

Introductory Biochemistry Laboratory, CHEM 5720, Spring 2019, 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, L. Seefeldt
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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.

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 2017 Possible Points		
Element	Description	Max. Points
Literature search assignment	Assignment to be completed on second day of lab (Thurs, Jan 10)	20
Pre-laboratory quizzes	12 Quizzes worth 10 points each. Drop lowest score. Due at 8:30 am every Tuesday.	110
Daily laboratory notebook	Best 22 Notebooks of 23, worth 5 points each. Due before leaving lab each day.	110
Laboratory reports	3 experimental reports (see schedule below).	150
Presentations	Lab result presentations (see schedule below).	100
Quizzes from lectures	3 quizzes covering lecture material. Worth 40 points each.	120
Total		610

- 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 with carbon-copy pages is also required and may be purchased at the USU Bookstore. The lab fee is used for equipment and supplies, and for a small fraction of Teaching Assistant support.
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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 (110 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.

Try to keep your notebook as neat as possible. 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.

The carbon-copy pages of your notebook must be turned in at the end of lab each day – BEFORE you leave the lab. Late notebooks will not be graded.

Laboratory Reports (150 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. (100 pts)

Presenting, explaining, and defending your scientific results are all important aspects of research. You will give three presentations throughout the semester 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.

Laboratory Schedule – overview

Week of	Prof.	Monday – lecture ESLC 046	Tuesday – lab ML148	Thursday – lab ML148
		Lecture material online		
Jan 7	RJ	Lecture – molecular biology	Lab 1. Buffer/media preparation <i>Safety, Check-in, Buffers pH</i>	Lab 2. Bioinformatics <i>BLAST, Primer Design, plasmid sequence manipulation</i>
Jan 14	RJ	Lecture – restriction analysis	Lab 3. PCR (Day 1) <i>Set up run PCR, Make TAE gels, Agar plates?</i>	Lab 3. PCR (Day 2) <i>Run Gel, Digest product, PCR Clean up</i>
Jan 21	RJ	No classes (Martin Luther King, Jr. Day)	Lab 4. Cloning (Day 1) <i>Ligate, Transform, Plate B/W screen</i>	Lab 4. Cloning (Day 2) <i>Miniprep, Restriction Digest, single cut, double cut, Run Gel</i>
Jan 28	RJ	Lecture – protein expression Quiz – molecular biology	Student Presentations Module 1	Lab 5. Protein Purification (Day 1) <i>Measure O.D. add IPTG, spin cells, make buffers for affinity purification</i>
Feb 4	LS	Lecture –protein purification	Lab 5. Protein Purification (Day 2) <i>Break cells, centrifuge, gravity Nickel, freeze elutions Lab report 1 due</i>	Lab 5. Protein Purification (Day 3) SDS-PAGE, Stain Destain gels, Dialysis
Feb 11	LS	Lecture – protein purification	Lab 5. Protein Purification (Day 4) <i>ion exchange, freeze elutions?</i>	Lab 5. Protein Purification (Day 5) SDS-PAGE, Stain Destain gels, Dialysis
Feb 18	LS	No classes (President's Day)	Lab 6. Protein activity assay (Day 1) <i>Bradford / A280 / freeze protein</i>	Lab 6. Protein activity assay (Day 2) <i>Assay activity Km and Vmax</i>
Feb 25	LS	Lecture – protein purification	Lab 6. Protein activity assay (Day 3)	Work with lab partner on presentation
Mar 4	ND	Lecture – inhibition kinetics Quiz – Protein purification	Extended YopH enzyme inhibition kinetics lab	Student Presentations Module 2
Mar 11		Spring break	Spring break	Spring break
Mar 18	ND	Lecture – protein stability/structure	Lab 7. Circular Dichroism Lab report 2 due	Circular Dichroism data analysis
Mar 25	ND	Lecture – Protein binding	Lab 8. Analytical Ultracentrifugation	Analytical Ultracentrifugation data analysis
Apr 1	ND	Lecture – protein analysis	Lab 9. Size Exclusion Chromatography	Wrap-up data analysis/work on final presentation
Apr 8	RJ	Lecture – protein structure	Lab 10. Lysozyme Crystallization and Structure Determination (Day 1)	Lab 10. Lysozyme Crystallization and Structure Determination (Day 2)
Apr 15		Quiz – protein assays / crystallography	Final presentations	Final presentations
Apr 22			Clean-up day & check out Lab report 3 due	