

BIBC 103: Biochemical Techniques

ONLINE Spring 21

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ZOOM Office Hours: During “scheduled” lecture time: Thu 12:30-1:50pm (Unless other times specified.) Enter through Zoom link on Canvas Zoom LTI page:

Lecture: Asynchronous: Lectures will generally be available the day prior to lab (Mon and Wed). Lectures will cover the background information for the lab projects and detail specifics of the labs to be conducted that day.

Labs: All labs Tue/Thu. 2pm-5:50pm. Log into Canvas and join each lecture through the link on the Zoom LTI page or in the Calendar. You will be directed to a waiting room when you enter, and your IA will admit you to the lab. You are required to use your full, real name on Zoom.

You are required to attend lab on Zoom with your video on (please contact me if you are not set up for this). You will work in groups of four to complete the lab work, and during the lab sessions you will go back and forth between your lab class of 24, and breakout rooms where you will work in your lab groups. The lab sessions will not be recorded. Some of the lab work is for credit for what is completed during the lab sessions.

BIBC 103 Remote Course Learning 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 conceptual understanding of various protein purification techniques and methods for analyzing the different properties of proteins. The laboratory work will consist of two big multi-week projects and some shorter side projects. The lab work will emphasize the analytical and quantitative reasoning skills that are essential to work independently in a biochemistry lab.

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 how 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 ask new questions.

Required Textbook: BIBC 103 Biochemical Techniques Laboratory Manual, 2020-2021 edition. An eBook version of the lab manual is available for quarter.

Point values for grade determination

Activity	Point Value
Quizzes (quiz 1: 50pts; Quiz 2: 100pts; Final: 200pts)	350
Lab activities/notebook entries	80
Written work: LDH purification table analysis	120
Written work: Write-up of purification strategy for your enzyme	90
Written work: Write-up of crystallization studies	40
Written work: Bioinformatics	20
Written work: FGF signaling lab report	225
Research project: Group presentation of current research proposal	75
Total	1000

Point Cutoffs for Grade Assignments:

990-1000	A+	790-799	C+
900-989	A	700-789	C
890-899	B+	600-699	D
800-889	B	<600	F

In addition: Extra credit pts are available
Greater than 80% CAPE response: 5 pts

Course Web Site:

All course materials will be accessed through the course webpage on [Canvas](#). Be sure to check Canvas frequently for announcements and updates on assignments.

Quizzes:

There will be three asynchronous quizzes. The quizzes will be delivered through Canvas. They will be asynchronous, and you will have between a 36-hour time windows in which to take the quiz (see details within the lecture and lab schedule. Once you begin the quiz you will have the specified time to complete the exam (see schedule: Quiz 1: 90 minutes; Quiz 2: 2hrs; Quiz 3: 3 hours)

When taking the quizzes, you may use the BIBC 103 lab manual, and any notes that you have prepared yourself, including your answers to the problem set questions. You may not communicate with other students during the quiz, and you may not utilize the internet (Canvas should be the only site open on your browser). Once you have completed the quiz, you are forbidden from discussing it in any way with other students until the window is over. *You are expected to conduct yourself with integrity in completing the quizzes and other assignments for the class.*

Lab Attendance Policies:

Attendance on Zoom 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 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 Written Work:

All written work for the class (New Enzyme Purification Strategy, LDH Purification Table Analysis, and the FGF Signaling Lab Report) will be submitted through Canvas, and is due by the end of the day (11:59 PM) on the due date indicated in the lab schedule (see below). Ten points will be deducted for each day that the lab report is 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 reference database solely for the purpose of detecting plagiarism of such papers. Use of the Turnitin service is subject to the terms of use agreement posted on the Turnitin site.

Lecture and Lab Schedule (Tentative)

The timing of the scheduled lab exercises is tentative. More time may be given for some exercises if necessary. Look for announcements for any changes.

