

LIFE212: Introductory Cell Biology Laboratory

Instructor: Cathy Radebaugh

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Office Hours: Available daily from 9:00 a.m.- 4:00 p.m. by email

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Graduate Teaching Assistant: Sophia Montoya

Office hours: Monday 3:00-4:00 p.m. and Wednesday 12:30-1:30 p.m.

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ClassTimes/Locations:

Recitation: Monday, 4:00 p.m. to 4:50 p.m.

Lab: Tues 9:00 a.m.-1:00 p.m.

Course Description:

This laboratory course aims to equip students with hands-on laboratory skills that are fundamental to modern cell biology and biomedical research. Upon completing this course, students will:

- Master basic computational chemistry and units of measurements
- Understand the importance of accuracy and precision of lab instrumentation.
- Be able to utilize spectrophotometry to determine protein and solute concentrations.
- Know how to partially purify enzymes and how to study enzyme kinetics.
- Know how to analyze proteins using protein gel electrophoresis
- Be able to conceptualize and use immunoassays to detect antigens or antibodies in organisms or tissue extracts.
- Have acquired hands-on skills in the use of light and fluorescence microscopy to study cell ultrastructure and function.
- Have an enhanced understanding of respiration and photosynthesis.

Adll Required Lab Resources:

- **CANVAS online:** Instructions and supporting material will be posted online at <http://info.canvas.colostate.edu/login.aspx>. This will be the online educational platform that your LIFE 212 instructor and TA will use to communicate with students.

Course Organization and Teaching Methods:

Classroom Climate: I am committed to creating an engaging learning environment that is consistent with the CSU mission of fostering the principles of community; a community that promotes learning, critical inquiry, and discovery. We as a class, (instructor, teaching assistants and students) will strive to uphold the CSU community principles of inclusion, integrity, and respect.

Special accommodations for student abilities: Consistent with University policy, the Student Disability Center (SDC) and the College of Natural Sciences (CNS), I am committed to providing ALL students an environment that supports their learning. Students should contact me, the instructor, as soon as they receive their memo from SDC so that we may discuss their individual needs.

Letter Grade Scheme:

- A- 90% and above
- B- 80% and above
- C- 70% and above
- D- 60% and above
- F- Below 60%

LIFE212 Changes and Requirements for Online Learning

1. You will now need to submit your work by scanning it, saving it as a PDF and uploading the PDFs in Canvas. I realize that not all of you may have access to a scanner however, there are apps for your phone that will allow you to scan using your phone's camera. I have used CamScanner and found that it is easy to use and produces good quality PDFs. Please review your PDF prior to submission to ensure everything is legible.
2. I will still be giving quizzes at the end of recitation however, their format and grading scale will be altered. Prior to the start of recitation you will need to have completed the pre-laboratory

writeup in your notebook. This includes the **experiment title, introductory or background section and the materials and methods section** for the experiment to be completed on the following Tuesday. This portion of your notebook will need to be scanned into a PDF and uploaded to Canvas by the end of our normal recitation time (Mondays at 5:00 MDT). This portion of your notebook will be worth 15 points and will be combined with a 5 point online quiz to equal the 20 points assigned to quiz grades in the syllabus. I will be giving you 10 minutes (4:50-5:00 PM) during our recitation time to complete the online quiz.

3. You will need to complete the experiment by viewing the videos of lab procedures that would have been completed by you if the lab had not gone online. These videos and data/picture files of the experimental results will be available during our normal lab time. These results must be entered in your notebook and the **results section** scanned into a PDF and uploaded to Canvas by the end of our normal lab time (Tuesdays 9:00 AM – 1:00 PM). The results section will take the place of your lab tech grade, will be worth 10 points and will be graded by Sophia. Please note that I have extended our lab time by an hour in case any of you are currently in the PDT time zone.
4. Lab reports will need to be completed, scanned into a PDF and uploaded to Canvas by the beginning of the following weeks recitation. This is the same time that you previously turned your lab reports in.
5. Before April 27th you will need to have completed your Table of Contents and the Conclusions for each of the labs in your notebook. These completed portions of your notebook need to be scanned into a PDF and uploaded to Canvas by the end of our normal recitation time on April 27th. Your Table of Contents and Conclusions will take the place of your notebook grade (100 points) and will be graded by Sophia.
6. Your fluorescence microscopy powerpoint presentations will be due by the end of the lab period on April 21. Your presentation slides will have to be printed, scanned into a PDF and uploaded to Canvas. These “presentations” will still be worth 100 points.

7. The final exam will be **open book and cumulative**. It will be available on May 4th from 3:00 to 6:00 PM (MDT) and will be worth 100 points.

