Term Information

Effective Term	Autumn 2025

General Information

Course Bulletin Listing/Subject Area	Biology
Fiscal Unit/Academic Org	Introductory Biology - D0326
College/Academic Group	Arts and Sciences
Level/Career	Undergraduate
Course Number/Catalog	1112
Course Title	Biological Foundations 2: Molecular Machinery & Genetics
Transcript Abbreviation	Bio Foundations 2
Course Description	An introductory exploration of life's cellular and genetic mechanisms, molecular biology, and metacognitive strategies. Includes a required weekly Peer Led Team Learning Workshop. Intended for student Majoring in STEM fields. Combined with Bio 1111, these courses will address content at similar depth and breadth as Bio 1113x.
Semester Credit Hours/Units	Fixed: 4

Offering Information

Length Of Course	14 Week, 12 Week, 8 Week
Flexibly Scheduled Course	Never
Does any section of this course have a distance education component?	No
Grading Basis	Letter Grade
Repeatable	No
Course Components	Laboratory, Lecture, Workshop
Grade Roster Component	Lecture
Credit Available by Exam	No
Admission Condition Course	No
Off Campus	Never
Campus of Offering	Columbus, Lima, Mansfield, Marion, Newark, Wooster

Prerequisites and Exclusions

Prerequisites/Corequisites	1111; Coreq/Prereq: Math 1048
Exclusions	Not open to students with credit for 1113x
Electronically Enforced	Yes

Cross-Listings

Cross-Listings

Subject/CIP Code

Subject/CIP Code	26.0101
Subsidy Level	Baccalaureate Course
Intended Rank	Freshman, Sophomore

Requirement/Elective Designation

General Education course:

Natural Sciences

The course is an elective (for this or other units) or is a service course for other units

Course Details

Course goals or learning objectives/outcomes

- explain the mechanisms and structures involved in mitotic and meiotic cell division and explain the different roles for and consequences of each.
- describe how the loss/failure of cellular control mechanisms can lead to disease.
- describe how genotypes and the environment influence the genetics of cancer.
- explain the transfer and modification of heritable traits from parents to offspring via Mendelian inheritance.
- apply principles of Mendelian and non-Mendelian genetics to predict the outcomes of a variety of genetic crosses.
- explain the basis of and identify examples of non-Mendelian patterns of inheritance.
- describe the nature and expression of heritable information at the molecular level, including: the Central Dogma, DNA replication, transcription, protein synthesis (translation).
- explain how gene expression is controlled in prokaryotes and eukaryotes (at transcription, post-transcription, translation, and post-translation levels).
- identify mutations in DNA and assess their impact on gene expression and diversity.
- explain chromatin structure, the histone code, and epigenetic inheritance.
- explain how differential gene expression relates to organismal development, including cellular reproduction, growth, and differentiation
- describe characteristics of viruses and bacteria (e.g., life history, genome type and content, exchange of genetic material).
- describe the experimental basis and select applications of recombinant DNA technology, including gene cloning, genetically modified organisms (GMOs), and gene editing (CRISPR)
- describe the development and evaluation of scientific explanations of natural phenomena.
- apply biological concepts in the assessment of contemporary issues.
- reflect on ethical implications of emerging biotechnology.
- explain how evolution accounts for the unity and diversity of life.
- apply the process of science to research questions, presented scenarios, historical experiments, and course lab experiments.
- design an experiment
- collect and organize both qualitative and quantitative data.
- support or refute an argument or conclusion using experimental results.
- refer to primary literature articles using proper paraphrasing and citation (compare and contrast primary, secondary, etc).
- create properly formatted graphs, figures, and tables using data.
- analyze and interpret qualitative and quantitative data
- create discipline-appropriate documents (poster, presentation, or paper).
- identify plagiarism and avoid plagiarizing when writing.
- evaluate the quality and accuracy of a written source.
- locate scholarly articles using electronic databases.
- distinguish between primary literature, secondary literature, and content created for mass media.
- employ safe laboratory practices.
- use a compound light microscope to view microorganisms; maintain microscope cleanliness.
- use a pipette to measure small volumes.

- understand the key steps and reagents in PCR.
- explain how gel electrophoresis works and interpret DNA separation on a gel.
- prepare a dilution series.
- demonstrate the ability to work effectively as a team.
- determine effective study strategies to better prepare for assessments.
- evaluate the effectiveness of study strategies and modify them as needed.

Content Topic List

- Cell division
- Cellular control mechanisms
- Mendelian genetics
- Non-Mendelian Genetics
- Central Dogma
- Transcription
- Translation
- Gene Expression
- Viruses
- Biotechnology

Sought Concurrence

No

Attachments

- Biology 1112 Syllabus.pdf

(Syllabus. Owner: Andrews,Adam Lee)

- Biology 1112 GE NS Cover Sheet.docx

(Cover Letter. Owner: Andrews,Adam Lee)

- Proposal to Create Biology 1111 and 1112 20240918.docx: Full proposal

(Other Supporting Documentation. Owner: Andrews,Adam Lee)

Comments

Workflow Information

Status	User(s)	Date/Time	Step
Submitted	Andrews,Adam Lee	10/28/2024 11:48 AM	Submitted for Approval
Approved	Kulesza,Amy Elizabeth	10/28/2024 01:41 PM	Unit Approval
Approved	Vankeerbergen,Bernadette Chantal	11/18/2024 10:22 AM	College Approval
Pending Approval	Jenkins,Mary Ellen Bigler Hanlin,Deborah Kay Hilty,Michael Neff,Jennifer Vankeerbergen,Bernadette Chantal Steele,Rachel Lea	11/18/2024 10:22 AM	ASCCAO Approval

Proposal to Create Biology 1111 and 1112

Center for Life Sciences Education | College of Arts & Sciences

Background

As part of the HHMI Driving Change project at Ohio State, several departments have followed the Department of Mathematics' prior success in offering a stretched version of the introductory gateway courses for STEM majors. In Mathematics, *Calculus 1* (Math 1151) is also offered as the two course sequence of Math 1140 + 1141. The Department of Chemistry and Biochemistry followed suit last year with the introduction of Chemistry 1206 + 1208, an equivalent to their Chemistry 1210. Most recently, the Department of Physics will launch this autumn Physics 1248 + 1249, and equivalent to Physics 1250. The Math and Chemistry offerings have been overwhelmingly successful, both in student performance and the ability to move students into Major courses more quickly, especially for those students who enter with low math placement scores. The slower pace allows students to better engage, retain, and ultimately better comprehend concepts through increased active learning rather than additional content.

The Center for Life Sciences Education is proposing to create a comparable course sequence in **Biology 1111 and 1112** to mirror the content of one of our two introductory Biology courses, Biology 1113. Student progress through the Biology and other Life Science Majors can be significantly impacted by a low Math placement score as Math 1148 is a prerequisite course for Chemistry 1210, which is a co/prerequisite for Biology 1113 and 1114. Approximately 20% of incoming Biology Major students do not have the math placement and must work through the remedial math sequence before taking Chemistry. For these students, it may be semester 4 or 5 before they enroll in their first Biology course. We know from our academic advisors that this results in significant retention issues, especially among underrepresented student populations. The course sequence we propose would allow students placing into at least Math 1075 to enroll in a Biology course as soon as their first semester.

Prerequisites

While Chemistry 1210 must be taken either concurrently or as a prerequisite for Biology 1113, the most chemistry-heavy content comes in the first few weeks of our course making the concurrent requisite minimally impactful. We propose that the new Biology courses will not have need of a chemistry requirement. Instead, we will address the essential Chemistry content in 1-2 weeks near the beginning of Biology 1111. It is important to note that Chemistry 1210 will still be a requirement for any student taking Biology 1114 as well

as for the Biology Major. We are proposing a concurrent / prerequisite requirement of Math 1075 for Biology 1111 and Math 1148 for Biology 1112.

Structure

The combination of Biology 1111 and 1112 will address all the same Expected Learning Outcomes as Biology 1113, plus a few extra outcomes related to Chemistry and Metacognition. We expect annual enrollment to be in the 150-200 student range based on math placement scores, though the course is scalable should there be higher than expected demand. Initially the sequence will be offered only on-cycle, but we could offer an off-cycle version as well should there be sufficient enrollment demand.

Biology 1111

Biology 1111 will be a 3-credit hour offering that may be scheduled in two ways. On the Columbus campus where enrollments will be significantly larger, the course will consist of 2 weekly hours of *Lecture* and 80 minutes of a Peer Led Team Learning (PLTL) *Workshop*. On the Regional Campuses where the classes are naturally smaller and benefit from more direct contact with the lecture instructor, the course will consist of 2 lecture hours, with an additional 80-minute lecture to include intensive active-learning similar to that in PLTL.

Based on our enrollment projections, those sections with the PLTL Workshop will offer a single lecture section that will be sub-divided into PLTL Workshops capped at 10 students. This course will focus on the chemistry and biochemistry portions of the 1113 outcomes while adding additional chemistry content for background and metacognitive training. The content will be addressed at a slower pace than 1113 and with additional active learning compared to our current 1113 offerings.

The lecture will be taught by a faculty member while the PLTL workshops are led by undergraduate students. A staff Course Coordinator will support the instructors, supervise the undergraduate students, and provide continuity across time.

By itself, Biology 1111 cannot be used to fulfill any requirements of the Biology Major, as a prerequisite for upper-level coursework, or as a GE course. Students must complete the 1111-1112 sequence in order to meet any of these requirements.

