

Physical Chemistry Laboratory: Chemistry 387

Fall 2019

Instructor:

Dr. Leanna C. Giancarlo
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Laboratory: T 9:30 a.m. – 12:15 p.m.; Jepson Science Center 409

Office Hours:

MT 2:00 – 3:00 pm
F 1:00 – 2:00 pm or by appointment

Required Course Materials:

Texts: Engel and Reid, *Thermodynamics, Statistical Thermodynamics & Kinetics, 3rd edition*
Hofmann, Angelika, *Scientific Writing and Communication, 3rd edition*
Coghill, Anne M. and Garson, Lorrin R., *ACS Style Guide, 3rd edition*
Course Pack for CHEM 387

Laboratory Notebook, Coat and Goggles
Scientific Calculator

Course Description and Objectives:

This laboratory course will provide an understanding of the fundamental principles of thermodynamics and chemical kinetics through experimentation. Since the course is designated **writing intensive**, communication of scientific results will be stressed in the form of long and brief scientific reports. These styles are the same as those used by physical chemists in premier scientific journals and in government and industrial work-place settings. After completing this course, a student should be able to

- discuss the use of chemical instrumentation to describe the theoretical underpinnings of chemically relevant thermodynamic problems
- interpret collected data in light of thermodynamic theories
- use the chemical literature
- begin to write as a scientist using standard literature formats

In accord with the learning outcomes for a Writing Intensive course,

1. (Ideas): Students will demonstrate satisfactory knowledge of the varying strategies to convey arguments, main ideas and support/ evidence.
2. (Organization): Students will demonstrate satisfactory knowledge of the varying patterns of composition organization and development.
3. (Rhetorical Situation): Students will demonstrate satisfactory knowledge of the audience, the role of the writer, and rhetorical strategies.

4. (Editing): Students will demonstrate satisfactory knowledge of writing conventions and correctness.

Grading:

Formal Laboratory Reports (3 graded at 150 points each)	450 pts
Abbreviated Laboratory Results (3 graded at 100 points each)	300 pts
In Class Writing and Peer Review (each at 25 points)	50 pts
Pre-Laboratory Assignments	100 pts
Final Examination	100 pts

Grades will be determined on the following point scale

Points accumulated	Letter Grade	Points accumulated	Letter Grade
≥ 930 points	A	769 – 730 points	C
929 – 900 points	A-	729 – 700 points	C-
899 – 870 points	B+	699 – 650 points	D+
869 – 830 points	B	649 – 600 points	D
829 – 800 points	B-	below 600 points	F
799 – 770 points	C+		

Students with a report and pre-lab average of C- or less will receive a midsemester report.

Honor System:

All graded work (literature assignments, laboratory reports, pre-laboratory assignments and the final exam) must be your own and pledged as such:

I hereby declare upon my word of honor that I have neither given nor received any unauthorized help on this work.

Signed

Data may be collected in the laboratory with a partner; however, the laboratory notebook (which is the record of these data) will be your own. There should be **no** consultation with others (either current or past students) as to calculations, analysis, interpretation or discussion of data. This is a violation of the Honor Code and possibly plagiarism.

Class Attendance:

Class attendance is **mandatory**. Each team of students will have approximately 3 hours during the laboratory period to collect the data for each experiment. You **must** be punctual for lab. It is suggested that a minimum of two hours per week be spent organizing the laboratory report, analyzing the data, searching the literature or preparing for the next experiment.

Pre-Laboratory Assignments:

Pre-laboratory assignments are to be presented to the instructor **at the beginning** of the laboratory period. The pre-laboratory assignments are two-fold:

1. Students will individually work through the theory (background) for each experiment, posted on Canvas as a PowerPoint lecture and video (these are accessible on youtube), and answer the questions on the pre-lab assignment page (also on Canvas) on a separate piece of paper to be handed in. (In some cases

there are also videos links demonstrating the experimental method; these videos that should be viewed as well.)

