

Physical Chemistry Laboratory - Spring 2026

CHEM 417
Room CSL-222

Instructors:

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Text: “Physical Chemistry Laboratory Manual” will be available in the bookstore. Other texts, such as those used for Chem 410A, 410B, and 251 will also be useful as references on theory and introductory laboratory techniques.

Required Lab Notebook: You will need a lab notebook with bound pages, and it must remain in the lab at all times. The notebook can simply be a spiral notebook with page number written in the upper right hand corner. You can photograph the pages to use at home. If you prefer, you can buy a notebook with duplicate pages. Each notebook page must be dated and signed. You will need to take very good notes, because if important information is missing, you may have to repeat the experiment! Your lab notebook must remain in CSL-222 at all times.

Catalog Description

CHEM 417. Advanced Physical Chemistry Laboratory

Six hours of laboratory.

Prerequisites: Chemistry 251, 410A, and credit or concurrent registration in Chemistry 410B

Experimental physical chemistry. Emphasis on interpretation and statistical evaluation of instrument-derived results, record keeping, report writing and individual initiative in observing results.

PROJECTS

This course focuses on quantitatively measuring the physical and chemical properties of compounds and understanding the limits of accuracy and precision in these measurements. There is also a strong writing component, with regard to both the laboratory notebook and written reports. There will be a short introductory experiment, followed by six major experimental projects and various smaller assignments.

In each of the six major projects, you will work with one other classmate, who is chosen randomly by the instructors. During the course of the semester, you will have the opportunity to work with up to seven different classmates. The reason for the random selection is so that you learn to work with peers from varied backgrounds, a skill that is important when working in academic or industrial labs.

The first experiment is the Speed of Sound experiment and will be done by everyone on the same day. After this introductory experiment, the six major projects will be carried out for the remainder of the semester. They will be conducted simultaneously during the lab period, each assigned to a different “team” consisting of two people. Therefore, “Project 1”, “Project 2”, etc. will vary for each student.

The points for the six major projects are divided as follows:

**Prelab
5 pts** At the beginning of class on the first day of each project, the instructors will have you either a) take a pre-lab quiz based on the experiment that you'll perform or b) write a paragraph in your notebook summarizing the project that you'll do (without notes). Three examples of prelab quiz questions are: 1) explain how to prepare a solution that you'll use in the experiment; 2) sketch the experimental setup; and 3) explain how a physically important quantity is determined from the measured data. If the instructors instead have you write the summary, you should include the purpose of the experiment, the measurements to be made, and the major equipment to be used. The quiz must be turned in before you start the lab. The point of this quiz is to encourage you to read the lab manual thoroughly and carefully before starting the experiment.

**Notebook
+ lab work
30 pts** Requirements and expectations for your lab notebook and lab work are given at the beginning of the lab manual. Some points will be given for the quality of the results.

**Report:
65 pts** The lab reports must be typed and turned in at the beginning of class, typically one week after the last day of the project (see schedule at the end of this syllabus). If you are having problems with printing, send the reports electronically to the instructor prior to class, and hand in a printed version by the next lab period. Include the following sections in the reports: introduction, experimental, results, and discussion. The introduction and experimental parts should be brief, with a **150-word limit** for each. The written part of the results section should not include tables and graphs – these will be put at the end of the report, in order, as an appendix, and referred to in the results and discussion sections. The report will be returned if this format is not used. All of the text in the report should be constructed of well-formed sentences and paragraphs. Part of your grades will be based on the quality of writing. The points for the report are divided approximately as follows:

10 pts Introduction + Experimental

45 pts Results

10 pts Discussion

Further details about how to write the reports will be discussed in class and are also contained in the manual.

Thus, the reports for Projects 1 – 6 will each have 100 total possible points. The Speed of Sound experiment will *not* have a report, but you must turn in your Excel file containing your data analysis; it will be worth 65 points. The introductory pipetting exercise will be worth 20 points, allotted to your lab work, documentation in your notebook of what you did, and data analysis. The error analysis assignment will count for 15 points.

You must write your own reports, and we expect all of the figures and tables to be done by the person writing the report. Therefore, do not send figures or tables to anyone else, including your partner; although the data might be the same, the figures should be your own creation. Also, do not let other people see your report, because it may be too tempting for them to use your ideas. If two reports are too similar to each other, then both will lose points.

1 point for each day late will be subtracted for reports submitted after the deadline (the beginning of class, one week after the last lab period for the relevant project).

Attendance and Punctuality

Attendance is mandatory: **20** points will be subtracted if you miss a lab period, unless you are completely finished with the lab work and have tabulated and plotted the data as needed for the report. Although you will lose these points for the absence, you will be able to use your partner's data from any missed days in your report, and, time permitting, you may have the opportunity to get the 20 points back at the end of the semester by doing a new experiment with a brief write-up (this will take one full class period). Even if your work is complete, we strongly recommend that you attend every day for the entire lab period. The analysis is time consuming and sometimes difficult, and it is useful to be able to ask questions while you are doing it. We will only provide time outside of class for additional help if you have made full use of the time in class.

If you are late to lab by more than 10 minutes, 5 points will be deducted; more than 5 points may be deducted for egregious violation of punctuality. These points cannot be made up.

