

**San José State University**  
**Department of Chemistry**  
**Chem 131B, Biochemistry Lab, Sections 01-02, Spring 2023**

**Course and Contact Information**

Instructor:	Alberto A. Rascón, Jr., Ph.D.
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Office Hours:	T, R 12:00 pm – 1:00 pm (or by appointment <b>in person</b> or <b>through zoom</b> )
Class Days/Time:	W 2:30 – 5:20 pm, F 1:30 – 5:20 pm (scheduled)
Classroom:	DH 609 and DH 611
Prerequisites:	<b>CHEM 100W, CHEM 130A, CHEM 131A (with grades of “C” or better; “C-” not accepted)</b>
Co-requisite:	CHEM 130B or CHEM 130C
GE/SJSU Studies Category:	Area R (Earth and Environment)

**Course Format**

**Canvas Web Page**

Course materials such as syllabus, handouts, notes, assignment instructions, videos, etc. can be found on the Canvas learning management system course website ([CANVAS](#)). *You are responsible for regularly checking with the CANVAS messaging system to learn of any updates.*

Lecture content and experimental procedures will be provided and uploaded to CANVAS. *It is your responsibility to ensure that all videos are viewed before class, quizzes, and the midterm exam.* Scheduled quizzes will be given before presenting of new experiments to ensure students are viewing the material. This will be done to ensure student success.

**Course Description**

A capstone course on advanced isolation techniques and enzyme methodology. Chem 131B is the second semester of a two semester biochemistry laboratory course. The laboratory work is associated with intermediate qualitative and quantitative techniques in modern biochemistry. *A capstone experience requires students to integrate principles, theories, and methods learned in previous courses (Chemistry, Biology, and Biochemistry, to name a few) throughout the major.* Students will be working on a research project that will allow analysis, synthesis, and evaluation of learned knowledge and will communicate the results of the project effectively in a professional manner via oral presentations and a written research report.

**Learning Outcomes**

Chem 131B addresses the following Program Learning Objectives:

**Core Chemistry Ideas (Fundamentals)**

1. PLO 1.1 - Students will be able to identify, formulate, and solve a range of chemistry problems (fundamental to complex) through application of mathematical, scientific, and chemical principles.
2. PLO 1.2 - Students will be able to recognize, relate, and/or apply chemistry terms and concepts to propose and solve interdisciplinary and multidisciplinary real-world problems.

### **Experimentation/Lab Practice**

3. PLO 2.1. Students will be able to develop an experiment to address a hypothesis using literature and execute the planned experiment using standard chemistry techniques.
4. PLO 2.2 Students will be able to acquire, record, and critically evaluate data through use of instrumentation and software, appropriate record keeping practices, figure preparation, and scrutiny of experimental results.
5. PLO 2.3 Students will be able to recognize and assess laboratory hazards, practice risk minimization, and conduct safe laboratory practices.

### **Community, Social, Societal Implications**

6. PLO 3.1 Students will be able to explore, critique, and reflect on how chemistry relates to society, culture, and issues of equity and ethics that shape their scientific beliefs and identities.
7. PLO 3.2 Students will be able to identify as scientists within the scientific community through constructing peer reviews, engaging in collaborations, and participating in mentorship.

### **Communication Skills**

8. PLO 4.1 Students will be able to design and deliver engaging presentations on diverse chemistry topics in a professional manner and with clear, concise organization that demonstrates mastery of the topic.
9. PLO 4.2 Students will be able to integrate research findings into a concise original written report that either analyzes collected data and obtained results or reviews and reflects on published scientific work.
10. PLO 4.3 Students will be able to identify an audience and construct a message tailored to that audience and act as a science ambassador by conveying the importance of the research or topic of study.

## **GE Learning Outcomes (GELO)**

### GE Area R (Earth and Environment) Goals

Students apply knowledge of scientific theories and concepts as well as quantitative reasoning to explore the relationship between humans and the natural environment.

Students achieve an understanding of the role that science plays in addressing complex issues, as well as the potential limits of scientific endeavors and the value systems and ethics associated with scientific inquiry.

