

**Biochemical Techniques**  
**BIBC 103**  
**Fall Quarter 2017**

**Instructor:** Swarna Mohan, Ph.D.

**Email:** swmohan@ucsd.edu

**Lecture:** Tues/Thurs 8:00 – 9:20am, Warren Lecture Hall 2204

**Lab:** Tues/Thurs 2:30 – 6:20pm First Floor Bonner Hall

**Office Hours:** Tuesdays 11am – 12pm in H&SS 1145LB or by appointment (24 hours' notice required)

**Support Staff:** Joe Stagg (Bonner Hall 1402) Telephone: 534-2195; email: jstagg@ucsd.edu

**Course Materials:**

1. Biochemical Techniques Lab Manual, 2017/2018 Edition (available from the Bookstore)
2. Bound laboratory notebook
3. Safety glasses
4. Lab coat
5. Proper attire

**Course Objectives:**

This course will introduce some of the experimental techniques used in biochemistry and molecular biology, focusing primarily on techniques used to study proteins. You will get some hands-on experience with protein purification, expression and purification of recombinant proteins from bacterial cells, and a variety of other techniques to analyze properties of proteins. The laboratory work will consist of three multi-day projects, as well as some smaller, single-day experiments. One of the main goals of the laboratory projects is to develop the skills needed to interpret data and design follow up experiments. Importance of good experimental design, including the use of appropriate controls, will be highlighted in all experiments. Additionally, all experiments will emphasize the learning of basic lab skills and good lab practices.

**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 IA, 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 there will be an issue. Only the instructor can excuse an absence. Two unexcused absences will result in the student failing the course.

**Triton Ed:** We will be using Triton Ed (<https://triton.ed.ucsd.edu/webapps/login/>) as the course web site. Except for the lab manual, all course materials will be accessed through the course webpage on TritonEd. Much of the data you generate in your experiments will be accessed through TritonEd, in addition to lab report guidelines and practice problem sets for quizzes and exams. Be sure to check the TEd frequently for announcements and updates.

## Exams and Assignments:

Your final grade for the class will be calculated using the following criteria:

Exams (100 pts. and 250 pts.)	350 points
Lab quizzes (4 at 35 pts. each)	140 points
LDH purification table analysis	75 points
Lab report on FGF signaling	260 points
Lab Notebook	100 points
FP lab data analysis	45 points
Lab practical and bioinformatics	30 points
Total	<b>1000 points</b>

## Grade cutoffs:

905-1000	A	780-789	C+
895-904	A-	695-779	C
885-894	B+	675-694	C-
800-884	B	590-674	D
790-799	B-	0-589	F

The grade cutoffs may be adjusted downward at the instructor's discretion.

## Quizzes and Exams:

The purpose of the lab quizzes is ensure you understand the purpose of the lab projects and how each experiment fits into this, the basic concepts underlying the procedures, and simple mathematical and analytical skills based on what you have actually done in lab. The quiz dates are given in the lab schedule. Quizzes will be given at the beginning of lab, will take 15 – 30 minutes, and will consist of 5 to 7 questions. Make up quizzes will not be given.

The two exams are cumulative and will be problem solving-based. They may include some basic questions on the concepts we have covered, but will emphasize taking the information you have learned and extrapolating to solve problems you have not seen before. Practice questions will be given on TritonEd to help you prepare for the exams.

Make-up exams will be given, if a valid excuse is provided, at the discretion of the instructor. In cases of illness a documented note from a physician is required to request a make-up exam. All make-up exams must be scheduled within one week of the regularly scheduled exam.

## Submitting lab reports and lab assignments:

Lab assignments and the lab report 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 assignment text or the lab report must also be submitted to Turnitin.com, which is accessed through TEd, before the hard copy is turned in. Assignments and the lab report not turned in at the beginning of the lab session on the due date will be considered one-day late. Ten percent of the total points will be deducted for each working day that the assignment or report is late. Assignments and the lab report will not be accepted after three working days past the due date.

