CHEM 3381 – Biochemistry Techniques
Spring 2021
revised 2/12/2021

Instructors:

Dr. Karen Lewis (KAL137@txstate.edu; Zoom ID 613-440-9947) CENT 401B

Dr. Steven Whitten (SW50@txstate.edu; Zoom ID 283-156-8894) CENT 408B

Instructional Assistants:

L01 (Tues 8 am – noon): Mitchell Myhre, mwm95@txstate.edu

L03 (Wed 8 am – noon): Elizabeth Williams, epw14@txstate.edu

L04 (Wed 2 pm – 6 pm): Elizabeth Williams, epw14@txstate.edu

L05 (Thurs 8 am – noon): Mitchell Myhre, mwm95@txstate.edu

L02 (Thurs 2 pm – 6 pm): Shahad Abdulsahib, sma121@txstate.edu

Locations

Lectures will be held in Centennial G01 on Mondays and Fridays from 12:30-1:20 pm, unless otherwise noted. As long as campus is open, lectures will be face-to-face and synchronously held on Zoom (i.e., hybrid format). All lab sections meet in Chemistry 109, and will *not* be electronically recorded. Any changes to the lecture or lab locations, including face-to-face vs remote, will be clearly announced in lecture, lab session, and on Canvas.

Office Hours

Dr. Whitten's office hours are Mon, Wed, and Fri from 8 – 9 am.

Zoom Office link: https://txstate.zoom.us/my/stwhitten

Dr. Lewis' office hours are Mon, Wed, and Fri from 9 – 10 am;

Zoom Office link: https://txstate.zoom.us/my/lewiska

Course Description

This course introduces biochemistry majors to the fundamental laboratory techniques used in analytical and physical biochemistry. Weekly experiments will reinforce concepts presented in pre- and co-requisite courses and utilize modern instrumentation. Experimental design, interpretation of results, analysis, and reporting of experimental data will be emphasized.

Prerequisite: CHEM 3375 with a C or better.

Course Objectives

Upon completion of this course, students will be able to:

1. Calculate concentrations in different units and prepare aqueous solutions.
2. Recognize the causes of various experimental errors and know how to identify, evaluate, and minimize them.
3. Perform successful titrations and calculate/report the experimental results (*i.e.,* concentrations, purity, *etc.*) with appropriate number of significant figures.
4. Isolate a protein from a native source using standard purification techniques.
5. Analyze various biomolecules using a variety of methods, including detection, separation, and characterization techniques.
6. Operate instruments used in biochemical experiments.
7. Use the scientific literature to write an experimental protocol.
8. Properly document laboratory experiments in a notebook.

Required Materials *(for every lab session)*

- 100 pg duplicate copy laboratory notebook (ISBN 978-1930882744)
- Ball point pen for writing in lab notebook
- an external storage drive (USB type)
- three-ring binder
- closed-toe shoes
- long pants
- shirt with sleeves
- safety goggles/glasses
- face covering that securely covers nose and mouth

Course Structure

This writing-intensive lab course is structured as a series of six modules. The first five modules each have a wet lab component and a dry lab component. Students will be divided into two groups ("A Group" and "B Group"). Within each module, the groups will alternate wet lab and dry lab (see schedule at the end of this syllabus).

The post-lab assignments for each Module will be due as hard copies at the beginning of each wet lab session for the following Module. For example, the two worksheets for Module 1 (one for wet lab, one for dry lab) will be due at the beginning of the Module 2 wet lab session. Group A will turn in their Module 1 worksheets during the first week of Module 2, and Group B will turn in their Module 1 worksheets during the second week of Module 2. In this way, every student will have 2 weeks to complete their data analysis and processing for the wet-lab experiments.

For example, the course opens with Module 1 and Module 2 as follows:

Monday, 25-Jan: Both Group A and Group B will take the Canvas quiz, covering the wet lab experiment.

