**Chemistry 333 Fall 2010**
**Organic Lab Lecture**

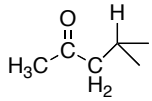
**Name:**_____

**Exam #2**

This is an open-book, open notes exam. Show your work, so you can receive credit for correct parts of the final molecule.

1. (20 points) $C_6H_{12}O_3$

| **$^{13}$C NMR** | **$^{1}$H NMR** |
|---|---|
| 205.2, s | 2.20, s, 3H |
| 101.5, d | 2.75, d, J =7.2 Hz, 2H |
| 53.8, q (2) | 3.35, s, 6H |
| 47.3, t | 4.80, t, J=7.2 Hz, 1H |
| 31.0, q | |

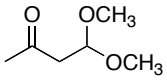
Step 2:  from generic chemical shifts: 

205.2, s = ketone

2.20, s, 3H 2.75, d, J=7.2 Hz, 2H

Step 3: Two ethers. From generic chemical shifts,  note symmetry

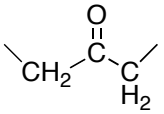
There is also  101.5, d

Putting it all together: 

2. (40 points) $C_7H_{12}O$

**$^{13}$C NMR**
211.6, s
50.0, t
41.1, t
34.2, d
33.3, t
25.3, t
22.1, q

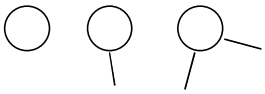
**$^{1}$H NMR**
1.05, d, J=7.3 Hz, 3H
1.30, m, 1H
1.60, m, 1H
1.95, m, 3H
2.4, m, 4H

Step 2:  from generic chemical shifts:  50.0, t
41.1, t

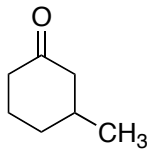
205.2, s = ketone

2.4, m, 4H

one ring



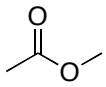
For every side chain attached to the ring, there must be one branching carbon and one end group. We have only one branching carbon, 34.2 d, and only one end group, 22.1, q, so the middle cartoon must represent the molecule. The methyl group is 1.05 d, so it must be directly attached to the ring



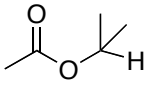
3. (40 points) $C_{10}H_{16}O_2$ IR: 2932, 2854, 1825, 1132 $cm^{-1}$

**$^{13}$C NMR**
172.9, s
79.0, d
46.8, d
37.7, d
28.9, t (2)
28.1, t
25.0, t (2)
8.4, q

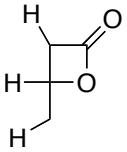
**$^{1}$H NMR**
4.18, dd, J = 10.6, 6.3 Hz, 1H
3.72, qd, J = 7.8, 6.3 Hz, 1H
2.01-1.92, m, 1H
1.82-1.52, m, 5H
1.34, d, J = 7.8 Hz, 3H
1.32-1.19, m, 3H
1.07-0.88, m, 2H



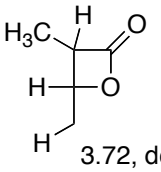

172.9, s is an ester



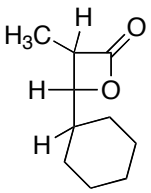

79.0, d tells us that there is one H where the O is attached




1825 $cm^{-1}$ tells that it is a four-membered ring lactone. 4.18 dd tells us that there is one H on each side




3.72, dq, tells us that the H next to the carbonyl is also next to a $CH_3$




One more ring, with symmetry, and no additional branching