

CHEM 3381 – Biochemistry Techniques
Spring 2022
revised 1/21/2022

Instructors:

Dr. Karen Lewis (KAL137@txstate.edu; [Zoom ID 613-440-9947](https://txstate.zoom.us/j/6134409947)) CENT 401B

Dr. Steven Whitten (SW50@txstate.edu; [Zoom ID 283-156-8894](https://txstate.zoom.us/j/2831568894)) CENT 408B

Instructional Assistants:

L01 (Tues 8 am – noon): Elizabeth Williams, epw14@txstate.edu

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

L04 (Wed 2 pm – 6 pm): Nicolas Coral, n_c240@txstate.edu

Sarah Mitchell, sam566@txstate.edu

Locations

Lectures will be held in-person in Centennial G01 on Mondays and Fridays from 12:30-1:20 pm, unless otherwise noted. All lab sections meet in-person in Chemistry 109. Any changes to the lecture or lab locations, including delivery method, will be clearly announced in lecture, lab session, and on Canvas.

Per University policy, the first two weeks of Spring 2022 (i.e. Jan 18 – 28) will be remote instruction. Lecture sessions will be held as synchronous Zoom sessions, and the laboratory section material will be covered via an asynchronous at-home assignment.

Office Hours

Office hours are offered both in-person and synchronously via Zoom.

Dr. Lewis' office hours are Tues and Thurs from 8 – 10 am.

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

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

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

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

Expectations

This is a writing-intensive, upper-level biochemistry laboratory course for biochemistry majors. 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 **weekly** Pre-Lab quizzes. At the beginning of each week, there will be a quiz administered on Canvas that covers the wet lab experiment. 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 accuracy and thoroughness of your pre-lab preparation will also be assessed as part of your in-lab notebook grade. Unannounced lab notebook checks may be carried out to evaluate proper notebook performance, which is described in detail in the **Laboratory Documentation Guidelines** (available on TRACS).

Post-Lab Analysis

The lecture session on Friday will almost always be post-lab discussions, data processing, and data analysis sessions. We strongly encourage and fully expect you to attend Friday lectures. Please take advantage of these lectures to ask questions. Additionally, you should expect to visit us during set office hours or through individual appointments to discuss your results and interpretations. 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	11	110	9
Pre-lab quiz	10	12	120	10
In-lab notebook	15	11	165	13
Post-lab analysis	40	12	480	38
Peer Reviews	25	3	75	6
Formal Report	200	1	200	16
Final	100	1	100	8
		TOTAL	1250	

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 **your responsibility** 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, must be worn at all times.** 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).
- **Pre-Lab Quiz:** A pre-lab quiz will be administered on Canvas, and will be due by class time on Monday (12:30 pm). You will have 15 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).
- **In-Lab Grading:** A duplicate copy of the pre- and in-lab notebook pages will be turned in to the IA at the end of the wet lab session. Late pre-/in-lab notebook pages will not be accepted.
- **Post-Lab Grading:** 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	Monday, beginning of lecture (12:30 pm)	Not accepted	Not accepted
In-Lab Notebook Copies	Carbon copy pages of lab notebook	End of lab session	Not accepted	Not accepted
Post-Lab Worksheets	Hard copy of assigned lab worksheets	Beginning of next lab session	Before 6 pm on date due -2 points	-4 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 lab partner and, as partners, 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. If repair or replacement of pipettes is necessary due to misuse, the responsible students will be charged.
- 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>.

If any illness (COVID-19 or other) impacts your ability to participate in this course, contact the [Dean of Students Office](#) with appropriate documentation.

Drop Policy

The automatic "W" deadline is March 29, 2022 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 21, 2022. 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 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 teach, a substitute faculty will take their place 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.

Especially because the lab work in this course will be carried out in close proximity to others, all students should follow the [10 Guiding Principles for Health, Safety, and Wellness](#) at Texas State, including the strong recommendation to wear a [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 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.

Lab #	Date	Lab Activity	Post-Lab Analysis	Additional Lecture Activity
	21-Jan*	First Lecture: Zoom (link on Canvas)		
1	24-Jan	Scientific Communication Dry Lab	Lab notebook, protocol, manuscript structure	
2	31-Jan	Pipetting & Buffer Preparation	Statistics of pipetting, comparison to standard	
3	7-Feb	Bradford Assay: Unknown Protein	Method & results writeup	
4	14-Feb	LDH lysis/AmSO₄ precipitation	Methods writeup, LDH bioinformatics	
5	21-Feb	LDH affinity	<i>Post-Lab:</i> Methods writeup, A ₂₈₀ plot <i>Lab Report:</i> Intro Draft	
6	28-Feb	Bradford	Methods writeup, standard curve, A ₅₉₅ /A ₂₈₀ double-y-axis plot	Intro Peer Review
7	7-Mar	LDH Activity Assay	Methods writeup, A ₃₄₀ plot, selection of fractions for SDS-PAGE assay	
	14-Mar	<i>Spring Break</i>		
8	21-Mar	SDS-PAGE	<i>Post-Lab:</i> Methods writeup, standard curve, id of LDH band <i>Lab Report:</i> Methods Draft	
9	28-Mar	LDH Kinetics & Inhibition	<i>Post-Lab:</i> data analysis, inhibition mechanism	Methods Peer Review
10	4-Apr	Redo: Analysis of LDH Fractions	<i>Post-Lab:</i> explanation of why, what, how, & results <i>Lab Report:</i> Results & Discussion	
11	11-Apr	Nonlinear Curve Fitting	Curve-fitting extrapolation and analysis	Results & Discussion Peer Review
12	18-Apr	Protein Denaturation	Protein denaturation mini-report	
13	25-Apr	Lab Practical Final Exam		
	2-May	LDH Lab Report Due Mon May 2		

*Note that this is a Friday (all other dates are Mondays)