

Chem 125L

Department of Chemistry and Biochemistry

University of California, Santa Barbara

Winter 2009

Syllabus and general course information for Chem 125L, **LABORATORY TECHNIQUES IN BIOCHEMISTRY**

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PSB-N 2623 (Office)
Office hours: Tuesday 12:15–1:15 PM, “Open Door” policy other times

Teaching assistants:

Section 1:	Gloria Mo	gmo@chem.ucsb.edu
	Office hours: CHEM 1317	Phone: x5468
Section 2:	Sunyia Hussain	sunyia@jhu.edu
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Section 3:	Adriana Patterson	aspatterson@lifesci.ucsb.edu
	Office hours: CHEM 1317	Phone x5845

Lecture time Mon 10:00–10:50 AM in Bldg (Trailer) 387, Rm 101

Trailer 387 is located by the parking lot between the University Center and the Psychology Building

Lab session times

Section 1:	Tuesday/Thursday	2:00-5:50 p.m.	PSB-N 2619
Section 2:	Tuesday/Thursday	6:00-9:50 p.m.	PSB-N 2619
Section 3:	Wednesday/Friday	2:00-5:50 p.m.	PSB-N 2619

Course website: <http://www.chem.ucsb.edu/~kalju/chem125L>

Course Goals

The purpose of Chem 125L is to introduce students to the practice of modern biochemical research. The course is structured into three components. The first component of the course focuses on molecular biology techniques, in the second component you will learn protein purification techniques, and in the last component you will be introduced to methods for characterization of proteins. Good understanding of techniques covered in Chem 110L is assumed. The course is organized to mimic real-life research and incorporates writing a grant proposal and giving a final presentation. The 1-hour weekly lecture series focuses on instrumental techniques and explains the methods used in the following lab.

General Information and Expectations of Students:

Chem 125L is a laboratory course, in which the main portion of your grade is earned by planning and performing experiments, documenting your work in your lab notebook, and answering questions in the experimental handout. There is a quiz at the beginning of each experiment, one exam near the end of the course, and an oral research presentation at the end of the course. As with any laboratory course, standard lab fee is collected from students who stay beyond the standard drop deadline.

Because most of the experiments were developed here at UCSB recently, you do not have to purchase a lab manual for this course. The lab manual will be available for download from the course website at <http://www.chem.ucsb.edu/~kalju/chem125L>. At the beginning of the course, you will receive a "Theory Manual" that provides a background on techniques and the first part of the "Operations Manual for Component 1" that contains the procedures for first experiments. After completing your research proposal, you will receive the rest of the "Operations Manual".

Attendance

Attendance in lectures and taking good lecture notes is expected. Supplementing the lecture notes with study notes based on the information available in the experiment manual, in scientific journal articles, in your Chem 142 textbook, or resources on the Internet is a good way to improve your chances to be successful in this course.

Attendance in all laboratory sessions is mandatory. Please contact your instructor, your TA, and your lab partner at least one week ahead of time if you have to miss a class. For each missed class you must turn in a signed letter detailing the reason for missing the class. For unexpected misses, you must provide a verifiable documentation stating that you "could not make the class". There are two make-up days toward the end of the quarter to repeat missed or unsuccessful experiments. If you are a student with a disability and would like to discuss special academic accommodations, please contact me during my office hours.

Preparation for the lab

You are expected to be well familiar with material in the course manual as well as with any material presented in the 'required reading' section. You should show an adequate preparation in order to perform the experiment. Your preparation is judged to be inadequate if you receive 33% or fewer points **both** on your quiz and on your prelab for that day. Your preparation is also judged to be inadequate if you receive 20% or fewer points on **either** the prelab or the quiz for that day. If you are not adequately prepared, you are asked to leave the lab. You may make up the experiment during one of the make-up days if this was the first instance of inadequate preparation. You will receive zero points for the whole experiment on any subsequent instance of inadequate preparation. The final quiz and prelab scores of the lab that you make up will be calculated as a mean of your original and new scores.

Academic honesty

Honesty and academic integrity must be always preserved. It is your responsibility to be familiar with common sense about academic integrity. Some examples of academic dishonesty are:

- a) altering experimental data without clearly explaining the nature of alterations
- b) intentional misrepresentation of the meaning of data
- c) using other student's ideas or data as if these were yours
- d) copying information from any source and presenting it as if it was your original answer
- e) copying images from any source and presenting them as if they were created by you
- f) sharing information about quiz questions with other students
- g) altering the experimental set-up of other students without their permission

For additional information about types of disallowed conduct, please see

http://www.ubalt.edu/studentaffairs/handbook/academic_dishonesty.html

While working with your partner(s) is encouraged in the laboratory, you must write your notebook up independently. You may discuss prelab questions and additional questions with other students in the class but make sure that your answers are original both in form and ideas. Plagiarism will not be tolerated and will result in score zero on that lab report. Cheating in any form will result in a failing grade and notification of Associate Dean of Students, Conduct and Student Relations. No supplemental materials should be used during quizzes and the final exam.