Grading scheme

The grading scheme for the course will be as follows:

A	89-100%	C	59-66%
A-	85-89%	C-	55-59%
B+	81-85%	D+	51-55%
B	74-81%	D	43-51%
B-	70-74%	D-	40-43%
C+	66-70%	F	< 40%

List of Projects and assignments

♣ In-class error analysis assignment	15 pts
♣ Introductory pipette exercise	20 pts
♦ Speed of Sound introductory experiment	65 pts

Projects #1 – #6:

♦ Kinetics of Bimolecular Quenching of Ru(bipy) ₃ ²⁺ by Oxygen	100 pts
♦ Fluorescence spectroscopy	100 pts
♦ NMR Determination of Keto-enol Equilibrium Constants	100 pts
♦ Prediction and Measurement of Infrared and Raman Spectra	100 pts
♦ Erythrosin oxidation kinetics	100 pts
♦ Measurement of Diffusion	100 pts

Total points possible = 700

LEARNING OUTCOMES

At the end of this course, we expect that you will be able to

- Write clear and concise reports, including the preparation of tables and graphs
- Record results and observations in a notebook in a complete and clear manner
- Clearly present numerical results and their uncertainties
- Develop a working knowledge of a various types of spectrometers used in modern chemical research (e.g., IR, Raman, steady state and time-resolved fluorescence, UV-Visible)
- Be able to analyze raw data to determine specific properties of compounds and molecules
- Build or hone your ability to work with peers having diverse backgrounds

Add/Drop Procedure: The add/drop deadline is February 2, 2026. For details, see <https://registrar.sdsu.edu/students/registration#start>

Accommodations: If you are a student with a disability and are in need of accommodations for this class, please contact Student Ability Success Center at (619) 594-6473 as soon as possible. Please know accommodations are not retroactive, and we cannot provide accommodations based upon disability until we have received an accommodation letter from Student Ability Success Center.

Religious observances: Notify the instructor of planned absences for religious observances by the end of the second week of classes.

Academic Honesty: The University adheres to a strict policy prohibiting cheating and plagiarism. Examples of academic dishonesty include but are not limited to:

- copying, in part or in whole, from another's test or other examination;
- obtaining copies of a test, an examination, or other course material without the permission of the instructor;
- collaborating with another or others in work to be presented without the permission of the instructor;
- falsifying records, laboratory work, or other course data;
- submitting work previously presented in another course, if contrary to the rules of the course;
- altering or interfering with grading procedures;
- assisting another student in any of the above;
- using sources verbatim or paraphrasing without giving proper attribution (this can include phrases, sentences, paragraphs and/or pages of work);
- copying and pasting work from an online or offline source directly and calling it your own;
- using information you find from an online or offline source without giving the author credit;
- replacing words or phrases from another source and inserting your own words or phrases.

The California State University system requires instructors to report all instances of academic misconduct to the Center for Student Rights and Responsibilities..

Resources for students: A complete list of all academic support services--including the Writing Center and Math Learning Center--is available on the Student Affairs' Academic Success website. Counseling and Psychological Services (619-594-5220) offers confidential counseling services by licensed therapists; you can Live Chat with a counselor at http://go.sdsu.edu/student_affairs/cps/therapist-consultation.aspx between 4:00pm and 10:00pm, or call San Diego Access and Crisis 24-hour Hotline at (888) 724-7240.

Classroom Conduct Standards: SDSU students are expected to abide by the terms of the Student Conduct Code in classrooms and other instructional settings. Prohibited conduct includes:

- Willful, material and substantial disruption or obstruction of a University-related activity, or any on-campus activity.
- Participating in an activity that substantially and materially disrupts the normal operations of the University, or infringes on the rights of members of the University community.
- Unauthorized recording, dissemination, or publication (including on websites or social media) of lectures or other course materials.

- *Conduct that threatens or endangers the health or safety of any person within or related to the University community, including*
 1. *physical abuse, threats, intimidation, or harassment.*
 2. *sexual misconduct.*

Violation of these standards will result in referral to appropriate campus authorities.

Medical-related absences: *Contact the instructor in the event they need to miss class, etc. due to an illness, injury or emergency. We will try to accommodate valid reasons for absence.*

SDSU Economic Crisis Response Team: *If you or a friend are experiencing food or housing insecurity, or any unforeseen financial crisis, visit sdsu.edu/ecrt, email ecrt@sdsu.edu, or walk-in to Well-being & Health Promotion on the 3rd floor of Calpulli Center.*

Course Schedule (tentative)
Spring 2026

Week of:	Tuesday	Thursday
Jan 20,22	Introduction First day of class	Speed of Sound (SOS) experiment <i>Email results by midnight Friday 1/23</i>
Jan 27,29	Discussion of SOS results <i>In-class error analysis assignment</i>	Introductory pipette exercise
Feb 3,5	Rotation #1 <i>Last day to add/drop is Mon Feb 2</i>	Rotation #1
Feb 10,12	Rotation #1	Rotation #2
Feb 17,19	Rotation #2 <i>Rotation #1 report due</i>	Rotation #2
Feb 24,26	NO CLASS	NO CLASS; prep for S3 symposium
Mar 3,5	Rotation #3	Rotation #3 <i>Rotation #2 report due</i>
Mar 10,12	Rotation #3	NO CLASS
Mar 17,19	Rotation #4	Rotation #4 <i>Rotation #3 report due</i>
Mar 24,26	Rotation #4	NO CLASS
Mar 30–Apr 3	SPRING BREAK	SPRING BREAK
Apr 7,9	Rotation #5	Rotation #5 <i>Rotation #4 report due</i>
Apr 14,16	Rotation #5	NO CLASS
Apr 21,23	Rotation #6	Rotation #6 <i>Rotation #5 report due</i>
Apr 28,30	Rotation #6	Lab Make-up if needed
May 5,7	NO CLASS <i>Rotation #6 report due</i>	<i>Last day of classes, May 6</i> <u>No reports accepted after May 8</u>
May 12,14	Finals week Last day of final exams is Wed May 13	Finals week