

San José State University
Chemistry Department
CHEM 131A, Biochemistry Lab, Section 1, Fall, 2022

Course and Contact Information

- Instructor(s): Dr. Sonia M. Cuellar-Ortiz (Dr. Cuellar) She/Her
- Office Location: Duncan Hall 451
- Telephone: 408 924 2808 (no voicemail)
- Email: sonia.cuellar-ortiz@sjsu.edu *Preferred contact method is emailing me **through Canvas**, I will respond within 24 business hours. Please do not expect an answer at night, on weekends or holidays.*
- Office Hours: Mondays 9 to 10 am, Tuesdays and Thursday 2 to 2:45pm. *Office hours can be attended by showing up in DH 451, by phone 408 924 2808 on T and Th, or in [zoom](#) any of the days. Students must register in zoom every time but the process is fast and can happen just before we meet. After you have registered Zoom will send you the link and a notification to me. (register link <https://sjsu.zoom.us/meeting/register/tZ0oceitrT0iGdKFAp5BedI5UxP9tSZfwJp>)*
- Class Days/Time: Tuesday and Thursday 3:00 to 5:50 pm
- Classroom: Duncan Hall 609. *In a campus contingency find information to continue the class in the [Lab Canvas page](#) (<https://sjsu.instructure.com/courses/1489631>)*
- Prerequisites: CHEM 55, CHEM 55L and CHEM 113A (with a grade of “C” or better; “C-” not accepted).
- Pre/Corequisite: CHEM 130A.

Course Description

Fundamental qualitative and quantitative techniques and methodology in modern biochemistry. This is a laboratory course focusing on the development of intermediate laboratory skills in modern biochemistry using the context of experiments examining biologically relevant molecules. These skills will comprise technique, the observation, recording, and evaluation of data acquired in the course of laboratory work, and the reporting of experimental results. This course is designed to foster skills in proper laboratory practice and record keeping, the use of biochemical instrumentation, the proper interpretation of experimental results, and the effective communication of the results through written reports.

Course Format

This is a **in person laboratory**. Students are expected to attend all the laboratory sessions (see schedule). Students require an internet-connected computer to access class materials in Canvas. In case of any contingency arise that stop us from attending to campus (pandemic, wild fires...), some lab sessions may be moved to online.

Universal Design for Learning ULD

This course and syllabus have been designed using Universal Design for Learning guidelines. The following elements have been incorporated into this course to support greater inclusion and access:

- Multimedia learning resources are offered when possible.
- Worksheets and quizzes have been added to help students remembering concepts learned in the lecture and to provide problem solving exercises in preparation for the experiments and the lab reports.
- To encourage independent study some assignments are designed to be worked independently or in small groups at students own pace.
- Time lines are set and you can use Canvas Calendar to set reminders.
- Course content and resources are available in a variety of formats.
- Varied assessment methods are used throughout the course. For most assessment the grading rubric is available in Canvas and students are encouraged to review it before submitting

Class Web Page and MYSJSU Messaging

Course materials such as syllabus, handouts, notes, assignment instructions, etc. can be found on [Canvas Learning Management System course login website](#). You are responsible for regularly checking with the messaging system through MySJSU on [Spartan App Portal](#) (or other communication system as indicated by the instructor) to learn of any updates. **For help with using Canvas see [Canvas Student Resources page](#).**

Course Goals

When you complete this laboratory course, you will have achieved the following:

- reasonably adept skills with biochemical experimental techniques
- ability to collect appropriately detailed data
- skill at analyzing and interpreting data
- understanding of the limitations of any one dataset
- increased comprehension of the material covered during class sessions

Course Learning Outcomes (CLO)

Students will learn how to carry out independent experimental work in a laboratory setting while investigating a research problem, utilize appropriate instrumentation and techniques to accomplish this and communicate the results of the work in the form of a clearly written journal article

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

1. Demonstrate understanding of core concepts, methods and limits of scientific investigation to effectively solve problems in biochemistry.
2. Answer questions regarding safe practices in the laboratory and chemical safety.
3. Demonstrate safe laboratory skills (including proper handling of materials and chemical waste) for particular laboratory experiments.
4. Write a formal scientific laboratory report which applies the scientific approach to address a chemical problem and follows the format and style of an article in a peer-reviewed American Chemical Society journal.

