CHM 4413L, Biophysical Chemistry Laboratory
Fall 2015

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Objectives: CHM 4413L students learn:

- Physical measurements of thermodynamic, kinetic, and spectroscopic properties.
- Error analysis and critical examination of experimental data.
- Preparation of formal written reports and oral presentations.

Texts: Killian, B. J. *Experiments for Physical Chemistry Laboratory*, Fall 2015, Target Copy: Gainesville, 2015.

Williams, K. R. *Error Analysis in Physical and Analytical Chemistry*, 3rd Ed, Target Copy: Gainesville, 2008.

Other Required Materials: Laboratory Notebook with duplicate pre-numbered pages or composition book; safety glasses; departmentally approved attire (long, loose-fitting pants, full shirt, shoes which cover the feet, tieback for long hair); USB drive

Grade Distribution:

Problem Set:	1 Error Analysis Problem Set @ 100 pts. (Due 9/11)	100 pts.
Written Reports:	2 @ 50 pts (Modeling and Raman)	100 pts.
	2 @ 60 pts (Conductivity and Fricke Dosimetry)	120 pts.
	4 @ 80 pts (C_P/C_V, Enzyme Kin., pKa, and either HCl/DCl or LIF)	320 pts.
	1 @ 150 pts (C_P/C_V II)	150 pts.
Pre-Lab Quizzes:	8 @ 20 pts	160 pts.
Data Grade:	7 @ 30 pts	210 pts.
Subjective Grade:		100 pts.
Total		**1260 pts.**

Factors affecting the subjective grade will be the student's attendance record (lecture and lab), preparation for laboratory work, laboratory technique, understanding of the experiments, and general attitude. Ten (10) subjective points will be deducted for each unexcused absence from lecture. Notebook "spot checks" will be made randomly to check for written procedures and data collection. Students are expected to arrive on time for all lectures and labs. Attendance will be recorded at the start of lecture. Pre-lab exercises must be submitted at the start of the laboratory period. No pre-lab assignments will be accepted after the beginning of lab.

Letter Grade	Total Points	Letter Grade	Total Points	Letter Grade	Total Points
A	≥1134	B-	≥970	D+	≥718
A-	≥1096	C+	≥907	D	≥680
B+	≥1058	C	≥844	D-	≥630
B	≥1008	C-	≥806	E	<630

Note: Chemistry majors earning grades below C (C-, D+, D, D-, or E) must repeat the course to earn credit towards the degree.

Pre-Lab Assignments: For all experiments (excluding Molecular Modeling) students will complete a pre-lab assignment. The pre-lab assignment can be found in the lab manual at the end of the experimental write-up. Students are expected to work independently on pre-labs. Pre-labs do not need to be typed; however, please follow the same presentation guidelines as with reports; i.e., include units, format LLS equations, proper graph construction, etc. When a spreadsheet assignment is completed, please turn in a formatted print-out of your results and bring an electronic version of the spreadsheet to lab with you. You need to provide sample calculations, even when the pre-lab involves a spreadsheet layout. Pre-lab assignments are due at 12:50 PM on the day of the experiment. NO late pre-lab assignments will be accepted.

Written Reports: It is expected that reports will be neat and written in good English, with proper attention paid to paragraph structure, grammar, spelling, etc. Substandard reports will be rewritten (with appropriate point deductions). Except for equations, laboratory reports must be typed (double space, except for the abstract and captions) using a minimum font size of 10 point. Please use a professional font, such as Times New Roman, Arial, Calibri, etc. Equations (both mathematical and chemical) should be generated using an equation editor. You may write equations by hand using black or blue ink; however, they must be clearly written with sufficient space to set them off from the text. Reports should contain the sections described below.

I. Abstract: The abstract (200 words max) should give a summary of the entire experiment: what was measured, experimental method, results with 95% confidence limits. The abstract must be complete in itself, although it is separate from the rest of the paper. Place the abstract on the title page, separate from the remainder of the report.

II. Introduction: This section should answer the questions: 1) What is the reason for performing this experiment, 2) What is the theory supporting the experiment? and 3) What is the methodology used? The second point will constitute the major part of the introduction. Give equations unique to the experiment and conditions necessary for the equations to be valid. Identify all variables with their units. Number equations consecutively in the right margin, and refer to the original number if the equation is used again. Also include molecular structures for pertinent compounds (other than macromolecules). In writing this section, you should aim to explain the experiment to a senior-level chemistry student who has taken physical chemistry, but who is otherwise unfamiliar with the procedure or method. Do not regurgitate the introductory material in the text or handout.

III. Experimental Procedure: The procedure should be clearly explained in paragraph form with sufficient detail that a person trained on the instrument could repeat the experiment, but do not give specific commands that were used. Use the passive voice (no commands), write in the past tense (tell me what you did), and do not write in the first person. Include the manufacturer and model name/number for each instrument used and important experimental parameters. Also, be sure to include a reference to the laboratory manual.