Biology 1112

Biology 1112 will be a 4-credit hour offering that may be scheduled in two ways. On the Columbus campus where enrollments will be significantly larger, the course will consist of 2 weekly hours of *Lecture* plus 80 minutes of a Peer Led Team Learning (PLTL) *Workshop* plus 3 weekly hours of a *Laboratory*. On the Regional Campuses where the classes are naturally smaller and benefit from more direct contact with the lecture instructor, the course will consist of 3.5 weekly lecture hours, with an expectation that instruction will

include an 80-minute lecture with intensive active-learning similar to that in PLTL plus 3 weekly laboratory hours.
Those sections with the PLTL Workshop will offer a single lecture section that will be sub-divided into PLTL Workshops capped at 10 students and labs capped at 24 students. The content of this course will focus on the molecular biology and genetics outcomes of Biology 1113 while additionally including some metacognitive strategies. The pace of the 1112 content will increase relative to that in 1111, but still remain short of what students will experience if they go on to take 1114. The increased pace will help ensure students do not receive an unexpected shock in subsequent courses.

The Biology 1112 laboratory experience will be comparable to that of Biology 1113, utilizing a combination of the existing Biology 1113 lab activities and a six week *Course-Based Undergraduate Research Experience (CURE)*. The CURE was specifically chosen because of its lighter quantitative demand, appropriate for a concurrent enrollment in algebra while still providing students with an authentic research experience aligning to the course content.

Biology 1112 will fulfill the General Education Foundations: Natural Science requirement in the same way that Biology 1113 does. While the GE Outcomes will be addressed throughout both 1111 and 1112, we are officially proposing that 1112 alone carry the GE designation since students will not be able to enroll without having completed 1111. Students will meet the GEN Natural Science Learning Objectives in multiple ways. The combination of Biology 1111 and 1112 is an in-depth study of the basic facts, principles, theories, and interrelationships within biology. Students gain an understanding of the foundations of modern biology by studying life, cell structure and function, bioenergetics, and genetics. Students explore the nonlinear process of science and how science relates and applies to contemporary issues and ethics. During the laboratory activities, students not only apply the biological concepts introduced in lecture, but also learn scientific reasoning and methods, collect and analyze qualitative and quantitative data, and practice scientific literacy and communication. While attaining these learning objectives students will gain an appreciation of the implications and impacts of scientific discoveries on science and technology.

The lecture will be taught by a faculty member while the PLTL workshops are led by undergraduate students supervised by a course coordinator. Labs will be instructed by either Teaching Associates or CLSE Lecturers. A staff Course Coordinator will support the instructors and provide continuity across time.

Peer Led Team Learning

Students in the Columbus sections of both Biology 1111 and 1112 will meet for weekly Peer Led Team Learning workshops. We have successfully employed the PLTL model for more than a decade in Biology 1113 and 1114, initially as standalone courses 1131 and 1141 and currently integrated as 1113.02 and 1114.02. Peer-Led Team Learning (PLTL) is a mode of

learning that complements the more familiar traditional biology classroom formats: lecture, lab, and recitation. Peer-Led team learning (PLTL) is an instructional model that has been recognized to help improve STEM student retention and achievement, especially for underrepresented groups. PLTL supplements lectures and introduces students to formalized study groups engaged in active learning. This socially constructed knowledge and problem-solving mirror what happens among scientists and provides a community within the classroom.

The peer leaders are trained to facilitate student discussions about the workshop problems, and to help students make explicit their problem-solving thought processes. During each 80-minute PLTL workshop, 8-10 students work together to solve a packet of biology problems. These packets have been purposefully designed to support and supplement what students are learning in the lecture and lab components of Biology 1113 and will be appropriate for 1111 and 1112. The problems are complex, challenging, and open-ended – there is no single correct answer to these problems. Each week, the group practices metacognitive and scientific thinking skills to self-evaluate the quality of their work and to measure their learning achievements. The small group size makes it possible for each student to speak up and participate, and it makes it easier for the group to get to know each other and form a supportive learning community.

Amending the Biology Major Program and Minor

Upon approval of this new course sequence, we propose to amend all Specializations (BS and BA) of the Biology Major and the Biology Minor to allow the combination of Biology 1111 + 1112 to fulfill the same requirement as Biology 1113. Updated advising sheets to reflect this change are included in Appendix D of this document.

We would like to take this opportunity to address the understandable concerns about increasing credit hours and time to degree that come with the addition of not just the 'stretch' Biology sequence, but those in the other gateway courses as well. It would be expected that underprepared students who would benefit most from the slowed-down Biology sequence may likely also be taking the corresponding Mathematics and Chemistry sequences as well, potentially adding as many as 8 hours to the Major's supporting courses. While the Physics sequence is an option for Biology Majors, few of our students would opt for 1250 with most choosing 1200 instead. Adding this stretch version as well would bring the total to 10 additional credit hours.

Students who *choose* to take one or more of the sequence options discussed in this proposal benefit in multiple ways that will, for many students, offset the additional credit hours. Students who take the stretch sequences are more likely to successfully complete those gateway courses without having to retake them. Additionally, students who are more successful in their gateway STEM courses are more likely to be retained in a STEM Major, reducing the risk of additional time to completion that frequently accompanies a Major change. Finally, students with low initial Math placements scores frequently are unable to

begin their science course sequences until later in their Program, requiring that they spend the first year or two taking only GE courses. This results in a backlog of science courses in year 3 and 4 with little opportunity for a 'mental break' that comes with interspersed GE courses. Ultimately this results in lower course grades and increased likelihood of failure. While it is ultimately a student's choice as to whether they take the traditional gateway course or its stretch sequence version, it is to the benefit of underprepared students to slow their progression and hopefully make better long-term progress toward degree completion in a STEM Major.

Attachments

Appendix A: Biology 1111 Syllabus
Appendix B: Biology 1112 Syllabus
Appendix C: Sample PLTL Workshop
Appendix D: Biology Major and Minor Advising Sheets

Appendix A: Biology 1111 Syllabus

THE OHIO STATE UNIVERSITY

Biology 1111
Biological Foundations 1: Cells and Chemistry of Life
Autumn 2025 – 3 Credit Hours

Lecturer:
Email:
Office:
Student Hours:
other times scheduled by appointment

Course Coordinator:
Center for Life Sciences Education
Email:
Office:
Phone:

Class Meeting Schedule:
Lecture: Twice Weekly for 55 minutes
PLTL Workshop: Once weekly for 80 minutes; *consult your BuckeyeLink schedule for specific time and day*

Prerequisites:
Coreq: Math 1075. Not open to students with credit for 1113x

Required Course Materials:
- Biological Science (8th Edition), 2024, by Freeman et al. ISBN: **978-0138224028.**

Credit Hours and Work Expectation:
This is a 3-credit-hour course. According to Ohio State policy, students should expect around 3 hours per week of time spent on direct instruction in addition to 6 hours of homework to receive a grade of C average. *ASC Honors* provides an excellent guide to scheduling and study expectations.

Course Description:
An introductory exploration of life's chemical and cellular foundations, including macromolecular and cellular structure and function, energetics, pathways, the nature of scientific endeavors, and metacognitive strategies. Includes a required weekly Peer Led Team Learning Workshop. Intended for student Majoring in STEM fields. Combined with Bio 1112, these courses will address content at similar depth and breadth as Bio 1113x.

Course Learning Outcomes:

Successful students will be able to…

1. The Chemistry of Life
    a. describe the basic structure of atoms and how it leads to the formation of molecules.
    b. connect the structure of atoms and molecules to the function of biological macromolecules.
    c. describe electronegativity and its role in the types of bonds and interactions present within and between molecules.
    d. define pH and buffers and explain their importance to cellular function and homeostasis.
    e. describe the properties of carbon and water and how they are necessary for life.

f. describe the basic structural characteristics of the major classes of biological macromolecules (proteins, nucleic acids, carbohydrates, lipids).
g. apply chemical principles to the analysis of the structure and function of macromolecules.
h. explain the relationship between the structures of macromolecules and their general functions and biological importance.

2. The Cell
    a. describe the structure and properties of the plasma membrane and its role in the cellular response to its environment (e.g., membrane transport, signal transduction).
    b. explain basic activities of the cell by relating structure and function of cellular components, organelles, and systems.
    c. compare and contrast prokaryotic, plant, and animal cells.
    d. outline representative mechanisms for how cells send, receive, and respond to signals.
    e. explain the forms of energy utilized in biological systems and the laws of thermodynamics that govern them.
    f. characterize enzymes, their functions, and the major mechanisms that control their activity.
    g. explain the transformations of energy and carbon involved in cellular respiration, fermentation, and photosynthesis (including orderly chemical transformations, the relevance of redox reactions, and electron/proton transport).
3. Nature of biological science and society
    a. describe the development and evaluation of scientific explanations of natural phenomena.
    b. apply biological concepts in the assessment of contemporary issues.
    c. reflect on ethical implications of emerging biotechnology.
    d. explain how evolution accounts for the unity and diversity of life.
4. Skills & Competencies
    a. Scientific Communication
        i. refer to primary literature articles using proper paraphrasing and citation (compare and contrast primary, secondary, etc).
        ii. create properly formatted graphs, figures, and tables using data.
        iii. analyze and interpret qualitative and quantitative data
        iv. identify plagiarism and avoid plagiarizing when writing.
    b. Literature
        i. evaluate the quality and accuracy of a written source.
        ii. locate scholarly articles using electronic databases.
        iii. distinguish between primary literature, secondary literature, and content created for mass media.
    c. Metacognition
        i. determine effective study strategies to better prepare for assessments.
        ii. evaluate the effectiveness of study strategies and modify them as needed.