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

1. Area R GELO (1): Apply scientific principles and the scientific method to answer questions about earth, the environment, and sustainability while recognizing the limits of both the method and principles.
2. Area R GELO (2): Apply mathematical or quantitative reasoning concepts to the analysis and generation of solutions to issues of earth, the environment, and sustainability.

3. Area R GELO (3): Communicate a scientific finding, assertion, or theory to a general audience with the integrity and rigor of the underlying science.
4. Area R GELO (4): Explain ethical, social, and civic dimensions of scientific inquiry.

This course fulfills the GE writing requirement as follows:

### Summary of Required Writing

Total writing for the whole semester will include a minimum of 5000 words:

1. In class writing will include maintaining an accurate and up-to-date laboratory notebook.
2. Primer design and DNA sequencing analysis reports.
3. Rough draft of the Research Communication.
4. Final draft of the Research Communication.

**Important note:** “A minimum aggregate GPA of 2.0 SJSU Studies (R, S & V) shall be required of all students as a graduation requirement.” To see full text, review [University Policy S11-3](http://www.sjsu.edu/senate/docs/S11-3.pdf) at <http://www.sjsu.edu/senate/docs/S11-3.pdf>.

### Course Learning Outcomes (CLO)

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

1. CLO (1): Apply proper laboratory practices including safety, waste management, and record keeping.
2. CLO (2): Use and understand modern biochemical techniques and instruments.
3. CLO (3): Plan, design, and execute experiments based on biochemical literature.
4. CLO (4): Interpret experimental results and draw reasonable conclusions.
5. CLO (5): Communicate effectively through written and oral reports.

### Required Texts/Readings

#### Textbook

No textbook is required for the course.

#### Other Readings

Alberts *et al.*, *Molecular Biology of the Cell*, 4<sup>th</sup> Ed. (*optional*)

This is a good source for background information on molecular biology concepts. It can be accessed for *free* on PubMed at <https://www.ncbi.nlm.nih.gov/books/NBK21054/>. *Copy the link and paste it in the search box if you have trouble clicking on this.*

*Occasionally, papers from the literature will be suggested for additional information on certain topics covered.*

#### Other technology requirements / equipment / material

*Research laboratory notebooks will be kept online using Google Docs (ensure the lab instructor has access on the first week of class); scientific calculator (equivalent to Ti 30) or capable of performing linear regression analysis. No graphing calculators, unless memory is cleared by the instructor.*

#### Library Liaison

Anne Marie Engelsen ([annemarie.engelsen@sjsu.edu](mailto:annemarie.engelsen@sjsu.edu))

## Course Requirements and Assignments (Required)

“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 3 hours per unit per week with 1 of the hours used for lecture) for instruction or preparation/studying or course related activities including but not limited to internships, labs, clinical practica. Other course structures will have equivalent workload expectations as described in the syllabus.” More details about student workload can be found in [University Policy S12-3](http://www.sjsu.edu/senate/docs/S12-3.pdf) at <http://www.sjsu.edu/senate/docs/S12-3.pdf>.

**Assignments** The course will consist of the following:

Assignments	Points
<b>Midterm Exam (Mar. 3)</b> (GELO 1-4; CLO 2, 4; PLO 1.1, 1.2, 2.1-2.3, 3.1, 3.2)	50
<b>Final Research Communication (Due May 18)</b> (GE writing requirement; CLO 1-4; PLO 3.1, 4.2, 4.3)	75
<b>Assignments (Info will be provided on Canvas)</b> (GELO 1-4; GE writing requirement; CLO 1-3; PLO 2.1-2.3, 4.2)	100
<b>Notebook and Instructor Evaluation</b> (GE writing requirement; CLO 1-4; PLO 2.1-2.3, 3.2)	125
<b>Quizzes (Eight Total, Lowest Score Dropped)</b> (GELO 1-4; CLO 1, 2, 4; PLO 1.1, 1.2, 2.1-2.3, 3.1, 3.2)	70
<b>Total</b>	<b>420</b>

### Instructor Evaluation

The instructor evaluation is based on technique, in-class participation, performance, lab organization, comprehension of experiments, attitude, understanding of proper use and disposal of chemicals, preparation prior to class, following directions, lab/lecture involvement, group dynamic, etc... worth **25 pts**.

