

CHEMISTRY 108 L

Welcome to Chemistry 108L! I'm convinced that we learn only what we enjoy. I'm also convinced that a solid and challenging laboratory course can be enjoyable provided the students' motivation is piqued by stressing how the experiments they will perform are connected to other fields of science and even with everyday life. In selecting the experiments for this class, I kept in mind that the "performers" are, for the most part, biology and biochemistry students. An effort was made to choose experiments with biological connotations. The introduction to some of the experiments is aimed at providing you with a biological framework in which organic chemistry proves to be a very useful tool. In doing so I hope that some of the aridity of chemistry has been swept away.

In the first part of Chemistry 108L, you will learn how to separate and purify organic chemicals by recrystallization, distillation, extraction, and chromatography. Chromatography is the most versatile and powerful separation technique in the chemistry and biochemistry laboratories. You will have first-hand experience on gas chromatography (GC), and thin layer chromatography (TLC). The last experiments in Chem 108L are devoted to chemical reactivity and the principles of organic synthesis. In Chemistry 108M, the second part of this laboratory course, emphasis will be put in organic reactivity and synthesis, and the applications of spectroscopy, especially Infrared (IR) and Nuclear Magnetic Resonance (NMR). With the exception of the very first experiments in Chem 108L, most of the experiments are coordinated with the subjects discussed in Chem 108A and 108B, so you can see in the laboratory the applications of the principles discussed in the lecture portion. By the end of the second quarter you will be equipped with a battery of laboratory techniques and ready to explore your own projects.

My TAs and I are ready to assist and teach you. I hope you will learn this new craft with joy. Do not hesitate to ask questions. Paraphrasing Oscar Wilde, I would say: *There are no stupid questions, there are only stupid answers.* If you want to contact me, call me at (831) 459-3405, e-mail at: drpaller@ucsc.edu, or stop by my office (313 Thimann Labs). **My office hours** for this term are: **Mon 3:00-3:45; Tue 2:15-4:00 and Wed 2:00-3:00**, in Thimann Labs, room 313.

COURSE ORGANIZATION

LECTURES

An introductory lecture will be given on each experiment before the experiment is performed. The lectures and the laboratory book will supply the theoretical background necessary to understand, perform, and enjoy the experiments. No further discussion of the subject will be given by the TAs in the lab, thus your attendance to lecture is of paramount importance.

BOOK

The experiments are from "Experimental Organic Chemistry" by Daniel Palleros, Wiley, New York, 2000. This book is mandatory. With the royalties from the sales of the book at UCSC (Bay Tree Bookstore) the *C. Fiore 2013-2014 Excellence in Chemistry* award for undergraduates will be established. The award will be given to the best student in the Chemistry 108A/B/L/M series. The winner will be announced in the Fall of 2014.

WEB SITE

Important ancillary course material such as laboratory safety, book resources, TA's office hours, practice tests, etc. are or will become available during the course of the quarter at the class web site:

<http://www.chem.ucsc.edu/courses/palleros/index.htm>

REQUIREMENTS

Necessary requirements for passing this laboratory course is **completion of all the assigned experiments, turning in all of the lab reports**, each one with a **passing grade of at least 70%** and **passing the final exam with a minimum of 55%**. Your final grade will be based on your performances in the lab and the final exam. Each part will make up 65% and 35% of your final grade, respectively (more under GRADES).

YOUR PERFORMANCE IN THE LAB

Attendance and Make-ups. Regular attendance to all of your lab sections is a must. There will be **no make-up labs**. *Under special circumstances only* (illness, see below), a make-up will be allowed. A medical certificate may be required. The lab must be made up the same week or, at the latest, the following week. It is not possible to make up a lab two lab periods after the completion of the experiment because the chemicals and equipment are removed from the lab to make room for the next experiment. If you were sick and missed a lab, do not try to crash a lab section because most of them are full and the TA will turn you away. To schedule a make up, please e-mail me (or see me in person) as soon as possible. **In your e-mail, please include your lab section and TA's name.** This strict policy on make-ups is not capricious. It stems from the fact that most lab sections are full and we cannot allow extra students in without creating an unpleasant situation for everybody. So, **your cooperation is required.**

Please keep in mind that the last experiment for the quarter cannot be made up the following week; it must be made up during the last week of class. **All experiments must be performed in order to pass the class.**

Preparation. Preparation for the laboratory is critical. Very often the success of your experiment will depend on how much effort you put into the lab preparation. In the lab book, at the end of each experiment you will find the **Pre-lab** questions. They must be answered before coming to the lab. Students who do not have the Pre-lab questions answered will not be allowed in the lab. This will jeopardize their standing in the class. The TA will initial your notebook to indicate that the preparation for the laboratory was complete upon arrival. We want you to learn and enjoy practical organic chemistry while developing your critical

thinking on the subject. We do not want to train “cooks” who just follow recipes. If you have questions about the material do not hesitate to see us during office hours, or ask your TA at the beginning of the lab section. **We are ready to help you.**

Punctuality. Punctuality is paramount. Lab sections begin at the indicated times, sharp. At the beginning of the section the TA gives general guidelines for the successful completion of the experiment as well as safety advise. If you are late, even if it is only for a few minutes, you may miss this important information. Students who are late may not be allowed in lab by their TAs.