Required Texts/Readings

Lab Manual

The lab manual will be posted on Canvas. Reading and reviewing the given experimental background is expected before coming to lab. The laboratory exercises can be found in the manual and will be supplemented with information on Canvas.

Other Readings

It is recommended to use a Basic Biochemistry textbook like the one used for previous or current Lecture class (a good option is: **Lehninger Principles of Biochemistry** 7th Edition. 2017 ISBN 978-1-4641-2611-6). The use of online sources to enhance your understanding of experiments is also recommended. Papers from the scientific literature and educational videos will be suggested for additional information on certain topics. Some assignments require the use of primary bibliography, if a scientific paper that students wish to use is not available the **Library Liaison** (Marie Engelsen annemarie.engelsen@sjsu.edu) may be able to help.

Other technology requirements / equipment / material

A personal computer (laptop) able to run basic software and the free software Chimera (<https://www.cgl.ucsf.edu/chimera/>) will be used in several lab sessions

Library Liaison

Marie Engelsen annemarie.engelsen@sjsu.edu

Course Requirements and Assignments

“Success in this course is based on the expectation that students will spend, for each unit of credit, a minimum of 45 hours over the length of the course (normally three hours per unit per week) for instruction, preparation/studying, or course related activities, including but not limited to internships, labs, and clinical practice. Other course structures will have equivalent workload expectations as described in the syllabus.”

This is a 3 units class so you are expected to spend at least 3 effective hours each week outside the lab time.

Laboratory Notebooks

For the lab, you need to have a notebook that is bound, for recording data and observations you make during each laboratory. Any bound notebook will suffice. Do not use pencil. Always use a permanent ballpoint pen. Make sure you write clearly, include all significant figures, and label all units. The clearer you are with your notebook, the easier it will be to write up your laboratory reports. Also, it is fine to write in the first person (usually plural “we”). Since you are the one(s) who performed the experiments, take credit for it.

It is imperative that **all experimental data for all experiments** is recorded in the laboratory notebook and that this information is kept up to date. Never depend on your memory to record such data; you will probably forget it if it is not written down. Notebook entries should be clear and concise. Entries should be neat enough (and annotated when necessary) so that the experimental notes and data can be read and understood by others. If any data are rejected for some reason, neatly cross out the entry with a single line and enter a brief explanation beside it. Don't obliterate what has been written down! ***Never discard or tear out a notebook page.*** Your notebook will be graded on these criteria. Scanned pages of your notebook may be requested for evaluation, other evaluations of the Lab Notebook will be done during the lab sessions. (Note that professional labs typically use duplicate or triplicate copy notebooks.)

Pre-lab work

Most pre-lab work will be done in the lab notebook before each lab session. Pre-lab and general completeness of the lab notebook will be assessed by the instructor in the first 15 minutes of each lab session.

Quizzes

Some experiments will have an online quiz that is required before coming to lab as part of your pre-lab. These will be short and cover the main points of the day's experiment. They are designed to assess preparedness for the lab exercise.

Laboratory Reports

Laboratory reports will be required for most experiments. These are to be completed outside of the laboratory period. The required content of each report will be explained in class, general instructions and a grading rubric for each lab report will be available in Canvas. Laboratory reports must be typed and include figures and tables as necessary. The due dates for submission of specific reports will be provided on Canvas with ample time for preparation. Failure to submit a report by a specified deadline will automatically lower the grade by 5% of the maximum for each day it is late. Notice that those a calendar day not class days, if a report is due Tuesday and it is turned in Thursday same week, the grade will be lowered by 10%. Assignments submitted on the due date but later than the time they are due are considered late one day.