### Midterm Exam and Quizzes

One exam will be given during the semester. The midterm will be given during one of the scheduled lab periods. ***The expectation is to have the midterm in person, in class, but if for any reason the campus goes back to social distancing or strictly online modality, the format of the midterm exam will be to allow students to take the exam at home.*** And to minimize cheating (if the midterm is at home), the exam will be emailed in PDF format 10 to 15 min before the scheduled class period along with an MS document with a disclaimer, which students are required to type in their name and date (this is considered “signed”) agreeing to the conditions. The MS document will also be where the student will type in their answers, showing any work that is required. ***The student will have until 5:20 pm on the day of the exam, to complete the exam, and once the exam is completed, the MS document with the “signed” disclaimer and answers will be uploaded to a Google Drive folder with their name, or if issues arise, emailed directly to me. If the exam is not in the folder or my email inbox by 5:20 pm or the disclaimer is not “signed,” the exam will not be graded and a grade of “F” (0 pts) will be given.***

***The disclaimer is:*** By typing my name below (in lieu of my signature), I will agree to ***only utilize*** the materials provided by the instructor on CANVAS (lecture videos, notes, slides, and any pertinent material posted on this website). ***Other material or websites not found posted on the Chem 131B CANVAS website cannot be used, especially Chegg or other similar sites. If I am caught posting midterm exam questions on any sites or it is determined that I have cheated, a***

**grade of “F” (0 pts) will be given and I will be reported to the Office of Academic Integrity and may lead to SJSU University dismissal.**

***A total of eight (8) quizzes (5 questions each (2 pts each), with the exception of the Safety Quiz, which is 10 questions (1 pt each)) will be given throughout the semester (with seven (7) counting towards the final grade, the lowest graded quiz will be dropped). The Exam and Quizzes (with the exception of the Safety Quiz) will cover theory, experimental protocol and data analysis. The content will be a combination of objective, calculations, short answer, short essay questions written as multiple-choice questions or true/false. The same rules apply as to the midterm exam if we can no longer meet in person, see disclaimer above. It is important to note that quizzes will cover material that has been presented prior to the day of the quiz AND will include at least one question from experiments being presented that day, meaning that you should be comfortable with all the information and always come ready to class!***

***Quizzes are scheduled at the beginning of class (see schedule) and students only have 15 min. There are no re-do quizzes!*** Therefore, pay special attention and make your selections/write your answers carefully. And ensure to come to class on the day of the quiz.

### **Missed Exam and Quizzes**

If the midterm exam or quiz is missed ***without*** a legitimate excuse a scaled score of zero (0) will be entered for the exam or quiz. If an acceptable excuse is provided, then the quiz or exam grade will be prorated. ***In no case will a make-up exam or quiz be given. In addition, there are no quiz re-grades.***

### **Midterm Exam Re-grade**

The student has **7 calendar days from the date they have received the exam** to bring to my attention any perceived errors in grading. However, in doing so, I have every right to review the entire exam, re-grade and adjust the grade accordingly, whether it is to your advantage or disadvantage. ***Only one re-grade is allowed, and the score given on the re-grade is FINAL! Important to note that no re-grade will be accepted or considered after the 7-day period.***

**To request a re-grade**, the student should follow the exact steps shown below:

1. On a separate document, note the question(s) or problem(s) that the student wants the instructor to review (keeping in mind that I have the right to review the entire exam).
2. Include your justification for the re-grade (what do you think is the problem with the way the question or problem was graded?) Include any supporting information such as a page from the lecture, slides, or other relevant info.
3. Submit all of the necessary information to the instructor 7 days from the date the exam was received.

