CHEM 435W Spring 2021
Section 02 Biochemistry Laboratory
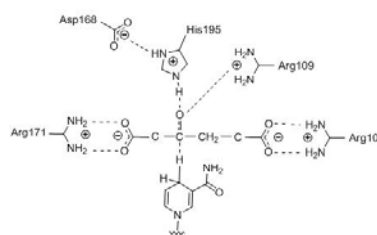
Instructors:	Dr. Ellis Bell
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Lab Hours:	**M/W** 1:30-5:30 pm SCST 427
Office Hours:	T/Th: by Zoom:10.30am-11.30am;
	Informal(voluntary) Virtual Lab Recitation: Fridays 3.00-4.00pm: will be held using zoom
	Virtual (zoom): by appointment

I am committed to affirming the identities, realities and voices of all students. This course values the use of person-centered language and respect for the experiences of others. Your experience in this course is important to me and I will do my best to help create an inclusive learning environment where all students can thrive. I strongly believe that all students at USD can be successful in science and it is my job to partner with you to help you achieve our shared learning goals.

Required Text: *Assigned Pre-Lab Readings on Blackboard*

Course Description: The course is an advanced laboratory course that is built around a focus on techniques for the preparation and quantitative analysis of proteins and other macromolecules, presenting students with a broad spectrum of techniques, approaches and concepts of contemporary biochemistry. You will learn aspects of bioinformatics and molecular visualization, DNA purification and analysis, protein expression and quantification, enzyme purification, enzymatic characterization, chromatography, electrophoresis, immunological techniques, and spectroscopic analysis. While you become skilled in these techniques, **you will demonstrate safe laboratory practices and** the art of **keeping a complete and organized notebook.**

This course has five specific learning goals:

i) **Find, use and present relevant primary literature, protein sequences, structures and bioinformatics tools**
ii) **Understand the various roles that non- covalent interactions may play in the structure, function and experimental analysis of an enzyme.**
iii) **Keep an accurate laboratory notebook that allows others to interpret and reproduce reported experiments, and work as an effective team.**
iv) **Be able to develop a hypothesis and research proposal and design and perform experiments to interrogate your hypothesis, and,**
v) **Can present the basis and results of your hypothesis/project using verbal, visual or written media to a variety of audiences, and draw evidence based conclusions using data obtained from a variety of biochemical and biophysical techniques that explore protein structure-function relationships.**

Expected Student Learning Outcomes. Students who succeed (ie C or better) in the course should be able to achieve a minimum of "acceptable" on each Learning Goal rubric:

Resources:

(a) <u>*Assigned Readings:*</u> **The Hypothesis Development and Proposal Module on Blackboard contains important background to the research that you will conduct throughout the semester as well as critical information for many of the graded assignments in the course. It also contains information germain to three of the five overall learning goals of the course, and their rubrics.** Although one of the major themes of this course is experimental and computational approaches that can be used to study protein structure and function, you will also learn how to find and use the primary literature as a critical part of the semester. The project component of the semester is organized around three modules of experimental approaches, i)

Construction & Validation, ii) Kinetics and Ligand Binding, and iii) Conformation & Stability. These modules are found on Blackboard and, together with "Enzymes: an Introduction" will be the subject of the in class quizzes that occur. In addition, for each lab approach you may use you will find a protocol or other documents that provides you with the information necessary to complete the required pre-lab entry on the electronic lab notebook (eLN) that is used throughout the semester

(b) _Blackboard course site._ Class materials will be available on the course Blackboard (Bb) site. The laboratory is broken down into 3 blocks, as listed in the lab block section of the Bb site. In addition to the modules listed above you will find a variety of protocols that you may or may not need depending upon the direction your project takes. You will also find the rubrics for the various graded assignments- these will give you a guide to the level of knowledge you need to be successful in the course. All assignments are posted to Bb under their respective tabs (Learning Outcome Associated Assignments, Homework, Writing Portfolio) All assignments **must** be turned in electronically (**emailed, as a pdf attachment, no later than the due date to jbell@sandiego.edu**) and **clearly indicate your name in the attachment title and file name**. Several video tutorials and websites are embedded in the Bb site. These are resources that provide information that is REQUIRED to be prepared for class and to complete your assignments. Ignore them at your own academic peril.

(c) **_LabArchives electronic notebook_**. Pre-Lab assignments, Lab prep, data, and analyses will be recorded in an electronic notebook. You will be enrolled in the electronic laboratory notebook (ELN) associated with the class. You will receive an email notification of this enrollment. An access fee will be assessed by LabArchives. A video tutorial on ELN usage is posted on the Bb site under the Notebook tab. Guidelines on maintaining your laboratory notebook also posted.

Group work: For some labs you will be assigned to a team. As part of your team work, you will evaluate your partners and your partners will evaluate you. Your group work reflects the real-world experience of scientists – that is - team-based studies and interdisciplinary cohorts. From your group work, you will gain experience working with peers to evaluate, interpret & debate data/ethical issues pertaining to the course materials.