Students will write some "group" lab report during the semester. This is designed to encourage cooperation and participation as well as foster good writing and teaching skills. Each member of the group will receive the same grade for the group report. If any member of the group has not contributed equally to the report up to two days before the due date, that individual must write his or her report alone. It is the responsibility of the group members to let the instructor know if any member of the group is not contributing.

Formal lab reports in this course are designed to teach you about how scientific researchers write articles for publication in peer reviewed journals. These are often the articles that lead to information used by the general public to inform our health habits and our education. In the scientific community they are referred to as "primary literature."

Lab Attendance

Attendance to laboratory sessions is mandatory. Missing two or more lab sessions without a documented valid excuse is enough to fail the class. Valid excuses include unforeseen force major events like medical situations that require consulting a health professional, jury duty, traffic accidents in the day of the lab, etc. Students may miss ONLY ONE lab session without excuse. If missing a lab session, the student must contact the instructor to find out the options about the report or prelab assignments related to that lab session. Students missing more than one lab session must document force major to be able to submit the assignments associated to that lab session.

Required COVID Safety

All students registered for a College of Science (CoS) class with an in-person component must view the CoS [COVID-19 Training slides](https://drive.google.com/drive/folders/1Vmp39U9-CNpbwRobtZsGIZPTgRwV_Nh6) (https://drive.google.com/drive/folders/1Vmp39U9-CNpbwRobtZsGIZPTgRwV_Nh6) and [the SJSU Health Advisories website](#).

Students must electronically sign the CoS Acknowledgement of the Training Form prior to the first class. Failure to comply with the safety requirements outlined in the CoS COVID-19 Training slides and outlined by instructors and TAs for in-person classes will be grounds for dismissal from class or laboratory and building or field site. Please review this material as needed throughout the semester, as updates will be implemented as changes occur (and posted to the same links).

Final Examination or Evaluation

There will be one final exam. The exam will cover all the theory, experimental protocols and data analysis associated with the experiments. The final exam must be taken at the time scheduled by the university for that purpose. It is expected that all students will take the final as schedule; make-up exams must be done in the make-up day and require a documented valid excuse.

Grading Information

Pre-lab assignments are graded based on completeness and correctness. Each student must show a full understanding of the experiment or exercise to be completed on the given day. Completeness and quality of the of the notebook (data from all previous experiments included) may be assessed in any lab session.

The grade for this course is heavily dependent on **lab reports**. Each individual lab report will be graded according to its unique rubric that will be discussed during each separate lab. The required section to be written of the report for each lab will vary, and this variation is indicated and explained in the lab manual, in canvas and during the lab session.

Part of your grade will be an **instructor evaluation**. Instructor evaluation is based on technique, organization, comprehension of experiments, preparation, attendance, involvement in class discussion, involvement in group work, attention to laboratory safety and proper disposal of waste, etc.

An important component of the grade in this course depends on the **Final Exam**. It will cover theory, experimental protocols and data analysis associated with each one of the experiments.

Determination of Grades

The reports and lab worksheets contribute 66% of the final grade (notice that they each one of them have different value as presented in Canvas). The final exam will contribute 16% toward the grade. The quality of the notebook and all the pre-lab work contributes 12% and the instructor evaluation comprises the remaining 6% of the total.

Most lab reports are due one week after the end of the experiment at the beginning of the lab (submit in canvas before coming to the lab). Lab worksheets are due by the end of the lab session. All pre-lab work (quizzes, prelab worksheets, and lab notebook pre-lab) is due before the corresponding lab session. The lab notebook will be reviewed any time during any/all lab sessions.

Late prelab-work is not accepted. Late reports will be penalized 5% each day they are late.