2. Students will also prepare the first page of their laboratory notebooks with proper identification, purpose and a multi-paragraph summary of the method to be followed for the experiment, having read through the detailed step-wise procedure in the coursepack, including a reference to where the entire procedure may be found using *proper citation format*.

Failure to submit either or both portions will result in a grade of zero for the entire laboratory experiment. (This includes both the pre-lab assignment and the lab report.) Any student who does not hand in a pre-laboratory assignment—answers to questions and completed notebook page-- will not be permitted to perform the experiment. These assignments must be completed individually; however, the use of your textbook and other reference materials to complete the work is allowed and encouraged.

Laboratory Reports:

All laboratory reports (formal and abbreviated) must be pledged as work performed individually. Reports are due **one week after the completion of an experiment by the end of the laboratory period**. A late report will receive a grade of zero without the benefit of resubmission. Each student is allowed a one week extension on **one** laboratory report (excluding the last report) provided that the student has submitted a written request for the extension (on the date that the lab is due). This should also be noted on the cover page for the report when the report is submitted. (See Coursepack.)

All laboratory report grades are a combination of scientific content and writing quality. Scientific content includes accuracy and precision of results, proper display of results (tables and figures), adequate explanation, interpretation and discussion of results in the context of the lab objectives and background information (theory), discussion of probable errors, well-formed conclusions based on data, and the ability to keep a proper scientific notebook. Writing quality includes, but is not limited to, inclusion of appropriate information in each section, proper use of written English, correct grammar and spelling, style and correct citations. Each formal report will be read by the instructor, graded and commented on (see Coursepack). I am employing a model where each formal report submission is identical to a submission to a scientific journal for publication (in this case the *Journal of Physical Chemistry*). The journal sends the submitted manuscript to several peer reviewers who “grade” the paper according to *accepted*, *accepted with minor revisions*, *accepted with major revisions*, and *rejected*. I will use the same “grading” scale as a scientific journal for your laboratory reports. In the past I have also included a letter grade along with this; however, my experience is that you look at the grade and stash the paper away, never reading and seriously considering my written feedback. In the “real world” and in this course, it is *very* difficult to have a paper accepted on a first try, so scientists learn to write by rewriting until their thoughts are as clear as possible. An accepted paper will be published with only small editorial changes in keeping with the typesetting and publishing process. If you receive a “grade” of anything lower than *accepted*, you may re-write the lab report (up to two more times, i.e., three times total) with NO grade penalty until you achieve *accepted* status. To be able to resubmit a paper to me, you must fulfill the following criteria:

- (1) You may not have received more than one *rejected* during the entire semester. *Rejected* is equivalent to an F. You did not put in the time and/or the effort to communicate the chemistry concepts behind the experiment.
- (2) You must have read through *all* of the comments on your report and tried to decipher what they mean. You can't do this alone. You *must* meet with me so we can talk about the report and ways to improve it. This may involve looking at the references listed at the end of each procedure in the Coursepack or doing a little bit more research until you understand the concepts so you can really explain, discuss, explicate and/or interpret your results.
- (3) One "lab" week after the return of the original report, you must submit **three** documents: the revised laboratory report, the original laboratory report, and a letter to the editor documenting and detailing your deliberate changes to the original in order to meet the standards of an *accepted* manuscript. This letter (to the editor) specifies the major areas that you are revising in order to meet the objectives of the report and the course. For example, if the major issues in the report are scientific, it should be demonstrated in the letter what the original errors were and how they have been corrected; these errors might include numerical miscalculations, flaws in logic, and incorrect application of theoretical arguments. If the major issues are grammatical, it should be demonstrated in the letter what has been done to correct these errors and what has been learned (it might be helpful to find the portions of the scientific writing text that are applicable and reference these). This is the process that scientists also undergo when resubmitting their manuscript for publication. The manuscript is then sent out to the same or new reviewers for comment.

Your grade on the report will be whatever the grade was received for the **last** submission. There is no averaging or deduction. You have the opportunity to achieve the same grade as a student who earned *accepted* on a single submission. At that point or following your third submission, you may obtain all of your rubrics and the final letter grade.