Tuesday, 26-Jan – Thurs, 28-Jan: Group A will come to campus and perform the wet lab experiment;
Group B will work remotely to complete the dry lab exercise.

Monday, 31-Jan: No Canvas Quiz

Tuesday, 1-Feb – Thurs, 3-Feb: Group B will come to campus and perform the wet lab experiment;
Group A will work remotely to complete the dry lab exercise.

The next week will begin Module 2.

Monday, 8-Feb: Both Group A and Group B will take the Canvas quiz, covering the wet lab experiment.

Tuesday, 9-Feb – Thurs, 11-Feb: Group A will come to campus and perform the wet lab experiment;
Group A Module 1 worksheets due at beginning of wet lab
Group B will work remotely to complete the dry lab exercise.

Monday, 15-Feb: No Canvas Quiz
*** Note that with the schedule revision on 12-Feb-2021, the following dates are revised ***
~~*Tuesday, 16-Feb – Thurs 18-Feb:*~~ Group B will come to campus and perform the wet lab experiment;
Tuesday, 23-Feb – Thurs 25-Feb: Group B Module 1 worksheets due at beginning of wet lab
Group A will work remotely to complete the dry lab exercise.

Please see the schedule at the end of this syllabus for details.

Expectations

This is a writing-intensive, upper-level chemistry laboratory course. Therefore, you should plan to spend approximately **4-6 hours/week** outside of class ***in addition to*** the 2 hours of classroom lecture and the 4 hours of laboratory time. These outside hours should be spent preparing for and processing data from the lab, including but not limited to:

- reading background material
- preparing pre-lab protocol
- analyzing data with appropriate software
- completing the weekly post-lab assignments and the long formal lab report

Pre-Lab Preparation

The quality of your data, and therefore the ease of your data analysis and interpretation, will depend on how well prepared you are to execute the experiment. Sufficient preparation includes knowing what reagents and instruments are required, having recorded the detailed recipes for all buffers and reaction mixes, understanding the theory behind the experiment, writing out a detailed stepwise protocol for the experiment, and knowing how to use common software like Excel. This preparation will require that you use the background resources that are posted for you on Canvas as well as the textbooks and lecture notes from CHEM 3375 and CHEM 3380.

The accuracy and thoroughness of your pre-lab preparation will be assessed through **bi**weekly Pre-Lab quizzes. At the beginning of each 2-week module, there will be a quiz administered on Canvas that covers the wet lab experiment for that module. The content for this quiz will be covered in the background reading and pre-lab background questions for each wet lab component, which will be available on Canvas in the relevant module section.

The first Monday of each Module will discuss the theory and execution of the wet-lab experiment for that Module. On the following Monday, Group A will debrief the wet-lab experience with the whole class, sharing lessons learned and beginning the data processing. The first Friday of each Module will discuss the dry-lab experiment. The second Friday of each Module will discuss analysis of wet-lab results. If time permits, the dry-lab experiment can be further discussed on the second Friday too.

Post-Lab Analysis

The 3rd and 4th lecture sessions of each Module will be predominantly post-lab discussions, data processing, and data analysis sessions. We strongly encourage and fully expect you to come see us for assistance in processing and interpreting data. Please take advantage of synchronous lectures to ask questions, and also feel free to visit us during set office hours or through individual appointments. It is important to note that although group discussion of results and interpretations of data are strongly encouraged, collaboration on the post-lab analysis that is submitted for a grade is strictly prohibited. Each student must prepare their own graphs and carry out their own data analysis and interpretation. Failure to do so will constitute an honor code violation, and will be pursued as described in the syllabus.

Course Grades

	Pts each	Number	Total Points	% of overall course grade
Lab Participation & Professionalism	10	6	60	6
Pre-lab quiz	15	6	90	9
In-lab notebook	15	6	90	9
Post-lab worksheet	40	11	440	45
Formal Report	200	1	200	20
Final	100	1	100	10
		TOTAL	***980***	

Grading Scale:

> 89.45%	A
79.45 – 89.44%	B
69.45 – 79.44%	C
59.45 – 69.44%	D

Attendance and Tardiness:

Lecture and lab attendance is ***mandatory***. Please see "COVID-19 Contingency Plans" below for illness-related policies.