Grading and Evaluation:

Graded assignments may come in three forms, and students should note the expectations for each in the descriptions of our class assignments below:

- **Independent Work ( )**: Strictly non-collaborative, original-individual work. You may discuss this assignment only with your instructor. Discussions with other individuals, either in person or electronically, are strictly prohibited and constitute academic misconduct.
- **Required Collaboration ( )**: An explicit expectation for collaboration among students either in-class or outside (i.e., group work).
- **Optional Collaboration ( )**: Students are permitted, but not required, to discuss the assignment or ideas with each other. However, all submitted work must be one's original and individual creation.

Assignment	Points	Assignment Type
Midterm Exam	100	
Final Exam	100	
Quizzes (4 @ 25 pts)	100	
Mastering Biology Homework	100	
Top Hat	75	
In-class Activities	50	
SALG	5	
PLTL Workshops (10 @ 10pts)	100	
Total Points Possible	**630**	

Exams (200 points):

There will be one midterm exam during class at the midpoint of the semester and one final exam during finals week following the semester. The final exam will only cover material following the midterm exam. Material will be drawn from the lectures, lecture activities, Mastering Biology assignments, and Quizzes. All questions will be multiple-choice style and will focus on application of the course material.

Quizzes (100 points):

There will be four 25-point quizzes evenly distributed throughout the semester, with the purpose of providing students practice opportunities for the exams. Quizzes will be taken outside of class but must be completed individually. Quizzes will be available over a three-day period, but each quiz is timed and must be completed in one session. Questions will be short-answer style and will focus on application of the course material.

Mastering Biology homework (100 points):

Weekly homework assignments will be available within Mastering Biology. Each weekly assignment will become available one week in advance and must be completed by Sunday evening at 11:59PM (see lecture schedule for exact dates). Mastering Biology assignments are designed to reinforce material covered in lecture throughout the week and may require you to apply and synthesize material learned throughout previous weeks. Most assignments will take 45-60 minutes to complete and can be worked on incrementally. Plan in advance– loss of power or internet access is not an excuse for a makeup or extension. Additional optional Mastering Biology assignments (ungraded) will also be available throughout the semester. The percentage of points you earn within Mastering Biology throughout the semester will be converted to course points at the end of the semester. (e.g. 100% in Mastering = 100 points).

Top Hat (75 points):

Top Hat questions will be administered in every lecture throughout the semester. Questions will typically be worth 1 point each, graded for participation, correctness, or a combination of both. Proper registration is required prior to the second lecture of the semester. At least 90 total questions will be administered, providing ample leeway in earning the total points. As such, no make-up opportunities will be available for missed lectures or nonfunctional technology. Points will be updated on Carmen at the end of the semester. Prior to that, current points can always be viewed in the Top Hat gradebook.

In-class Activities (50 points):

During most lectures throughout the semester, we will complete various additional learning activities that either provide extra practice on lecture material or are designed to enhance scientific literacy.

Selected activities will be submitted to Carmen and graded for participation, correctness, or a combination of both. All graded activities must be submitted to Carmen individually, but you may work on them with other students in the class. You will be given until 11:59PM the day the activity is assigned to complete it and turn it in. No make-up opportunities will be available for missed lecture activities, but more than 50 total points will be available throughout the semester.

PLTL Workshops (100 points):

In total, there are 10 PLTL workshops throughout the semester. Each workshop consists of 3 activities, a pre-workshop, workshop, and post-workshop activities. In preparation for PLTL workshops, there is an assignment "Introduction to Peer-led Team Learning (PLTL)" (worth 10 points) to be completed by the end of week 1.

1. Pre-workshop activities (2.5 pts each) → Due before the start of workshop. These should be submitted individually to Carmen.
2. Workshop activities (5 pts each) → Completed as a group during the PLTL workshop session. Students will submit their answer sheets to Carmen at the end of their workshop. Note: If you are more than 20 minutes late to the workshop, you will not be permitted to attend and will be marked absent.
3. Post-workshop activities (2.5 pts each) → Due by Sunday at 11:59 pm following the workshop and submitted individually to Carmen. This activity includes reflecting on the knowledge gained in the workshop, identifying knowledge still desired, and an extension of the workshop material. **Note: You must attend the workshop in order to earn credit for completing the post-workshop assignment.**

SALG (5 points):

At the end of the course, 5 points will be assigned based on participation in a survey, the Student Assessment of Learning Gains (SALG). Grades on the SALG will be based solely on completion.

Your Final Grade:

Your final grade will be based on the percentage of the 630 points that you earn during the course of the semester as described above. Please note that we do not grade the course on a curve and Carmen does not round averages up to the next nearest percentage point, so 92.11% and 92.97% both earn the grade of A-. Final letter grades will be determined by the grade scale below:

Grade Scale:

A	A-	B+	B	B-	C+	C	C-	D+	D	E
100 – 93.0%	92.9 – 90.0%	89.9 – 87.0%	86.9 – 83.0%	82.9 – 80.0%	79.9 – 77.0%	76.9 – 73.0%	72.9 – 70.0%	69.9 – 67.0%	66.9 – 60.0%	59.9 – 0%

Posting of Grades:

All grades will be posted on Carmen. After grades are posted you have 10 working days to challenge any grade or inquire regarding an unposted or missing grade. **After that time, grades are final.** To challenge or inquire about a missing grade, contact your laboratory instructor.

*****IMPORTANT*****

Make sure that all of your grades are properly posted on Carmen as you receive them. Challenges about grades, particularly after the end of the semester, will not be entertained after the 10-day grace period.

Late Assignments:

All assignments are due on the date and time prescribed in the course schedule. Late work will not be accepted except in rare (and documentable) circumstances.

Absences:

If you are too ill to take an exam or must miss for another legitimate unscheduled reason, you must contact the Course Coordinator within 24 hours of the exam. Make up exams will be given only to students who produce, at the make up or before, documentation of a legitimate reason (at the time of the absence) for missing the exam. Valid excuses are limited to problems that are beyond the student's control, such as military duty, intercollegiate athletic or academic activities, funerals, etc. Medical excuses will be considered only if you have been treated by a medical professional on the day of the exam (excuses from the student health center website will not be accepted). Lack of transportation, loss of electricity, travel plans, etc. are not considered valid excuses. If you anticipate having to miss an exam due to attendance at a university sanctioned event or other qualifying conflict, you must contact the Course Coordinator at least one week in advance of the exam.

If you have no documentation to support your absence, or your absence from the exam is not for an excused reason, you will still be offered the opportunity for a makeup exam, with a 25% overall deduction on your exam score if arrangements are made within 24 hours of the original exam.
The format of makeup exams is at the discretion of the instructors. All makeup exams must be made up within one week of when the original exam was given.

Note: Check the date and time of the final examination now and make sure that this time does not conflict with your future plans. No early final exams will be given. The only makeup exam will be held on Wednesday, December xx at 9:00 a.m. and is available only in emergency situations and with prior approval of the Course Coordinator.

Make-Up Workshops and Lecture Activities: Both the lecture and workshop are integral parts of this course. If you miss a class, you must contact your instructor (lecture or workshop, as appropriate) within 48 hours of their missed class in order to be eligible to complete a make-up assignment. All make-up work requires a valid written excuse from a doctor, therapist, athletic coach, or other person involved with the absence (preferably before the event occurs, if it's a planned absence). We will consider one absence for every student to be excused without documentation, however students must contact their instructor within **48 hours** of their missed workshop to receive the make-up exercise. Therefore, it is essential that you contact your instructor immediately if you miss a workshop, or if you know in advance that you cannot attend class on a specific date.

Make-up work must be completed and received within one week of the original assignment date (unless very unusual circumstances apply), or else you forfeit all points for that workshop.

Excused absences include, but are not limited to:

1. Illness and injury
2. Mental health
3. Disability-related concerns
4. Military service
5. Death in the immediate family
6. Religious observance
7. Academic field trips
8. Participation in university sanctioned concert or athletic event
9. Participation in university disciplinary hearings

If you have a reason to miss class that is not listed above, please reach out to the instructor to discuss your options. It is the intention of the Center for Life Sciences Education to remain supportive of the needs of each of our students. Students who do not contact their instructor within 48 hours of the missed class will not be eligible for make-up work.

PLTL Workshop, Assignments, and Grading Policy

Each week in PLTL, you will work with 7-10 other students in your course to solve carefully designed biology problems with the help of a peer leader. Your peer leader is an undergraduate student who previously excelled in Biology and has been trained to facilitate collaborative problem-solving. The work you do in PLTL each week will be integrated with your lecture and laboratory activities, and vice versa.

