

Colorado State University Department of Biochemistry
BC 404 Comprehensive Biochemistry Lab (BC-404-L02)
Fall Semester 2021

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Schedule: 307 and 308 Yates, TR 2:00 – 4:50 PM

Textbook: Digital notebook via Benchling

Important information for students on COVID-19:

All students are required to follow public health guidelines in any university space, and are encouraged to continue these practices when off-campus(es). Students also are required to report any COVID-19 symptoms to the university immediately, as well as if they have potentially been exposed or have tested positive at a non-CSU testing location. If you suspect you have symptoms, please fill out the COVID Reporter (<https://covid.colostate.edu/reporter/>).

If you have COVID symptoms or know or believe you have been exposed, it is important for the health of yourself and others that you complete the online COVID Reporter. Do not ask your instructor to report for you; if you report to your instructor that you will not attend class due to symptoms or a potential exposure, you are required to also submit those concerns through the COVID Reporter. If you do not have access to the internet to fill out the online COVID-19 Reporter, please call (970)491-4600.

If you report symptoms or a positive test, your report is submitted to CSU's Public Health Office. You will receive immediate, initial instructions on what to do and then you will also be contacted by phone by a public health official. Based on your specific circumstances, the public health official may:

- choose to recommend that you be tested and help arrange for a test
- conduct contact tracing
- initiate any necessary public health requirements or recommendations and notify you if you need to take any steps

If you report a potential exposure, the public health official will help you determine if you are at risk of contracting COVID.

For the latest information about the University's COVID resources and information, please visit the CSU COVID-19 site (<https://covidrecovery.colostate.edu/>).

COVID-specific lab safety:

Under current guidance we are operating at normal capacity in the lab (10 teams of 2). We are required to wear facemasks in the lab at all times. These guidelines are subject to change.

Course goal:

Learning goal #1: *Students will be able to plan, execute, and problem solve common molecular biology and protein chemistry techniques including: PCR, agarose and polyacrylamide electrophoresis, bacterial transformation, vector and PCR restriction digestion, protein expression, protein purification, enzymatic characterization, and site-directed mutagenesis.*

Learning goal #2: *Students will understand the underpinning theory and experimental design for the experimental techniques listed above leading to the transfer of such knowledge in future research that the student may perform.*

Learning goal #3: *Students will demonstrate proficiency in working with a partner to plan and direct a “mini” research project.*

Learning goal #4: *Students will learn to carry-out “hypothesis-driven” research. From their project students will present data and argue for whether their data supports or refutes their hypothesis.*

Canvas:

I will use this site to post all the protocols and procedures you will be using to successfully execute the biochemical technique. I also plan to use this site to post weekly quizzes and your current grade.

Textbook:

In lieu of a paper notebook, we will be using [Benchling](#) as a solution for on-line lab notebooks. We will post more detailed Benchling instructions on Canvas.

Assessment:

Your grade will be derived from a number of places some of which is wrapped up in your ability to perform the experiments.

1. Primer Design- 10 points

- a. In order to mutate LDH you will need to design a point mutagenesis primer. This will be done in class and your design will be handed in and graded.

2. Weekly quizzes - 90 points (15 x 6)

- a. Weekly quizzes are designed to test your (1) preparation for the upcoming week’s labs, and (2) knowledge of theory for particular techniques as well as your skill in working with data.

3. Notebooks- 60 points

- a. 30 of these points will be given for you final ONLINE Benchling notebook at the end of the semester. Points will be

given for:

- i. Whether it is complete or not including, written objectives, methods (“a diagram of the setup with sufficient detail for reproducibility”), results (data including graphs, gel images, etc.), and conclusions for each day in lab.
 - ii. Legibility and organization.
 - iii. Accuracy of calculations.
 - iv. Line of reasoning for your conclusions based on results.
 - v. Dates consistent with the course layout. In other words, it was being completed as you worked, not at the end of the semester.
- b. 30 of these points will be given in at least two ONLINE Benchling notebook checks. KEEP THEM UPDATED and you won't lose points. The following criteria will be assessed when the notebooks are collected.
- i. 3 points for written objectives of all the labs from the last check up to the current lab (that day).
 - ii. 3 points for written methods of all the labs from the last check up to the current lab (that day).
 - iii. 3 points for written results of all the labs from the last check up to the last lab fully executed.
 - iv. 3 points for written conclusion of all the labs from the last check up to the last lab fully executed.
 - v. 3 points for legibility and organization.
 - vi. There will not be any partial credit for these points. Either you get the 3 points, or you don't. For example, if you have all the purposes for the labs written except one then you lose 3 points.
 - vii. If you do not have your lab notebook that day you will lose all 15 points.