- Students should arrive on time for lecture and laboratory sessions. Extra time will not be given for the pre-lab notebook quiz without documented ODS accommodations.
- Students who are not prepared to begin lab on time may not be able to complete the experiment and will lose credit on their in-lab grade.
- **A laboratory absence** will result in a zero for the in-lab notebook grade and participation grade. However, with documented absences related to illness and/or COVID-19 exposure, data may be obtained from your lab partner and used to complete the post-lab assignment for full credit.
- **There are no make-up labs without documented accommodation.** If you have any conflicts with your current lab section, you should immediately discuss them with Drs. Lewis and Whitten **and** provide a written explanation via email.
- IAs are *not permitted* to extend the laboratory session times or adjust assignment due dates.
- Be aware that repeated absences from either the lecture or lab sessions will not earn a passing grade in this course. Likewise, multiple post-lab assignments that are submitted late or not at all will also endanger your grade. It is **imperative** that you complete assignments fully and on time.

Laboratory Safety:

- It is **<u>your responsibility</u>** to observe and follow the departmental laboratory safety policy and all course-specific safety policies. These include following direct instructions from the IA and the instructors.
- **Proper laboratory attire, including safety glasses and a face covering that covers the nose and mouth, <u>must be worn at all times</u>.** Safety glasses must be on your eyes from the minute you cross the threshold into the laboratory and remain in place throughout the laboratory session.
- In the event of a safety violation:
    - Safety violations will be penalized as a deduction in lab participation points.
    - Depending on the severity of a safety violation, a student may be given a warning for a first violation. Major and/or repeat safety violations may result in a student being asked to leave the laboratory.
    - Upon removal from the laboratory as a result of a safety violation, a student may not be given the opportunity to make up the missed experiment(s).

Lab Notebook:

- Your notebook is extremely important for success in this course. It will also serve you as a reference in subsequent biochemistry laboratory courses. **Each student is required to maintain a duplicate page lab notebook** that will contain all methods, reagents, protocols, procedures, purpose statements, sample calculations, results, and data processing for each wet-lab experiment. See "Laboratory Documentation Guidelines" document for complete details (on Canvas).
- **<u>Pre-Lab Quiz:</u>** A pre-lab quiz will be administered on Canvas, and will be due by class time on Monday (12:30 pm). You will have 20 min to complete the quiz. No make-up quizzes will be given. Extra time for quizzes will not be given without documented and pre-arranged accommodations (see below).
- **<u>In-Lab Grading:</u>** A duplicate copy of the pre- and in-lab notebook pages will be turned in to the IA at the <u>end</u> of the wet lab session. Late pre-/in-lab notebook pages will not be accepted.
- **<u>Post-Lab Grading:</u>** A hard copy of both worksheets for each Module (wet lab and dry lab) will be submitted as a hard copy at the beginning of the next Module's wet lab session.

	Format	Deadline	Same-day late	Per-day late
Pre-Lab Quiz	On Canvas	1st Monday of each Module, beginning of lecture (12:30 pm)	Not accepted	Not accepted
In-Lab Notebook Copies	Carbon copy pages of wet lab notebook	End of wet lab session	Not accepted	Not accepted
Post-Lab Worksheets	Hard copy of both wet and dry lab worksheets	Beginning of next wet lab session; see syllabus for dates	Before 5 pm on date due -1.25 points	-2.5 points / day

Assignment Retention & Grade Dispute Policy:

- Keep all materials handed back to you, including grading rubrics.
- Regularly monitor your grade on Canvas. Report discrepancies to Drs. Lewis and Whitten either by email or during office hours.
- Grade disputes are not entertained during or immediately after lecture. It is critical that these concerns be discussed either during lab session or office hours, when Drs. Lewis and Whitten can give the issue their full attention.