Lab Reports. You must keep a **bound, carbon-copy** lab notebook to document all the information about the lab, especially the Pre-lab and In-lab questions. A legible carbon copy (or a photocopy of the original upon request by the TA) of the **Pre-lab and In-lab questions will be given to the TA for evaluation (you always must keep the original). This will be your lab report.** Your lab report will be *no more but no less* than the answers to the Pre-lab and In-lab questions. Lab reports will be graded 0-10. All lab reports must be turned in and each lab report must have a grade of at least 7 to pass the course. Typed lab reports are not acceptable.

Late Lab Reports. All lab reports must be turned in at the beginning of the next lab period after completion of the experiment. Lab reports turned in after that will be considered late. **One late lab report (late for no more than one lab period) will be allowed in the term without penalty.** This applies to any lab report except for the very last one which cannot be late.

If the lab report is late for a second lab period, or a second lab report is late for a lab period, the penalty will be -2.5 points out of 10. If the same lab report is late for a third lab period, or a new lab report is late for a lab period, the penalty will be -5.0 points out of 10, and so on. Each lab period that a lab report is late the penalty will increase by -2.5 points. Still, all lab reports must be turned in to pass the class.

Last Lab Report. The last lab report must be turned in at a date and place that will be announced by your TA. Make sure that you follow the directions carefully. Because of the deadlines in submitting grades, no late last lab report can be admitted. Make sure to include in your last lab report **your name, your lab-TA's name, the course title, and your lab section.** Please **do not place the lab report in your TA's mailbox** because it can get lost. **Failure to turn in the last lab report on time has serious consequences and may lead to an F in the class.**

Academic Integrity. Academic misconduct in any of its forms (which includes, but it is not limited to, cheating, copying answers during tests, fabrication, facilitating academic dishonesty, etc.) will not be tolerated and will lead to academic and disciplinary sanctions to those responsible of such acts.

As a student and as a scientist-to-be you are expected to conduct the business of learning with total honesty and integrity. If you did not perform part of an experiment, for whatever reason,

explain in your lab report what happened but do not report data generated by other students unless you are instructed to do otherwise by your TA. **Do not fabricate data. Do not copy data or any other part of your report from other students.** Students who copy or fabricate data will face serious consequences that may include, but are not limited to, failing the class and other academic sanctions.

Dress Code. Everybody should wear **safety goggles** while in the lab and the instrument room **at all times**, whether they are directly working with chemicals or not. This applies to students, TAs, instructors and staff. Feet should be completely covered. **Sandals** and other shoes that leave the instep uncovered (such as **ballerina-type shoes**) are **not allowed** in the lab. **Sandals plus socks** do not offer much protection in case of spill and **are not allowed** in the lab. Legs must be completely covered (to the instep of the foot). **Short pants, Bermuda shorts, short skirts and capris are not allowed** in the lab. **Tights, leggings and tight pants should not be worn** in the lab because they offer little protection in case of a spill. In fact, because of their proximity to the skin they may even worsen the effects of a spill. The torso should also be covered. **Tank tops and midriffs are not allowed. Long hair, loose-fitting sleeves, scarves and ties should not be worn or must be confined** in the lab. Students who are not properly dressed for the lab will be asked to leave.

Headphones, cell phones and electronic material. Using cell phones (including texting) and wearing headphones is prohibited in the lab. Electronic equipment (cell phones, computers, etc.) should not be kept on the work bench as they can be easily ruined by the accidental spill of chemicals.

Safety. Read carefully the section on Safety in your lab book (Unit 1 and also available online) and follow the guidelines described there. Dispose of the waste following the written instructions. Pay special attention to announcements made in lecture and in lab concerning safety and waste disposal. Read labels. Do not remove chemicals from their assigned locations. Take only what you need. Visit the class website for more information about safety in the laboratory. A Safety Quiz will be given at the beginning of the quarter. All students must take it and pass it.

Keeping It Tidy. Take good care of your bench space. Keep it clean and tidy at all times. Keep the reagents counter and the balances clean. If you spill a small amount of a solid when transferring or weighing it, clean it with wet paper towels and dispose of the towels in the solid-waste container; wear gloves while doing it. Keep reagent bottles and your Erlenmeyer flasks well capped.