The final course grade will be determined by rounding your final score to three significant figures and assigning grades as follows:

Grading summary

	Percentage of the grade	
Lab Reports and Worksheets	220p	66%
Final Exam	50p	16%
Lab Notebook Pre-lab work and quizzes	60p	12%
Lab Work, instructor evaluation	20p	6%
Total	320p	100%

Determination of Grades

The final course grade will be determined by rounding your final score to three significant figures and assigning grades as follows:

<i>Grade</i>	<i>Percentage</i>	<i>Grade</i>	<i>Percentage</i>	<i>Grade</i>	<i>Percentage</i>	<i>Grade</i>	<i>Percentage</i>
<i>A plus</i>	<i>97.0 to 100%</i>	<i>B plus</i>	<i>87.0 to 89.9 %</i>	<i>C plus</i>	<i>77.0 to 79.9%</i>	<i>D plus</i>	<i>67.0 to 69.0%</i>
<i>A</i>	<i>93.0 to 96.9%</i>	<i>B</i>	<i>83.0 to 86.9%</i>	<i>C</i>	<i>73.0 to 76.9%</i>	<i>D</i>	<i>63.0 to 66.9%</i>
<i>A minus</i>	<i>90.0 to 92.9%</i>	<i>B minus</i>	<i>80.0 to 82.9%</i>	<i>C minus</i>	<i>70.0 to 72.9%</i>	<i>D minus</i>	<i>60.0 to 62.9%</i>

Classroom Protocol

You should read the safety section in the manual and on the SJSU Catalog under Chemistry Department. Note in particular: "Failure to comply with proper procedures and prescribed safety cautions shall subject the student to disciplinary action. 1) Any student engages in unauthorized experimentation, or who seriously disregards safety, thereby endangering self and others shall be withdrawn immediately from the class with a grade of F. 2) Any student who shows persistent disregard for safety may have his/her grade lowered, and may risk being withdrawn with a final grade of F.

Since this is a lab course, you are expected to arrive on time with pre-lab activities prepared. For many of the experiments, you will work in groups. For the success of the group, each group member is expected to participate fully with each experiment.

At SJSU, we hope that the classroom and laboratory will serve as an environment that will promote learning and the development of new ideas, as well as be a safe and respectful community. Behavior that interferes with the normal academic function in a lab is unacceptable. Students exhibiting this behavior will be asked to leave the class.

Examples of such behavior include

- Persistent interruptions or using disrespectful adjectives in response to the comments of others.
- The use of obscene or profane language.
- Yelling at classmates and/or faculty.
- Persistent and disruptive late arrival to or early departure from class without permission.
- Physical threats, harassing behavior, or personal insults (even when stated in a joking manner).
- Use of personal electronic devices such as pagers, cell phones, PDAs in class, unless it is part of the instructional activity**

University Policies

Per [University Policy S16-9](#), relevant university policy concerning all courses, such as student responsibilities, academic integrity, accommodations, dropping and adding, consent for recording of class, etc. and available student services (e.g. learning assistance, counseling, and other resources) are listed on [Syllabus Information web page](#) (<https://www.sjsu.edu/curriculum/courses/syllabus-info.php>). Make sure to visit this page to review and be aware of these university policies and resources.

Student Technology Resources

Computer labs for student use are available in the [Academic Success Center](#) at https://www.sjsu.edu/it/index.php?utm_source=at&utm_medium=permanent&utm_campaign=redirect located on the 1st floor of Clark Hall and in the Associated Students Lab on the 2nd floor of the Student Union.

Additional computer labs may be available in your department/college. Computers are also available in the Martin Luther King Library. A wide variety of audio-visual equipment is available for student checkout from Media Services located in IRC 112. These items include DV and HD digital camcorders; digital still cameras; video, slide and overhead projectors; DVD, CD, and audiotape players; sound systems, wireless microphones, projection screens and monitors.

SJSU Peer Connections

Peer Connections, a campus-wide resource for mentoring and tutoring, strives to inspire students to develop their potential as independent learners while they learn to successfully navigate through their university experience. You are encouraged to take advantage of their services which include course-content based tutoring, enhanced study and time management skills, more effective critical thinking strategies, decision making and problem-solving abilities, and campus resource referrals.

