

Physical Chemistry Laboratory - Spring 2021

CHEM 417

Room CSL-222, CSL-508, and at-home

Instructors:

Section 01: TTh 8:00-10:40

Dr. Karen Peterson

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Section 02: TTh 2:00-4:40

Dr. David Pullman

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Text: “Physical Chemistry Laboratory Manual”; this year, the entire manual will be found in Blackboard/Documents. Download the parts as you need them, because they may be updated throughout the semester. Other texts, such as those used for Chem 410A, 410B, and 251 may also be useful as references on theory and introductory laboratory techniques.

Required Lab Notebook: You will need a lab notebook with bound pages, but this can be simply a spiral notebook with page number written in the upper right hand corner. Duplicate pages will not be necessary. Instead, you will photograph the pages and send these to us on a weekly basis. Each notebook page must be dated and signed. Since the lab work will be done in a short time window, and there may not be time to write reports between lab experiments, you will need to take very good notes. If important information is missing, you may have to repeat the experiment!

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.

Required Attendance:

Attendance is mandatory: **3 - 10** points will be given for attendance and participation in a lab period or required Zoom meeting (total will be 100 pts). Make full use of the Zoom sessions to get help with the project analyses, because that is the only time the instructors will be available for this.

You must be on time for the in-class lab experiments. Points will be deducted if you are late and are unable to finish the lab in the time allotted.

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 six experimental projects which require a full report: three will be done in the laboratory, CSL-222, one will be done in CSL-508, one will be done at home with equipment supplied by the instructors, and one will be done at home with data supplied by the instructors. In addition, there will be 5 projects involving very short reports or worksheets.

- Projects in CSL-222: Fluorescence spectroscopy (100 pts)
Vibrational Spectroscopy of Oxalates; IR and Raman (100 pts)
UV-Visible Spectra of Polymethine Dyes (100 pts)
Use of a Pipette (in-class exercise; 25 pts)
- Project in CSL-508: Determination of the Diffusion Constant of KCl (100 pts)
- Projects at Home: Speed of Sound Through Air (100 pts)
NMR Determination of Keto-Enol Equilibrium Constants (75 pts)
Measuring the Gravitational Acceleration (short lab; 50 pts)
NMR worksheet (Zoom workshop; 25 pts)
Gaussian calculation of excited electronic states (short lab 50 pts)
Keto-Enol Equilibrium; Temperature Dependence (25 pts)

Attendance/participation: 100 pts

Full reports are required for six of the projects.:

Note that the Keto-Enol NMR project is worth only 75 pts, because you will not be doing the labwork.

Prelab: This year, we will not have a prelab assignment, but you must watch the relevant videos and read the project handout carefully. If you are not prepared, you might not be able to finish the lab, or you may do the experiments incorrectly. That would be unfortunate.

Notebook/lab work: Notebook pages must be copied (e.g., photographed) and sent to the instructor every lab period where lab work is done. This includes days in which you are doing a lab at home. Details about the notebook expectations are given in the introductory handout.
30 pts

Report: The lab reports must be typed and sent to the instructor on the day they are due. Due dates will be given as the semester progresses. The reports will contain these sections: introduction, experimental, results and discussion. The introduction 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. The manual contains more details about how to write the report.
70 pts

1 point for each day late will be subtracted for reports submitted after the deadline.
Deadlines will be posted as the semester progresses.

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; if they are copied, both the sender and sendee will be penalized. 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. **The data used in the report must match the data in your notebook and excel files.**

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%

Total points = 850

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 variety of spectrometers (e.g., NMR, IR, Raman, Fluorescence, UV-Visible)
- Be able to analyze raw data to determine specific properties of compounds and molecules

Add/Drop Procedure: *The add/drop deadline is February 2, 2021. For details, see http://arweb.sdsu.edu/es/registrar/schedule_adjustment.html*

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 – updates will be posted on blackboard) Spring 2021

Week of: (Monday date)	Tuesday	Thursday
Jan 18	No class	Zoom: Introduction First day of class Assign “Gravity” project
Jan 25	Zoom: Reports/Estimating errors/error analysis. Updates of “Gravity project	Zoom: NMR Workshop “Gravity” project is due
Feb 1	Zoom: NMR Project worksheet; Gravity project is due (firm deadline)	Zoom: Gaussian Project introduction; Discussion of “Gravity” project results
Feb 8	<u>Speed of sound</u> (2 students pick up equipment at 10 am in College entrance to CSL); return by 9 am next Tues. <u>Dye experiment</u> (1 student in CSL-222) <u>Diffusion</u> experiment (1 student in CSL-508)	<u>Dye experiment</u> (1 student in CSL-222) <u>Diffusion</u> experiment (1 student in CSL-508) Zoom help room – time TBA
Feb 15	<u>Speed of sound</u> (2 students pick up equipment at 10 am in College entrance to CSL); return by 9 am next Tues. <u>Dye experiment</u> (1 student in CSL-222) <u>Diffusion</u> experiment (1 student in CSL-508)	<u>Dye experiment</u> (1 student in CSL-222) <u>Diffusion</u> experiment (1 student in CSL-508) Zoom help room – time TBA
Feb 22	<u>Speed of sound</u> (2 students pick up equipment at 10 am in College entrance to CSL); return by 9 am next Tues. <u>Dye experiment</u> (1 student in CSL-222) <u>Diffusion</u> experiment (1 student in CSL-508)	<u>Dye experiment</u> (1 student in CSL-222) <u>Diffusion</u> experiment (1 student in CSL-508) Zoom help room – time TBA
Mar 1	TBA	TBA
Mar 8	TBA	TBA
Mar 15	TBA	TBA
Mar 22	TBA	TBA
Mar 29	Rest Day	TBA
Apr 5	TBA	TBA
Apr 12	TBA	Rest Day
Apr 19	TBA	TBA
Apr 26	TBA	TBA
May 3	TBA	<i>Last day of classes, May 6</i> Reports not accepted after May 13

May 10		