

# Chemistry 563

## Objectives

- Understand the quality and information content of experimental numbers
- 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:* Each project lab has one prelab quiz on the Learn@UW course website worth 20 points. You have an unlimited number of attempts for each quiz, and your grade will be the highest score of all attempts. The quizzes are intended to help you evaluate your understanding of the concepts involved in the lab. Any difficulties on a quiz should lead to further examination of the resources provided on the course website and/or conversations with staff members.
- *Oral exams:* You will perform oral exams worth 50 points each for two of the project labs. You should be prepared to discuss the theory behind the experiment as well as specifics of your data and methods. Specific topics to review before the oral exam are provided in the corresponding project lab handout.
- *Reports:* Each project lab requires a formal written report which is worth 50 points. The specific format of the formal report is discussed in a separate handout. You should submit the report for each project lab electronically on the Learn@UW course website using the appropriate dropbox. Files should be submitted in .pdf format. Late reports should be submitted to the "Late Submissions" dropbox and are penalized 4 pts/day.
- *Prelab Experiments:* For each project lab you will have a series of exercises outlined in the "Prelab Checklist" section of the project lab handout. A hard copy of these exercises (one copy per group) is due by the end of the first lab period of the project lab. These exercises are worth 10 points.
- *Data Acquisition:* A 10 point evaluation score will be assigned based on lab performance during the data acquisition day for each project lab. A primary factor in this score is making efficient use of the time available during the lab period.
- *Postlab Discussion:* For each project lab you will have a postlab discussion with a staff member during the final lab period scheduled for that experiment. The materials required for the discussion are described in the project lab handout and are worth 10 points. A hard copy (one copy per group) is due at the end of the lab period.

Note that all of the 10 point scores (prelab materials, postlab materials, and the lab evaluation score) will be affected by participation and overall lab hygiene during that lab period.

## Grading

|                            |           |
|----------------------------|-----------|
| Introductory Exercises (2) | = 100 pts |
| Project Labs (3)           | = 300 pts |
| Oral Exams (2)             | = 100 pts |

*Total = 500 pts*

Written reports and oral exams are graded using the following guidelines:

- 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, should be viewed as:
  - *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 include all items discussed in the “Postlab Checklist” present at the end of each experiment handout. Calculations must also be mostly correct. Essentially this means a report basically just presents the data, calculations, and results without a directly relevant, meaningful discussion (assignment of uncertainty may not be discussed at all, improperly assigned, etc.)
  - *D*, 10-20: A letter grade of *D* means that the report is inappropriate in some fashion, such as completely missing a necessary section or lacking items discussed in the “Written Report Data Presentation Checklist” present at the end of each experiment handout.
  - *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.
- Written report and oral exam scores will be normalized across all graders at the end of the semester.

Using the above guidelines for reports and oral exams, and assuming perfect scores for quizzes and evaluation scores, the final grades are intended to be assigned on the following scale:

|           |        |
|-----------|--------|
| <i>A</i>  | >91%   |
| <i>AB</i> | 86-91% |
| <i>B</i>  | 79-86% |
| <i>BC</i> | 74-79% |
| <i>C</i>  | 64-74% |
| <i>D</i>  | 52-64% |
| <i>F</i>  | <52%   |

**Schedule** (★ = individual assignment, ☆ = group assignment)

| Week | Activity    | Notes   |
|------|-------------|---|
| 1/25 | Intro Ex 1  |   |
| 2/1  | Intro Ex 2  | ★ Intro 1 due end of day<br>★ Intro 2 quizzes due end of day  |
| 2/8  | Calorimetry | ★ Calorimetry quiz due start of lab<br>☆ Calorimetry prelab materials due end of lab  |
| 2/15 | Calorimetry |   |
| 2/22 | Calorimetry | ☆ Calorimetry postlab materials due end of lab  |
| 2/29 | Conductance | ★ Conductance quiz due start of lab<br>☆ Conductance prelab materials due end of lab<br>★ Calorimetry report due start of lab |
| 3/7  | Conductance |   |
| 3/14 | Conductance | ☆ Conductance postlab materials due end of lab  |
| 3/21 |             | <i>Spring Recess</i>  |
| 3/28 | Conductance | ★ Conductance report due start of lab<br>☆ Conductance oral exam  |
| 4/4  | Kinetics    | ★ Kinetics quiz due start of lab<br>☆ Kinetics prelab materials due end of lab  |
| 4/11 | Kinetics    |   |
| 4/18 | Kinetics    | ☆ Exp 91 postlab materials due end of lab   |
| 4/25 | Kinetics    | ★ Exp 91 report due start of lab<br>☆ Kinetics/Calorimetry oral exam  |

Note that although this course is only one credit, it is a 500-level course. The work in this course can be very difficult and time-consuming, but there are only three lab projects for the entire semester. The key to minimizing the overall time you spend on this course is to do as much work as you can in the lab when there are other students and staff around to provide assistance.

## Academic Misconduct

Make sure you are aware of the rules regarding academic misconduct. An overview of the rules can be found at <http://students.wisc.edu/doso/acadintegrity.html>. Pay particular attention to the following sections:

### Collaboration or Group Assignments

You should be aware that different instructors have different expectations about working with others. If you wish to consult with or work with another student on an assignment and you are not sure of the course rules, ask the instructor. It is each student's responsibility to seek information about the boundaries of appropriately working with others on assignments, papers, experiments, or examinations. If no rules concerning working with others have been discussed in a course, the student must assume that working with others writing a paper, completing homework, or taking an exam is not permitted.

### Plagiarism

Plagiarism means presenting the words or ideas of others without giving credit. You should know the principles of plagiarism and the correct rules for citing sources. In general, if your paper implies that you are the originator of words or ideas, they must in fact be your own.

If you use someone else's exact words, they should be enclosed in quotation marks with the exact source listed. You may put someone else's idea in your own words as long as you indicate whose idea it was (for example, "As Jane Smith points out, . . ."). If you are unsure about the proper ways to give credit to sources, ask your instructor or consult the Writing Center at 6171 Helen C. White Hall (phone: 608/263-1992, e-mail: [writing@wisc.edu](mailto:writing@wisc.edu)) for a copy of their handout "Acknowledging, Paraphrasing, and Quoting Sources," which you can download [here](#).

## 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 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.