

Rubric for 5.35 Module 1 Oral Examination of \_\_\_\_\_  
 Exam taken on October 1/2 2012 at \_\_\_\_\_.

	<b>Key points:</b>	<b>Extra Comments:</b>	<b>Points:</b>
<b>Experiment 1</b> <i>Explain Interferometry</i>	<ul style="list-style-type: none"> <li>- Interference</li> <li>- Role of sample/reference.</li> <li>- Fourier Transform</li> </ul>		____/5
<b>Experiment 2</b> <i>Beer-Lambert</i>	<ul style="list-style-type: none"> <li>- Demonstrate knowledge of Law &amp; utility.</li> </ul>		____/5
<b>Experiment 3</b> <i>Aromatic Hydrocarbs</i>	<ul style="list-style-type: none"> <li>- Explain PIB</li> <li>- Lengths of boxes</li> <li>- How well does the model fit the system? What improvements should be made? How is error evident in the model?</li> </ul>		____/6
<b>Experiment 4</b> <i>Quantum Dots</i>	<ul style="list-style-type: none"> <li>- What are QDots? Explain the expression in the Procedure.</li> <li>- Calculate dot sizes.</li> <li>- Why is there broadening?</li> </ul>		____/6
<b>Experiment 5</b> <i>Chloroform IR</i>	<ul style="list-style-type: none"> <li>- Compare interferograms.</li> <li>- Explain isotope effect (and show in spectrum, including calculated frequency shift).</li> <li>- Assign the major shifted peaks in IR spectrum.</li> </ul>		____/5
<b>Experiment 6</b> <i>IR of Essential Oils</i>	<ul style="list-style-type: none"> <li>- Assign peaks &amp; explain location (force constants, etc.)</li> <li>- Compare between oils.</li> <li>- How are the enantiomers different?</li> </ul>		____/5
<b>Experiment 7</b> <i>VT-IR of Proteins</i>	<ul style="list-style-type: none"> <li>- What are secondary structures in proteins?</li> <li>- How do secondary structures appear in IR?</li> <li>- What information about secondary structure can you get from IR?</li> <li>- Show how the protein changes over <math>\Delta T</math> in the spectrum and explain the associated molecular changes.</li> </ul>		____/10
<b>Experiment 8</b> <i>15 MHz NMR</i>	<ul style="list-style-type: none"> <li>- Find <math>\Delta</math>, <math>\gamma_1</math>, <math>\gamma_2^*</math>, <math>\gamma</math> and <math>\Gamma</math> as described in manual (and office hours). Explain these</li> </ul>		____/15

	<p>variables and what contributes to them.</p> <ul style="list-style-type: none"> <li>- Explain resonance and precession in the NMR experiment.</li> <li>- Why only one peak in FT?</li> <li>- Explain a <math>\pi</math> and <math>\pi/2</math> pulse (include for each sample). Bloch sphere may be helpful.</li> <li>- Explain pulse sequences.</li> <li>- Compare 53% and 30% glycerol in H<sub>2</sub>O.</li> </ul>		
<b>Experiment 9</b> <i>300 MHz NMR</i>	<ul style="list-style-type: none"> <li>- Why is 300 MHz better resolution?</li> <li>- What is the basis for coupling?</li> <li>- Coupling constants, integrations &amp; identify compounds.</li> <li>- Relative concentrations in mixture.</li> </ul>		____/5
<b>Discussion of Lineshape</b>  <i>(should be discussed at some point in presentation)</i>	<ul style="list-style-type: none"> <li>- Origin of broadness</li> <li>- Fourier transforms</li> <li>- Decay (how is it present in the spectra and what causes it?)</li> </ul>		____/10
<b>Explanation of Abs./Fluor. Spectroscopy</b>	<ul style="list-style-type: none"> <li>- Explain difference between the experiments.</li> </ul>		____/5
<b>Explanation of NMR Spectroscopy (Theory)</b>	<ul style="list-style-type: none"> <li>- Explain basic NMR experiment.</li> <li>- Explain FID and FT to acquire spectrum.</li> </ul>		____/5
<b>Error Analysis</b>	Discuss error in measurements/models and experiments.		____/8
<b>Other (Students May Choose to Pick an Extra Type of Spectroscopy to Discuss Here, or to Elaborate upon a Previously Discussed Technique)</b>			____/5
<b>Referencing Problems</b>	Are all of the relevant new pieces of data/information referenced appropriately?		____/5

\_\_\_\_/100

For your presentations:

We will not have time in our 30 minute presentations to address every data point that you collected. In order to make sure that we cover everything, we will need to skip over some of the experiments. Some experiments lend themselves to this more than others. Specifically, the more math-heavy experiments should have more self-explanatory slides that allow me to look over your numbers beforehand so that we do not need to dwell on things during the presentations. You will need to discuss all three different spectroscopic techniques we discussed during this lab, but I will ask that you choose one type of spectroscopy to talk about in more detail than the other two. Please discuss this one topic last in your presentation so that we can get through everything else first and will have time to delve into more detail at the end. You are of course welcome to go beyond the specific requirements of the course if you would like, and I will only reward you for learning more, but you will not be penalized for only discussing things directly related to these 9 experiments.

**You will be required to send me a copy of your presentation by the midnight preceding your exam date. This means that if you are presenting on Monday, you must send me the presentation by Sunday at midnight (technically 12AM Monday), and if you are presenting on Tuesday you must send me the presentation by Monday at midnight (or 12AM Tuesday).**

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5.35 / 5.35U Introduction to Experimental Chemistry  
Fall 2012

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