

*The laboratory component of this course is designed to introduce you to experimental approaches and techniques used in modern biochemical research, through both discussion and application (hands-on).*

Laboratory will meet on Tuesday (section 10), Wednesday (section 11), or Thursday (section 12) from 1:30-4:20 pm in Shankweiler 235S. Please plan to attend your assigned lab section. This is essential in order to maintain appropriate working group size in the various activities scheduled throughout the semester. Your participation in laboratory experiments, problem solving, and discussions will contribute to your overall course grade (see main syllabus). If you must miss a lab due to severe illness or family emergency, I request that you (1) notify me in advance of the laboratory period and (2) provide documentation from an appropriate College official; then we will discuss any opportunities that may exist for you to make up missed work. Obviously failure to attend a lab will impact your grade in various ways (no lab notebook entry, lack of participation in lab experiments or problem solving, etc.). Similarly, *leaving lab early is not acceptable* (students who may need to leave early for athletic or other College events should discuss this with me during the first week of class).

The first two **experimental modules** will focus on analysis of DNA. Methods will include nuclease digestion, agarose gel electrophoresis, and polymerase chain reaction (PCR); these lab modules are designed to serve as a “next step” from exercises you may have performed in introductory biology courses. The second two modules focus on working with proteins, including assays for enzyme activity and kinetic studies, protein purification by affinity chromatography, determination of protein concentration in solution, and use of SDS-PAGE to analyze proteins. Because the laboratory focuses on nucleic acids and proteins while the lecture material additionally covers carbohydrates, lipids, and metabolism, topics will not be able to be completely coordinated between lab and lecture. However, topics will be introduced in lecture concurrently or before you encounter related lab exercises, so that laboratory work may serve as a review and extension of this prior knowledge. **Handouts** describing each experiment will be provided in lecture each Monday (in weeks where wet labs are scheduled).

You will be expected to keep a **lab notebook** to record your experimental rationale; procedural details; and conclusions, troubleshooting, and other thoughts about your experiments. Please see the attached document for more detailed information about the use of lab notebooks in general and the requirements for our class. One goal of this course is to encourage use of lab notebooks as a place for recording *and reflecting on* your scientific experiments. Please note that while experimental projects may be carried out in pairs or groups, lab notebooks should represent your independent work - please ask me if you have any questions about this.

Please note that during portions of some lab periods (see laboratory schedule) we will engage in **problem solving** activities, similar to the approach described for lecture. These group exercises are designed to help familiarize you with experimental approaches used in biochemical research that we will not experience “hands-on” this semester, but that you may encounter in the literature. Problems will encourage you to apply these approaches to research or clinical questions. Exercises will also be provided to help review or make connections to relevant points from lecture. In one

case (Week 3), I will lead a discussion of various research methods that involve working with nucleic acids. Material encountered in problem solving activities or lab lectures may serve as a source for exam questions.

In addition, the in-class components of the **scientific information explorations (SIEs)** will take place largely during lab time:

- A journal club (discussion of an article from the primary literature) is included in this course to increase your understanding of techniques used in biochemical research, as well as your proficiency in reading and evaluating reports published in scholarly journals. The article for this year will focus on the insertion of a non-canonical amino acid into protein sequences, which will serve as an extension of in-class discussions of translation, etc.
- A discussion of bioinformatics resources freely available through the National Center for Biotechnology Information (NCBI) will be followed by your individual practice designed to further explore two proteins that serve as models for ligand binding and enzymatic reaction mechanism.
- The final SIE project is designed to help you further your ability to access and evaluate scientific material presented in published reports as well as information available in public databases. Typically, we will explore mitochondrial function as an extension of in-class conversations about metabolism and cellular energy.

Each SIE activity will involve an introductory discussion held during lab followed by an assignment for students to complete individually. More information about these aspects of the course will be provided in advance of each activity.

Finally, please carefully review the attached **lab safety** guidelines. I have provided two copies; please sign and date one to acknowledge that you have read it and turn it in to me by the end of the first laboratory period.

<b>Week</b>	<b>Dates</b>	<b>Labs and other activities</b>
1	1/13-1/15	Review of lab syllabus and projects; Lab safety
2	1/20-1/22	Chromatin Structure I Nuclei prep and digestion <i>Lab problem solving: Working with nucleic acids, part I</i>
3	1/27-1/29	Discussion of DNA technologies
4	2/3-2/5	Chromatin Structure II Gel electrophoresis <i>Lab problem solving: Working with nucleic acids, part II</i>
5	2/10-2/12	Identification of Genetically Modified Organisms using PCR I DNA prep; set up PCR <i>Lab problem solving: Working with nucleic acids, part III</i>
6	2/17-2/19	Identification of GMOs using PCR II Electrophoresis of PCR products <i>Lab problem solving: Studying protein-DNA interactions</i>
7	<b>2/23, 11:30am</b>	<b>Journal Club questions due (via email)</b>
	2/24-2/26	SIE - Journal Club  Lab make-up day (if needed)
	<b>2/27, 11:30am</b>	<b>Lab notebooks due (outside NSB 225)</b> <i>* I will assess the TOC and work from Weeks 2, 4-6</i>

SPRING BREAK

*Continued on reverse*

<b>Week</b>	<b>Dates</b>	<b>Labs and other activities</b>
8	3/10-3/12	SIE - Bioinformatics discussion
	<b>3/13, 11:30am</b>	<b>SIE assignment 1 (journal club) due</b>
9	3/17-3/19	Enzyme kinetics I
10	3/24-3/26	Enzyme kinetics II
	<b>3/27, 11:30am</b>	<b>SIE assignment 2 (bioinformatics) due</b>
11	3/31-4/2	Purification and characterization of albumin I Purification using affinity chromatography Protein concentration determination (Bradford assay)
12	4/7-4/9	SIE - Final project discussion
13	4/14-4/16	Purification and characterization of albumin II SDS-PAGE to characterize affinity-purified albumin and to determine the molecular weights of proteins <i>Lab problem solving: Working with proteins/review of protein structure</i>
14	4/21-4/23	Lab make-up day (if needed)
	<b>4/24, 11:30am</b>	<b>Lab notebooks due (outside NSB 225)</b> <i>* I will assess the TOC and work from Weeks 9-11, 13</i>
15	4/28-4/30	No labs this week
	<b>5/1, 11:30am</b>	<b>SIE assignment 3 (final project) due</b>

*Please note that this schedule represents a tentative outline and may be subject to change.*