PLTL Learning Outcomes: In addition to achieving the Biology 1111 learning outcomes in PLTL, students in PLTL can expect to:

1. Develop and strengthen a suite of logical problem-solving skills including scientific argumentation, metacognitive thinking, and creative thinking
2. Develop and strengthen skills necessary for success in the sciences such as communication, collaboration, and conflict resolution
3. Learn to more accurately self-evaluate their course content mastery and learning achievements
4. Learn to effectively identify and achieve personalized learning goals

PLTL Attendance Policy

- Attendance to PLTL workshops is REQUIRED.
  - If you miss more than 2 unexcused workshops, then your final grade will drop by 1/3rd of a letter grade.
    - Example: Final grade will change from B- to C+.
  - If you miss 5 or more unexcused workshops, then your final grade will drop by 2/3rds of a letter grade
    - Example: Final grade will change from B- to C.
- If you are absent or know ahead of time that you will be absent to a workshop, contact your Peer Leader or Dr. O'Brien (obrien.501@osu.edu) as soon as possible to discuss whether your absence is excusable.
  - Connecting to your workshop through Zoom is an option, but you must contact your peer leader as soon as possible to set up the Zoom meeting.
- We will automatically drop the lowest score for each type of assignment (pre-workshop, workshop, and post-workshop).
  - There are no make-up assignments for missed PLTL workshops, regardless of whether the absence is considered excused or unexcused.
- PLTL workshops will start during Week 2 of the semester.

Disability Services:

The university strives to maintain a healthy and accessible environment to support student learning in and out of the classroom. If you anticipate or experience academic barriers based on your disability (including mental health, chronic, or temporary medical conditions), please let us know immediately so that we can privately discuss options. To establish reasonable accommodations, we may request that you register with Student Life Disability Services. After registration, make arrangements with the Course Coordinator as soon as possible to discuss your accommodations so

that they may be implemented in a timely fashion. Only the course coordinator is authorized to complete SLDS accommodations. This will help us ensure that your individual needs will be met appropriately and fairly. SLDS contact information: slds@osu.edu; 614-292-3307; slds.osu.edu; 098 Baker Hall, 113 W. 12th Avenue.

If you are isolating while waiting for a COVID-19 test result, please let me know immediately. Those testing positive for COVID-19 should refer to the Safe and Healthy Buckeyes site for resources. Beyond five days of the required COVID-19 isolation period, I may rely on Student Life Disability Services to establish further reasonable accommodations. You can connect with them at slds@osu.edu; 614-292-3307; or slds.osu.edu.

Religious Accommodations:

Ohio State has had a longstanding practice of making reasonable academic accommodations for students' religious beliefs and practices in accordance with applicable law. In 2023, Ohio State updated its practice to align with new state legislation. Under this new provision, students must be in early communication with their instructors regarding any known accommodation requests for religious beliefs and practices, providing notice of specific dates for which they request alternative accommodations within 14 days after the first instructional day of the course. Instructors in turn shall not question the sincerity of a student's religious or spiritual belief system in reviewing such requests and shall keep requests for accommodations confidential.

With sufficient notice, instructors will provide students with reasonable alternative accommodations with regard to examinations and other academic requirements with respect to students' sincerely held religious beliefs and practices by allowing up to three absences each semester for the student to attend or participate in religious activities. Examples of religious accommodations can include, but are not limited to, rescheduling an exam, altering the time of a student's presentation, allowing make-up assignments to substitute for missed class work, or flexibility in due dates or research responsibilities. If concerns arise about a requested accommodation, instructors are to consult their tenure initiating unit head for assistance.

A student's request for time off shall be provided if the student's sincerely held religious belief or practice severely affects the student's ability to take an exam or meet an academic requirement and the student has notified their instructor, in writing during the first 14 days after the course begins, of the date of each absence. Although students are required to provide notice within the first 14 days after a course begins, instructors are strongly encouraged to work with the student to provide a reasonable accommodation if a request is made outside the notice period. A student may not be penalized for an absence approved under this policy.

If students have questions or disputes related to academic accommodations, they should contact their course instructor, and then their department or college office. For questions or to report discrimination or harassment based on religion, individuals should contact the Office of Institutional Equity.

Policy: Religious Holidays, Holy Days and Observances

Weather or Other Short-Term Closing:

Should in-person classes be canceled, students will be notified as to which alternative methods of teaching will be offered to ensure continuity of instruction for this class. Communication will be via Carmen announcements and course-wide email.

Section Changes:

All section changes and adds are completed by the course coordinator. Due to the need to keep up-to-minute availability of seats in each workshop, the lecturer and workshop instructors are unable to sign any permission forms.

Instructor Feedback and Response Expectations

- **Email response**: The CLSE's expectation of instructors is that emails will be responded to within one business day. If your email is sent during the evening or over the weekend, you may not receive a response until the next business day.
- **Class announcements**: I will send important class-wide messages through the Announcements tool in Carmen. Please check your notification preferences (go.osu.edu/canvas-notifications) to ensure you receive these messages.
- **Graded assignments:** Assignments will be graded and returned to you within one week after they were due. All scores are posted on Carmen no later than the day the graded assignment is returned.

Course Technology

For help with your password, university e-mail, Carmen, or any other technology issues, questions, or requests, contact the OSU IT Service Desk. Standard support hours are available at https://ocio.osu.edu/help/hours, and support for urgent issues is available 24x7.

- **Self-Service and Chat support:** http://ocio.osu.edu/selfservice
- **Phone:** 614-688-HELP (4357)
- **Email:** 8help@osu.edu
- **TDD:** 614-688-8743

Carmen

- Carmen, Ohio State's Learning Management System, will be used to host materials and activities throughout this course. To access Carmen, visit Carmen.osu.edu. Log in to Carmen using your name.# and password. If you have not setup a name.# and password, visit my.osu.edu.
- Help guides on the use of Carmen can be found at https://resourcecenter.odee.osu.edu/carmen
- **This online course requires use of Carmen (Ohio State's learning management system) and other online communication and multimedia tools. If you need additional services to use these technologies, please request accommodations with your instructor.**
- Carmen accessibility

CarmenZoom

- Office hours will be held through Ohio State's conferencing platform, CarmenZoom. A separate guide to accessing CarmenZoom and our office hours is posted on the course Carmen page under Files.
- Students may use the audio and video functions if a webcam and microphone are available. If not, there is still a chat function within CarmenZoom for the student to live chat with the professor or TA in the virtual office hours room.
- Carmen Zoom help guide

TurnItIn

- Students at The Ohio State University are accountable for the integrity of the work they submit. Therefore, you should be familiar with the guidelines provided by the Committee on Academic Misconduct (COAM) and Section A of OSU's Code of Student Conduct in order to meet the academic expectations concerning appropriate documentation of sources. In addition, OSU has made TurnItIn, a learning tool and plagiarism prevention system, available to instructors. For this

class, you will submit your papers to TurnItIn from Carmen. When grading your work, I will interpret the originality report, following Section A of OSU's Code of Student Conduct as appropriate. For more information about TurnItIn, please see the vendor's guide for students. Note that submitted final papers become part of the OSU database.

- Please know that I view TurnItIn first and foremost as a teaching tool to make you a better writer. You will see in your individual originality reports exactly what the instructors see. We WANT you to look at this report as soon as you submit your assignments. If you see an issue, please correct it right away, before we start grading the assignment. You can resubmit without penalty as many times as you want prior to the established due date for any assignment. After the due date, the late policy is in effect.

TopHat

- TopHat is a web-based response system that allows students to use their own devices provide responses in the classroom. This course uses Top Hat to promote active engagement, allow for synchronous feedback, and monitor attendance.
- TopHat help guide

Discussion and Communication Guidelines

The following are expectations for how we should communicate as a class. Above all, please remember to be respectful and thoughtful.

- **Tone and civility**: Let's maintain a supportive learning community where everyone feels safe and where people can disagree amicably. Remember that sarcasm doesn't always come across online and is not always appreciated in-person. The instructional team work very hard to provide a positive learning experience. Please keep this in mind and remain civilized and respectful in your class communications.
- **Citing your sources**: When we have academic discussions, please cite your sources to back up what you say.

Issue Resolution:

The CLSE believes that student concerns are usually most effectively addressed by the staff closest to the situation. Therefore, students are ordinarily expected to address issues or concerns first with their instructors. If the issue cannot be resolved by your instructor, or for some reason you feel that you absolutely cannot address your concern with your instructor, please feel free to contact the Course Coordinator or Assistant Director Adam Andrews (andrews.171@osu.edu).

Building Emergency Action Plan:

Each building on campus has a Building Emergency Action Plan (BEAP) outlining that specific building's specific procedures to be followed in the event of a range of emergency situations, including fire, weather, terrorism, chemical spills, etc. It is the role of every Buckeye to help keep each other safe and to be aware of these procedures. You can find all of the campus BEAPs at https://dps.osu.edu/beap.

Lyft Ride Smart:

Lyft Ride Smart at Ohio State offers eligible students discounted rides, inside the university-designated service area, from 7 p.m. to 7 a.m. Prices may be impacted by distance, traffic, time of day, special events and prime time surcharges. To qualify for program discounts, users must select "shared ride" when booking in the Lyft app. For more information, visit: https://ttm.osu.edu/ride-smart.

Mental Health:

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 a student's ability to participate in daily activities. The Ohio State University offers services to assist you with addressing these and other concerns you may be experiencing. If you or someone you know are

suffering from any of the aforementioned conditions, you can learn more about the broad range of confidential mental health services available on campus via the Office of Student Life's Counseling and Consultation Service (CCS) by visiting ccs.osu.edu or calling 614-292-5766. CCS is located on the 4th Floor of the Younkin Success Center and 10th Floor of Lincoln Tower. You can reach an on call counselor when CCS is closed at 614-292-5766 and 24 hour emergency help is also available 24/7 by dialing 988 to reach the Suicide and Crisis Lifeline.

