

**Colorado State University Department of Biochemistry**  
**BC 404 Comprehensive Biochemistry Lab**  
Fall Semester 2019

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Yates 307  
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Office hours: Wednesday 4-5PM in Yates 307/310

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

Textbook: Laboratory Notebook (in the bookstore under BC404)

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, 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 your current grade.

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. Problem Sets- 100 points**

- a. Problem sets are designed to test your knowledge of theory for particular techniques as well as your skill in working with data. There will be a mid-term and end-term problem set each worth 50 points.

**3. Notebooks- 60 points**

- a. 30 of these points will be given when you hand-in your completed 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 lab 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 5 to 10-minute presentation. Details on the aspects of the report will be given later in the semester.

**5. Lab participation – 20 points**

- a. Unexcused absences will result in automatic deduction of at least half of these points, no questions asked.
  - i. Multiply occurrences will result in additional points being deducted.
- 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 is a short-list of 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. LISTEN at the beginning of class for changes and additional instructions.
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            |
| Problem sets             | 100           |
| Notebooks                | 60            |
| Reports                  | 50            |
| <u>Lab participation</u> | <u>20</u>     |
| <b>Total</b>             | <b>240</b>    |

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

What this means is that you are guaranteed at least those grades if you have those percentages. A curve may or may not apply to this class. I have, in the past, used a minus policy and reserve the right to do so depending on the distribution of the grades.

Attendance: Attendance to every class 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. Missing class because you need to take a nap is not acceptable. If you need to miss a class come and see 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.

| <b>BC404-FA19 Daily Schedule – Subject to change</b> |  |
|--|--|
| <b>Date</b>  | <b>Experiment/Schedule</b>                                   |
| <b>Day One - 8/27</b>                                | <b>Lab Check-in, Introduction</b>                            |
| <b>Day Two - 8/29</b>                                | <b>Pymol and Primer Design</b>                               |
| <b>Day Three – 9/3</b>                               | <b>PCR Experiment and Pouring an Agarose gel</b>             |
| <b>Day Four – 9/5</b>                                | <b>Agarose Gel, Cloning Enhancer rxn, and Transformation</b> |
| <b>Day Five – 9/10</b>                               | <b>Plasmid Isolation and DNA sequencing</b>                  |
| <b>Day Six - 9/12</b>                                | <b>Sequence analysis and BL21 transformation</b>             |
| <b>Day Seven – 9/17</b>                              | <b>Start of Protein Expression</b>                           |
| <b>Day Eight - 9/19</b>                              | <b>BL21 Expression Harvest</b>                               |
| <b>Day Nine - 9/24</b>                               | <b>Introduction to Chromatography</b>                        |

|                             |  |
|-----------------------------|--|
| <b>Day Ten - 9/26</b>       | <b>Enzyme Kinetics Theory</b>                  |
| <b>Day Eleven – 10/1</b>    | <b>Protein Purification</b>                    |
| <b>Day Twelve – 10/3</b>    | <b>Enzyme Kinetics</b>                         |
| <b>Day Thirteen - 10/8</b>  | <b>Enzyme Kinetics – LDH control</b>           |
| <b>Day Fourteen - 10/10</b> | <b>Protein Quantitation &amp;<br/>SDS-PAGE</b> |
| <b>Day Fifteen - 10/15</b>  | <b>Lab Group presentation</b>                  |
| <b>Day Sixteen – 10/17</b>  | <b>Clean up and Check out</b>                  |