The University of Vermont

CHEM 201: Advanced Chemistry Laboratory

Chem 201 Syllabus - Spring 2016

Course Description:

What the UVM Catalogue says about CHEM 201 - Advanced Chemistry Laboratory: "Discussion and laboratory experiments using spectroscopy techniques (mass spectrometry, NMR, IR, UV/visible, and atomic spectroscopy) to solve problems in analytical, physical, and inorganic chemistry."

And that is what we hope we have for you in CHEM 201:

- Infrared spectroscopy in *lab 1* and again in *lab 2 & 4*
- NMR spectroscopy in *lab 3* and again in *lab 4*
- UV/visible and excitation/emission (fluorimetry) spectrometry in *lab 2*
- Inductively coupled plasma (ICP) atomic emission spectroscopy in *lab 5*
- Mass spectrometry in *lab 6*

Learning Goals:

- **To apply knowledge of chemical and physical principles to the solution of qualitative and quantitative chemical problems**
- **To understand the interplay of observational data, hypotheses, and hypothesis-driven experimentation through application of the scientific method**
- To become proficient in chemical laboratory techniques and apply these techniques to practical and current problems in research
- To be able to read and critically evaluate the chemical and scientific literature
- **To learn to present scientific data clearly and effectively through both written and verbal communication**

Prerequisites that are important:

- **CHEM 161 (recommended, but not required)** – *Because CHEM 201 is the place where we will put in practice the knowledge in quantum chemistry, CHEM 161 is recommended to*

Get info

Lab oral presentation:

Communication skills are critical to success in a career in science. Everyone has to present their work during their careers. Here is a perfect opportunity for you to begin in a less threatening environment.

- **Each student chooses one of the six laboratory experiments to present orally to the class, rather than as a written lab report.** The basic format will be the same as the written lab reports.
- You will have ~30 min to present and 10 min for the audience (your class & instructors) to ask questions.
- An overhead computer-projection device projector that connects to a PC and an overhead display camera will be available for your talk, or you may bring your own laptop to attach.
- The schedule for the oral presentation will be 1st-come 1st-served. You need to send an e-mail to me (**DEM**) stating which presentation date you wish to reserve and which laboratory you wish to present.
- **See the link in the menu above** for details about the oral presentation.

General lab format:

- At the start of each lab, your TA will get together with you to discuss the experiment to be done. This is your best chance to ask questions. Preliminary reading assignments, the general plan for the experiment, etc. will have been given to you at least a week in advance of the experiment.
- Key to success in the course is a positive mental attitude when you arrive to start a lab. We will have done the best we can in preparing an experiment, but Murphy's law will sometimes strike, causing delays or slowing completion of experiments. Should extraordinary difficulties occur, your TA will work with you to extend working hours or to complete the experiment at another time.
- We have planned each laboratory so that all necessary data can be obtained within the scheduled laboratory time, but sometimes more time may be needed.

Brief Synopsis of the Laboratory Experiments:

Lab #1: FT-IR

1 lab day. You will learn how to use a high resolution Fourier transform-infrared spectrometer (FT-IR). We will take advantage of the FT-IR's high spectral resolution to measure various physical chemical vibrational properties of diatomic gases. The 1st gas to be studied will be CO at normal and high resolution modes. The 2nd gas will be HCl. Here you will be able to distinguish the isotopes of ^{35}Cl and ^{37}Cl. You will also prepare ^{2}HCl and measure the spectrum of ^{2}HCl. You will calculate the physical chemistry rotational and rotational-vibrational parameters for both ^{1}HCl and ^{2}HCl. You will also calculate bond strengths from the measured mechanic parameters of these oscillators.

Lab #2: Molecular Spectroscopy

1 lab day. You will use our resea /Styl- Tf- -0.0007 0.0Gw d.0027Ffde UV4 (8Tc -)((FT-ors.)]T 8032 Tc 0nfur epan ⁄eparur rb 6i3 (u)-2F2 (r