Title IX:

Title IX makes it clear that violence and harassment based on sex and gender are Civil Rights offenses subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories (e.g., race). If you or someone you know has been sexually harassed or assaulted, you may find the appropriate resources at http://titleix.osu.edu or by contacting the Ohio State Title IX Coordinator at titleix@osu.edu.

Diversity:

The Ohio State University affirms the importance and value of diversity in the student body. Our programs and curricula reflect our multicultural society and global economy and seek to provide opportunities for students to learn more about persons who are different from them. We are committed to maintaining a community that recognizes and values the inherent worth and dignity of every person; fosters sensitivity, understanding, and mutual respect among each member of our community; and encourages each individual to strive to reach his or her own potential. Discrimination against any individual based upon protected status, which is defined as age, color, disability, gender identity or expression, national origin, race, religion, sex, sexual orientation, or veteran status, is prohibited.

Academic Misconduct:

It is the responsibility of the Committee on Academic Misconduct to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term "academic misconduct" includes all forms of student academic misconduct wherever committed, illustrated by, but not limited to, cases of plagiarism and dishonest practices in connection with examinations. Instructors report all instances of alleged academic misconduct to the committee (Faculty Rule 3335-5-487). For additional information, see the Code of Student Conduct http://studentlife.osu.edu/csc/. We will adhere to this policy.

- Unless otherwise specified for a particular assignment, all submitted work should be a student's own unique effort. Collaborative efforts are not permitted unless expressly sanctioned for a particular assignment.
- Unless otherwise specified for a particular assignment, use of AI-generated materials for course submissions is not permitted.
- Reusing past work: In general, you are prohibited in university courses from turning in work from a past class to your current class, even if you modify it. If you want to build on past research or revisit a topic you've explored in previous courses, please discuss the situation with me.
- Using others' verbatim words without the use of quotation marks *and* citation is plagiarism. Paraphrased work requires citation to denote the use of others' ideas. Copying other's words without quotation while using citations is still considered plagiarism.
- Use of any technology during a quiz or exam (including but not limited to cell phones, smart watches, headphones, electronic dictionaries, etc.) is strictly prohibited.

Copyrighted Class Materials:

Course Schedule: Autumn 2025

Schedule and assignments subject to change with as much advance notice as possible

Week	Lecture Topic	PLTL Workshop	Assignments Due
1	Course Intro and Ch1 – Biology the Study of Life	None	
2	Ch1 (cont.) and Ch2 – Chemistry of Atoms and Bonding and Properties of Water	Intro to PLTL & Metacognition	HW1 due Sunday
3	Ch2 – Chemical Reactions and Biological Molecules	Scientific Method	HW2 due Sunday
4	Ch3 – Protein Structure and Function	Biochemistry/Molecules	**Quiz 1 (Ch1-3) open Tues-Fri** HW3 due Sunday
5	Ch4 – Nucleic Acid Structure and Function	RNA World	HW4 due Sunday
6	Ch5 – Carbohydrate Structure and Function	Macromolecules in Food	HW5 due Sunday
7	Ch6 – Lipid Structure and Function and the Cell Membrane	Exam Review	**Quiz 2 (Ch4-6) open Tues-Fri** HW6 due Sunday
8	Ch6 (cont.) and **Midterm Exam (Chapters 1-6)**	None	HW7 due Sunday
9	Ch7 – Cell Parts and Functions	Exam Wrapper & Metacognition	
10	Ch7 – Cell Systems	Cells and Organelles Pt1	HW8 due Sunday
11	Ch11 – Cell Signaling	Cells and Organelles Pt2	HW9 due Sunday
12	Ch8 – Energy and Enzymes	Cell Signaling	**Quiz 3 (Ch7,11) open Tues-Fri** HW10 due Sunday
13	Ch9 – Cellular Respiration	Cell Respiration	HW11 due Sunday
14	Ch9 (cont.) and Ch10 – Photosynthesis	Photosynthesis	
15	Ch10 (cont.)	Exam Review	**Quiz 4 (Ch 8-10) open Tues-Fri** HW12 due Sunday
Finals	**Final Exam**		

Appendix B: Biology 1112 Syllabus

THE OHIO STATE UNIVERSITY

Biology 1112
Biological Foundations 2: Molecular Machinery & Genetics
Autumn 2025 – 4 Credit Hours

Lecturer:
Email:
Office:
Student Hours:
other times scheduled by appointment

Course Coordinator:
Center for Life Sciences Education
Email:
Office:
Phone:

Class Meeting Schedule:
Lecture: Twice Weekly for 55 minutes
Laboratory: Once weekly for 165 minutes; *consult your BuckeyeLink schedule for specific time and day*
PLTL Workshop: Once weekly for 80 minutes; *consult your BuckeyeLink schedule for specific time and day*

Prerequisites:
1111; Coreq: Math 1048. Not open to students with credit for 1113x

Required Course Materials:
- Biological Science (8th Edition), 2024, by Freeman et al. ISBN: **978-0138224028.**
- Biology 1112 Laboratory Manual

Credit Hours and Work Expectation:
This is a 4-credit-hour laboratory course. According to Ohio State policy, students should expect around 6 hours per week of time spent on direct instruction in addition to 6 hours of homework to receive a grade of C average. *ASC Honors* provides an excellent guide to scheduling and study expectations.

Course Description:
An introductory exploration of life's cellular and genetic mechanisms, molecular biology, and metacognitive strategies. Includes a required weekly Peer Led Team Learning Workshop. Intended for student Majoring in STEM fields. Combined with Bio 1111, these courses will address content at similar depth and breadth as Bio 1113x.

General Education Natural Science (GEN) Expected Learning Outcomes
Students who successfully complete this course will fulfill the following GE Natural Science learning outcomes:

Foundations: Foundations: Natural Sciences	
Goals	**Expected Learning Outcomes**
GOAL 1: Successful students will engage in theoretical and empirical study within the natural sciences, while gaining an appreciation of the modern principles, theories, methods, and	**Successful students are able to …** **1.1** Explain basic facts, principles, theories and methods of modern natural sciences; describe and analyze the process of scientific inquiry.

modes of inquiry used generally across the natural sciences.	**1.2** Identify how key events in the development of science contribute to the ongoing and changing nature of scientific knowledge and methods.
	1.3 Employ the processes of science through exploration, discovery, and collaboration to interact directly with the natural world when feasible, using appropriate tools, models, and analysis of data
GOAL 2: Successful students will discern the relationship between the theoretical and applied sciences, while appreciating the implications of scientific discoveries and the potential impacts of science and technology.	**2.1** Analyze the inter-dependence and potential impacts of scientific and technological developments
	2.2 Evaluate social and ethical implications of natural scientific discoveries.
	2.3 Critically evaluate and responsibly use information from the natural sciences.

General Education Natural and Biological Science (GEL) Goals & Objectives

Goals/Rationale: Courses in natural sciences foster an understanding of the principles, theories and methods of modern science, the relationship between science and technology, and the effects of science and technology on the environment.

1. Students understand the basic facts, principles, theories and methods of modern science.
2. Students understand key events in the development of science and recognize that science is an evolving body of knowledge.
3. Students describe the inter-dependence of scientific and technological developments.
4. Students recognize social and philosophical implications of scientific discoveries and understand the potential of science and technology to address problems of the contemporary world.

In Biology 1112, students meet the GEN Foundations: Natural Sciences Learning Objectives in multiple ways. The course (especially when combined with Biology 1111 & 1114) is an in-depth study of the basic facts, principles, theories, and interrelationships within biology. Students gain an understanding of the foundations of modern biology by studying life, cell structure and function, bioenergetics, and genetics. Students explore the nonlinear process of science and how science relates and applies to contemporary issues and ethics. During the laboratory activities, students not only apply the biological concepts introduced in lecture, but also learn scientific reasoning and methods, collect and analyze qualitative and quantitative data, and practice scientific literacy and communication. While attaining these learning objectives students will gain an appreciation of the implications and impacts of scientific discoveries on science and technology.

