

CHEM 3381 – Biochemistry Techniques

Spring 2020

revised 1/17/2020

Instructors:

Dr. Karen Lewis (KAL137@txstate.edu) CENT 401B

Dr. Steven Whitten (SW50@txstate.edu) CENT 408B

Instructional Assistants:

L01 (Tues 8 am – noon): canceled

L02 (Tues 2 pm – 6 pm): Mitchell Myhre, mwm95@txstate.edu

L03 (Wed 8 am – noon): Brianna Norbury, bjn29@txstate.edu

L04 (Wed 2 pm – 6 pm): Brianna Norbury, bjn29@txstate.edu

L05 (Thurs 8 am – noon): Julia Roberts, jer155@txstate.edu

Locations

Lectures will be held in Centennial G01 on Mondays and Fridays from 12:30-1:20 pm, unless otherwise noted. All changes will be clearly announced in lecture, lab session, and on TRACS. All lab sections meet in Chemistry 109.

Office Hours

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

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

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 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
- writing the weekly post-lab reports 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 TRACS 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 Monday lecture and 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 a data processing and analysis session. Additionally, we strongly encourage and fully expect you to come see us for assistance in processing and interpreting data. Please take advantage of set office hours, make individual appointments, and email questions. Collaboration on the post-lab analysis 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

Lab Participation/Cooperation/Safety (10 pts each)	120
Pre-Lab Quiz (15 pts each)	180
Pre-/In-Lab Notebook Duplicates (5 pts each)	60
Post-Lab Reports (35 pts each)	420
Formal LDH Lab Report	150
Final Exam (lab practical final)	100
TOTAL	1030

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**.

- Students should arrive on time for lecture and laboratory sessions. Extra time will not be given for the pre-lab notebook quiz.
- 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, data may be obtained from your lab partner and used to complete the post-lab notebook assignment for full credit.
- **There are no make-up labs.** 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.
- 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, **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 pre-lab assignments, sample calculations, procedures to be performed, results, and data processing for each experiment. See "Laboratory Documentation Guidelines" document for complete details (on TRACS).
- Pre-Lab Quiz:** A pre-lab quiz will be administered in lecture on Mondays. No make-up quizzes will be given. If you are absent, then your grade for the pre-lab quiz will be zero. Extra time for quizzes will not be given without documented and pre-arranged accommodations (see below).
- Pre- and 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 lab session. Late pre-/in-lab notebook pages will not be accepted.
 - If you are absent the day that an assignment is due, you may email pictures or scans of the work that is due. The email with attachments must be sent to Dr. Lewis AND Dr. Whitten, regardless of which instructor is leading lab that week. The email will serve as a timestamp of submission; however, the hard copy of the assignment *must* be submitted for grading. Electronically submitted pre/in-lab pages will not be graded.
- Post-Lab Grading:** An electronic copy of the post-lab report must be submitted via TRACS, with the file naming format "Lastname_Firstname_LabX", where "X" is the lab number. This assignment is due at the beginning of the next lab session. Assignments will be considered late if they are turned in more than 5 minutes after the lab session is scheduled to begin. A hard copy of the assignment may also be submitted, but a hard copy will not substitute for the electronic submission.

	Deadline	Same-day late	Per-day late
Pre-Lab Quiz	Monday, beginning of lecture	Not accepted	Not accepted
In-Lab	End of lab session	Before 5 pm on date due -0.75 points	-1.5 points / day
Post-Lab	Beginning of next 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 the grading rubrics.
- Regularly monitor your grade on TRACS. 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 TRACS course website, which will be used for posting course information throughout the semester (including experimental protocols, instructions, and resources) and maintaining grades. You can access TRACS at <https://tracs.txstate.edu/portal> or from the link on the Texas State homepage.
- Students are encouraged to use supplementary materials provided on the course TRACS site as well as materials from CHEM 3380 Analytical Biochemistry and CHEM 3375 Principles of Biochemistry.
- Students should check their Texas State email accounts daily for lab announcements. Copies of each announcement will be posted on TRACS in the email archive.