In addition to offering small group, individual, and drop-in tutoring for a number of undergraduate courses, consultation with mentors is available on a drop-in or by appointment basis. Workshops are offered on a wide variety of topics including preparing for the Writing Skills Test (WST), improving your learning and memory, alleviating procrastination, surviving your first semester at SJSU, and other related topics. A computer lab and study space are also available for student use in Room 600 of Student Services Center (SSC).

Peer Connections is located in three locations: SSC, Room 600 (10th Street Garage on the corner of 10th and San Fernando Street), at the 1st floor entrance of Clark Hall, and in the Living Learning Center (LLC) in Campus Village Housing Building B. Visit [Peer Connections website](http://peerconnections.sjsu.edu) at <http://peerconnections.sjsu.edu> for more information.

SJSU Writing Center

The SJSU Writing Center is located in Clark Hall, Suite 126. All Writing Specialists have gone through a rigorous hiring process, and they are well trained to assist all students at all levels within all disciplines to become better writers. In addition to one-on-one tutoring services, the Writing Center also offers workshops every semester on a variety of writing topics. To make an appointment or to refer to the numerous online resources offered through the Writing Center, visit the [Writing Center website](http://www.sjsu.edu/writingcenter) at <http://www.sjsu.edu/writingcenter>. For additional resources and updated information, follow the Writing Center on Twitter and become a fan of the SJSU Writing Center on Facebook. (Note: You need to have a QR Reader to scan this code.)



SJSU Counseling and Psychological Services

The SJSU Counseling and Psychological Services is located on the corner of 7th Street and San Carlos in the new Student Wellness Center, Room 300B. Professional psychologists, social workers, and counselors are available to provide confidential consultations on issues of student mental health, campus climate or psychological and academic issues on an individual, couple, or group basis. To schedule an appointment or learn more information, visit [Counseling and Psychological Services website](http://www.sjsu.edu/counseling) at <http://www.sjsu.edu/counseling>

CHEM 131A, Section 1, Fall 2022 Course Schedule

The schedule is subject to changes. Changes will be announced in class and in Canvas announcements.

Date	Module	Experiment	Learning Outcome (By doing the module students will...)	Assignments due dates
8/23	1	Lab orientation/ Check-in*	-Learn the class structure and expectations -Analyze the Syllabus -Demonstrate mastery in basic Lab Safety -Introduce each other	Safety quiz due 8/25
8/25	2	Hypothesis Case Study*	-Reflect and discuss about Scientific Method and Hypothesis development -Identify different kind of hypothesis used in this class -Identify key elements of an experimental hypothesis	Summary assignment (2p)
4>8/30	3	Nuts and Bolts	-Identify key steps in good pipetting technique. -Remember key elements of spectrophotometry -Practice pipetting, weighting, and use of the spectrophotometer -Use software to graph linear a relationship between variables -Use measures of central tendency and data dispersion	Worksheet due same day. Summited in two assignments (10 points)
9/1	4	Laboratory Ethics*	-Reflect about Ethics concerns in lab work including: safety, intellectual property and plagiarism	
9/6	5	Formatting a Lab Report*	-Illustrate the key elements in the different components of a lab report -Identify what should the Introduction/background include? -Differentiate Protocols vs Methods -Identify how to present Results in figures and narrative -Identify what is Discussion and conclusions	Pre-lab: Discussion (2p) Assignment (4p)
9/8	6	pH & Buffers	-Explain buffer composition; what makes a buffer? -Restate how to make different buffers -Compare buffer strengths and limitations -Develop an experimental protocol -Write the background and methods section in a report	Pre-lab: Quiz (2p), Lab Notebook (4p) Figure and questions due next lab day (7points)
9/13	6	pH & Buffers	Create meaningful tables and figures	Pre-lab: Lab Notebook (4p) Lab report due 9/20 (13 points)
9/15	7	Protein Structure: 3D Models*	Review and consolidate the following concepts: -protein primary structure -protein secondary structure, -protein tertiary structure, -amino acid interactions	Pre-lab: Lab Notebook (4p)
9/20	7	3D Models*		Worksheet due next lab 9/27 (20 points)
9/22	7	3D Models*		
9/27	8	QC Biologics*	Review: -protein stability	Pre-lab: Lab Notebook (4p) WS due same day 9/27 (5 points)

