Chem 112L

Department of Chemistry and Biochemistry

University of California, Santa Barbara

Spring 2003

General course information for Chem112L,

BIOPHYSICAL AND BIOANALYTICAL LABORATORY

Lecturer: Kalju Kahn kalju@chem.ucsb.edu Phone: x7158
Chem 1005A (Office); Chem 1056 (Research Lab)
Office hours Mon 10:00-12:00 and by appointment

Teaching assistants:

Section 1: Scott Hauenstein shauenstein@chem.ucsb.edu
Office hours: Chem 1202 Phone: x2677

Section 2: Fa-Kuen Shieh fshieh@chem.ucsb.edu Phone: x8283
Ben Hopkins bhopkins@chem.ucsb.edu Phone: x8283
Office hours: Chem reading room

Lab session times

Section 1:	Monday/Wednesday	2:00-5:50p.m.	**PSB-N 2619**
Section 2:	Tuesday/Thursday	2:00-5:50p.m.	**PSB-N 2619**

Course website: http://chem.ucsb.edu/~kalju/chem112L

Recommended text: *Principles of Physical Biochemistry*, K. E. van Holde, W. C. Johnson, and P. S. Ho, Prentice Hall, 1998.

Course Goals

The purpose of Chem 112L is twofold: (i) introduce you to the instrumentation used in biophysical and bioanalytical chemistry, and (ii) help to understand concepts that are taught in Chem112. Your work is organized around six projects, and most projects will take more than one lab session. There will be lectures at the beginning of some of the lab sessions to cover topics that are not normally taught in Chem112.

Course Information and Expectations from Students:

General.

Chem 112L is a laboratory course where the main portion of your grade is earned by planning and performing experiments, documenting your work in your lab report, and answering questions presented with the manual. There is a quiz at the beginning of each experiment, two exams throughout the course, and a poster research presentation at the end of the course.

Experiments and lab reports.

There are six major projects and possibly one or two instrument demonstrations. The six projects are:

1. Circular dichroism measurements on the unfolding transition of lysozyme
2. NMR and computational determination of the 3-D structure of allantoin
3. Enzyme kinetics of glyceraldehyde-3-phosphate dehydrogenase / urate oxidase
4. Inhibitor binding equilibrium to lysozyme
5. Electrospray ionization mass spectrometry characterization of proteins
6. Protein crystallography

Each report must be typed and look professional as if it was a manuscript that you submit for a publication. Each report should include:

- answers to the prelab questions
- the lab unit objective in your own words,
- the rationale of the experimental set-up,
- a results section with appropriate equations to fit your data in graphic form,
- a discussion about the physical meaning of your results
- a conclusions section summarizing the most important findings.
- and answers to the additional questions given at the end of the experiment
- an appendix with all raw data that were collected, and all calculations that you performed

Honesty and academic integrity must be always preserved. While working with your partner(s) is encouraged in the laboratory, you must write your report up independently. You may discuss the discussion questions with other students in the class but make sure that your answers are original. Plagiarism will not be tolerated and will result score zero on the report on that experiment. No supplemental material should be used during quizzes and the final exam.

Chem 112L is a relatively new course. Because most of the experiments were developed here at UCSB, you do not have to purchase a lab manual for this course. The instructor will distribute the manual for each experiment. These manuals can be also downloaded from the course website: http://www.chem.ucsb.edu/~kalju/chem112L

As with any laboratory course, standard lab fee is collected from students who stay beyond the standard drop deadline.

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 this quarter include hot water or hot surfaces, toxic or corrosive chemicals, electricity, 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. Your TA will remind you of the potential hazards before each class.

You must follow basic safety rules 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 two face shields in the laboratory. If you are wearing normal glasses, wear goggles over 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.
3) Wear appropriate clothing in the wet lab. 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) 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. First aid kits are available in the storerooms on the first and second floor.
5) 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.
6) 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.
7) 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.

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 contained 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 pippettors 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**.

Student must label all the containers larger than 5 mL that contain solutions made by them clearly with their name and content of the container. Unlabeled containers will be disposed by your instructor. Each student is responsible for completely cleaning the workplace, washing all the glassware used, and disposing all the disposable plastic-ware. Your instructor 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 groups to perform the experiments. Computer assignments will be performed independently.

In order to best use the available time, all the students in one section are assigned into one of the four groups. The schedule at the end of this syllabus outlines experiments that each group does on a particular day.

Quizzes.

There will be six quizzes in this lab on the first day of a related experiment. There is no quiz on the first day of the class; the allantoin conformational analysis quiz will be given at the time of NMR experiment. All quiz scores count, so the maximum number of quiz points is 60.

Exams.

There will be two exams. The first will be on protein folding by CD measurements, mass spectrometry, and ligand binding equilibria. The second will cover enzyme kinetics, protein crystallization, and structure determination by NMR. The purpose of the exams is to evaluate (1) your understanding of the theory behind the technique and (2) your ability to analyze the physical meaning of the data obtained. Each exam is worth 30 points, and the total maximum from two exams is 60.

Poster presentation.

There will be a poster presentation at the end of the quarter. Currently, the poster session is planned for noon to 2 PM for Friday, June 6. The poster presentation is worth 20 points.

Grading.

Your grade will be based on the number of points you earn out of 400 points possible. There are six lab write-ups. You may make up failed experiments during the last two weeks. The points for each experiment are as follows:

	Lysozyme Unfolding as Monitored by CD	40
	Allantoin Conformational Analysis	50
	Mass Spectrometry	40
	UV/VIS Binding Study of NAG to Lysozyme	40
	Enzyme Kinetics – Inhibition Studies	50
	Protein Crystallography	30
	Lab work ethics/cleanliness	10
Total Lab	**260**	
	Quizzes	60
	Exams	60
	Poster presentation	20
Total Theory	**140**	
Grand Total	**400**	

Wishing you the best success in this course

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