Course Learning Outcomes:

Successful students will be able to…

1. The Cell
    a. explain the mechanisms and structures involved in mitotic and meiotic cell division and explain the different roles for and consequences of each.
    b. describe the functionality of cellular control mechanisms.
        i. describe how the loss/failure of cellular control mechanisms can lead to disease.
        ii. describe how genotypes and the environment influence the genetics of cancer.
2. Genetics
    a. explain the transfer and modification of heritable traits from parents to offspring via Mendelian inheritance.
    b. apply principles of Mendelian and non-Mendelian genetics to predict the outcomes of a variety of genetic crosses.
    c. explain the basis of and identify examples of non-Mendelian patterns of inheritance.
    d. describe the nature and expression of heritable information at the molecular level, including:

the Central Dogma, DNA replication, transcription, protein synthesis (translation).
    e. explain how gene expression is controlled in prokaryotes and eukaryotes (at transcription, post-transcription, translation, and post-translation levels).
    f. identify mutations in DNA and assess their impact on gene expression and diversity.
    g. explain chromatin structure, the histone code, and epigenetic inheritance.
    h. explain how differential gene expression relates to organismal development, including cellular reproduction, growth, and differentiation
    i. describe characteristics of viruses and bacteria (e.g., life history, genome type and content, exchange of genetic material).
    j. describe the experimental basis and select applications of recombinant DNA technology, including gene cloning, genetically modified organisms (GMOs), and gene editing (CRISPR)
3. Nature of biological science and society
    a. describe the development and evaluation of scientific explanations of natural phenomena.
    b. apply biological concepts in the assessment of contemporary issues.
    c. reflect on ethical implications of emerging biotechnology.
    d. explain how evolution accounts for the unity and diversity of life.
4. Skills & Competencies
    a. Process of Science
        i. apply the process of science to research questions, presented scenarios, historical experiments, and course lab experiments.
        ii. design an experiment
        iii. collect and organize both qualitative and quantitative data.
        iv. support or refute an argument or conclusion using experimental results.
    b. Scientific Communication
        i. refer to primary literature articles using proper paraphrasing and citation (compare and contrast primary, secondary, etc).
        ii. create properly formatted graphs, figures, and tables using data.
        iii. analyze and interpret qualitative and quantitative data
        iv. create discipline-appropriate documents (poster, presentation, or paper).
        v. identify plagiarism and avoid plagiarizing when writing.
    c. Literature
        i. evaluate the quality and accuracy of a written source.
        ii. locate scholarly articles using electronic databases.
        iii. distinguish between primary literature, secondary literature, and content created for mass media.
    d. Laboratory
        i. employ safe laboratory practices.
        ii. use a compound light microscope to view microorganisms; maintain microscope cleanliness.
        iii. use a pipette to measure small volumes.
        iv. understand the key steps and reagents in PCR.
        v. explain how gel electrophoresis works and interpret DNA separation on a gel.
        vi. prepare a dilution series.
        vii. demonstrate the ability to work effectively as a team.
    e. Metacognition
        i. determine effective study strategies to better prepare for assessments.
        ii. evaluate the effectiveness of study strategies and modify them as needed.

Grading and Evaluation:

Graded assignments may come in three forms, and students should note the expectations for each in the descriptions of our class assignments below:

- **Independent Work ( )**: Strictly non-collaborative, original-individual work. You may discuss this assignment only with your instructor. Discussions with other individuals, either in person or electronically, are strictly prohibited and constitute academic misconduct.
- **Required Collaboration ( )**: An explicit expectation for collaboration among students either in-class or outside (i.e., group work).
- **Optional Collaboration ( )**: Students are permitted, but not required, to discuss the assignment or ideas with each other. However, all submitted work must be one's original and individual creation.

Assignment	Points	Assignment Type
Midterm Exam	100	
Final Exam	100	
Quizzes (4 @ 25 pts)	100	
Mastering Biology Homework	100	
Top Hat	75	
In-class Activities	50	
SALG	5	
Lab Assignments	265	
PLTL Workshops (10 @ 10 pts)	100	
Total Points Possible	**905**	

Exams (200 points):

There will be one midterm exam during class at the midpoint of the semester and one final exam during finals week following the semester. The final exam will only cover material following the midterm exam. Material will be drawn from the lectures, lecture activities, Mastering Biology assignments, and Quizzes. All questions will be multiple-choice style and will focus on application of the course material.

Quizzes (100 points):

There will be four 25-point quizzes evenly distributed throughout the semester, with the purpose of providing students practice opportunities for the exams. Quizzes will be taken outside of class but must be completed individually. Quizzes will be available over a three-day period, but each quiz is timed and must be completed in one session. Questions will be short-answer style and will focus on application of the course material.

Mastering Biology homework (100 points):

Weekly homework assignments will be available within Mastering Biology. Each weekly assignment will become available one week in advance and must be completed by Sunday evening at 11:59PM (see lecture schedule for exact dates). Mastering Biology assignments are designed to reinforce material covered in lecture throughout the week and may require you to apply and synthesize material learned throughout previous weeks. Most assignments will take 45-60 minutes to complete and can be worked on incrementally. Plan in advance– loss of power or internet access is not an excuse for a makeup or extension. Additional optional Mastering Biology assignments (ungraded) will also be available throughout the semester. The percentage of points you earn within Mastering Biology throughout the semester will be converted to course points at the end of the semester. (e.g. 100% in Mastering = 100 points).

Top Hat (75 points):

Top Hat questions will be administered in every lecture throughout the semester. Questions will typically be worth 1 point each, graded for participation, correctness, or a combination of both.

Proper registration is required prior to the second lecture of the semester. At least 90 total questions will be administered, providing ample leeway in earning the total points. As such, no make-up opportunities will be available for missed lectures or nonfunctional technology. Points will be updated on Carmen at the end of the semester. Prior to that, current points can always be viewed in the Top Hat gradebook.

In-class Activities (50 points):

During most lectures throughout the semester, we will complete various additional learning activities that either provide extra practice on lecture material or are designed to enhance scientific literacy. Selected activities will be submitted to Carmen and graded for participation, correctness, or a combination of both. All graded activities must be submitted to Carmen individually, but you may work on them with other students in the class. You will be given until 11:59PM the day the activity is assigned to complete it and turn it in. No make-up opportunities will be available for missed lecture activities, but more than 50 total points will be available throughout the semester.

Laboratory/Recitation Assignments (265 points):

The laboratory portion of this course is integral to the learning experience and **is mandatory**. The laboratory experience includes a combination of both inquiry-based traditional labs and a DNA Barcoding Course Based Undergraduate Research Experience (CURE). The DNA Barcoding CURE is an authentic research project in which students collect live specimens, characterize them using common genetic research techniques, and ultimately submit the results to a public database. You must come prepared to all lab sessions. This includes wearing appropriate clothing and footwear, having completed the pre-lab assignment, and having read and understood the lab you will be conducting that day. (See schedule below, as labs are not in the same order that they appear in the lab manual)

Pre-lab assignments (11 @ 2pts each):

Most labs will have a pre-lab that must be submitted on Carmen by the start of the lab period. These questions may be answered using your lab manual and any provided materials. Once laboratory has begun, no further pre-lab activities will be accepted.

Lab Assignments/Exercises (11 @ 10-15 pts each):

Students will complete lab exercises in cooperative groups, based on the lab manual and other lab exercises related to the DNA Barcoding project. All group members are expected to contribute equally. Groups are required to turn in one lab summary. All lab group members will receive the same score for each graded lab summary as long as all members participated equally in the work each day. Not contributing equally may result in loss of some or all credit for a lab. These lab summaries are due by 1 hour after the end of the lab period unless otherwise stated in the syllabus or announced by your Lab Instructor.

Lab Quizzes (30 pts) and Lab Exam (40pts):

The lab quizzes and exams will be taken individually, not as part of your lab group. Lab quizzes and the lab exam will be administered at the beginning of lab/recitation on the days listed in the schedule below.

DNA Barcoding Poster (40pts):

Students will work in groups to design and present a poster on their findings throughout the DNA Barcoding CURE, including methods used, results obtained, and discussion and interpretation of results. This research-style poster is intended to provide students experience with authentic scientific communication. The poster project and associated assignments are explained in detail in the Research Poster Guidelines document on Carmen and will be discussed by your instructor in lab.

PLTL Activities (100 points):

In total, there are 10 PLTL workshops throughout the semester. Each workshop consists of 3 activities, a pre-workshop, workshop, and post-workshop activities. In preparation for PLTL workshops, there is an assignment "Introduction to Peer-led Team Learning (PLTL)" (worth 10 points) to be completed by the end of week 1.

1. Pre-workshop activities (2.5 pts each) → Due before the start of workshop. These should be submitted individually to Carmen.
2. Workshop activities (5 pts each) → Completed as a group during the PLTL workshop session. Students will submit their answer sheets to Carmen at the end of their workshop. Note: If you are more than 20 minutes late to the workshop, you will not be permitted to attend and will be marked absent.
3. Post-workshop activities (2.5 pts each) → Due by Sunday at 11:59 pm following the workshop and submitted individually to Carmen. This activity includes reflecting on the knowledge gained in the workshop, identifying knowledge still desired, and an extension of the workshop material. **Note: You must attend the workshop in order to earn credit for completing the post-workshop assignment.**

SALG (5 points):

At the end of the course, 5 points will be assigned based on participation in a survey, the Student Assessment of Learning Gains (SALG). Grades on the SALG will be based solely on completion.

Your Final Grade:

Your final grade will be based on the percentage of the 895 points that you earn during the course of the semester as described above. Please note that we do not grade the course on a curve and Carmen does not round averages up to the next nearest percentage point, so 92.11% and 92.97% both earn the grade of A-. Final letter grades will be determined by the grade scale below:

Grade Scale:

A	A-	B+	B	B-	C+	C	C-	D+	D	E
100 – 93.0%	92.9 – 90.0%	89.9 – 87.0%	86.9 – 83.0%	82.9 – 80.0%	79.9 – 77.0%	76.9 – 73.0%	72.9 – 70.0%	69.9 – 67.0%	66.9 – 60.0%	59.9 – 0%

Posting of Grades:

All grades will be posted on Carmen. After grades are posted you have 10 working days to challenge any grade or inquire regarding an unposted or missing grade. **After that time, grades are final.** To challenge or inquire about a missing grade, contact your laboratory instructor.

*****IMPORTANT*****

Make sure that all of your grades are properly posted on Carmen as you receive them. Challenges about grades, particularly after the end of the semester, will not be entertained after the 10-day grace period.

