

Chemistry 563

Objectives

- Understand the quality and information content of experimental measurements
- Emulate, to some extent, the process by which new knowledge is generated
- Communicate scientific content in oral conversation
- Generate technical reports in a style that emulates scholarly publications
- Make connections between the physical chemistry laboratory experience and other courses
- Gain exposure to experiments that have helped to establish the foundations of physical chemistry

Safety

Eye protection (goggles, or safety glasses that include side protection) and closed-toe shoes are always required in the laboratory whenever any experiments are in progress. Goggles are available in the lab for student use, but you are encouraged to use your own. Other clothing choices are up to you but be aware that there are always dangers of stains, corrosive chemical spills, splashes, and broken glass when working in a chemistry laboratory.

Graded Materials

- *Online quizzes:* There are four prelab quizzes worth 10 points each. These quizzes are due before the laboratory period on the assigned day. Your final score for each quiz is the highest score out of a maximum of three attempts.
- *Oral exam:* There is one oral exam worth 50 points. You should be prepared to discuss the theory behind the experiment as well as specifics of your data and methods. Specific topics, details of the format, and the schedule will be discussed before the exam.
- *Written reports:* There are three formal written reports worth 50 points each. The specific format of the formal report is discussed in a separate handout. Reports should be submitted to the appropriate dropbox on the course website. Files should be submitted in .pdf format. The penalty for late submissions is 4 pts/day.
- *Written activities:* Most laboratory periods have a set of written activities that are to be submitted at the end of the period. There are a total of ten sets of these activities worth 120 points combined.
- *Evaluation:* There is a 10 point evaluation score for each of the first three days associated with each experiment (90 points total). This score is affected primarily by participation, lab hygiene, and timeliness.

Point Breakdown

Online quizzes (4)	= 40 pts
Oral exams (1)	= 50 pts
Written reports (3)	= 150 pts
Written assignments (10)	= 120 pts
Evaluation (9)	= 90 pts

Total = 450 pts

Using the grading scale for written reports and oral exams given on the next page, and assuming near perfect scores in the other categories, the final grades are intended to be assigned on the following scale:

<i>A</i>	>90%
<i>AB</i>	86-90%
<i>B</i>	80-86%
<i>BC</i>	76-80%
<i>C</i>	68-76%
<i>D</i>	58-68%
<i>F</i>	<58%

Grading Scale for Written reports and Oral Exams

- The overall strategy is to first assign an overall letter grade, then assign a score in the range based on the presence of minor flaws such as grammar and spelling mistakes, and lastly deduct points for late penalties or for improper presentation of data (e.g. plots with inappropriate formatting, tables that lack units or uncertainty estimates, etc). The grade categories, and corresponding points on a 50-point scale, are:
 - *A*, 42-50: A letter grade of *A* means that the student: understands the concepts behind the experiment, understands the experimental implementation, understands the experimental variables, understands how to properly assign and propagate experimental uncertainty throughout the experiment, and has acquired data of reasonable quality (1-2 outliers, expected trends are present, etc).
 - *AB*, 38-42: A letter grade of *AB* means that the student demonstrates flaws in a few minor aspects of the above mentioned characteristics. Common situations include assigning uncertainty without proper justification, performing calculations without subsequent discussion in the text, excessive outliers in the data set, etc.
 - *B*, 32-38: A letter grade of *B* means that the student demonstrates a major flaw in understanding in one or two of the above mentioned characteristics. Common situations include improper assignment of uncertainty, mistakes in calculations, incorrect statements regarding the concepts behind the experiment, etc.
 - *BC*, 28-32: Compared to the previous case, a letter grade of *BC* means the student demonstrates multiple major flaws in scientific reasoning and the data analysis, but calculations are still expected to be mostly correct.
 - *C*, 20-28: The concept of a letter grade of *C* is that the student has, in a certain sense, simply followed directions and has completed what has been asked of them without scientific thought. The report must still be complete and calculations must be mostly correct. Essentially this means a report basically just presents the data, calculations, and results without a directly relevant, meaningful discussion (uncertainty may not be discussed at all, assigned improperly, etc.)
 - *D*, 10-20: A letter grade of *D* means that the report is inappropriate in some fashion, such as completely missing a section or missing calculations.
 - *F*, 0-10: A letter grade of *F* means the student has failed the report. Compared to the previous case this means the report is simply missing multiple, necessary items.
- Scores are normalized across all graders at the end of the semester.