No student shall give, sell, or otherwise distribute to others or publish any electronically available course materials or recordings made during any course presentation without the written consent of the instructor.

Safety

Even though we have had an excellent safety record in our biochemistry laboratory, the teaching laboratory can be a dangerous place. A few hazards that are present include hot water or hot surfaces, toxic or corrosive chemicals (ethidium bromide, acrylamide), live microorganisms (nonpathogenic strains of *E. coli*), electricity, ultraviolet light, operating centrifuges, and broken glass. The general advice to safety is: **know what you are doing by preparing for lab**. Each experiment in the manual outlines most serious hazards that are present while performing the experiment and discusses ways to prevent accidents. Be sure to read these carefully and ask your TA or the instructor if you have any questions. Students have a right to view Material Safety Data Sheets (MSDS) for chemicals used in the class. These can be accessed from <http://ehs.ucsb.edu>. Your TA will remind you of the potential hazards before each class.

You must follow basic safety rules¹ to ensure safety for yourself and fellow students during the class.

- 1) Always wear some sort of protective eyewear. You must wear either lab goggles that protect from the sides as well as from the front or a face shield. You can purchase lab goggles during the first weeks of the class from the bookstore. There are four face shields in the laboratory. If you are wearing normal glasses, wear goggles over

¹ The course manual is the equivalent to the OSHA Chemical Hygiene Plan. This applies to course TA-s.

them as normal glasses do not provide side-protection. You may wear contact lenses along with lab goggles. Protective eyewear is not required in the computer lab.

- 2) Wear gloves when required, or when you are working with dangerous chemicals. Replace gloves when they become contaminated with toxic materials, such as ethidium bromide. Throw used gloves into the trash.
- 3) Wear appropriate clothing. You must wear closed shoes, and a shirt that covers the midsection. No shorts are allowed, and long pants and long sleeves are recommended.
- 4) Label all solutions that you prepare clearly. If the solution is in a container larger than 5 mL, make sure that the label conveys information about the content of the container and also identify your group or you personally as the person responsible for this solution. Unlabeled solutions will be discarded.
- 5) Familiarize yourself with the safety equipment in the lab. Our lab has one fire extinguisher near the back door, and eyewash station near the front door. The first aid kit is available in the top drawer near the shelf. The nearest phones are in offices across the hallway or downstairs in the main office. In case of fire, earthquakes, or other major disasters leave the lab if this is safe, and meet your instructor at the lawn south of PSB-N building.
- 6) Do not eat or drink in the laboratory. Closed containers with food may be brought into the laboratory but must be stored in your bag or backpack placed in the cabinet box. You may eat or drink outside the laboratory if time permits.
- 7) Wash your hands with soap and warm water before you start the experiments and after you leave the class. This is important for two reasons: (i) it minimizes the risk of contaminating our bacterial cultures with other microorganisms, and (ii) it minimizes the risk that bacteria from your experiments contaminate your food.
- 8) Never work alone. Never use mouth suction. Never open the lid of a spinning centrifuge. Do not perform any unauthorized experiments. Come and see your instructor if you would like to perform an additional interesting or fun experiment. He is probably willing to let you do it.
- 9) In case of accident, alert fellow students and immediately take an appropriate action. Explain to your TA what happened and seek further help if necessary.

Ignoring safety rules while in the laboratory will lead to oral warning on the first instance, and deduction of lab quality points for each following instance. Serious intentional violations of safety rules will lead to the dismissal from the course.

Cleanliness

It is important to maintain cleanliness in this laboratory. Even minor impurities on the glassware or on the pipette tip may ruin an otherwise well-done biochemical experiment. For example, using the same pipette tip to transfer two enzymes from their containers into your microcentrifuge tube will most surely contaminate the stock of the second enzyme with the first one and will likely ruin the results for the whole class. You will be working a lot with pipettors that use disposable tips. Discard the tip as soon as you do not need it. They are a lot cheaper than the chemicals that you are working with. Most used plasticware, such as microcentrifuge tubes or Falcon tubes (15 mL, 50 mL size) are

for one-time use. Empty all the tubes before discarding them (it's OK to leave less than 50 μL in microcentrifuge tubes). Discard broken glassware and used glass pipets into the red container. Do not discard functional glassware or any parts of the equipment used. If your glassware is visibly dirty, wash it with soap and hot water, otherwise rinse several times with distilled water from the tap, and place on the drying racks. **Do not leave any dishes in the sink.** Each student is responsible for completely cleaning the workplace and all the glassware used. Your TA will adjust your grade based on your work ethics. Leaving a mess will result in a bad grade.

Experiments and group work

You will perform series of experiments in this laboratory and complete several computer assignments. Because of the large number of students and limited resources, students will work in pairs or small groups to perform the experiments. Computer assignments will be performed independently.

