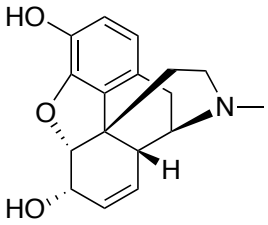
Chemistry 235
Experiment 13 – Report Sheet

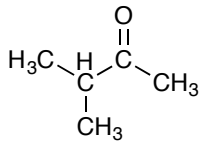
Name:	Lab Room:	Desk #:

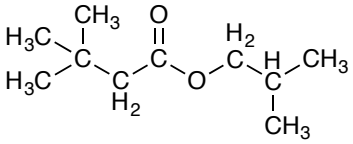
Pre-Lab Questions (Complete Prior to Lab)

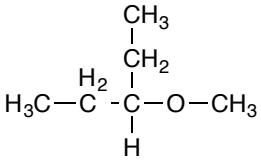
1. The structure of morphine is shown below. How many chemically distinct types of hydrogen are present in this molecule?



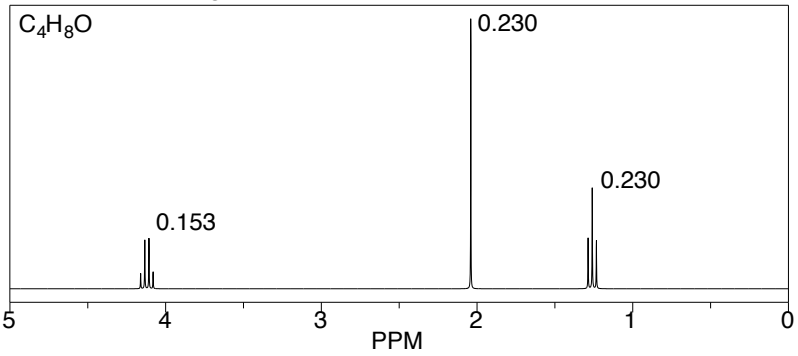
2. Predict the expected multiplicity (singlet, doublet, etc.) for every distinct set of hydrogen in each molecule below.



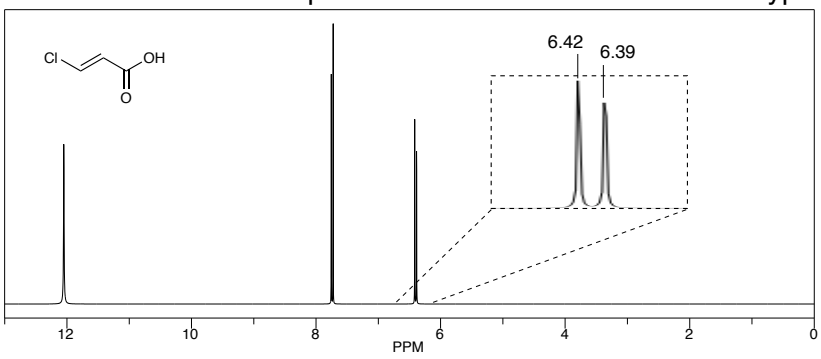




3. Consider the NMR spectrum shown below. The integration values are not normalized. Normalize every integration by dividing each integration value by the lowest integration value. Do your values add up for the correct number of hydrogen? If not, multiply each value by a common number to get the correct total number of hydrogen represented.



4. Calculate the coupling constant *(J)* for the NMR signal at δ 6.4 ppm shown below. A 500 MHz instrument was used to record the spectrum. You will find that this is a typical coupling constant for *trans*-alkenes.



Experimental Data (Complete During Lab)

For each unknown, record the IR spectrum then go through the IR and pick out key absorptions. List these absorptions in the table below along with the structural/functional group assignment for each absorption. Using this data and the supplemental tables of possible IR unknowns, narrow down your unknown to three (or fewer) potential compounds.

Unknown Number:	
Key IR Absorptions	**Assignment**
NMR Signals	**Group Assignment**
i.e. 2.2 ppm, t, 2H	$-CH_2-$

Identification:	**Additional Notes:**

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Key IR Absorptions	**Assignment**
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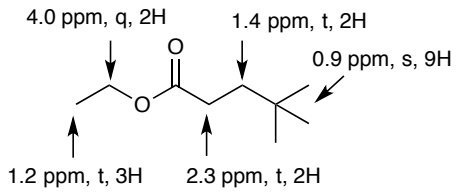
Identification:	**Additional Notes:**

Post-Lab Questions (Complete Following Lab)

1. A careless student mistakenly dissolved his sample in non-deuterated chloroform ($CHCl_3$). What do you think resulted in the corresponding NMR spectrum that he recorded?

2. For each compound shown below, predict the expected IR and NMR data. Record the NMR data in the form (chemical shift, multiplicity, integration). You chemical shift values and IR absorption values only need to be a rough approximation. The first molecule is already assigned to provide an example.



IR Data: C=O, 1740 cm^{-1}
Csp^3-H, 2930-2990 cm^{-1}
Csp^2-O, 1250 cm^{-1}
Csp^3-O, 1050 cm^{-1}