Guidelines for Academic Misconduct in the Physical Chemistry Laboratory

All writing presented in your formal reports must constitute your own intellectual property. Although you may certainly discuss ideas with other students, the presentation of those ideas must be your own individual work.

What *is* allowed:

- Work with other students for all experimental work
- Collaborate with other students for all data analysis work, including preparation of plots and tables
- Discuss ideas with other students regarding the interpretation of experimental results

What *is not* allowed:

- Write a report based off of someone else's work (another student, or a literature paper)
- Collaborate with other students on the written discussion of results, ideas, and concepts related to the experiment (i.e. write a group report)
- Submit a report with portions of text that are identical to the work of another person
- Submit a report where the presentation of ideas is identical to the work of another person (text only differs by superficial paraphrasing)

Cases of academic misconduct in the physical chemistry laboratory generally result in a score of 0 for the report for all individuals involved. A report of the incident is also filed with the Offices of the Dean of Students.

With this in mind, do not share electronic versions of your lab reports with other students. You are certainly welcome (and encouraged) to receive feedback from students and staff on rough drafts of your reports, but be protective of your intellectual property.

Schedule (★ = online individual submission, ⊕ = hard copy individual submission, ☆ = hard copy group submission)

Week	Topic	Before Lab	During Lab	End of Lab
1/23	Numerical Treatment of Experimental Data	⇒ Read handout ⇒ Watch Excel primer videos ★ Take quiz	⇒ Introductions ⇒ Review of syllabus ⇒ TA discussion ⇒ Work on activities	⊕ Submit activities
1/30	Calorimetry	⇒ Read handout ⇒ Watch video ★ Take quiz	⇒ TA discussion ⇒ Work on day 1 activities	☆ Submit day 1 activities
2/6	Calorimetry		⇒ Work on day 2 activities	☆ Submit day 2 activities
2/13	Calorimetry	⇒ Read day 3 activities ⇒ Analyze data	⇒ Write up results on boards ⇒ Present results to class ⇒ Discuss concepts ⇒ Work on day 3 activities	☆ Submit day 3 activities
2/20	Calorimetry	⇒ Work on report	⇒ Work on report (attendance not required)	★ Submit written report (due end of day)
2/27	Kinetics	⇒ Read handout ★ Take quiz	⇒ TA discussion ⇒ Work on day 1 activities	☆ Submit day 1 activities
3/6	Kinetics		⇒ Work on day 2 activities	☆ Submit day 2 activities
3/13	Kinetics	⇒ Read day 3 activities ⇒ Analyze data	⇒ Write up results on boards ⇒ Present results to class ⇒ Discuss concepts ⇒ Work on day 3 activities	☆ Submit day 3 activities
3/20	<i>Spring Recess</i>			
3/27	Kinetics	⇒ Work on report	⇒ Work on report (attendance not required)	★ Submit written report (due end of day)
4/3	Conductance	⇒ Read handout ★ Take quiz	⇒ TA discussion ⇒ Work on day 1 activities	☆ Submit day 1 activities
4/10	Conductance		⇒ Work on day 2 activities	☆ Submit day 2 activities
4/17	Conductance	⇒ Read day 3 activities ⇒ Analyze data	⇒ Write up results on boards ⇒ Present results to class ⇒ Discuss concepts ⇒ Work on day 3 activities	☆ Submit day 3 activities
4/24	Conductance	⇒ Work on report ⇒ Prepare for oral exam	⇒ Oral exam ⇒ Work on report	★ Submit written report (due end of day)