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.

### **Regrade policy:**

All assignments including the lab report will be graded by your IA, based on the guidelines provided by me. Note that I work closely with all the IAs to ensure that the grading is accurate and equivalent between sections. If you disagree with the grading of your assignment you may submit the assignment to me for a regrade within one week of receiving the graded assignment. Along with your assignment you must submit a written explanation of why you are submitting it for a regrade. Your assignment will not be regraded without a written explanation. Submission of an assignment for regrade does not guarantee a score change for that assignment.

Graded exams and the exam key will be available to you for review in lab as soon as the exams are graded. You are not permitted to take the exams with you. Any exam not returned will be subject to a 20% penalty. If you feel an error has been made in the grading of your exam, you may submit it for a regrade. Please attach a written note indicating which question(s) were graded incorrectly and turn it in to the instructor.

Note: Unless the regrade request is due to an addition error, all regrades will be done to the entire assignment or exam.

### **Lab Notebooks:**

You will keep a formal laboratory notebook for all of your work in the class. Your notebook needs to be bound (no loose pages), but composition books and spiral-bound notebooks are both acceptable. The notebook does not need to have carbon copy pages, you will not have to turn in copies of notebook pages. See page *xi – xii* in the lab manual for how to format your notebook and what information it should contain. Pay particular attention to the following:

1. Write the **experiment date** in the upper left-hand corner of **each page**. Make all entries in chronological order. You do not need page numbers or a table of contents—you will index your entries by the experiment date.
2. **Project title** following the date on each page (*e.g.*, LDH Purification and Analysis). Be sure to separate the three projects in your notebook.
3. **Experiment title** underneath the project title on each page. This should be a single sentence indicating the specific procedure that was performed.
4. Briefly list any changes to the procedures from the lab manual. Other than that you do not need to write out procedures.
5. Raw data and important observations: Enter numerical values in an organized table. For large numbers of numerical values collected electronically, you may paste printer tapes or a printout of the Excel spreadsheet into the notebook. These must be permanently fixed; you will not get credit for items loosely tucked into the pages. Also include any important observations (be brief). Look for prompts in the lab manual for what to include.

6. Data analysis: Include any calculations, statistics, or graphs immediately following the raw data. This should be done for any and all data you collect (with the exception of the exercises in Lab 1). Graphs and plots should be done using Excel (or another graphing package) and should be labeled in text. They need to be printed and pasted into your notebook. Be sure they look professional! — ask for help with graphing in Excel if you are having trouble.
7. All electrophoresis gel and Western blot images should clearly labeled with text, printed, and pasted into your notebook.
8. Include a brief statement of the conclusions from the experiment. This may be a single sentence to simply verify that you successfully concluded that procedure on days where you don't collect any data, to a short paragraph describing the results of a multi-day experiment. You should also succinctly describe anything that went wrong with that experiment. What would you do differently if you had to do the experiment again?
9. Your lab notebook should **not** contain lecture notes!

Your notebook should be kept up to date as you carry out each lab. Analysis (including plots and gel images) must be completed and added to the notebook by the lab period following collection of the data. Your IA will perform unannounced lab notebook checks throughout the quarter.

**Academic Integrity:** As a UCSD student enrolled in this course you are expected to abide by the Policy of Integrity of Scholarship at UCSD (<http://academicintegrity.ucsd.edu/process/policy.html>). Cheating, and/or plagiarism will not be tolerated and the consequences for such behaviors can result in receiving a failing grade in the course and disciplinary sanctions such as suspension or dismissal from the University.

While you will work in groups during the lab sessions, each student must work on the assignments and lab report independently. Working on assignments and lab reports with other students will be considered plagiarism and you will receive a zero for that assignment. Additionally, you are not permitted to use old lab reports for this class. If you are caught using old reports or assignments to assist you in any way, you will receive a zero for that assignment and additional disciplinary actions might be taken.