***It is important to note:*** Re-grade requests based on another student’s graded exam (for example, “Another student answered the same question the same way I did and received more points”) will require that both exams be submitted for a re-grade so that both may be adjusted, if necessary. Errors in adding scores is not considered a re-grade, so submitting an exam for this type will not be checked otherwise. ***Be aware that students who submit frivolous re-grade requests may become ineligible to receive future letters of recommendation from me and may be reported to the Office of Academic Integrity.***

### **Laboratory Notebook**

It is imperative that all experimental data are 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 forget it if it is not written down. Notebook entries should be clear and concise. Entries should be neat enough and annotated so that the experimental notes and data can be read and understood by others. Your notebook will be graded on these criteria.

***It is important to note that in professional settings, the notebook is the primary document verifying your intellectual property. Establishing good notebook habits now will prepare you for your career.***

**You will use Google docs to maintain the Laboratory Notebook.** Ensure that NB pages are up to date and completed by the end of each laboratory period. **Since notebooks will be kept as a Google doc, the instructor will be checking notebooks periodically, sometimes without notice. Students will be reminded in class every day to ensure that these notebooks are kept up to date.** Feedback will be given to ensure the correct information and materials are found in the NB during grading. There will be four NB checks throughout the semester (see schedule) worth **100 pts**.

## Research Communication

A Research Communication of the most important laboratory work will be required, specifically based on the ACS Biochemistry journal ([Biochemistry Author Guidelines](#)) This is to be completed outside of the lab period (and if time permits, with some class time dedicated to help with this). The required content and format will be explained in class and posted on CANVAS with appropriate PDF files. **Although the data presented by each student may be the same, all interpretations must be your own.** Details regarding the format of the paper (final research communication) will be available on [CANVAS](#) and discussed periodically. **The Communication is limited to an overall 1,000-word minimum with a 250-word abstract, not including figures and tables. Points will be lost if the minimum word count is not met or if the word count is overly exceeded. In addition, any late submissions will accrue a 5% reduction for each day not turned in.**

[University Policy F15-3](#) at <https://www.sjsu.edu/senate/docs/F15-3.pdf> states, “Attendance is the responsibility of the student. However, attendance itself may not be used as a criterion for grading. Students are expected to attend all meetings for their courses, as they are responsible for all material covered, and active participation is frequently essential to ensure maximum benefit to all class members. Participation may be used as a criterion for grading when the parameters and their evaluation are clearly defined in the course syllabus and the percentage of the overall grade is stated.”

## Grading Information

Points will be distributed as described below. I reserve the right to scale the exam grade. If scaled, scores will never be scaled down from your raw score. Generally, the average score on an exam will be scaled to the C+/B- range, though I reserve the right to adjust this in either direction if, in my estimation, the class overall performed differently than a “typical” class. The course grade will be determined from the resulting average of the point total as follows:

<u>Percent Average</u>	<u>Final Course Grade</u>
97-100	A+
94-96	A
90-93	A-
87-89	B+
84-86	B
80-83	B-
77-79	C+
74-76	C
70-73	C-
67-69	D+
64-66	D
60-63	D-
< 60	F

## Late Assignments, Extra Credit, and Misc. Information

*The student assignments are due at the beginning of the laboratory period, unless otherwise stated.* Assignments

submitted on the due date but later than the beginning of class are considered late and subject to a 5% point reduction (and subsequent 5% point reductions for each further day late). ***Many assignments will be required to be emailed directly to the instructor, so any email time stamped later than the start of class (whether it is due Wed. (2:30 pm) or Fri. (1:30 pm)) will incur a 5% reduction, and as above, subsequent 5% point reductions for each further day late.***

There is **NO** extra credit or extra assignments during or after the semester is over, ***so please don't ask.***

**“Passage of the Writing Skills Test (WST) or ENGL/LLD 100A with a C or better (C- not accepted), and completion of Core General Education are prerequisite to all SJSU Studies courses. Completion of, or co-registration in, 100W is strongly recommended. A minimum aggregate GPA of 2.0 in GE Areas R, S, & V shall be required of all students.”**

**Note:** “All students have the right, within a reasonable time, to know their academic scores, to review their grade-dependent work, and to be provided with explanations for the determination of their course grades.” See [University policy F13-1](#) at <http://www.sjsu.edu/senate/docs/F13-1.pdf> for more details.

