

SYLLABUS

CHEM 358, Physical Chemistry Laboratory II

Spring 2013

Instructor Information

Instructor: Dr. Reinhard Schweitzer-Stenner
Office: Disque 605
Tel.: (215) 895-2268
Email: rschweitzer-stenner@drexel.edu
Office hours: Monday, 3.00 – 5.00 p.m. These are my ‘official’ office hours.
Students are welcome to email me to schedule a meeting outside of my office hours.

T.A.’s: Ms. Leah A. Pandiscia
Office: Disque 605
Tel.: (215) 895-2654
Email: lp438@drexel.edu
Office hours: Wednesday 10-12 a.m. Students are welcome to email their TAs to schedule a meeting outside of designated office hours.

Student Learning Information

A. Course Description and Calendar

Lecture (358A) (Monday, 1.00-1.50 p.m.)

The 1 hour lectures are associated with the experiment. Experiments, which are spread over two weeks will be introduced in a single lecture. The lectures will introduce the physical and chemical background of the experiments and will provide a short overview of the respective experimental protocols without going into details. You are expected to review the laboratory protocols prior to the lecture and laboratory.

Lecture schedule

Week 1:	April 7	E1: Kinetics of Homogeneous Reactions in Solution I
Week 2:	April 14	E2: Kinetics of Homogeneous Reactions in Solution II
Week 3:	April 21	E3: Spectrophotometric Determination of pK of an Indicator
Week 5;	May 5	E3: Adsorption of Acetic Acid on Charcoal
Week 6:	May 12	E4: Excited State Properties of 2-Naphthol: Equilibrium
Week 7;	May 19	E5: Excited State Properties of 2-Naphthol: Kinetics

Week 8: No Lecture – Memorial Day Week (University Holiday)

Experiment schedule

(Thursday, 3.00 p.m. – 5.50 p.m. , in Disque 409):

This laboratory consists of 5 experiments. Even though this is not an official writing intensive course, the requirements for lab-reports are the same as those stipulated for CHEM 357.

<u>WEEK</u>	<u>DATE</u>	<u>EXPERIMENT</u>
1	April 10	E1a: Kinetics of Homogeneous Reactions in Solution I
2	April 17	E1b: Kinetics of Homogeneous Reactions in Solution II
3	April 24	E3a: Spectrophotometric Determination of pK of an Indicator I
4	May 1	E3b: Spectrophotometric Determination of pK of an Indicator Parts II
5	May 8	E2: Adsorption of Acetic Acid on Charcoal
6	May 15	E4: Excited State Properties of 2-Naphthol: Equilibrium (Exp. 34)
7	May 22	E5: Excited State Properties of 2-Naphthol: Kinetics (Exp. 35)
8	Memorial Day week.	Make up laboratories

Examinations (room to be announced)

- | | | |
|----|-----------|---|
| 10 | June 2-6: | 10 minutes power point presentations of a selected experiment |
| 12 | | Final Examination During Finals Week |

B. Purpose of course

The overall goal of this course is to link theoretical knowledge of specific physical chemistry topics to a “hands-on” experimental experience. The physical chemistry topics dealt with in this course are thoroughly taught in Chem 253 and 359, specific aspects and key concepts will be repeated in the accompanying lecture course.

C. Statement of expected learning

After completing this lab-course, the students should have learnt:

- To perform, analyze, and accurately describe in writing quantitative physical measurements on chemical systems that illustrate the principles of physical chemistry.

- Core physical principles of absorption and fluorescence spectroscopy.
- Basic laws of chemical kinetics and the relationship between relaxation and chemical equilibrium.

Course Material

Most of the scheduled experiments are from Experimental Physical Chemistry, Second Edition, by Arthur M. Halpern (Prentice Hall, 1997). For all experiments, handouts will be provided to the students, which contain information about the theoretical background of the experiments and exact descriptions of the experimental protocol. The handouts will be uploaded on Blackboard prior to the day of an experiment. Students are expected to read the handouts in order to prepare themselves for the experiments. Further information about the experiments' background can be inferred from classical physical chemistry textbooks (e.g. Atkins-de Paula), used for Chem 253 and 359.