Resources

- The laboratory instructors will maintain a Canvas course website, which will be used extensively for posting course information and assessments throughout the semester. Please enable notifications for messages via Canvas in your own account.
- Students are encouraged to use supplementary materials provided on the course Canvas site as well as materials from CHEM 3380 Analytical Biochemistry and CHEM 3375 Principles of Biochemistry.
- Students should check their Texas State email and Canvas accounts *daily* for lab announcements.

Lab Glassware and Supplies

- Each student is responsible for proper care of all equipment and supplies.
- Students will be assigned a drawer at the beginning of the semester to hold assigned equipment (such as spatulas, tips, and stir bars) and personal items. Students are responsible for returning their items to their assigned drawer and locking it at the end of each lab session.
- Micropipettors will be checked out from the IA at the beginning of each lab session and must be returned at the end of each lab session. Failure to promptly return all pipettes will result in loss of Lab Participation/Safety points.
- On occasion, specialized equipment may need to be checked out from the stockroom, using your Texas State ID or driver's license as collateral. It is **your responsibility** to return this equipment in a complete, unbroken, and properly cleaned condition.
- Replacement of lost or damaged supplies, glassware, or equipment will be charged to the responsible party(ies). The balance(s) will be paid through Texas State University Business Services. Unpaid balances may prevent registration and/or graduation.

Honor Code

- **No collaboration** is permitted on graded work (including tests, quizzes, and post-lab analysis.).
- All work submitted for a grade is expected to be completed individually. Collaborations are **not** allowed on discussions, conclusions, or written reports. This policy is not intended to discourage students from studying together or working together to prepare for lab.
- This policy explicitly forbids copying or paraphrasing the work of others, including a text, journal article, another student's lab report, or any site on the Internet. All outside sources must be clearly acknowledged. *Referencing or otherwise acknowledging the source of text (even a portion of a single sentence) that has been* ***copied directly or closely paraphrased is still considered plagiarism.*** A complete description of the Code of Student Conduct is at
  http://www.dos.txstate.edu/handbook/rules/cosc.html

  The Texas State University Honor Code and information is at
  http://www.txstate.edu/honorcodecouncil/Academic-Integrity.html

  If you need additional clarification on the implementation of these policies in this course, please contact Drs. Lewis and Whitten.
- Violation of the Texas State Honor Code will result in academic penalties at the instructors' discretion, up to and including failure in the course.

Professionalism and Respect

The University and Drs. Lewis and Whitten are committed to an educational community in which each individual is respected, appreciated, and valued. Class rosters are provided with the student's legal name. All requests to address you by an alternate name, pronunciation, and/or gender pronoun will be honored. Please advise us (either in person or by email) of this preference early in the semester.

Special Needs

If you are a student with a disability who will require an accommodation(s) to participate in this course, please contact both Drs. Lewis and Whitten as soon as possible. You will be asked to provide documentation from the Office of Disability Services. Failure to contact us in a timely manner may delay your accommodations.

The University recognizes that students may have extreme emergencies that affect academic performance. Students should contact Emergency Student Services (through the Dean of Students Office) to seek assistance. Detailed information can be found at http://www.dos.txstate.edu.

Drop Policy

The automatic "W" deadline is March 30, 2021 at 11:59 pm. After that deadline, students cannot drop any course. Students may *withdraw* from the University (*i.e.*, drop all courses, and go to zero credit hours for the current semester) by April 22, 2021. Withdrawal from the University is not the same as dropping a course.

COVID-19 Contingency Plans

The University requests that all students, faculty, and staff who test positive for COVID-19 or who are identified as a close contact report in Bobcat Trace. This is a secure web application for reporting positive COVID-19 cases and will guide contact tracing efforts at Texas State.

