

Introductory Biochemistry Laboratory, CHEM 5720, Spring 2022, 3 Credits

Utah State University

Department of Chemistry and Biochemistry

Lab: Maeser Lab 148

Lecture: ESLC 046 Mon. 2:30-3:30

AM Section Tues. Thurs. 8:30-11:20

PM Section Tues. Thurs. 1:30-4:20

Instructor	Profs. R. Jackson, N. Dickenson, S. Johnson
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Course Goals: This course is designed to provide hands-on experience with techniques and concepts and approaches common to biochemistry research. This will be accomplished through a lecture and laboratory experience that will involve directed reading, design and performance of experiments, data analysis, and completion of laboratory reports. *Please note: This course is designated a Communication Intensive (CI) course. Therefore, the writing expectations are rigorous.* This course is intended to be taken concurrently with Chemistry 5710. Learning objectives include: (1) understanding standard molecular biology, protein expression and protein expression techniques typically used in biochemistry labs; (2) applying these approaches in a “real-life” research setting. The course is appropriate for all pre-health and pre-vet professionals, and those preparing for life science-oriented graduate programs and industrial careers.

Prerequisites: Concurrent enrollment in Chemistry 5710. Prior general chemistry and organic chemistry laboratory experience is expected.

Lab fees: Course fees of \$100 are used to pay for supplies, materials, repair and replacement of equipment and teaching assistant support.

Texts: There is no required textbook. All lecture notes will be posted on the course Canvas site.

Canvas: Information essential to the course will be available through the course Canvas webpage. This site is found at canvas.usu.edu. Username = banner ID; Password = banner pin. Only students who are registered for the class will have access to the course pages.

Grading: This course will be graded based on the total points received for quizzes, laboratory notebook, laboratory reports, and the group project. The lowest quiz grade and the lowest notebook grade will be dropped. Final letter grades will be assigned based on the percentage of the total points possible with the following scale: A's 100%-90%, B's 89%-80%, C's 79%-70%, D's 69%-60%, F below 60%. Attendance at all of the assigned meetings is essential. **Make-up of any missed meeting will only be allowed for excused absences or at the discretion of the Professor.** Unexcused absences in the lab will automatically result in a 10 point deduction on the lab report. All laboratory reports turned in after the deadline will have 10% of the possible points deducted for the first day that it is late, with 10% of the possible points deducted for each additional day that it is late. All assignments are due on the deadline date at the beginning of your scheduled lab time.

Graded Elements: Following are the graded elements (with maximum possible points).

Chemistry 5720 Spring 2022 Possible Points		
Element	Description	Max. Points
Literature search assignment	Assignment to be completed by second Tuesday of lab (Tues, Jan 26)	20
Pre-laboratory quizzes	13 Quizzes worth 10 points each. Drop lowest score. Due at 8:30 am every Tuesday.	120
Daily laboratory notebook	Each day worth 5 points each.	120
Laboratory reports	3 experimental reports (see schedule below).	200
Kinetics assignment	Assignment completed with Kinetics lab	10
Presentation	Lab result presentation	75
Quizzes from lectures	3 quizzes covering lecture material. Worth 40 points each.	120
Experimental proposals	PCR primer design; Protein purification; Protein assay	100
Benchmark goals	Successful cloning of insert into plasmid; 90% purity of protein; complete dataset from activity assay	75
Teamwork		25
Total		865

Assessment: Assessment of the course will include a Course Evaluation (administered by USU) at the end of the course. Information from the Course Evaluation will be used to improve the course in subsequent years.

Provisions: This course will adhere to the USU Academic Policies and Procedures Manual found at the web site <http://www.usu.edu/policies/>. USU welcomes students with disabilities. If you have, or suspect you may have, a physical, mental health, or learning disability that may require accommodations in this course, please contact the Disability Resource Center (DRC) as early in the semester as possible (University Inn # 101, 435-797-2444, drc@usu.edu). All disability related accommodations must be approved by the DRC. Once approved, the DRC will coordinate with faculty to provide accommodations.

Supplies: Eye protection, lab coat, full-length pants, and closed-toe shoes are required in the laboratory. A laboratory notebook may be purchased at the bookstore, or you can use an electronic notebook.

Literature Search assignment (20 pts)

A literature search assignment on your assigned protein will be given during the second week of the lab.

Pre-lab quiz (110 pts total)

A short pre-lab quiz will be posted on the Canvas website and will be due by 8:30am Tuesday for each week that there is a lab. Late quizzes will not be graded.

Laboratory notebook (120 pts total)

You are required to individually keep a laboratory notebook containing the title, date, objectives, materials and methods, and results for each experiment. Include tables for all dilutions and show all calculations in this section. Prepare the **title, objectives and procedures sections BEFORE coming to the laboratory**. It is also best to prepare tables for results ahead of time as well. Be sure to note any problems or observations in the results section. Such observations will aid in your discussion in the laboratory report.