You don't have to resubmit a report. If you have earned the *accepted* rating, then you have already earned an A or B. You can simply stop by and retrieve the graded rubric from me and get the grade for that report. If you were graded at anything less than *accepted* and you choose not to submit a revised report, you may also stop by and get the graded rubric and your grade. Keep in mind that grades scale with each step down from *accepted*. Also, if you choose not to re-write the report, prior to receiving your letter grade and rubric, you must sign a document stating that you have chosen to forgo resubmission and will accept your current grade. This contract you have just signed cannot be revoked. You should discuss what may need to be done to improve the report (based on my written feedback) and reflect upon your weekly workload before making this decision.

The abbreviated laboratory reports and other in-class writing assignments may only be submitted **once**. The abbreviated laboratory reports will be graded based on the organization/referencing, written abstract and results and discussion (accuracy and precision of results—both raw data and calculated, proper portrayal of results (tables and

graphs), adequate explanation of results, well-formed conclusions based on data, answers to questions, and the ability to keep a proper scientific notebook).

I should be able to read through the text of your reports in 20 – 30 minutes. If I cannot, then you are not doing an adequate job conveying your thoughts in a clear and concise manner. If this is the case, then I will mark where I have stopped reading and will grade you on what I have been able to glean from what I have read.

Disability Services: The Office of Disability Services has been designated by the University as the primary office to guide, counsel, and assist students with disabilities. You will need to request appropriate accommodations through this office as soon as possible and then make an appointment with me to discuss your approved accommodation needs. I will hold any information you share with me in the strictest confidence unless you give me permission otherwise.

Title IX: University of Mary Washington faculty are committed to supporting students and upholding the University's *Policy on Sexual and Gender Based Harassment and Other Forms of Interpersonal Violence*. Under Title IX and this Policy, discrimination based upon sex or gender is prohibited. If you experience an incident of sex or gender based discrimination, we encourage you to report it. ***While you may talk to me, understand that as a "Responsible Employee" of the University, I MUST report to UMW's Title IX Coordinator what you share.*** If you wish to speak to someone confidentially, please contact the below confidential resources. They can connect you with support services and help you explore your options. You may also seek assistance from UMW's Title IX Coordinator. Please visit <http://diversity.umw.edu/title-ix/> to view UMW's *Policy on Sexual and Gender Based Harassment and Other Forms of Interpersonal Violence* and to find further information on support and resources.

Class Recordings: Video and/or audio recording of class lectures and review sessions without the advance consent of the instructor is prohibited. On request, the instructor may grant permission for students to record course lectures, on the condition that these recordings are only used as a study aid by the individual making the recording. Unless explicit permission is obtained from the instructor, recordings of lectures and review sessions may not be modified and must not be transferred or transmitted to any other person, whether or not that individual is enrolled in the course. Students with approved accommodations from the Office of Disability Resources permitting the recording class meetings must present the accommodation letter to the instructor in advance of any recording being done. On any days when classes will be recorded, the instructor will notify all students in advance. Distribution or sale of class recordings is prohibited without the written permission of the instructor and other students who are recorded. Distribution without permission is a violation of educational law. This policy is consistent with UMW's Policy on Recording Class and Distribution of Course Materials.

Topics and Experiments:

Note that these labs may be changed at any time due to availability of the instrumentation required.

Introduction and Laboratory Organization
Writing Intensive/Mock Laboratory Reports

Thermodynamics:

Bomb Calorimetry

Electrolytes and Equilibrium:

Conductance of Weak and Strong Electrolytes

Debye-Huckel Theory, Ionic Strength and Equilibrium: CaSO_4

Evaluation of Freezing Point Depression by DSC

Kinetics and Thermodynamics:

Saponification of Ethyl Acetate

Approximation of Molecular Radius from Effusion

Self-directed Project

Final Exam: Tuesday, December 10th 8:30 – 11:00 am