Grades: _Except for homework and the PreLab Quizzes, you will be provided with rubrics for each writing or presentation assignment. These rubrics should act as a guide as to the quality of the work required to succeed in this course. Each Rubric has 4 "zones" that will be used in grading: Excellent (100%), Good (85%), Acceptable (75%) and Unacceptable (60%)._

Homework & Prelab Quizzes 200 pts (20% of total grade)
Homework assignments, Pre-Lab reading quizzes will be turned in throughout the semester and must be completed on time to be adequately prepared for the next lab period. See the detailed grade breakdown below and refer to the schedule of due dates provided. Late homework and assignments will be accepted for a grade but assessed a late penalty.

Laboratory Notebook 100 pts (10% of total grade)
Your laboratory notebook should be an accurate record of what you do in the lab, and should contain notes and calculations as well as appropriate comments to the lab your working on. You should enter the lab with your notebook prepared for the day's experiments (Do the prelab assignment!). A major function of a lab notebook is to allow another competent scientist to reproduce exactly your experiment. (See lab notebook format document for detailed information.) **NOT MAINTAINING A LAB NOTEBOOK WILL RESULT IN AN AUTOMATIC "F."**

Writing Assignments 450 pts (45% of total grade)
This is a writing course. To fulfil the writing requirement during the semester there will be four assignments where you turn in a draft for grading, receive feedback, and revise for final grading. These writing assignments are based upon common elements of a published paper and consist of i) Introduction and literature review, W1, ii) Hypothesis and Proposal,W2, iii) Materials and Methods,W3, and iv) Results, and Discussion, W4, that will be written and revised at various times during the semester. In addition you will combine all of the above and add a conclusions and future directions section in the final paper, W5. The Materials and Methods component will also be evaluated in the context of your laboratory notebook. Through instructor feedback, revision and peer review, you will hone your scientific writing skills. You will also learn how to prepare publication quality figures and figure legends, prepare a literature review of relevant primary literature, and master proper usage of references.

Learning Outcome Associated Assignments 250 pts (25% of total grade)

At various times throughout the semester you will make group presentations of the background, your hypothesis and research proposal, experimental approaches and data analysis you have gained experience with during the semester. **These will also involve, as appropriate, individual discussions/question/answer sessions to explore the depth of your knowledge.**

Due Dates for Assignments

Excuses for Missing a listed Due Date without penalty can only include: 1) Official University or academically-related events **pre-approved by your instructor**, or 2) Illness, if you provide a doctor's note. For non-illness related absences you must inform the instructors at least 48 hours in advance, and provide supporting documentation. In the event of missing a due date or turning in an assignment late a penalty of 10% of the assigned points **per day** will be applied. Missed due dates on assignments requiring instructor feedback prior to final submission will receive a zero, but you may revise to earn up to 50% of the initial points available. Incomplete prelabs will receive zero points.

Revision of Work

This is a writing class and drafts and final versions of various assignments are required. The draft will be graded, and on these assignments you can earn back up to 50% of the missed points on submission of the final version. Late submission of drafts will incur a penalty as indicated above. Similarly, with Homework problem sets, you will receive a grade and will have 7 days to correct any errors you find and be able to earn back up to 50% of the missed points on resubmission. Late submission of homework will incur a penalty as indicated above, but of course you can still submit to earn back up to 50% of the grade for the assignment.

The overall grade cut offs are A-90%, B-80%, C-70%, D-60% F-<60%. The +/- grades will be awarded within each range, typically top 2% of each range corresponds to "+," bottom 2% of each range corresponds to "-." If revisions are offered, they **must** be completed within one week of graded work being returned to student.

Expected Level of Work/Performance

To guide you as to the level of work/performance required to achieve these grades you are provided with Rubrics for the eLN, Writing and Learning Objective Associated Assignments.

Safety: Safety regulations require that all students working in laboratory receive training in the safe handling of any potentially dangerous chemicals or biohazards. The first day in lab will cover refresher training in the safe handling of these materials. For the most part this laboratory poses very little risk, however we will be using several chemicals that are potentially dangerous. A safety training sheet will be signed at the beginning of the semester.

Attendance Policy: Attendance is mandatory. Excused absences can only include: 1) Official University or academically-related event approved by your instructor, or 2) Illness, if you provide a doctor's note. For non-illness related absences you must inform the instructors at least 48 hours in advance, and provide supporting documentation. In the event of an unexcused absence from the laboratory, you will not be allowed to make up the session and you will not receive credit for that part of the lab. Continued absence may result in a failing grade or you will be asked to withdraw from the class.

Academic Integrity: Review the Student Code of Rights and Responsibilities and Rule of Conduct (sandiego.edu/conduct/the-code/). In particular, familiarize yourself with the Academic Integrity Policy, which is found under "University Policies." You will need your MySanDiego username and password to view the policy.