Date	Module	Experiment	Learning Outcome (By doing the module students will...)	Assignments due dates
9/29	8	QC Biologics*	<ul style="list-style-type: none"> -Prepare dilutions of protein stocks -Perform various protein quantification assays. -Compare such assays by range, sensitivity, and specificity. -Generate and use standard curves -Conclude about reproducibility and accuracy of the assays tested -Interpret data using statistical tests -Conclude about protein stability -Report results and conclusions 	WS due same day 9/29 (10 points)
10/4	8	QC Biologics		Pre-lab: Lab Notebook (4p)
10/6	8	QC Biologics		Report due one week after finishing the experiment 10/13 (20 points)
10/11	8	Writing Workshop*		
10/13	9	Chimera Exercise: Neuraminidase*	<ul style="list-style-type: none"> -Learn to manipulate structures using the visualization program Chimera. -Dissect enzyme tertiary structure: size and form of enzymes, active sites and substrates -Correlate tertiary structure and enzyme function. -Outline Inhibition of enzymes - structure and function of inhibitors 	Pre-lab: Chimera WS (2p)
10/18	9	Chimera Exercise: Neuraminidase*		Pre-lab: Lab Notebook (2p)
10/20	10	Computer Programming and Biochemistry: Python*	<ul style="list-style-type: none"> -Recognize basics of coding -Practice logical thinking and Problem solving 	Worksheet due next lab 10/20 (20 points)
10/25	11	Enzyme Kinetics*	<ul style="list-style-type: none"> -Apply Michaelis-Menten assumptions to kinetics experiments -Use graphs to assess kinetic parameters -Choose and apply experimental techniques -Identify new questions that arise from your data -Suggest new experiments to address these questions -Write a complete report 	Pre-lab: Lab Notebook (2p) WS due same day 10/20 (10 points)
10/27	11	Enzyme Kinetics		Pre-lab: Quiz (4 p)
11/1	11	Enzyme Kinetics		WS due same day 10/25 (15 points)
11/3	11	Enzyme Kinetics		Pre-lab: Lab Notebook (4p)
11/8	11	Enzyme Kinetics		Pre-lab: Lab Notebook (4p)
11/10	12	Exploring Carbohydrates	<ul style="list-style-type: none"> -Develop a scientifically interesting question -Write an experimental hypothesis to address the question. -Plan a scientifically valid experimental strategy (Method) to test the hypothesis -Apply chosen experimental techniques (protocols) -Write a complete report 	Report due one week after finishing the experiment 11/15 (40 points)
11/15	12	Exploring Carbohydrates		Pre-lab: Quiz (4 p) Lab Notebook (4p)
11/17	12	Exploring Carbohydrates /Exam preparing day		Report due one week after (11/24) (30 points)
11/22	13	Structural Biochemistry*	<ul style="list-style-type: none"> -Use tools available from the NIH -Manipulate of biomolecular structures using the visualization program Chimera -Create one educational resource -Teach the class about a selected molecule's structure/function 	Pre-lab: Lab Notebook (4p)
11/24		<i>Thanksgiving</i>		
11/29	13	Structural Biochemistry*		Worksheet design, presentation due 12/1 during class time (20 points)
12/1	13	Structural Biochemistry*		
12/6		Check Out		
Friday, December 9			Final exam DH 609 2:45-5:00 PM	

*Dry labs