Compounds Made in the Lab. All products made or purified in the lab should be stored in a screw-cap vial or a plastic bag which should be properly labeled with the compound's name, melting point (if applicable), weight, your name and the date. The vials or bags are to be turned in immediately after completion of the experiment to the stockroom or your TA unless requested to do otherwise.

Illness. Casts and Crutches. Pregnancy. If you are ill, you **should not attend** lab and should contact me as soon as possible to make arrangements for a make-up. In the circumstance that you must wear a cast, a sling or use crutches, please contact me immediately, before your next lab section, so we can arrange the best possible accommodations for you. If you are pregnant or intend to get pregnant during the course of this term, it is very important that you discuss it with your doctor. Also, please contact us before your next lab section to obtain relevant information about chemicals and pregnancy.

FINAL EXAMINATION

The Final. It will be a short final (90 minutes) based on the experiments you have done. The passing grade for the final examination is 55%. The final will be given on the date announced below (see Schedule). **No make-up exams will be administered.** Attendance is mandatory. Students **who arrive at the test late, after somebody has already turned it in, will not be allowed to take the test.**

Please bring calculator and ruler as they are needed for the test (no blue book, no scantron are needed).

To Prepare for the Final. Your sources of inspiration for the final exam should be your **lecture notes**, the **lab book** and your **lab reports**. The final is conceptual. Thus, just as an example, there is no need to memorize how many milliliters of this or that reagent you used; you should know instead why the reagent was used. To give you an idea about the type of questions and the level of difficulty that you may find on the final exam, a couple of **practice tests** will be available with their answer keys. Use these tests for the purpose they are intended, as extra practice and not as the only study tool. **No review sessions will be offered** at the end of the quarter since it is not possible to review in a couple of hours the material covered in the whole quarter without leaving plenty of important concepts out.

GRADES

Your performance in the lab counts for 65% of your overall grade and your performance on the final exam for 35%. Let's say that a student gets an average of 8.8 points on the lab reports and a grade of 91% on the final. The student's overall score is:

$$88\% \times 0.65 + 91\% \times 0.35 = 89\%$$

Grades will be curved, if necessary. Although a strong effort will be made to have the grading system as uniform as possible across all lab sections, if needed, each TA's grades will be individually curved. Keep in mind that this is a very competitive class and students tend to get high scores. Usually, an A- grade starts at an overall performance of 90%.

DRC STUDENTS

If you qualify for classroom accommodations because of a disability, please submit your Accommodation Authorization Letter from the Disability Resource Center (DRC) to me as soon as possible, preferably within the first week of the Summer Session. Contact DRC by phone at 831-459-2089 or by email at drc@ucsc.edu for more information.

ABOUT THE LAB BOOK

The lab book is organized in three sections. The first section contains **Laboratory Safety**, **Basic Concepts**, and **Basic Operations**. Use this section as a reference when preparing and performing the experiments. Section II describes the experiments that you will perform. Please notice that the experiments are not necessarily performed in the order in which they are presented in the book. Refer to the attached Schedule. An introduction precedes each experiment. This introduction will give you the information to answer most of the Pre-lab questions. You will also find **Exercises** at the end of the introduction and before the experiment. These exercises are highly recommended to fully understand the concepts illustrated in the labs but they are not to be turned in for grading, and **they are not part of your lab report**. The answers to odd-numbered exercises can be found at the end of Section III. Section III also contains the spectroscopy units.

Don't hesitate to visit us during office hours!...Have a great quarter.

Daniel

Summer 2014

Lectures: Mon and Wed 11:30-12:40 in Thimann 1

Date	Lecture's Subject
June 23	Introduction. Recrystallization
June 25	Continue Recrystallization. Melting point. Boiling Point
June 30	Steam Distillation. Partitioning
July 2	Partition Chromatography: Gas chromatography
July 7	Adsorption Chromatography: Thin layer chromatography
July 9	IR Spectroscopy
July 14	Applications of IR Spectroscopy. IR Tables
July 16	Elimination Reactions: Dehydration of Methylcyclohexanols
July 21	Calculation of Yields. Nucleophilic Substitutions.
July 23	More on Nucleophilic Substitutions

Final exam: A 1.5-hr written final exam on Thursday July 24, 11:00 am-12:30 pm in Thimann 1. No make-ups. No exceptions. Bring ruler and calculator.

Laboratory Schedule

Date	Exp #	Title
June 24	-	Check-in. Laboratory Safety
June 26	4	Recrystallization and Melting Point. Safety Quiz
July 1	4	Continue Experiment 4
July 3	7C	Isolation of Citrus Oils (available at the class website)
July 8	7C	Analysis of Citrus Oils (available at the class website)
July 10	8	TLC analysis of Plant Pigments
July 15	31	IR Exercise (available at the class website)
July 17	12	Dehydration of methylcyclohexanols
July 22	13.2;13.3	Synthesis of 2-chloro-2methylbutane (<i>t</i> -pentyl chloride)