BIBC 103: Biochemical Techniques

Fall Quarter, 2012

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Office Hours: Wednesdays 10-11 AM

Lecture: Peterson Hall 104

Labs: First floor Bonner Hall; Weds/Fri 2-6 PM

Course Objectives:
This course will introduce some of the experimental methods used in biochemistry and molecular biology, with an emphasis on those techniques used to study proteins. You will gain a conceptual understanding of, and some hands-on experience in, various protein purification techniques, expression and purification of recombinant proteins from bacterial cells, and methods for analyzing the different properties of proteins. The laboratory work will consist of three multi-day projects, as well as some smaller, single-day experiments. As this is an introductory lab course, all lab work will emphasize the learning of basic lab skills and good lab practices.

More importantly, this course is designed to give an appreciation of what science is and how it works. Science is not just a bunch of random facts…it is a process! It is easier to understand biology, or any field, when you understand why we know what we know about it. Understanding how information in biology is brought to light is just as important as the information itself. Through the laboratory projects we will develop the skills necessary to interpret data from experiments in order to answer questions about biological systems, and to design experiments to answer new questions. In keeping with this, the importance of good experimental design, including the use of appropriate controls, will be highlighted in all experiments.

Materials Required:
1) Biochemical Techniques Lab Manual, 2012/2013 Edition (available from the Bookstore)
2) Bound laboratory notebook
3) Safety glasses
4) Lab coat

Course Requirements and Grading: Your final grade for the class will be calculated using the following criteria:

Exams (3 at 160 pts. each)	480 points
Lab Reports (2 at 220 pts. each)	440 points
Data Write-up (mini report)	40 points
Lab Notebook Checks (4 at 5 pts. each)	20 points
Pre-Lab Pop Quizzes (4 at 5 pts. each)	20 points
Total	**1000 points**

Point Cutoffs for Grade Assignments: (Cutoffs may be lowered at the instructor's discretion.)

910-1000	A	790-799	C+
900-909	A-	705-789	C
890-899	B+	695-704	C-
810-889	B	600-694	D
800-809	B-	0-589	F

Course Web Site:
Many of the course materials are available only through the course website on TritonLink Education, or Ted (https://ted.ucsd.edu). All students will need to be able to access this site. Once you are enrolled in the class you will have access to the site using your ACS username and password. Be sure to check the course website frequently for announcements and updates on assignments. Items such as lab report guidelines and image files of gels and other data will be provided through the website. The 'Additional Materials' folder contains additional background material for some of the experiments. Use the Discussion Board to ask questions on material from lecture or lab. The instructor will check the Discussion Board daily to answer questions, but students are encouraged to answer questions as well. This is a handy resource for last minute questions that come up during late night studying for an exam.

Lab Notebooks:
You will be expected to keep a formal laboratory notebook for all of the work you do in lab. The notebook should be bound (spiral bound or composition book style are both okay), and should have numbered pages with a table of contents (it is okay to write these in). You will need to hand in either photocopies or carbon copies of your notebook pages for the experiments that are written up as lab reports. Notebook entries should be in chronological order, with each project or set of experiments together and easily referenced by the table of contents. Each page should have a brief title for the experiment and the date on which the work was performed. Refer to the course lab manual for some other tips on entering information into your notebook. Starting on the second day of lab, you will need to have the following entered in your notebook at the beginning of each lab session:

A. From the previous day's experiment: all of your data entered in labeled spaces, and any analysis for that experiment completed. Analysis includes any calculations and graphs that may be required to analyze the data. Your TA will tell you what analysis needs to be done for each experiment. There should also be a brief summary (not more than a few sentences) of the experiment that states how well the procedure worked and any major conclusions from the data.

B. For the current day's experiment, a brief purpose explaining what you are doing that day (one or two sentences is fine), and appropriately labeled spaces and tables in which you will enter any data collected that day. Also, make sure that your table of contents and page numbering is up to date.

There will be four unannounced notebook checks, worth 5 points each, where your TA will inspect your lab notebook. The TA will most likely choose certain labs or analysis to focus on at each check.
Lab Manual and Pop Quizzes: It is important to carefully read the pertinent sections of the lab manual before coming to class. The experiments will proceed much more smoothly, and you will get a lot more out of them, if you have read through the procedure and understand what you are doing. To encourage you to read the lab manual before class, there will be four unannounced quizzes that will be given at the beginning of lab.