Point allocation:

Quizzes:	20 pts each	total of 10 quizzes	200 points
Laboratory Reports:	50-60 pts each	total of 11 reports	575 points
Lab Presentation:	100 pts	1 presentation	100 points
Laboratory Notebook:	100 pts each	graded twice	200 points
Lab technique grade :	10 pts per lab	total of 11 labs	110 points
Exams:	100 pts ea	2 Exams	200 points
Total:			1,385 points

Laboratory Notebooks:

Students need to follow the specific instructions outlined in **section C** below for writing in their lab notebooks. Lab notebooks will be collected twice during the semester for grading. Legible handwriting and neatness is crucial for good grades.

A) A secure spine-bound notebook is required:

- Please use the notebook that came with the class textbook.
- The laboratory notebook of a scientist is a legal document: it outlines the daily progress of experiments.
- Calculations, notes, and results should be recorded in ink directly into the notebook.
- Nothing should be erased or obliterated. Mistakes are crossed out with a single line so the original work is still visible.

B) Pre-laboratory write-up and preparation:

Written BEFORE recitation on Monday and in your own words; do not copy directly from the handouts. This will help you do well on the quizzes and finish the lab on time. Pre-lab write-ups should include the following:

- Title & Date of the experiment,
- Introduction
- Materials and Methods

C) Specific Instructions for Lab notebook write-ups: You should write legibly and follow the following format:

1. **Table of Contents:** Please use the pages labeled "Table of Contents" in your laboratory notebook. Always write the title and page number(s) of each experiment in this section of your notebook. Keep it up to date as you write in your notebook.

2. **Title and Date:** The title of each experiment needs to be descriptive yet concise. Record the date the experiment was carried out.
3. **Introduction:** This section should be written in your own words **before** the lab period. Cutting and pasting from handouts' material is NOT allowed. The introduction should contain
 - the theory or background behind the experiment (not more than 2 to 3 sentences)
 - the question to be investigated based upon the background (one sentence)
 - hypothesis which includes the predicted results (one to two sentences maximum)
 - the objectives of the experiment (one to two sentences).
4. **Materials and Methods:** This section should be written **before** the lab period and then modified as needed as you perform the experiment. The experiment section should contain
 - the materials and reagents,
 - the equipment used
 - the methods (protocol) that you will follow during labCreate an accurate **flow Chart** of the protocol. You and others should be able to follow your protocol easily.
5. **Results:** The results section contains the raw data, observations, sketches of biological specimens, calculations, and tables and graphs that are generated from the data, as well as any other notes. Raw data should go **directly** into your notebook.
6. **Discussion/Conclusions:** This section is written right after the experiment is completed or after you write your report and before you submit it for grading. The conclusion should include:
 - A brief summary of the expected results
 - A brief interpretation of your results
 - The significance of the findings: did you get the expected results?
 - If you didn't get the expected results suggest reasons for why you didn't

Modified Recitation and Lab Schedule

Jan. 27	Recitation: Review of solution concentrations and accuracy versus precision
Jan. 28	Lab: Concentrations of solutions, accuracy and precision of instruments
Feb. 3	Recitation: Introduction to Spectrophotometry
Feb. 4	Lab: Quantitative determination of protein concentration
Feb. 10	Recitation: Introduction to protein purification and enzymes
Feb. 11	Lab: ENZYMES I: Partial purification and characterization of Tyrosinase from potato tubers
Feb. 17	Recitation: Effect of the environment on enzyme activity
Feb. 18	Lab: ENZYMES II: Effects of enzyme concentration, pH and temperature on enzyme activity
Feb. 24	Recitation: Parameters of enzyme kinetics
Feb. 25	Lab: ENZYMES III: Kinetic analysis of Tyrosinase: K_M and V_{MAX} , and inhibitor analysis
Mar. 2	Recitation: Introduction to genomics and protein gel electrophoresis
Mar. 3	Lab: Assessing the purity of Tyrosinase by SDS-PAGE
Mar. 9	Recitation: EXAM 1, Lab notebooks due (No quiz)
Mar. 10	Lab: Introduction to the compound light microscope: types and proper use
	Spring Break
Mar. 30	Recitation: Light microscopy continued
Mar. 31	Lab: Cells of living organisms
Apr. 6	Recitation: Cellular fractionation, Mitochondria isolation and respiration
Apr. 7	Lab: Isolation of mitochondria: respiration
Apr. 13	Recitation: Introduction to photosynthesis: Light/Hill reaction
Apr. 14	Lab: Isolation of chloroplasts and Hill reaction assay
Apr. 20	Recitation: Introduction to immunoassays and fluorescence microscopy
Apr. 21	Lab: ELISA and viewing of fluorescently labeled cells
Apr. 27	Recitation: EXAM II review, Lab notebooks due (No quiz)
Apr. 21	Lab: Fluorescence microscopy powerpoint presentations
May 4	Recitation: EXAM II and course evaluations