It is vital that we all follow the Bobcat Pledge, including the shared responsibility to practice healthy behaviors and follow the health and safety guidelines, which shows respect for others and helps prevent the spread of COVID-19 on campus and in the surrounding community.

Instructor gets sick: If either Dr. Lewis or Dr. Whitten contracts the virus, they will self-isolate and the other instructor will continue to lead the class in person and synchronously on Zoom while the ailing instructor participates remotely as long as symptoms allow. If both instructors fall ill and their collective symptoms interfere with their ability to host either the synchronous class meetings or office hours, a substitute faculty will take their place and serve as the synchronous class Zoom host, lecturer, and provide substitute office hours until one or both instructors recover. If one of the IAs contracts the virus, then a substitute IA and/or Drs Lewis & Whitten will take their place until the IA is able to resume their duties.

Student gets sick: **If you feel ill, do not come to lab.** Contact Drs. Lewis & Whitten via email, and accommodations will be made to ensure you have as much opportunity as possible to interact with the wet lab activity and complete the post-lab analysis.

All students should follow the 10 Guiding Principles for Health, Safety, and Wellness at Texas State, including the requirement to wear a cloth face covering and perform a self-assessment each day before coming to campus. If you are sick, **do not go to school or work**. If you have COVID-19 symptoms, contact your healthcare provider or the Student Health Center (512-245-2161) for evaluation and testing for COVID-19. The Student Roadmap contains valuable information regarding safe practices and procedure for successful reopening of our campus. If any illness impacts your ability to participate in this course, contact the Dean of Students Office with appropriate documentation.

If Bobcat Trace alerts us that either the lecture class or an individual lab section has been exposed to COVID-19, that section may need to quarantine per CDC recommendations and University regulations. Adjustments to the laboratory schedule will be made at that time as necessary and as appropriate.

Module	Week of	A Group	B Group	Assignment
	22-Jan	**First Lecture: G01**		
Module 1	25-Jan	**Buffer prep & SEC**	Keeping a Scientific Notebook	SEC worksheet
	1-Feb	Keeping a Scientific Notebook	**Buffer prep & SEC**	Notebook worksheet
Module 2	8-Feb	**LDH lysis/AmSO$_4$**	LDH Bioinformatics	Lysis/AmSO$_4$ worksheet LDH Bioinformatics worksheet
	15-Feb	Polar Vortex Bye Week		
	22-Feb	LDH Bioinformatics	**LDH lysis/AmSO$_4$**	
Module 3	1-Mar	**LDH affinity**	Written Scientific Communication	LDH affinity worksheet Science Communication worksheet
	8-Mar	Written Scientific Communication	**LDH affinity**	
	15-Mar	*Spring Break*		
Module 4	22-Mar	**Bradford**	Writing Methods/Results	Bradford worksheet Writing Methods/Results worksheet
	29-Mar	Writing Methods/Results	**Bradford**	
Module 5	5-Apr	**Purified LDH Activity**	LDH Kinetics & Inhibition	Purified LDH activity worksheet LDH Activity +/- inhibition worksheet
	12-Apr	LDH Kinetics & Inhibition	**Purified LDH Activity**	
Module 6	19-Apr	**SDS-PAGE (1st 2 hours)*** ~~Writing Time~~	**SDS-PAGE (2nd 2 hours)*** ~~Writing Time~~	SDS-PAGE worksheet ~~Full Lab Report Due Fri Apr 23~~
	26-Apr	~~Final Lecture: G01~~		
	26-Apr	**Final Lab Practical (1st 2 hours)***	**Final Lab Practical (2nd 2 hours)***	
	3-May	**Final Lecture: G01**		**Full Lab Report Due Mon May 3**

Wet Lab experiments are in bold.
Dry Lab experiments are in regular text
* Wet Lab time for these two weeks will be split between A and B groups in 2-hour shifts.
Schedule adjustments