IV. Data and Results: Use a spreadsheet program (e.g. Excel) or plotting program to prepare graphs, making sure that you obey general rules for graph drawing. Tables should contain all necessary data and results, but not raw (e.g., uncorrected) data or intermediate calculations (include the data needed to obtain the final presented results only; i.e., no "spreadsheet dumps"). Guidelines for tables and graphs are given in Laboratory Manual for Introductory Analytical Chemistry, pp. 5-8 (or older versions). Also include introductory text to direct the reader to the tables and graphs, to specify experimental parameters (e.g., temperature) held constant throughout the experiment, and to explain symbols, etc. The table summarizing the final results should include (and cite) available literature and/or theoretical values.

V. Conclusions and Discussion: This is a very important section of the report and should not be taken lightly. Referring to your summary table, evaluate the quality of your results (i.e., Do the error limits for the measured value include the accepted value?). Relate the experimental results to the chemistry of the system (What did you learn from the experiment?). Discuss pertinent sources of error (both random and systematic) and their effects on the results. If possible, make suggestions for improvements. Be sure to answer any additional questions in the manual.

VI. References: Special procedures, literature values, and discussions of previous research results must be referenced in the text using superscript numbers. References belong in a separate section at the end of the report. The proper format to use is the ACS format. Details can be obtained by reviewing the *ACS Style Guide* (see https://www.libraries.psu.edu/content/dam/psul/up/pams/documents/QuickGuideACS.pdf for details). Note: The laboratory manual should be referenced as shown on the first page of this syllabus.

Library Course Guide: Marston Science Library has a number of important references available to you, including a course guide that can be found at http://guides.uflib.ufl.edu/chm4411L. The chemistry librarian, Dr. Neelam Bharti, is available for research questions. Most, if not all, of the referenced items can be obtained from the Reserve desk in Marston.

Chemical Structures and Equations: It is strongly recommended that you use an electronic means of generating chemical structures and equations. Microsoft Office has a built-in equation editor. Several computer programs exist for building chemical structures. Symyx offers free academic software at http://symyx-draw.en.softonic.com/download.

Additional Grading Policies: Written reports must be submitted by 12:50 PM on the designated dates. All assignments submitted after 12:50 PM are considered late. Deductions at the rate of 5% per day (including weekends) will be assessed for late work. The

maximum allowable late time is one calendar week, after which a grade of zero will be assigned. All written work (late or otherwise) must be received by 12:50 PM on Thursday, 12/09/2015.

Schedule of Experiments and Reports:

Laboratory Schedule

Date (week of)	Lab Experiment	Lecture Topic	Date Due (week of)
8/24	First Meeting	Error Analysis; C_P/C_V	
8/31	C_P/C_V	Error Analysis; Conductivity	9/14
9/7	Labor Day (Mon) No Lab	Conductivity; Enzyme Kinetics	
9/14	Conductivity	Enzyme Kinetics; pKa	9/21
9/21	Enzyme Kinetics	pKa	9/28
9/28	No Lab	pKa; Dosimetry	
10/5	pKa of Neutral Red	Dosimetry	10/12
10/12	Molecular Modeling	IR Spectroscopy	In Class
10/19	Fricke Dosimetry	IR Spectroscopy; LIF	10/26
10/26	No Lab	LIF	11/2,3
11/2	HCl/DCl and LIF	LIF; Raman	11/16
11/9	Veterans Day (Wed) No Lab	Raman; Stat Thermo	
11/16	Raman	Stat. Thermo; C_P/C_V II	In Class
11/23	Thanksgiving No Lab	No Lecture	
11/30	TBA	TBA	
12/7	TBA	Reading Days No Lecture	
12/14	Exam Week No Lab or Lecture		

Class Attendance: Requirements for class attendance and make-up assignments are consistent with university policies that can be found at https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx.

Students with Disabilities: Students with disabilities requesting accommodations should first register with the Disability Resource Center (352.392.8565, www.dso.ufl.edu/drc/) by providing appropriate documentation. Once registered, students will receive an accommodation letter, which must be presented to the instructor when requesting accommodations. Students with disabilities should follow this procedure as early as possible in the semester.

Grading Policies: Information about the most current UF grading policies for the assigning of grade points can be found at https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx.

Course Evaluations: Students are expected to provide feedback on the quality of instruction in this course by completing on-line evaluations at https://evaluations.ufl.edu. Evaluations are typically open during the last two or three weeks of the semester, but students will be given specific times when they are open. Summary results of these assessments are available to students at https://evaluations.ufl.edu/results/.

Academic Honesty: UF students are bound by The Honor Pledge, which states, "We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code." On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: "On my honor, I have neither given nor received unauthorized aid in doing this assignment."

Sharing of lab reports between students is considered a violation of the Honor Code, as is the sale or transfer of graded or ungraded course materials to another student for use in this course (current or future semesters). All violations will be reported to the Office of Student Judicial Affairs.

Additional information may be found at https://www.dso.ufl.edu/sccr/process/student-conduct-honor-code/. If you have specific questions, please consult with the instructor or your TA.

Student Wellness: We hold student success very highly, and we hope that any concerns of both an academic and a personal nature can be addressed in a timely and helpful manner. The Counseling and Wellness Center is an important service provided by the university to help with a variety of personal issues and concerns. The center can be contacted at 352.392.1575. More information is available at http://www.counseling.ufl.edu/cwc/Default.aspx.