No student communication of any form is allowed during the quizzes and exams. You are only allowed to use blue or black pen and a scientific calculator during the exams. You may not take the quiz or exam in pencil. During the exams you may not leave the room and come back to resume the exam. If you leave the room, your exam will be collected and graded as is. If you will need to leave the room for medical or psychological reasons, be sure to provide me with documentation from the Office for Students with Disabilities.

**Disability access:** Students requesting accommodations for this course due to a disability must provide a current Authorization for Accommodation (AFA) letter issued by the Office for Students with Disabilities (OSD) which is located in University Center 202 behind Center Hall. Students are required to present their AFA letters to Faculty (please make arrangements to contact me privately) and to the OSD Liaison in the department in advance so that accommodations may be arranged.

Contact the OSD for further information:

858.534.4382 (phone)

[osd@ucsd.edu](mailto:osd@ucsd.edu) (email)

<http://disabilities.ucsd.edu> (website)

## Lab Schedule

	Dates	Experiment/Activity	Lab Manual Chapter
<b>Wk 0</b>	Sept. 28	Organization/safety; Introduction to micropipettes and pipetting exercises	Lab 1
<b>Wk 1</b>	Oct. 3	Making a pH buffer; Quantitative measurements	Lab 2 and pp. 1 – 10
	Oct. 5	LDH 1: Initial purification of LDH from crude homogenate: centrifugation, ammonium sulfate precipitations; prepare size exclusion column	Lab 3
<b>Wk 2</b>	Oct. 10	LDH 2: Affinity chromatography	Lab 4
	Oct. 12	LDH 3: Size exclusion chromatography <b>Quiz 1</b>	Lab 5
<b>Wk 3</b>	Oct. 17	LDH 4: Activity assays; Bradford protein assays	Lab 6
	Oct. 19	LDH 5: SDS-PAGE of LDH purification fractions	Lab 8
<b>Wk 4</b>	Oct. 24	LDH 6: Examine SDS-PAGE gels; Native gel electrophoresis of LDH with activity stain;	Lab 7
	Oct. 26	FGF 1: FGF Signaling: Develop hypotheses to explain data in lab manual and design experiments to test <b>Quiz 2</b>	Lab 9B
<b>Wk 5</b>	<b>Oct. 31</b>	<b>Exam 1 In lecture</b>	
	Oct. 31	FGF 2: Prepare Samples for Western blot and ELISA <b>LDH assignment due in lab</b>	Lab 9B
	Nov. 2	FGF 3: MAPK Western blot—SDS PAGE and electroblotting	Lab 10
<b>Wk 6</b>	Nov. 7	FGF 4: MAPK Western blot—Immunodetection	Lab 11
	<b>Nov. 9</b>	<b>Veterans Day Holiday—no lab</b>	
<b>Wk 7</b>	Nov. 14	FGF 5 ELISA for phospholipase C activity; Bioinformatics 1	Lab 12 Lab 19 (part A only)
	Nov. 16	FP 1: Fluorescent proteins (FP): Make competent cells and transform with plasmid <b>Quiz 3</b>	Lab 13 pp. 163-171 only Lab 15
<b>Wk 8</b>	Nov. 21	FP 2: Purification and analysis of fluorescent proteins	Lab 16
	<b>Nov. 23</b>	<b>Thanksgiving Holiday—no lab</b>	
<b>Wk 9</b>	Nov. 28	FP 3: SDS-PAGE of fluorescent proteins; Set up lysozyme crystallization <b>FGF signaling formal lab report due in lab</b>	Lab 17 Lab 20
	Nov. 30	Bioinformatics 2 <b>Quiz 4</b>	Lab 19 (parts B – D)
<b>Wk 10</b>	Dec. 5	FP 4: Examine SDS-PAGE gels; Examine lysozyme crystals	Lab 18 Lab 20
	<b>Dec. 7</b>	<b>FP assignment due in lab</b> <b>Exam 2 in Lab</b>	