

CHEM5720 – ADVANCED PHYSICAL CHEMISTRY LABORATORY**SYLLABUS****Instructor: Prof. Michael H. Bartl**

Department of Chemistry
 Office: HEB-South Rm.4402
 Phone: 801-585-1120
 Email: bartl@chem.utah.edu

Secretary: Ms. Jiliane Eizember (HEB-South Rm 2420; eizember@chem.utah.edu)

Office Hours

You are welcome to stop by my office/labs anytime, and if I am available, I will try to help you out. If you want to make an appointment first, please send me an email. TA office hours will be posted on our CANVAS site.

Lectures	TH 12:55-1:45 PM JFB-101 (James Fletcher Physics Building)
Laboratory	Section 2: TH 2:00-6:00 PM HEB-4215
	Section 3: MW 1:00-5:00 PM HEB-4215
	Section 4: TH 6:00-10:00 PM HEB-4215

Course Objectives

In the laboratory part of this course, each student will perform four experiments. Each experiment will be performed by two students working together, but all lab reports will be written separately. In the lecture portion of the course, we will discuss the science and instrumentation of physico-chemical experiments (light, lasers, electronics and semiconductors), data and error analysis, and the scientific literature.

Expected Learning Outcomes

By the end of this course, students are expected to master the following important skills:

- thorough preparation for each experiment by studying lab handouts and links therein
- master the safety requirements and lab skills to perform physico-chemical experiments
- knowledge of how to keep records of instruments, parameters, and experimental observations
- reporting of experimental results (including error analysis) in a publication-style (journal paper)
- appreciation for modern problems and scientific controversies in physical chemistry
- key spectroscopic techniques including FTIR, UV-vis absorption, luminescence, laser methods
- use of chemistry software programs to model energy potentials and vibrational levels of molecules
- set-up and use of standard vacuum and cryogenic techniques used in physico-chemical experiments

Textbooks

- John R. Taylor, *An Introduction to Error Analysis*, 2nd Ed., University Science Books, Sausalito, CA.
- Thomas Engel, Philip Reid, *Physical Chemistry*, 2nd Ed., Pearson Education, Upper Saddle River, NJ.

Lab Experiments and Schedule

Each student is expected to select a lab partner to perform the lab experiments together. Each student pair will be assigned four lab experiments out of the list given below. Handouts for each of the experiments are posted on the course website for downloading. If there are particular experiments that you would like to perform, I will try to assign you to these experiments. However, due to scheduling conflicts that might not always be possible. Each student is expected to select a partner by 6 pm on Monday, March 4, 2013—please send me an email with your lab section and the name of your partner. Students who have not sent me an email with the lab partner selection by **6 pm on Monday, March 4, 2013**, will be assigned a partner by the instructor. The final assignment to your four lab experiments will be handed out in class and posted on our website. The lab experiments of this course are:

- Nanocrystal “Quantum Dots”
- Kinetics of a Solvolysis Reaction
- Infrared Spectroscopy of HCl/DCI
- Quantum Chemical Calculations
- Kinetics of a Unimolecular Reaction
- Lattice Energy of Solid Argon
- Laser-Induced Fluorescence Spectroscopy of Iodine
- Bomb Calorimetry
- Structure and Molecular Weight of Polyvinyl Alcohol (Solution Viscometry)

Lab Safety

Prior to entering the laboratory it is the responsibility of each student to become familiar with potential safety hazards of each experiment and to learn the location and instructions of safety equipment located in the lab. Each student shall wear safety glasses at all times in the lab. Any student who jeopardizes the safety of her/himself or others in the lab as a result of failing to observe proper safety procedures will be dismissed from the lab and given a zero for the lab report score.

Pre-Lab Quizzes

Before conducting a lab experiment each student is required to study the lab handout and review the physico-chemical background information (as indicated on each lab handout) for the experiment to be performed. The lab handouts for all experiments are available for downloading from the course website. Each student must then take a pre-lab quiz at the beginning of the lab session about the experiment scheduled for the afternoon. The pre-lab quizzes will be handed out by the TA in charge of the experiment and will be used to determine if you are sufficiently prepared to conduct the experiment. **Students who are not prepared for an experiment will not be permitted to perform it and will take a zero for this experiment/lab report score.**

Lab Notebooks

Each student is required to maintain a bound laboratory notebook with numbered pages. Spiral notebooks are acceptable and pages may be numbered by hand, but loose-leaf notebooks are not acceptable. For each of the four experiments all relevant information, special instructions, experimental procedure and data, notes, comments, etc. should be recorded directly into the lab notebook.

Lab Reports

Each student shall write up the first two experiments as informal lab reports and the third and the fourth experiments shall be written as formal lab reports. Informal lab reports shall include *Title and Abstract*, *Experimental Method*, *Results*, and *Appendices* (if necessary). Formal lab reports must be written in a style suitable for publication in the *Journal of Physical Chemistry*, and should, in addition, include an *Introduction*, *Discussion*, and *References*. We will discuss the structure and content of both informal and formal lab reports in detail in class. Lab reports are due one week from the day the experiment is scheduled to be finished (1 pm of the following Wednesdays for Section 3 experiments, and 2 pm and 6 pm of the following Thursdays for Section 2 and 4 experiments, respectively). They are to be turned in directly to the TA responsible for the experiment. Late reports will be penalized by subtracting one point for each day overdue.

Exams

The midterm and the final exam will cover materials presented in the *lecture part of the course*.

Grading

Your grade in this course will be based on scores in the following areas:

Pre-Lab Quizzes	10%
Informal Lab Reports	20%
Formal Lab Reports	40%
Midterm Exam	10%
Final Exam	20%

Academic Integrity Policy

All students of this course will be subject to the University of Utah Student Code. *In particular, any instances of academic misconduct and/or dishonesty will result in a grade of E for the course and referral to the appropriate University Dean or Administrator.* See: www.regulations.utah.edu/academics/6-400.html

Dropping This Course

The last day to drop this course without paying tuition is Friday, March 8, 2013. After that date tuition is assessed. You may still withdraw from the course according to the *university withdrawal policy*.

Special Accommodations

The University of Utah Chemistry Department seeks to provide equal access to its programs, services and activities for people with disabilities. If you will need accommodations in the class, reasonable prior notice needs to be given to the Center for Disability Services, 162 Olpin Union Building, 581-5020 (V/TDD). CDS will work with you and the instructor to make arrangements for accommodations.