You will be working with one of the two proteins. One of the proteins, hereafter called 'the old protein' has been used in this laboratory in past. It has its share of problems, but with great care from your part, the experiments will work. The second protein, hereafter called 'the new protein' is not as thoroughly tested in the undergraduate laboratory but your instructor is well familiar with this protein, and believes that it is easier to work with. You will choose at the first day if you want to work with the old or new protein, and then follow the appropriate protocol. The schedule for experiments is attached to this syllabus.

Grant proposal

Writing a successful grant proposal is an essential component of a modern academic life. In this course you will be introduced into grant-writing skills and you will write a short grant proposal. Details on how to write the proposal can be found in the Operations Manual.

Lab notebooks

There will be three components in this course. Each component is to be written up as a single write-up composed of several parts. The parts and approximate percentages of points are:

- title page giving the name of the experiment, your name, and grading rubric
- the objective (goal) of lab unit objective in your own words (3 %)
- the rationale of the experimental set-up (10 %)
- methods: a concise summary of steps taken to accomplish the goal (3 %)
- answers to all the prelab questions (14 %)
- a results section with all observations and raw data that was collected (20 %)
- discussion of the experiment and your results (20 %)
- answers to the additional questions given at the end of the handout (20 %)
- and a conclusions section on the physical meaning of your results (10 %)

The lab component objective, the rationale for the experimental set-up, concise summary of the procedure, and answers to your prelab questions constitute the *prelab* that you must prepare before performing each experiment. The rationale for the experimental setup is very important concept that many students find confusing. In this section, you should explain how the methods that you are going to use in the class allow you to achieve the objective of the lab. Typically, you should show how the technique you will use allows study of the property of interest in your system. You should also offer a plan how to interpret your data and predict at least one reasonable outcome. Please note that this section is not a copy of your lab manual's background section nor a place to repeat detailed experimental procedures but involves thoughtful synthesis of all the information available to you.

Use notebooks with carbon copy pages for documenting your work. The copy of the notebook that you present to your TA is very important. Your notebook is the primary way you have to convey that you understand the lab unit. All raw data should be written directly into the notebook and not onto scrap paper for later recopying into the notebook. Appropriate note-keeping, for example, is critical for validation of claims of priority in discoveries submitted for patents. Of course, legible handwriting is a key to communication. Your TA will grade the lab notebook and he may have more specific requirements. Please consult your TA about further requirements at the beginning of the course. Turn your lab notebooks in for grading by no later than the day indicated in the schedule (below). Please discuss any grading-related issues first with your TA, and then with your instructor.

Prelab questions

The prelab questions are designed to help you to understand the experiment that you are doing. Answer your prelab questions directly into your notebook but make an additional carbon copy (or photocopy) of the answers and bring the copy with you to the class. Your TA will check your prelab and collect the carbon copy with your answers to the prelab questions. He will also tell you if any of your answers to prelab questions were wrong. You may correct your wrong answers and get up to 25% of credit on the wrong answer when you turn your notebook in for final grading. Please mark clearly the corrected answer. Answers to the prelab questions typically contribute about 14% of your total lab report points.

Quizzes and exams

There will be a quiz on the first day of each lab to test your knowledge and preparation, except that there will be no quiz in the first lab. There will be total of thirteen quizzes. The quiz questions are based on the material presented in the Theory Manual and in the Operations Manual. The maximum number of points for each quiz is 10 and your TA will grade the quizzes. The lowest-scoring quiz will be dropped, so the maximum number of quiz points is 120.

Exams

There will be an exam after you have finished two of the three lab components. The purpose of the exams is to evaluate (1) your understanding of the theory behind the technique and (2) your ability to interpret the meaning of the data obtained. The final exam is worth 80 points.

Final presentation

Scientists use a variety of ways to present their work to other people. The most common ways, loosely arranged in the order of increasing significance and effort, are (i) informal discussions with their colleagues, friends, or research mentors, (ii) posting research descriptions on their personal or professional websites, (iii) giving poster presentations in scientific meetings or at their workplace, (iv) giving oral talks with visual presentations at scientific meetings, and (v) publishing their research in peer-reviewed scientific journals. In this course you will learn and practice giving an oral talk accompanied by visual presentation of your research. You will give a short (15 minutes) talk toward the end of the quarter. Further details on how to prepare will be given later. The talk is worth 40 points.

Grading

Your grade will be based on the number of points you earn out of 500 points possible. There are three lab write-ups. The first and the second lab write-up are worth 80 points each, and the third one is worth 40 points. The total number of points from your lab write-ups is 200 points. You may make up failed experiments during the last week of the classes.

Lab reports (3)	200
Quizzes (12)	120
Exam	80
Grant proposal	40
Final presentation	40
Work quality points	20
Grand Total	500

The course grade will be based on the curve. Last year, all students who received more than 87% of possible points received A in this course. I anticipate that earning less than 66 % of possible points in this course will likely result in an unsatisfactory grade.

— *Wishing you fun and success with experiments!*

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