Kumeyaay Land Acknowledgement: I want to acknowledge that the land on which we gather is the traditional and unceded territory of the Kumeyaay Nation. I want to pay respect to the citizens of the Kumeyaay Nation, both past and present, and their continuing relationship to their ancestral lands.

Assignment Schedule and Associated Points

Pre-Lab Assignment Quizzes and Homework: Total 200 points: Individual

Quizzes	Date	Points Available
PL1: Enzymes, an Overview	2/1	15
PL2: Non Covalent Interactions	2/22	40
PL3: Construction & Expression Module	3/8	15
PL4: Kinetics & Binding Module	3/29	15
PL5: Conformation & Stability Module	4/14	15
Homework*		
HW1: Specific Activity Calculations, Purity, Yields	2/10	20*
HW2: Spartan Worksheet	3/1	20
HW3: Characterization & Molecular Weight Calculations etc	3/24	20*
HW4: Kinetics and Inhibitors, Binding Calculations	4/12	20*
HW5: Folding and Stability	4/28	20*
*Up to 50% missed points can be regained upon correction		

Laboratory NoteBook: Total 100 Points: Individual

In addition to prelab assignments which must be entered into the eLN **before** coming to class on the indicated dates there will be four formal lab notebook checks to ensure that your eLN is up to date.

Prelab Assignments: **Must be done before every Lab Period**		50
NB1	2/17	25
NB2	3/10	25
NB3	4/7	25
NB4	5/3	25

Learning Outcome Related Assignments: Total 250 Points Individual

RP1: Background Presentation and MindMap	2/3	40
RP2: Hypothesis and Approach Presentation	3/10	50
RP3: Results Presentation, MindMap	4/26	40
RP4: Final Presentation	Exam Day	100
RP5: Peer Review Session and Group & Self Reflection Critiques	5/22	20

Writing Assignments#: Total 450 Points: Individual

*W1:Introduction & Literature Review	2/6 & 2/20	75
*W2: Hypothesis and Proposal	3/6 & 3/20	100
*W3: Materials and Methods Section	3/27 & 4/10	75
*W4: Results Section, Data Presentation, Analysis & Discussion	4/22& 5/8	100
W5: Final Paper	5/22	100

*Up to 50% missed points on the draft can be claimed upon Revision

CHEM435W Monday/Wednesday
The Schedule is tentative and may change based on COVID 19 Restrictions, the pace of the project and class

Day		Activity Description	Date	PLab Quiz	HWK	NB		Writing
1		**Course/Project Overview/Lab eLN**	M 1/15					
2		**What is Known: Finding & Reading Literature**	W 1/27					
3		**BioInformatics, Clustal Omega**	M 2/1	PL1				
4	RP1	**Molecular Visualization: PyMol Background Presentation**	W 2/3					
			Sat 2/6					**W1 Draft**
5		**Using the Vernier Specs: Spectra, Single Absorbance, Rates**	M 2/8					
6		**Pipetting, Bradford Assays, Reproducibility**	W 2/10		HW1			
7		**Protein Purification I**	M 2/15					
8		**Protein Purification II**	W 2/17			NB1		
			Sat 2/20					**W1 Revised**
9		**SDS PAGE etc**	M 2/22	PL2				
10		**Specific Activity Determination**	W 2/24					
11		**DNA Sequence Analysis,**	M 3/1		HW2			
12		**Hypothesis & Proposal I**	W 3/3					
			Sat 3/6					**W2 Draft**
13		**Connecting Questions to Experiments**	M 3/8	PL3				
14	RP2	**Proposal Presentations**	W 3/10			NB2		
15		**Preparing & Validating Mutants I**	M 3/15					
16		**Preparing & Validating Mutants II**	W 3/17					
			Sat 3/20					**W2 Revised**
17		**Using pKa Analysis to report Conformation**	M 3/22					
18		**Examining Interfaces**	W 3/24		HW3			
			Sat 3/27					**W3 Draft**
		SPRING BREAK	M 3/29	PL4				
		SPRING BREAK	W 3/31					
		EASTER BREAK	M 4/5					
19		**Examining Ligand Interaction**	W 4/7			NB3		
			Sat 4/10					**W3 Revised**
20		**Project Experiments 1**	M 4/12		HW4			
21		**Project Experiments 2**	W 4/14	PL5				
22		**Project Experiments 3**	M 4/19					
23		**Project Experiments 4**	W 4/21					
			Sat 4/22					**W4 Draft**
24		**Data Presentations**	M 4/26					
25		**Project Experiments 5**	W 4/28		HW5			
26		**Project Experiments 6**	M 5/3			NB4		
27		**Reproduce Key Observations**	W 5/5					
			Sat 5/8					**W4 Revised**
28		**Presentation Preparation**	M 5/10					