Day	Activity
1, Tue 3/30	Lecture: Introduction to course; Calculations Lab: Organize groups; Lab 1 part E calculations
1, Thu 4/1	Lecture: SDS PAGE Electrophoresis Lab: Calculations for preparing electrophoresis samples (Lab 2, part C, table for step 2); Analysis and preparation of gel figure for paper
2, Tue 4/6	Lecture: Fluorescent proteins Lab: Determine unknown fluorescent proteins
2, Thu 4/8	Lecture: Fluorescent proteins (continued) Lab: Determine unknown fluorescent proteins 1 (continued)
	<u>QUIZ 1: Calculations and gel electrophoresis (1hour exam)</u> <u>Window: Sunday 4/11 noon-Monday 4/12 midnight</u>
3, Tue 4/13	Module 5: Live demo hanging drop preparation ; Prepare crystals round 1 (Lab 18 part C)
3, Thu 4/15	Module 3: Bioinformatics Lab 19 part A,B,C
4, Tue 4/20	Lecture: LDH Purification: Overall strategy; Initial steps of purification Lab: LDH purification: Overall purification strategy; Centrifugation and salt precipitation; Begin discussing possible alternative enzymes. LDH Lab 3 live demo
4, Thu 4/22	Lecture: LDH Purification: Chromatography: Size and affinity Lab: LDH Purification: Affinity and size exclusion chromatography Live demo size exclusion chromatography Narrow down (choose on enzyme); Begin outlining strategy Determine LDH isozymes from native gel electrophoresis; look up new enzyme amino acid sequence and isoelectric point
5, Tue 4/27	Lecture: LDH Purification: Chromatography: ion exchange; Determination of LDH isozyme

	Lab: <i>LDH Purification:</i> Determine LDH isozymes from native gel electrophoresis Look up new enzyme amino acid sequence and isoelectric point Work/finish draft of enzyme isolation procedure
5,Thu 4/29	Lecture: <i>LDH Purification:</i> Activity and protein assays LAB: Examine crystals round 1; prepare crystal round 2 <i>LDH Purification:</i> Get LDH enzyme activity and Bradford assay data, analyze for purification table
6, Monday 5/3	<u>Novel Enzyme purification due</u>
6,Tue 5/4	Lecture: <i>LDH Purification:</i> Preparation of Purification table and your enzyme analysis LDH Purification: Design enzyme activity assay for their enzyme and work on overall purification strategy; Continue work on purification table and analysis
6,Thu 5/6	Lecture: <i>FGF project:</i> Introduction to FGF Signaling project Lab: <i>FGF project:</i> interpret Lab 9B part B data; come up with questions form hypotheses to explain lab manual data, make predictions based on that hypothesis
	<u>QUIZ 2: LDH Purification (2 hour exam)</u> <u>Window: 5/7-5/8 Friday 9am-Saturday 9pm</u>
7,Tue 5/11	<u>LDH PURIFICATION DUE</u> Lecture: <i>FGF project:</i> Immunodetection: Western blotting Lab: <i>FGF Project:</i> Design Western blot and ELISA experiments to test; receive Western blot data, interpret
7,Thu 5/13	Lecture: Immunodetection: ELISA Lab: <i>FGF Project:</i> Receive ELISA data, interpret
8,Tue 5/18	Lecture: <i>FGF Project:</i> Preparation of FGF report: Sufficiency and necessity Module 4: <i>FGF Project: Catch up on material</i>
8,Thu 5/20	Module 5: <u>Examine crystals round 2</u>
9,Tue 5/25	Module 5: Bioinformatics Lab 19 part D
9,Thu 5/27	Lecture: <i>FGF Project: TBD</i> Lab: <i>FGF Project:</i> work on proposal presentations
Monday 6/1	<u>FGF PAPER DUE</u>
10,Tue 6/2	Lecture: <i>FGF Project:TBD</i> Lab: <i>FGF Project:</i> GROUP presentations
10,Thu 6/4	CUMULATIVE EXAM: FRIDAY 2:30-5:30pm (lab times) 3 hour exam
FINAL EXAM 6/5-6/6	