Late Assignments:

All assignments are due on the date and time prescribed in the course schedule. Late work will not be accepted except in rare (and documentable) circumstances.

Absences:

If you are too ill to take an exam or must miss for another legitimate unscheduled reason, you must contact the Course Coordinator within 24 hours of the exam. Make up exams will be given only to students who produce, at the make up or before, documentation of a legitimate reason (at the time of the absence) for missing the exam. Valid excuses are limited to problems that are beyond the student's control, such as military duty, intercollegiate athletic or academic activities, funerals, etc. Medical excuses will be considered only if you have been treated by a medical professional on the day of the exam (excuses from the student health center website will not be accepted). Lack of transportation, loss of electricity, travel

plans, etc. are not considered valid excuses. If you anticipate having to miss an exam due to attendance at a university sanctioned event or other qualifying conflict, you must contact the Course Coordinator at least one week in advance of the exam.

If you have no documentation to support your absence, or your absence from the exam is not for an excused reason, you will still be offered the opportunity for a makeup exam, with a 25% overall deduction on your exam score if arrangements are made within 24 hours of the original exam.
The format of makeup exams is at the discretion of the instructors. All makeup exams must be made up within one week of when the original exam was given.

Note: Check the date and time of the final examination now and make sure that this time does not conflict with your future plans. No early final exams will be given. The only makeup exam will be held on Wednesday, December xx at 9:00 a.m. and is available only in emergency situations and with prior approval of the Course Coordinator.

Make-Up Workshops and Lecture Activities: Both the lecture and workshop are integral parts of this course. If you miss a class, you must contact your instructor (lecture or workshop, as appropriate) within 48 hours of their missed class in order to be eligible to complete a make-up assignment. All make-up work requires a valid written excuse from a doctor, therapist, athletic coach, or other person involved with the absence (preferably before the event occurs, if it's a planned absence). We will consider one absence for every student to be excused without documentation, however students must contact their instructor within 48 **hours** of their missed workshop to receive the make-up exercise. Therefore, it is essential that you contact your instructor immediately if you miss a workshop, or if you know in advance that you cannot attend class on a specific date.

Policies for lab absences are detailed below in the Lab Policies section.

Make-up work must be completed and received within one week of the original assignment date (unless very unusual circumstances apply), or else you forfeit all points for that workshop.

Excused absences include, but are not limited to:

2. Illness and injury
3. Mental health
4. Disability-related concerns
5. Military service
6. Death in the immediate family
7. Religious observance
8. Academic field trips
9. Participation in university sanctioned concert or athletic event
10. Participation in university disciplinary hearings

If you have a reason to miss class that is not listed above, please reach out to the instructor to discuss your options. It is the intention of the Center for Life Sciences Education to remain supportive of the needs of each of our students. Students who do not contact their instructor within 48 hours of the missed class will not be eligible for make-up work.

PLTL Workshop, Assignments, and Grading Policy

Each week in PLTL, you will work with 7-10 other students in your course to solve carefully designed biology problems with the help of a peer leader. Your peer leader is an undergraduate student who previously excelled in Biology and has been trained to facilitate collaborative problem-solving. The work you do in PLTL each week will be integrated with your lecture and laboratory activities, and vice versa.

PLTL Learning Outcomes: In addition to achieving the Biology 1112 learning outcomes in PLTL, students in PLTL can expect to:

1. Develop and strengthen a suite of logical problem-solving skills including scientific argumentation, metacognitive thinking, and creative thinking
2. Develop and strengthen skills necessary for success in the sciences such as communication, collaboration, and conflict resolution
3. Learn to more accurately self-evaluate their course content mastery and learning achievements
4. Learn to effectively identify and achieve personalized learning goals

PLTL Attendance Policy

- Attendance to PLTL workshops is REQUIRED.
  - If you miss more than 2 unexcused workshops, then your final grade will drop by 1/3rd of a letter grade.
    - Example: Final grade will change from B- to C+.
  - If you miss 5 or more unexcused workshops, then your final grade will drop by 2/3rds of a letter grade
    - Example: Final grade will change from B- to C.
- If you are absent or know ahead of time that you will be absent to a workshop, contact your Peer Leader or Dr. O'Brien (obrien.501@osu.edu) as soon as possible to discuss whether your absence is excusable.
  - Connecting to your workshop through Zoom is an option, but you must contact your peer leader as soon as possible to set up the Zoom meeting.
- We will automatically drop the lowest score for each type of assignment (pre-workshop, workshop, and post-workshop).
  - There are no make-up assignments for missed PLTL workshops, regardless of whether the absence is considered excused or unexcused.
- PLTL workshops will start during Week 2 of the semester.

Lab Policies

Laboratory and Recitation: Laboratory and recitation are an integral part of course. They are designed to complement as well as supplement the lecture. You may first encounter something in lab before you have it in lecture or vice versa. It is expected that you come prepared to lab having read the chapter in the lab manual that will be presented. Labs do not necessarily go in the order presented in the manual—check the schedule on the syllabus. Recitation is a scheduled opportunity for students to ask questions and have concepts and information clarified by the TA. Students should be prepared with questions about lecture and/or lab. Make the most of recitation by bringing your lecture notes to lab and taking additional notes over material presented by the TA.

Lab Safety: Eating, drinking, and the use of cell phones (including text messaging) are all prohibited in the lab room. Open-toe shoes and flip-flops cannot be worn in the lab room.

Lab Worksheets: All Pre-lab assignments are due in Carmen BEFORE your lab starts.
The lab worksheets are typically due 48 hours after lab is held (48hrs after your lab's start time). Worksheets submitted late will be penalized 25% of the worksheet's total points per 24-hr period starting immediately after the deadline (**0-24 hours late** – 25%; **24-48 hours** – 50%, **48-72 hours** – 75%; **72+ hours** – 0 points earned). Lab worksheets are typically submitted as a group, and always to the appropriate assignment in Carmen.

Lab Quizzes: Quizzes will be administered on paper at the start of lab by your TA (10 pts each). The lowest score is dropped.

Missed Labs: Lab is an integral part of this course. If you miss a lab, you must contact your lab instructor within **48 hours** of the missed lab to be eligible to complete a make-up assignment. All make-up work requires a **valid written excuse** from a doctor, therapist, athletic coach, or other personnel involved with the absence (preferably *before* the event occurs, if it's a planned absence).

Make-up lab work must be completed and received before the start time of the next lab period, or else you forfeit all points for that lab.
Anyone who misses three or more labs/recitations (excused or unexcused) in a given semester will receive a failing grade for the course.

Excused absences include, but are not limited to: Illness and injury, mental health, disability-related concerns, military service, death in the immediate family, religious observance, academic field trips, participation in university sanctioned concerts or athletic events, participation in university disciplinary hearings.
If you have a reason to miss lab that is not listed above, please reach out to the lab or lecture instructor to discuss your options. It is the intention of the Center for Life Sciences Education to remain supportive of the needs of each of our students.

You are expected to attend each lab for the *full lab period:**

- If you arrive 15 minutes late or more, you will be considered absent.
- Students who are less than 15 minutes late to lab/recitation repeatedly (3+) will have one absence counted toward the lab attendance (failure) policy.

****Class scheduling conflicts (e.g., inadequate transit times) are not valid excuses to arrive late to lab and/or to leave lab early.***

Disability Services:

The university strives to maintain a healthy and accessible environment to support student learning in and out of the classroom. If you anticipate or experience academic barriers based on your disability (including mental health, chronic, or temporary medical conditions), please let us know immediately so that we can privately discuss options. To establish reasonable accommodations, we may request that you register with Student Life Disability Services. After registration, make arrangements with the Course Coordinator as soon as possible to discuss your accommodations so that they may be implemented in a timely fashion. Only the course coordinator is authorized to complete SLDS accommodations. This

will help us ensure that your individual needs will be met appropriately and fairly. SLDS contact information: slds@osu.edu; 614-292-3307; slds.osu.edu; 098 Baker Hall, 113 W. 12th Avenue.

If you are isolating while waiting for a COVID-19 test result, please let me know immediately. Those testing positive for COVID-19 should refer to the Safe and Healthy Buckeyes site for resources. Beyond five days of the required COVID-19 isolation period, I may rely on Student Life Disability Services to establish further reasonable accommodations. You can connect with them at slds@osu.edu; 614-292-3307; or slds.osu.edu.

Religious Accommodations:

Ohio State has had a longstanding practice of making reasonable academic accommodations for students' religious beliefs and practices in accordance with applicable law. In 2023, Ohio State updated its practice to align with new state legislation. Under this new provision, students must be in early communication with their instructors regarding any known accommodation requests for religious beliefs and practices, providing notice of specific dates for which they request alternative accommodations within 14 days after the first instructional day of the course. Instructors in turn shall not question the sincerity of a student's religious or spiritual belief system in reviewing such requests and shall keep requests for accommodations confidential.

With sufficient notice, instructors will provide students with reasonable alternative accommodations with regard to examinations and other academic requirements with respect to students' sincerely held religious beliefs and practices by allowing up to three absences each semester for the student to attend or participate in religious activities. Examples of religious accommodations can include, but are not limited to, rescheduling an exam, altering the time of a student's presentation, allowing make-up assignments to substitute for missed class work, or flexibility in due dates or research responsibilities. If concerns arise about a requested accommodation, instructors are to consult their tenure initiating unit head for assistance.

