

CHEMISTRY 546 – BIOCHEMISTRY LABORATORY
Syllabus Spring Semester 2007

Meeting: Chem LL16 Lecture (Wed 8:00 to 8:50 am)
Chem B14 Lab Session (Friday 12:00 to 3:55 am)

Professor: Dr. Muriel C. Maurer Office Hours: Wednesday 3:00 – 4:30pm
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Teaching Assistant: Mr. Prakash Doiphode Office Hours: Thursday 1:00-2:00pm
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Text: Boyer, R. *Biochemistry Laboratory: Modern Theory and Techniques*
Benjamin/Cummings, San Francisco, CA 2006

Course Description:

Chemistry 546 is an upper division, undergraduate biochemistry laboratory course. Students are required to have already completed one semester of Biochemistry (either Chem 545 or Chem 445). The two-credit Chem 546 course contains lecture and laboratory sessions. The one-hour lecture period will be used to present background information necessary for carrying out the laboratory work. Examples of other modern strategies that could be used to address the same research questions will also be discussed. Computer resources that are available for the different disciplines of biochemistry will be presented throughout the course. The laboratory portion of the course will provide students with practical, hands-on experience in contemporary biochemical methods. Teams of students will be assigned a laboratory bench station that contains instrumentation/equipment found in a typical biochemistry laboratory. They will then work together on a series of experiments. Several of these experiments will involve more than one laboratory session and will have a discovery-based approach. The biochemical techniques that will be used include uv/vis spectrophotometry, liquid chromatography, centrifugation, gel electrophoresis, 2D-NMR (TOCSY), matrix-assisted laser-desorption ionization time-of-flight mass spectrometry (MALDI-TOF MS), and recombinant DNA methods. Funds for this laboratory course were originally provided by the National Science Foundation.

Important Dates:

Last day to enroll	01/08/07
Last day to withdraw	02/26/07
Spring Break	03/12/07 – 03/18/07
Last day of classes	04/23/07
Final Exam	05/01/07 (Tues, 8am –10:30am)

SCHEDULE FOR THE INDIVIDUAL WEEKS OF THE SPRING 2006 SEMESTER

<u>WEEK</u>	<u>LECTURE</u>	<u>LABORATORY</u>	<u>REPORT</u>	<u>DUE DATE</u>
1/10 – 1/12	Overview	Pipetting, Dilutions Genesys 5 uv/vis unit		
1/17 – 1/19	Methods for Determining Protein Concentration	Quantitative Determination by uv and colorimetric assays (Genesys 5)	Full Report (100pt)	01/26/07
1/24 – 1/26	Protein and peptide sequencing Mass Spec applied to biological systems. Computer methods for sequence analysis	MALDI-TOF MS Masses of unknown peptides Protein Digests using Trypsin Identification of unknowns	Results/Disc (100pt)	02/02/07
1/31 – 2/02	Characterizing proteins by gel electrophoresis methods. Theory and practice. 1D and 2D gels applications.	Assessing the purity of proteins. Evaluating the oligomeric states of disulfide and nondisulfide containing proteins.	Full Report (200pts)	02/16/07
2/07 – 2/09	Further applications of PAGE to follow enzyme rexn	Continuation of SDS-PAGE Expts		
2/14 – 2/16 2/21 – 2/23	Enzyme Kinetic Theory Fast Kinetic Methods	Hydrolysis of p-nitrophenylacetate by carboxyesterase. Effect of changing enzyme, substrate, and inhibitor concentrations. (Genesys 5)	Full Report (200pts)	03/02/07
2/28 – 3/02	Protein Purification Methods Tissue vs Recombinant Sources Monitor enzyme activity	Purification of Lysozyme by liquid chromatography methods (Isco Low Pressure LC). Enzyme activity verified.	Results/Disc (100pt)	03/10/07
3/08 – 3/10	Intro to x-ray crystallography Theory and Applications	Growth of x-ray quality crystals of lysozyme, Tour of x-ray facility	Results/Disc (100pt)	03/28/07
3/14 – 3/16	SPRING BREAK	SPRING BREAK		
3/21-3/23	2D NMR on biological samples	2D TOCSY on a small peptide Examine X-ray crystals	Results/Disc (100pt)	04/02/07
3/28 – 3/30	Background information on recombinant DNA methods	Mapping Restriction Sites on Plasmid DNA Identifying the type of mutation responsible for an inherited hemoglobin disorder	Full Report (100pt)	04/06/07
4/04- 4/06	Human Genome Project	Cholesterol Gene Study or a tRNA toxicity project	Results/Disc (100pt)	04/13/07

4/11 – 4/13	Lipid Chemistry and Tools for Analysis Lipid extraction and MALDI-MS	Isolation and Characterization of Phospholipids in porcine lenses	Results/Disc (100pt)	4/20/07
4/18-4/20	Special Topic, Final Review	Lab Checkout		
05/01	FINAL EXAM (8:00 to 10:30am)			

Strategies for Success:

This course will be very much a “hands-on” experience. Students will need to attend lecture on a regular basis to learn about the research methods to be used in the next laboratory session. Information on alternative methods and instruments will also be presented. Students are then expected to come on time to the laboratory sessions and *be prepared* to carry out the experiments in an efficient manner. **A bound notebook is required for the course.** For each laboratory session, the notebook should contain the procedures for that day along with appropriate tables. Results collected during the experiment should then be recorded directly into this notebook. At times, data will be processed using computer software packages. Students are expected to save and keep copies of this information on their own disks. The TA and the Professor of the course will monitor the progress of the students throughout the semester. Those students who come prepared, who maintain a well-organized notebook, and who are conscientious in data evaluation/processing will have a much easier time writing up the required laboratory reports.

Grading:

Each graded laboratory handout will come with an accompanying PreLab Question sheet. These sheets will be turned in at the start of lab class and reviewed for completeness. They will be worth 10pts for every 100pts of a lab report. Laboratory reports from the previous week will also be due at the start of each Friday laboratory session. **Late reports will not be tolerated.** Students will be required to turn in typewritten laboratory reports with accompanying tables and graphs. Some will be Full Reports whereas others will focus on Results/Discussion. Full reports will contain an abstract, introduction, material/methods, results, and discussion sections. For both cases, all results collected should be presented and discussed in depth. At times, specific biochemical questions will also need to be addressed. At the end of the semester, students will take a final exam worth 200 points.

Laboratory Reports	12 lab reports x 100 points	1200
Final Exam		<u>200</u>
	Total	1400 points

Grading Scale: A (90– 100 %), B (89 – 80 %), C (79 – 70 %)

D (69 – 60%), F (less than 59%)