You have the option to keep a paper notebook or an electronic notebook. Either way, you are required to submit a pdf version of your lab notebook for grading. Try to keep your notebook as neat as possible. For paper notebooks, mistakes are made and are common, but be neat about crossing-out "wrong" sections. **DO NOT ERASE!** Always write in **INK!** A research notebook must be organized and neat such that ANYONE could pick it up and repeat your work without any questions (and hopefully get the same results and observations). Laboratory notebooks are scientific records and can be submitted as evidence in court trials, so learn now how to keep a neat, detailed (but succinct) notebook.

Late notebooks will not be graded.

Laboratory Reports (200 pts total)

You are required to submit your own laboratory report three times during the semester. **You are encouraged to discuss your results with your lab partner, but the writing must be your own.** Guidance will be provided with respect to the desired format of the reports and **grading will be based on a detailed rubric posted on the Canvas website.**

Project presentations. (75 pts)

Presenting, explaining, and defending your scientific results are all important aspects of research. You will give a presentation summarizing your results from the lab. A scoring rubric will be available on Canvas.

Lecture quizzes (120 pts total)

Three quizzes covering material presented during Monday lectures will be given throughout the semester and will be taken through the USU testing center.

Experimental proposals (100 pts)

You will be responsible for the experimental design of several experiments. Proposals for each experiment will be graded and must be approved before performing the experiment.

Benchmark goals (75 pts)

For each major component of the course, you are required to achieve specific benchmarks. Full credit will be given for (1) successful cloning of your protein insert into an expression plasmid, (2) purification of your protein to 90% purity, and (3) obtaining a complete dataset from an activity assay.

Teamwork (25 pts)

You are expected to contribute fully as a lab partner.

Laboratory Schedule – overview

Week of	Prof.	Monday – lecture ESLC 046	Tuesday – lab ML148	Thursday – lab ML148
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----- *Molecular Biology* -----

Jan 10	RJ	Lecture – molecular biology	Bioinformatics <i>BLAST, Primer Design, plasmid sequence manipulation</i> PCR – primer design, assign students mentors and projects.	Buffer/media preparation Safety, Check-in, Buffers pH Primer Design Due (Friday)
Jan 17	RJ	No classes (Martin Luther King, Jr. Day)	PCR (Day 1) <i>Set up run PCR, Make TAE gels</i>	PCR (Day 2) <i>Run Gel, Digest product, PCR Clean up</i>
Jan 24	RJ	Lecture – restriction analysis	Cloning (Day 1) <i>Agar plates, Ligate, Transform, Plate</i>	Cloning (Day 2) <i>Miniprep, Restriction Digest, single cut, double cut, Run Gel, prepare for sequencing</i>

----- *Protein Expression and Purification* -----

Jan 31	SJ	Lecture – protein expression	Purification Proposal Due (Wed)	
Feb 7	SJ	Lecture – protein purification Quiz – molecular biology	Protein Purification Project	Protein Purification Project Lab report 1 due
Feb 14	SJ	Lecture – protein purification	Protein Purification Project	Protein Purification Project
Feb 21	SJ	No classes (President's Day)	Protein Purification Project	Protein Purification Project
Feb 28	SJ	Lecture – protein purification	Protein Purification Project	Protein Purification Project
Mar 7	SJ	Spring Break		

----- *Protein Characterization* -----

Mar 14	ND	Lecture – inhibition kinetics Quiz – Protein purification		YopH enzyme inhibition kinetics lab Lab report 2 due
Mar 21	ND	Lecture – protein stability/structure Assay Proposal Due	Kinetics – data analysis	Protein Characterization Project
Mar 28	ND	Lecture – protein binding	Protein Characterization Project	Protein Characterization Project
Apr 4	ND	Lecture – protein analysis	Protein Characterization Project	Protein Characterization Project
Apr 11	RJ	Lecture – Western Blot – Mass spec	Protein Characterization Project	Protein Expression and Western
Apr 18		Quiz – protein assays / western blot	Protein Expression and Western	Final presentations
Apr 25			Last Day of Classes Clean-up day & check out Lab report 3 due	

Additional Provisions:

COVID-19 Classroom Safety Protocols

While not mandated, USU encourages and welcomes the wearing of masks in all university building, especially within 6 feet of others. Furthermore, it is strongly encouraged to take measures to mitigate risk as recommended by federal and state public health officials. These measures include getting fully vaccinated, staying home if you are sick (even with mild symptoms), and maintaining good hygiene including frequent hand washing. Testing will be provided, without charge, throughout the semester and the [USU COVID Webpage](#) will provide up-to-date information. Please remember; COVID can have significant impact on the health and safety of those around you so remain vigilant and respectful.

Academic Freedom and Professional Responsibilities

Academic freedom is the right to teach, study, discuss, investigate, discover, create, and publish freely. Academic freedom protects the rights of faculty members in teaching and of students in learning. Freedom in research is fundamental to the advancement of truth. Faculty members are entitled to full freedom in teaching, research, and creative activities, subject to the limitations imposed by professional responsibility. [USU Policy 403](#) further defines academic freedom and professional responsibilities.