Assessment of student performance

Lab reports. Lab reports have to be submitted within 7 days after completion of the experiment. Late submission of any lab reports will reduce the overall grade by 5 points per day (weekend days are included in this grading system). The reports have to be uploaded as pdf files onto BB-learn. Word files will not be accepted. The average grade of the laboratory reports will count for 65% of the final grade.

The student's grade is primarily based on the written reports, but points may be subtracted, if he/she is unprepared or does not practice safe and neat laboratory procedures. Some basic principles for writing the lab report should be taken into account. The introduction should contain information about the basic issue to be addressed by the experiment and the basic theory. If **you write equations, use the equation editor of word. Do not copy and paste from the handouts. Do not copy and paste Maple programs or Excel outputs.** Define the parameters. The result section should contain sufficient text to guide the reader through the experimental data in a clear and logical way. Figure and table captions should be meaningful and self-explanatory.

The structure of a lab report is listed in the following:

1. The title of the experiment, your name, etc.

2. Abstract.

This is a short paragraph that gives a summary of the experiment, including the final results (with uncertainties, if possible).

3. Introduction (or background)

This section (generally no more than two pages) describes the theory and concepts involved. Include primary equations used in the calculations.

4. Procedure

This should be a brief and general description of the experimental procedure, avoiding detailed descriptions of the operation of any instrumentation.

5. Data

Here the measurements and the raw data are presented. Use tables prepared with a spreadsheet. In general no calculations should be associated with the data.

6. Results

This section presents the results obtained using the raw data from the previous section, including any plots or figures produced (when making plots, label the axes and display the proper units). Once this part of the report is completed, you should know if you were able to accomplish the "Objective" of the experiment. For example, if the objective of the experiment is to measure the viscosity of a liquid at five different temperatures, you should have a table in the RESULTS section with values for viscosity at those five temperatures. An example of each type of calculation should be included in this section. Report statistical errors of your data, but do not include an error analysis in this section.

7. Error analysis

This section shows the accuracy and precision of the experimental results. The accuracy is represented by the relative error, which is obtained using the "true value" of the parameter of interest. The "true value" (or best accepted value) can usually be found in reference sources, such as the CRC Handbook of Chemistry and Physics. When reference data are cited, be sure to properly identify the source or sources of such data in the acknowledgements section.

In cases where repeated measurements are performed, the precision can be determined by obtaining the standard deviation and/or standard error. Sample calculations of any error analysis should be included in this section.

The error section should contain the error analysis, NOT an explanation of errors, which is part of the discussion (in the following section). Any error discussion in the error section will be ignored by the instructor.

8. Conclusions and Discussion

The experimental results and the respective errors are discussed in this section. The explanation of errors should be justified by quantitative estimations, not by speculations. This section should also include a discussion of sources of error and/or uncertainty. You must be specific here. "Human error" is NOT an acceptable source of error. The quality of the experiment is evaluated considering its success or failure. In case of failure, the student should attempt to identify the source of the problem. In general, the student(s) should discuss how the lab demonstrated the objectives of the lab, or how the data answered the questions posed at the start of the lab.

9. Acknowledgements

This section should include any reference materials used in the interpretation of data, the writing of the report, or the answering of questions. Persons contributing to this work also should be acknowledged in this section (e.g., other groups who provided data).

10. Questions.

At the end of each experiment, there are a few questions. Include the answers to the questions in your report.

The lab-reports assess

- The quality of the students' experimental performance in the lab
- The students' understanding of the underlying physics and chemistry
- The students' capability to use appropriate technical and scientific language
- The students' capability to perform simple data analyses
- As well as the general writing capabilities of the student.

Oral presentation. Each student will have to present one experiment in the seminar session in week 10. The time for each power point or keynote presentation will be 10 minutes + 5 minutes for questions and discussions. The concrete experiment for the talk will be selected by the instructor at the end of October. In this talk, the student should present background, experimental set up and strategy, results and a short discussion. The presentation will be graded and counts for 20% of the overall grade. The oral presentation assesses the capability of students to present scientific facts to an audience.