Lab Attendance Policies:
Attendance at each lab session is mandatory. An unexcused absence will result in 10 points being deducted. If you know that you need to miss a lab session, discuss this with the instructor (not the TA, they are not authorized to give you permission) to see if it will be possible to make up the lab session or excuse you from the lab with no consequences. Please bring this to the instructor's attention as soon as you know that it will be an issue. **Only the instructor can excuse an absence. Two unexcused absences will result in the student failing the course.**

Turning in Lab Reports:
Lab reports are due at the beginning of lab on due date listed in the lab schedule. In addition to the hard copy turned in to your lab TA, an electronic copy of the report must also be submitted to Turnitin.com. The report must be submitted to Turnitin.com before the hard copy is turned in, and the hard copy must contain the Turnitin.com submission receipt in the appendix. Lab reports submitted to the Turnitin.com site do not need to have graphs, tables, or attachments, but you may include them if it is easier. Lab reports not turned in at the beginning of the lab session on the due date will be considered one-day late. Ten points will be deducted for each working day that the lab reports are late. Students agree that by taking this course all required papers will be subject to review for textual similarity by Turnitin.com for the detection of plagiarism. All submitted papers will be included as source documents in the Turnitin.com reference database solely for the purpose of detecting plagiarism of such papers. Use of the Turnitin.com service is subject to the terms of use agreement posted on the Turnitin.com site.

Re-Grade Policy on Lab Reports: Your lab reports will be graded by your TA, based on the same lab report guidelines (general and specific) that you receive. Note that I work closely with all the TAs to ensure that the grading is accurate and equivalent between sections. If you disagree with the grading of your lab report, discuss this with your TA first to get clarification on why points were deducted. If you still disagree with the grading you may submit the report to me for a re-grade. This must be done within one week of receiving the graded report. I will re-grade the entire report and give you a new score, and this is the score that will be recorded. Note that it is possible your score may go down. This policy is not intended to scare students off from submitting re-grades; if you believe your report was not fairly graded based on the guidelines posted on Ted then I encourage you to submit it for a regrade.

Make-up Exams:
Please note that it is extremely burdensome for the instructor and TAs to have to prepare and proctor make-up exams. Missing a scheduled exam will only be excused for medical reasons <u>where documentation can be provided</u>. At the instructor's discretion, a missed exam that is excused will either be dropped from the student's point total for the class, or made up by an oral exam scheduled within one week of the original exam.

Lab Schedule:

	Dates	Experiment/Activity	Lab Manual Chapter
	Sept. 28	Lab organization and safety—attendance mandatory	
Wk 1	Oct. 3	Introduction to Micropipettes and pipetting exercises	Lab 1
	Oct. 5	Making a pH buffer; Quantitative Measurements	Lab 2
Wk 2	Oct. 10	LDH 1: Initial purification of LDH from crude homogenate: centrifugation, ammonium sulfate precipitations; prepare size exclusion column	Lab 3
	Oct. 12	LDH 2: Affinity chromatography purification of LDH	Lab 4
Wk 3	Oct. 17	LDH 3: Size exclusion chromatography purification of LDH	Lab 5
	Oct. 19	LDH 4: Activity assays; Bradford protein assays	Lab 6
Wk 4	Oct. 24	LDH 5: Native gel electrophoresis of LDH with activity stain	Lab 7
	Oct. 26	Bioinformatics: LDH and Fluorescent Proteins **Exam 1 in lecture**	Lab 18
Wk 5	Oct. 31	Fluorescent proteins (FP) 1: Plasmid preps **Lab report 1 due in lab**	Lab 12
	Nov. 2	FP 2: Restriction enzyme digest; Agarose gel electrophoresis	Lab 13
Wk 6	Nov. 7	FP 3: Make competent cells and transform with plasmid	Lab 14
	Nov. 9	FP 4: Purification and analysis of fluorescent proteins	Lab 15
Wk 7	Nov. 14	FP 5: SDS-PAGE of fluorescent proteins	Lab 16
	Nov. 16	FP 6: Examine SDS-PAGE gels; Set up lysozyme crystallization	Lab 17 Lab 19
Wk 8	Nov. 19	**Exam 2 in lecture**	
	Nov. 21	**Turn in lab report 2 in lab**; no experiment scheduled	
	Nov. 23	Holiday—No lab	
Wk 9	Nov. 28	MAP kinase Western blot (MAPK): Sea urchin fertilization	Lab 8
	Nov. 30	MAPK: SDS-PAGE and electroblotting	Lab 9
Wk 10	Dec 5	MAPK: Immunodetection and analysis of X-ray films; Examine lysozyme crystals	Lab 10 Lab 19
	Dec. 7	**Last Exam In Lab;** **Sea Urchin Fert. data write-up due**	