4. Oral Report – 50 points

- a. At the end of the semester each group will present the results of their research in a short 10-minute (max) presentation. Details on the aspects of the report will be given later in the semester.

5. Lab participation – 20 points

- a. Attendance is necessary to ensure that your project progresses on schedule. **If you are unable to attend due to an excused absence or health-related concerns you need to email Professor Nishimura before missing class.** You should also contact your lab partner.
- b. Poor effort resulting in “lousy” data or slow progress will result in points being lost.
- c. Poor organization resulting in loss of samples will result in

points being lost.

To be Successful: Here are some ways to be successful:

1. Come prepared knowing exactly what you are going to do and have your notebook prepared to take down data.
 - a. Watch the Online lectures to understand what will happen in each class.
 - b. LISTEN at the beginning of class for changes and additional instructions.
 - c. Read the protocol in advance.
2. Be careful in the way you proceed, do not rush through experiments.
 - a. Rushed science is usually bad science.
3. Carefully label your reagents and your products. Make sure you know where you have stored them.
 - a. Never throw away something unless you are sure you don't need it. Each lab procedure will tell you what to keep and what to throw away upon the completion of the lab.
4. Talk to your fellow classmates about things you are confused about.

Grades: The following is a complete breakdown of point accumulation:

<u>Assignment</u>	<u>Points</u>
Primer Design	10
Quizzes	90 (6 x 15 points)
Notebooks	60
Reports	50
<u>Lab participation</u>	<u>20</u>
Total	230

<u>Grade</u>	<u>Percentage</u>
A+	97 - 100%
A	93 - < 97%
A-	90 - < 93%
B+	87 - < 90%
B	83 - < 87%
B-	80 - < 83%
C+	77 - < 80%
C	73 - < 77%
C-	70 - < 73%
D	60 - < 70%
F	below 60%

Attendance: Attendance to every assigned is mandatory for each experiment and the lectures. You must perform the experiments with your partner or you will start to lose points. There are obvious exceptions to this rule like a death in the family, extreme illness or a University excused absence. If you need to miss a class talk to me and we can talk about whether it is a valid reason and how we can arrange to make it right. In the case of an emergency or a tragedy deal with it first and then come see me.

Lab Safety: Some general policies regarding lab safety:

- 1) No open toed shoes (shorts are fine).
- 2) No "horse-play" in the lab.
- 3) No eating or drinking in the lab.
- 4) Place Backpacks on racks.

Academic Integrity: This course will adhere to the Academic Integrity Policy found in the Colorado State University [General Catalog](#).

End of the Semester: **I WILL NOT NEGOTIATE GRADES AT THE END OF THE SEMESTER.** It is my expectation that you will accept the grade assigned to you and take responsibility for YOUR work throughout the semester. Grade negotiation always leads to someone receiving special treatment and is a policy that I cannot abide as I desire to maintain an atmosphere of academic honesty and integrity. If you are concerned about your grade please come and talk to me **DURING** the semester when something **can be done** about it.

The Class Schedule: Below is a class schedule detailing each day and the experiment we will be running on that particular day. BC404 is an “authentic research experience” some weeks will require short visits to the lab outside of T/Th hours. We will work with you to get this done.

BC404-FA21 Daily Schedule – Subject to change	
Date	Experiment/Schedule
Day One - 8/24	Lab Check-in, Introduction
Day Two - 8/26	Pymol and Primer Design
Day Three – 8/31 (Monday Quiz 1)	PCR Experiment and Pouring an Agarose gel
Day Four – 9/2	Agarose Gel, Cloning Enhancer rxn, and Transformation
Day Five – 9/7 (Monday Quiz 2)	Plasmid Isolation and DNA sequencing
Day Six - 9/9	Sequence analysis and BL21 transformation
Day Seven – 9/14 (Monday Quiz 3)	Start of Protein Expression
Day Eight - 9/16	BL21 Expression Harvest
Day Nine - 9/21 (Monday Quiz 4)	Introduction to Chromatography
Day Ten - 9/23	Enzyme Kinetics Theory

Day Eleven – 9/28 (Monday Quiz 5)	Protein Purification
Day Twelve – 9/30	Enzyme Kinetics
Day Thirteen - 10/5 (Monday Quiz 6)	Enzyme Kinetics – LDH control
Day Fourteen - 10/7	Protein Quantitation & SDS-PAGE
Day Fifteen - 10/12	Lab Group presentation
Day Sixteen – 10/14	Clean up and Check out