CHEM 166 – Physical Chemistry Lab

Time: 10:50 AM-2:50 PM Monday

Room: Discovery W407

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TA: Christopher Snyder

Summary

CHEM166 is the lab course of Physical Chemistry, covering selected topics in thermodynamics, kinetics, and quantum chemistry. The goals of this course inlcude (1) to provide the practical experience in the techniques of experimental/theoretical physical chemistry, (2) to deepen the understanding of the principles in physical chemistry through experimentation, (3) to develop advanced laboratory skills in chemistry, (4) to advance the ability to read, interpret and understand modern professional chemical literature, and (5) to foster critical thinking, problem solving, and creativity in chemical discovery. Students taking CHEM166 should be taking concurrently (or has taken previously) CHEM165. Each experiment is designed for 6 to 8 hours of preparation, laboratory work and discussion. Students will meet on a weekly basis.

Schedule

Time	Topics	Experiments	Lab
Weeks 1-2	*Thermodynamics*: Heats of formation	Bomb calorimetry	W407
Weeks 3-4	*Thermodynamics*: Phase transitions	Differential scanning calorimetry	W319
Weeks 5-6	*Kinetics*: Sugar inversion	Polarimetry	W407
Weeks 7-8	*Kinetics*: internal rotation of NNDMA	NMR	NMR room
Weeks 9-10	*Thermodynamics, Kinetics, and Quantum*: calculations of reaction mechanisms	Computer Modeling	W327
Weeks 11-12	*Quantum*: vibration and rotation of HCl	FTIR	W303
Weeks 13-14	*Quantum*: electronic structure of anthracene	UV/Vis spectroscopy	W303

Note: Students will be working in pairs/groups and rotate among the experiments under the topics of chemical thermodynamics, kinetics and quantum chemistry. For example, half the students will do Experiment 1 during the first two weeks, and that the other half will do Experiment 2 during those two weeks, and so forth.

Preparation for an experiment

Lab materials will be posted in Blackboard at least two days before you arrive in the lab to perform an experiment. It is essential that you study the experiment carefully, with special emphasis on the theory, the method, the apparatus design, and the procedure.

Execution of an experiment

With assistance of the lecturers and the TA, you will have the opportunity to execute an experiment and collect the data. You will work in groups assigned by the computer. Every person working in a laboratory should be alert to possible safety problems. It is important for you to follow the safety instruction from the lecturers and the TA.

Lab reports.

You will submit your lab report after the experiment. Typed reports are required and should be in the single-spaced format on the paper of the A4 size. Scientific style is required for all the lab reports. The requirements of the lab reports for this course (including style, format, tables/figures, data processing/presentation, etc.) are detailed in the materials available in Blackboard.

There are two types of lab reports in this course. One report, called the *Full Report (150 points)*, will include the following sections: (1) Introduction, (2) Experimental, (3) Results, (4) Discussion, (5) Conclusions, and (6) References. Appendices containing your data may be included. You will choose an experiment for the long report. The entire report, written in the style of a published manuscript, should be ~8-10 pages long, including figures but not including appendices. It will be due on the last day of classes (May 4, 2018).

Brief Reports (50 points each) should be written for each of the seven experiments, and turned in two weeks after completing the lab. It should contain (1) a brief introduction, (2) methodology, (3) your results, and (4) your conclusions. Each report should be at least three pages long, including figures but not including appendices.

Grading

No late work will be graded.

(a) Formatting (5 points).

(b) Language (5 points).

(c) Content of the brief reports (40 points):

(1) Introduction (8 points) is self-contained and sufficient to explain why the experiment was performed and why the method was used and how it could be used to yield the result. (~400-500 words)

(2) Methodology (8 points) gives a concise and complete overview of what the experiment without delving into procedural monotony. (~200-300 words)

(3) Results (16 points) presents and analyze your data and figures, and provides justification for the results or explains inconsistencies in the data.

(4) Conclusions (8 points) summarizes the results and findings. (~100-200 words)

(d) Content of the full report (140 points)

(1) Introduction (20 points)
(2) Experimental (30 points)
(3) Results (25 points)
(4) Discussion (35 points)
(5) Conclusions (25 points)
(6) References (5 points)

The final letter grade will be assigned based on the total grades (7 brief reports + 1 full report, 500 points in total).

Student Learning Accommodations: In keeping with University policy, any student with a documented disability interested in utilizing accommodations should contact ACCESS, the office of Disability Services on campus. ACCESS works with students and faculty in an interactive process to explore reasonable and appropriate accommodations via an accommodation letter to faculty with recommended accommodations as early as possible each semester.

Contact ACCESS: A170 Living/Learning Center; 802-656-7753; access@uvm.edu; www.uvm.edu/access

UVM's policy on disability certification and student support: www.uvm.edu/~uvmppg/ppg/student/disability.pdf

Religious Holidays: Students have the right to practice the religion of their choice. If you need to miss class to observe a religious holiday, please submit the dates of your absence to me in writing by the end of the second full week of classes. You will be permitted to make up work within a mutually agreed-upon time.

Academic Integrity: The policy addresses plagiarism, fabrication, collusion, and cheating. http://www.uvm.edu/~uvmppg/ppg/student/acadintegrity.pdf

Grade Appeals: If you would like to contest a grade, please follow the procedures outlined in this policy: http://www.uvm.edu/~uvmppg/ppg/student/gradeappeals.pdf

Grading: For information on grading and GPA calculation, go to www.uvm.edu/academics/catalogue and click on Policies for an A-Z listing.

Code of Student Rights and Responsibilities: www.uvm.edu/~uvmppg/ppg/student/studentcode.pdf

FERPA Rights Disclosure: The purpose of this policy is to communicate the rights of students regarding access to, and privacy of their student educational records as provided for in the Family Educational Rights and Privacy Act (FERPA) of 1974. http://www.uvm.edu/~uvmppg/ppg/student/ferpa.pdf

Promoting Health & Safety:
The University of Vermont's number one priority is to support a healthy and safe community:

> ***Center for Health and Wellbeing*** http://www.uvm.edu/~chwb/
> ***Counseling & Psychiatry Services (CAPS)*** Phone: (802) 656-3340
> ***C.A.R.E.*** If you are concerned about a UVM community member or are concerned about a specific event, we encourage you to contact the Dean of Students Office (802-656-3380). If you would like to remain anonymous, you can report your concerns online by visiting the Dean of Students website at http://www.uvm.edu/~dos/

Final exam policy: The University final exam policy outlines expectations during final exams and explains timing and process of examination period.