Lab Glassware and Supplies

- Each student is responsible for proper care of all equipment and supplies.
- Students (as partners) 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, including a P-1000, P-200, and P-20, 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 both lab partners (i.e. 50% per partner) if the responsible party cannot be identified. 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.).
- Lab partners will perform the experiment and collect data together. However, 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 or perform the experiments. Lab partners must carry out their post-lab analysis **independently**.
- 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 31, 2020 at 11:59 pm. After March 31, 2020, 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 23, 2020. Note that withdrawal from the University is not the same as dropping a course.

JANUARY

Sun	Mon	Tue	Wed	Thu	Fri	Sat
19	20 MLK Jr Day	21 <i>S20 classes begin</i>	22	23	24 First Lecture	25
26	27 Lewis Lecture	28 Lab 1 Pipette/ Solutions	29 Lab 1 Pipette/ Solutions	30 Lab 1 Pipette/ Solutions	31 Lewis Lecture	

FEBRUARY

						1
2	3 Lewis Lecture	4 Lab 2 AA Titration	5 Lab 2 AA Titration	6 Lab 2 AA Titration	7 Lewis Lecture	8
9	10 Whitten Lecture	11 Lab 3 SEC	12 Lab 3 SEC	13 Lab 3 SEC	14 Whitten Lecture	15
16	17 Lewis Lecture	18 Lab 4 LDH Bio- informatics	19 Lab 4 LDH Bio- informatics	20 Lab 4 LDH Bio- informatics	21 Lewis Lecture	22
23	24 Whitten Lecture	25 Lab 5 LDH Extraction	26 Lab 5 LDH Extraction	27 Lab 5 LDH Extraction	28 Whitten Lecture	29

MARCH

1	2 Whitten Lecture	3 Lab 6 LDH Affinity	4 Lab 6 LDH Affinity	5 Lab 6 LDH Affinity	6 Whitten Lecture	7
8	9 Whitten Lecture	10 Lab 7 Bradford	11 Lab 7 Bradford	12 Lab 8 Bradford	13 Whitten Lecture	14
15	16 S P R I N G B R E A K	17	18	19	20	21
22	23 Whitten Lecture	24 Lab 8 LDH Activity Assay	25 Lab 8 LDH Activity Assay	26 Lab 8 LDH Activity Assay	27 Whitten Lecture	28
29	30 Whitten INTRO DUE	31 Lab 9 LDH SDS-PAGE				

APRIL

Sun	Mon	Tue	Wed	Thu	Fri	Sat
			1 Lab 9 LDH SDS-PAGE	2 Lab 9 LDH SDS-PAGE	3 Whitten PEER REVIEW INTRO	4
5	6 Lewis RETURN REVIEWS	7 Lab 10 Kinetics	8 Lab 10 Kinetics	9 Lab 10 Kinetics	10 Lewis	11
12	13 Lewis METHODS DUE	14 Lab 11 Denatur- ation	15 Lab 11 Denatur- ation	16 Lab 11 Denatur- ation	17 Lewis PEER REVIEW METHODS	18
19	20 Lewis RETURN REVIEWS	21 Lab 12 Nonlinear Regression	22 Lab 12 Nonlinear Regression	23 Lab 12 Nonlinear Regression	24 Lewis	25
26	27 Lecture FORMAL REPORT DUE	28 FINAL PRACTICAL EXAM	29 FINAL PRACTICAL EXAM	30 FINAL PRACTICAL EXAM		

MAY

					1 no class	2
3	4 no class S20 classes end	5 <i>Reading Day</i>	6	7	8	9

IMPORTANT DATES

January 21	First day of class
January 28	Laboratories begin
February 4, 5, 6	First Post-Labs Due
March 16-20	Spring Break
March 30	Formal Intro Due
March 31	Drop/Automatic W deadline
April 3	Peer Review: Introduction
April 6	Peer Review: Methods
April 20	Formal Lab Report Due
April 23	Withdrawal deadline
April 28, 29, 30	Final Practical Exam
May 4	Last day of semester classes