### **Classroom Protocol**

***Students are expected to be on time and attend all classes.*** Students should be courteous and professional to other students, the instructor, teaching assistants, and/or guest instructors. ***In addition, no cell phones are allowed during class time. If the need of a cell phone arises, the student shall leave the class to do so. However, if in doing so becomes distracting and problematic and impedes normal academic function, the student will be asked to leave the class.***

We hope that the classroom 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 classroom is unacceptable. Students exhibiting this behavior will be asked to leave the class.*** Examples of such behavior include:

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

The university has a PDF on student conduct that you can view at [SJSU Student Conduct Code](#), click on the link, followed by Student Conduct Code PDF.

### **Laboratory and COVID-19/Monkey Pox Safety**

You should read the safety section of the SJSU Catalog under the 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 who engages in unauthorized experimentation or who seriously disregards safety, thereby endangering self or 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.” ***This information is not as relevant for these sections of Chem 131B this semester, but students should be aware and understand the safety precautions.***

Follow the link for the safety information: [CoS COVID-19 and Monkey Pox Safety Training](#)

**NOTE:** A safety quiz will be given during the second day of class and must be passed with a grade of 80% or better. The quiz will be based on the [SJSU Chemistry Department Safety Sheet](#) found at: [https://www.sjsu.edu/chemistry/docs/Forms/Safety%20Sheet%20for%20Teaching%20Laboratories\\_02262020.pdf](https://www.sjsu.edu/chemistry/docs/Forms/Safety%20Sheet%20for%20Teaching%20Laboratories_02262020.pdf)

Ensure that you have reviewed the *Laboratory Safety PDF* info and provide ME with a signed Student acknowledgement form, which then I will submit to the COS Safety Office. Please note: Material from the PDF training will be on the safety quiz.

### Some important COVID/Monkey Pox guidelines

- If attending class, you must, ***at all times***, wear a face covering, unless instructed differently by the University. ***NO EXCEPTIONS!*** Failure to do so will lead to removal from class. If you do not have a face mask, I will provide you with one.
- When arriving to lab, make sure you wash your hands for at least 30 sec or use alcohol-based hand sanitizers.
- Wipe down counters or any area you are working with ethanol before and after use.
- Make sure that if you do not feel well or are experiencing any COVID-19 symptoms, ***STAY HOME***.
- If you have come in contact with anyone that has tested positive or is showing symptoms and not tested positive, please self-quarantine and let the instructor know as soon as possible. Furthermore, you are required to report your positive result to the University. Utilize the following link: [CoS COVID Reporting Guidelines and Info](#).

### University Policies

Per University Policy S16-9, university-wide policy information relevant to all courses, such as academic integrity, accommodations, etc. will be available on Office of Graduate and Undergraduate Programs' [Syllabus Information web page](#) at <http://www.sjsu.edu/gup/syllabusinfo/>.

## Chem 131B: Biochemistry Lab, Spring 2023, Course Schedule

*The schedule is subject to change. Changes will be noted in class or posted on Canvas.*

### Course Schedule

Week	Date	Topics, Readings, Assignments, Deadlines
1	Jan. 25	Intro to Lab, Green sheet info, Semester goals, and Research Communication Info – <b><i>Check In</i></b>
1	Jan. 27	<b><i>Computer Lab (DH 503) Lecture 1:</i></b> Recombinant DNA Technology (Bacterial Expression Vectors, Cloning, Primer Design); Primer Design – <b><i>Safety Quiz #1 (10 pts)</i></b>
2	Feb. 1	<b><i>Lecture 2:</i></b> Plasmid Transformation of pET28b Vector; Overnight Cultures (Aug. 31) – <b><i>Google Lab Notebook Access Due (5 pts)</i></b>
2	Feb. 3	Vector DNA Extraction (Mini Prep), NanoDrop, DNA Electrophoresis – <b><i>Primer Design Report Due (20 pts); Quiz #2 (10 pts)</i></b>
3	Feb. 8	<b><i>Lecture 3:</i></b> Agarose Gel Electrophoresis; Restriction Enzyme Digestion of Vector DNA/dephosphorylation
3	Feb. 10	<b><i>Lecture 4:</i></b> PCR, PCR Settings, Exp. Procedures, and Results – <b><i>Quiz #3 (10 pts); Notebook Check #1 (25 pts)</i></b>
4	Feb. 15	<b><i>Lecture 5:</i></b> PCR Mechanism of Action; PCR Product Gel Extraction, Restriction Enzymes Digestion, Co-Extraction/Purification, Ligation, and Transformation
4	Feb. 17	Colony Re-Streaking, Colony PCR, DNA Electrophoresis – <b><i>Quiz #4 (10 pts)</i></b>
5	Feb. 22	Colony Re-Streaking, Colony PCR, DNA Electrophoresis Cont...
5	Feb. 24	Overnight Culture of Plasmid DNA (Feb. 23), Plasmid DNA Extraction, NanoDrop, pDNA Digestion, and Preparation for DNA Sequencing



