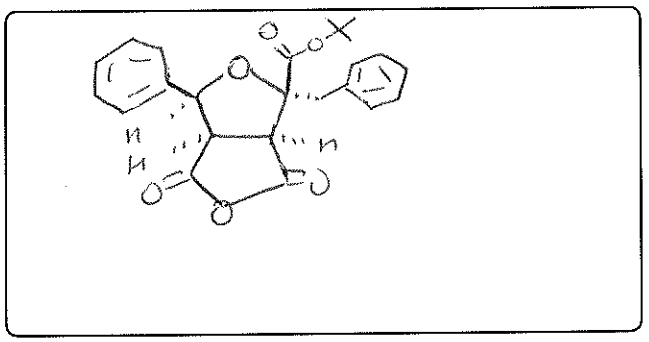
IR: 1866, 1790, 1743 cm^{-1}

$C_{24}H_{24}O_6$

^{1}H NMR	^{13}C NMR	
7.34-7.31 (m, 5H)	168.6 (s)	128.5 (d, 2 carbons)
7.27-7.20 (m, 5H)	167.4 (s)	127.4 (d)
5.33 (d, J=8.6 Hz, 1H)	167.0 (s)	126.2 (d)
3.79 (d, J=8.9 Hz, 1H)	135.1 (s)	88.9 (s)
3.71 (dd, J=8.6, 8.9 Hz, 1H)	134.5 (s)	84.0 (s)
3.31 (d, J=14.1 Hz, 1H)	130.3 (d, 2 carbons)	82.0 (d)
3.21 (d, J=14.1 Hz, 1H)	129.0 (d, 2 carbons)	55.2 (d)
1.44 (s, 9H)	128.6 (d, 2 carbons)	52.0 (d)
		41.7 (t)
		27.7 (q, 3 carbons)

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

(21 points)



Any stereoisomer accepted.

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

5.33 (d, J=8.6 Hz, 1H)

3.79 (d, J=8.9 Hz, 1H)

3.71 (dd, J=8.6, 8.9 Hz, 1H)