Academic Integrity - "The Honor System"

The University expects that students and faculty alike maintain the highest standards of academic honesty. The Code of Policies and Procedures for Students at Utah State University ([Student Conduct](#)) addresses academic integrity and honesty and notes the following:

Academic Integrity: Students have a responsibility to promote academic integrity at the University by not participating in or facilitating others' participation in any act of academic dishonesty and by reporting all violations or suspected violations of the Academic Integrity Standard to their instructors.

The Honor Pledge: To enhance the learning environment at Utah State University and to develop student academic integrity, each student agrees to the following Honor Pledge: "I pledge, on my honor, to conduct myself with the foremost level of academic integrity". Violations of the Academic Integrity Standard (academic violations) include, but are not limited to cheating, falsification, and plagiarism

Plagiarism

Plagiarism includes knowingly "representing by paraphrase or direct quotation, the published or unpublished work of another person as one's own in any academic exercise or activity without full and clear acknowledgment. It also includes the unacknowledged use of materials prepared by another person or agency engaged in the selling of term papers or other academic materials." The penalties for plagiarism are severe. They include warning or reprimand, grade adjustment, probation, suspension, expulsion, withholding of transcripts, and denial or revocation of degrees.

Grievance Process

Students who feel they have been unfairly treated [in matters other than discipline, admission, residency, employment, traffic, and parking - which are addressed by procedures separate and independent from the Student Code] may file a grievance through the channels and procedures described in the Student Code: [Article VII Grievances](#)

Discrimination and Sexual Misconduct

USU strives to provide an environment for students and employees that is free from [discrimination](#) and [sexual misconduct](#). If you experience sexual misconduct or discrimination at any point during the semester inside or outside of class, you are encouraged to contact the [USU Title IX Coordinator](#) via Old Main room 161 in Logan, [435-797-1266](#), titleix@usu.edu, or at equity.usu.edu/report. You can learn more about the USU resources available for individuals who have experienced sexual misconduct at sexualrespect.usu.edu. Resources for individuals who have experienced discrimination are listed at equity.usu.edu.

Required Reporting of Sexual Misconduct

The instructor is designated by USU as a "[reporting employee](#)." This means that if you share information about [sexual misconduct](#) (sexual harassment, sexual assault, relationship violence, or sex-based stalking) with the instructor, they *will report* that information to the [USU Title IX Coordinator](#). The instructor is also required to tell you about [designated confidential resources](#), [supportive measures](#), and [how you can file a report](#) with the USU Title IX Coordinator.

Students with Disabilities

USU welcomes students with disabilities. If you have, or suspect you may have, a physical, mental health, or learning disability that may require accommodations in this course, please contact the Disability Resource Center (DRC) as early in the semester as possible (University Inn # 101, 435-797-2444, drc@usu.edu). All disability related accommodations must be approved by the DRC. Once approved, the DRC will coordinate with faculty to provide accommodations.

Withdrawal Policy, "I" Grade Policy and Dropping Courses

If a student does not attend a class during the first week of the term or by the second class meeting, whichever comes first, the instructor may submit a request to have the student dropped from the course. (This does not remove responsibility from the student to drop courses which they do not plan to attend.) Students who are dropped from courses will be notified by the Registrar's Office through their preferred e-mail account.

Students may drop courses without notation on the permanent record through the first 20 percent of the class. If a student drops a course following the first 20 percent of the class, a W will be permanently affixed to the student's record (check [General Catalog](#) for exact dates).

Students with extenuating circumstances should refer to the policy regarding Complete Withdrawal from the University and the Incomplete (I) Grade policy in the General Catalog.

No-Test Days Policy

For classes that meet for a full semester, a five-day period designated as "no-test" days precedes final examinations. During this time, no major examinations, including final examinations will be given in order that students may concentrate on classwork, the completion of special assignments, writing projects, and other preparation for duly scheduled final examinations. Approved exceptions include final papers, weekly chapter quizzes, quizzes, projects, and examinations associated with a lab that does not meet during final examinations. This policy does not apply to classes that meet only during the second 7-week session of the semester or to classes offered during the summer term. Complete information related to [Final Examination Policies](#) can be reviewed in the General Catalog.

Assumption of Risk

All classes, programs, and extracurricular activities within the University involve some risk, and some involve travel. The University provides opportunities to participate in these programs on a voluntary basis. Therefore, students should not participate in them if they do not care to assume the risks. Students can ask the respective program leaders/sponsors about the possible risks a program may generate, and if students are not willing to assume the risks, they should not select that program. By voluntarily participating in classes, programs, and extracurricular activities, students do so at their own risk. General information about University Risk Management policies, insurance coverage, vehicle use policies, and risk management forms can be found at <http://www.usu.edu/riskmgt/>.

Mental Health

Mental health is critically important for the success of USU students. As a student, you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance or reduce your ability to participate in daily activities. Utah State University provides free services for students to assist them with addressing these and other concerns. You can learn more about the broad range of confidential mental health services available on campus at [Counseling and Psychological Services \(CAPS\)](#).

Students are also encouraged to download the "[SafeUT App](#)" to their smartphones. The SafeUT application is a 24/7 statewide crisis text and tip service that provides real-time crisis intervention to students through texting and a confidential tip program that can help anyone with emotional crises, bullying, relationship problems, mental health, or suicide related issues.