Week	Date	Topics, Readings, Assignments, Deadlines
6	Mar. 1	Plasmid DNA Extraction, NanoDrop, pDNA Digestion, and Preparation for DNA Sequencing Cont...; Midterm Exam Review
6	Mar. 3	<b>Midterm Exam (50 pts)</b>
7	Mar. 8	<b>Computer Lab: Lecture 6:</b> DNA Sequencing Analysis; Work on report in class – <b>Notebook Check #2 (25 pts)</b>
7	Mar. 10	<b>Computer Lab:</b> Work on Research Communication Draft: Search for articles, etc... – <b>DNA Sequencing Analysis Report Due (25 pts)</b>
8	Mar. 15	<b>Lecture 7:</b> Recombinant Protein Expression and Transformation into T7 Shuffle Cells – <b>Quiz #5 (10 pts)</b>
8	Mar. 17	Bacterial Growth Experiment at 30°C (LB/TB Media) – set, follow growth, collect samples; In lab prep for SDS-PAGE analysis (prepare tubes w/ 6x SDS-dye)
9	Mar. 22	<b>Lecture 8:</b> SDS-PAGE Analysis, Gel Electrophoresis of Proteins; Sample preparation and running of gel; Work on Abstract Draft and Figures for Research Communication
9	Mar. 24	Catch-up and Work on Notebook – <b>Abstract Draft Due (10 pts)</b>
10	Mar. 29	<b>Spring Recess</b>
10	Mar. 31	<b>Spring Recess</b>
11	Apr. 5	In lab prep for SDS-PAGE analysis (prepare tubes w/ 6x SDS-dye); Work on Figures for Research Communication
11	Apr. 7	Transformation into T7 Shuffle Cells for repeat growth experiment
12	Apr. 12	Bacterial Growth Experiment at various conditions (TB Media only); Work on notebook in class – <b>Notebook Check #3 (25 pts); Quiz #6 (10 pts)</b>
12	Apr. 14	Bacterial Growth Experiment at various conditions (TB Media only) Cont...; Start SDS-PAGE Analysis of samples collected
13	Apr. 19	Discussion of SDS-PAGE Results (TB Media only) Growth Experiment; Work on notebook in class
13	Apr. 21	<b>Computer Lab:</b> Review of Semester Materials for Research Communication; Work on Communication in Class – <b>Quiz #7 (10 pts)</b>
14	Apr. 26	<b>Computer Lab:</b> Work on Communication, Notebook in Class
14	Apr. 28	<b>Computer Lab:</b> Work on Communication, Notebook in Class
15	May 3	Repeat Experiments, if needed...; Work on Notebook – <b>Research Communication Draft Due (35 pts)</b>
15	May 5	Repeat Experiments, if needed...; Work on Notebook
16	May 10	<b>Computer lab:</b> Work on Research Communication in Class Work on lab notebook – <b>Quiz #8 (10 pts)</b>
16	May 12	Work on lab notebook; Work on Research Communication – <b>Locker Check Out</b>
	May 18	<b>Final Research Communication Due (beginning of scheduled Final Exam) at 12:15 pm in my email inbox (75 pts); Final Notebook Check #4</b>