Quizzes. Quizzes will be given at the beginning of some lab-sections. The quizzes will not be announced. They are supposed to check the students' preparedness. The total grades for quizzes counts for 10% of the final grade. The quizzes will be closed book.

Final Exam (in Exam Week). The final exam is *optional*. Each student may use his/her grade on the final exam to replace the lowest lab grade. If the grade on the final is lower than the lowest lab grade, the final exam will not be counted towards the final course grade. This exam is cumulative and will be based on the theory and analysis associated with the labs performed.

Attendance. Lab-attendance counts for 5% of your grade and will include punctuality, whether or not you brought/wore your safety glasses and overall laboratory technique, among other things.

Summary of Grade Accounting: Lab reports: 65%
Quiz2: 10%
Oral Presentation: 20%
Attendance:5%

Grade scale. Final grades will be determined according to the following scale:

A+: 97-100, A: 93-96, A-: 90-92, B+ :87-89, B: 83-86, B- : 80-82, C+ : 77-79, C: 73-76, C- :70-72, D+ : 67-69, D :63-66, D- : 60-62, F: 0-59.

Grade A reflects an excellent, far above average, nearly flawless performance. Grade B reflects a very good/good performance with minor deficiencies. Grade C reflects an average performance with some significant deficiencies. Grade D reflects a partially deficient though still satisfactory performance. Grade F reflects an unacceptable, highly deficient performance. Note that the instructors grade the performance not the amount of effort invested.

Academic policies

Attendance. Students are expected to attend the lecture and laboratory each week. Attendance will not be taken in the lecture class, but students will be responsible for obtaining any information presented during the lecture. Once the lecture has begun, I expect to have your full attention. Make sure that your cell phone is turned off during class. If I catch you text-messaging during class, I reserve the right to ask you to leave. The use of cell phones during laboratory hours are absolutely forbidden. A failure to comply will force the TA or the instructor to expel a student from the lab.

Role of TA and instructor. It is the job of TA to assist students who are running into difficulties with their experiments and to advise them with respect to the writing of their lab report. It is not his or her job, to answer questions that are clearly addressed in the syllabus and in the lab procedures.

Students can make up only for one of the laboratories they miss, regardless of the reason for the absence. A valid reason for missing the scheduled laboratory will not excuse the student from performing the lab. A make up for a second lab will be approved only under exceptional circumstances.

Safety. Students are expected to practice proper and **SAFE** laboratory procedures as defined by University policies. No food or drinks are allowed in the labs. **A laboratory coat and proper eye protection must be worn at all times.** All students have to buy a laboratory coat. Safety rules can be reviewed at <http://www.drexel.edu/facilities/healthSafety/labSafety/>

Students who do not comply with these rules, which will be enforced by the respective teaching assistant, will not be allowed to start or continue an experiment. If a student was prevented from completing an experiment due to his/her violation of safety rules, he/she will not receive any credit for this particular lab and he/she will be reported to the department head. A list of safety rules will be handed out to the student at the beginning of the class, which he/she has to read and sign.

Preparedness: Students are obliged to prepare themselves for the laboratory by reading the laboratory procedures and attending the lecture. It is not the job of the teaching assistant to explain the entire experiment in a pre-lab session. Students should be prepared to enter the lab and begin the experiment with minimum direction. Up to ten points from the score can be subtracted by the instructor/TA, if a student is not sufficiently prepared for the experiment. Moreover, knowledge of lab procedures and the underlying physics of the experiments will be checked by sporadic 15-20 minutes quizzes (2-3) which will be given right at the beginning of the lab.

Cheating or dishonesty (which includes plagiarizing) will not be tolerated. Students are urged to check Drexel's policy regarding academic conduct (http://drexel.edu/studentaffairs/community_standards/studenthandbook/general_information/code_of_conduct/) Cheating or dishonesty will result in score reduction or a ZERO for the respective experiment, or failure of the course, as appropriate. The instructor will report the incident to the department head and to the Office of Student Conduct (http://www.drexel.edu/studentlife/community_standards/overview/).