A student's request for time off shall be provided if the student's sincerely held religious belief or practice severely affects the student's ability to take an exam or meet an academic requirement and the student has notified their instructor, in writing during the first 14 days after the course begins, of the date of each absence. Although students are required to provide notice within the first 14 days after a course begins, instructors are strongly encouraged to work with the student to provide a reasonable accommodation if a request is made outside the notice period. A student may not be penalized for an absence approved under this policy.

If students have questions or disputes related to academic accommodations, they should contact their course instructor, and then their department or college office. For questions or to report discrimination or harassment based on religion, individuals should contact the Office of Institutional Equity.

Policy: Religious Holidays, Holy Days and Observances

Weather or Other Short-Term Closing:

Should in-person classes be canceled, students will be notified as to which alternative methods of teaching will be offered to ensure continuity of instruction for this class. Communication will be via Carmen announcements and course-wide email.

Section Changes:

All section changes and adds are completed by the course coordinator. Due to the need to keep up-to-minute availability of seats in each workshop, the lecturer and workshop instructors are unable to sign any permission forms.

Instructor Feedback and Response Expectations

- **Email response**: The CLSE's expectation of instructors is that emails will be responded to within one business day. If your email is sent during the evening or over the weekend, you may not receive a response until the next business day.
- **Class announcements**: I will send important class-wide messages through the Announcements tool in Carmen. Please check your notification preferences (go.osu.edu/canvas-notifications) to ensure you receive these messages.
- **Graded assignments:** Assignments will be graded and returned to you within one week after they were due. All scores are posted on Carmen no later than the day the graded assignment is returned.

Course Technology

For help with your password, university e-mail, Carmen, or any other technology issues, questions, or requests, contact the OSU IT Service Desk. Standard support hours are available at https://ocio.osu.edu/help/hours, and support for urgent issues is available 24x7.

- **Self-Service and Chat support:** http://ocio.osu.edu/selfservice
- **Phone:** 614-688-HELP (4357)
- **Email:** 8help@osu.edu
- **TDD:** 614-688-8743

Carmen

- Carmen, Ohio State's Learning Management System, will be used to host materials and activities throughout this course. To access Carmen, visit Carmen.osu.edu. Log in to Carmen using your name.# and password. If you have not setup a name.# and password, visit my.osu.edu.
- Help guides on the use of Carmen can be found at https://resourcecenter.odee.osu.edu/carmen
- **This online course requires use of Carmen (Ohio State's learning management system) and other online communication and multimedia tools. If you need additional services to use these technologies, please request ac56commodations with your instructor.**
- Carmen accessibility

CarmenZoom

- Office hours will be held through Ohio State's conferencing platform, CarmenZoom. A separate guide to accessing CarmenZoom and our office hours is posted on the course Carmen page under Files.
- Students may use the audio and video functions if a webcam and microphone are available. If not, there is still a chat function within CarmenZoom for the student to live chat with the professor or TA in the virtual office hours room.
- Carmen Zoom help guide

TurnItIn

- Students at The Ohio State University are accountable for the integrity of the work they submit. Therefore, you should be familiar with the guidelines provided by the Committee on Academic Misconduct (COAM) and Section A of OSU's Code of Student Conduct in order to meet the academic expectations concerning appropriate documentation of sources. In addition, OSU has made TurnItIn, a learning tool and plagiarism prevention system, available to instructors. For this class, you will submit your papers to TurnItIn from Carmen. When grading your work, I will interpret the originality report, following Section A of OSU's Code of Student Conduct as appropriate. For more information about TurnItIn, please see the vendor's guide for students. Note that submitted final papers become part of the OSU database.

- Please know that I view TurnItIn first and foremost as a teaching tool to make you a better writer. You will see in your individual originality reports exactly what the instructors see. We WANT you to look at this report as soon as you submit your assignments. If you see an issue, please correct it right away, before we start grading the assignment. You can resubmit without penalty as many times as you want prior to the established due date for any assignment. After the due date, the late policy is in effect.

TopHat

- TopHat is a web-based response system that allows students to use their own devices provide responses in the classroom. This course uses Top Hat to promote active engagement, allow for synchronous feedback, and monitor attendance.
- TopHat help guide

Discussion and Communication Guidelines

The following are expectations for how we should communicate as a class. Above all, please remember to be respectful and thoughtful.

- **Tone and civility**: Let's maintain a supportive learning community where everyone feels safe and where people can disagree amicably. Remember that sarcasm doesn't always come across online and is not always appreciated in-person. The instructional team work very hard to provide a positive learning experience. Please keep this in mind and remain civilized and respectful in your class communications.
- **Citing your sources**: When we have academic discussions, please cite your sources to back up what you say.

Issue Resolution:

The CLSE believes that student concerns are usually most effectively addressed by the staff closest to the situation. Therefore, students are ordinarily expected to address issues or concerns first with their instructors. If the issue cannot be resolved by your instructor, or for some reason you feel that you absolutely cannot address your concern with your instructor, please feel free to contact the Course Coordinator or Assistant Director Adam Andrews (andrews.171@osu.edu).

Building Emergency Action Plan:

Each building on campus has a Building Emergency Action Plan (BEAP) outlining that specific building's specific procedures to be followed in the event of a range of emergency situations, including fire, weather, terrorism, chemical spills, etc. It is the role of every Buckeye to help keep each other safe and to be aware of these procedures. You can find all of the campus BEAPs at https://dps.osu.edu/beap.

Lyft Ride Smart:

Lyft Ride Smart at Ohio State offers eligible students discounted rides, inside the university-designated service area, from 7 p.m. to 7 a.m. Prices may be impacted by distance, traffic, time of day, special events and prime time surcharges. To qualify for program discounts, users must select "shared ride" when booking in the Lyft app. For more information, visit: https://ttm.osu.edu/ride-smart.

Mental Health:

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 a student's ability to participate in daily activities. The Ohio State University offers services to assist you with addressing these and other concerns you may be experiencing. If you or someone you know are suffering from any of the aforementioned conditions, you can learn more about the broad range of confidential mental health services available on campus via the Office of Student Life's Counseling and Consultation Service (CCS) by visiting ccs.osu.edu or calling 614-292-5766. CCS is located on the 4th Floor of the Younkin Success Center and 10th Floor of Lincoln Tower. You can reach an on call counselor when CCS is

closed at 614-292-5766 and 24 hour emergency help is also available 24/7 by dialing 988 to reach the Suicide and Crisis Lifeline.

Title IX:

Title IX makes it clear that violence and harassment based on sex and gender are Civil Rights offenses subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories (e.g., race). If you or someone you know has been sexually harassed or assaulted, you may find the appropriate resources at http://titleix.osu.edu or by contacting the Ohio State Title IX Coordinator at titleix@osu.edu.

Diversity:

The Ohio State University affirms the importance and value of diversity in the student body. Our programs and curricula reflect our multicultural society and global economy and seek to provide opportunities for students to learn more about persons who are different from them. We are committed to maintaining a community that recognizes and values the inherent worth and dignity of every person; fosters sensitivity, understanding, and mutual respect among each member of our community; and encourages each individual to strive to reach his or her own potential. Discrimination against any individual based upon protected status, which is defined as age, color, disability, gender identity or expression, national origin, race, religion, sex, sexual orientation, or veteran status, is prohibited.

Academic Misconduct:

It is the responsibility of the Committee on Academic Misconduct to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term "academic misconduct" includes all forms of student academic misconduct wherever committed, illustrated by, but not limited to, cases of plagiarism and dishonest practices in connection with examinations. Instructors report all instances of alleged academic misconduct to the committee (Faculty Rule 3335-5-487). For additional information, see the Code of Student Conduct http://studentlife.osu.edu/csc/. We will adhere to this policy.

- Unless otherwise specified for a particular assignment, all submitted work should be a student's own unique effort. Collaborative efforts are not permitted unless expressly sanctioned for a particular assignment.
- Unless otherwise specified for a particular assignment, use of AI-generated materials for course submissions is not permitted.
- Reusing past work: In general, you are prohibited in university courses from turning in work from a past class to your current class, even if you modify it. If you want to build on past research or revisit a topic you've explored in previous courses, please discuss the situation with me.
- Using others' verbatim words without the use of quotation marks *and* citation is plagiarism. Paraphrased work requires citation to denote the use of others' ideas. Copying other's words without quotation while using citations is still considered plagiarism.
- Use of any technology during a quiz or exam (including but not limited to cell phones, smart watches, headphones, electronic dictionaries, etc.) is strictly prohibited.

Copyrighted Class Materials:

Course Schedule: Spring 2026

Schedule and assignments subject to change with as much advance notice as possible

Week	Lecture Topic	PLTL Workshop	Assignments Due
1	Course Intro and Ch12 – Mitosis and the Cell Cycle	None	
2	Ch12 – Cancer and Ch13 - Meiosis	1111 Wrapper & Metacognition	HW1 due Sunday
3	Ch13 (cont.) and Ch14 – Mendelian Genetics	Cancer & Mitosis	**Quiz 1 (Ch12-13) open Tues-Fri** HW2 due Sunday
4	Ch14 (cont.) – Extensions of Mendelian Genetics	Meiosis & Inheritance	HW3 due Sunday
5	Ch15 – DNA Replication and Repair	History of DNA	HW4 due Sunday
6	Ch16 – The Central Dogma	Exam Review	**Quiz 2 (Ch14-16) open Tues-Fri** HW5 due Sunday
7	**Midterm Exam (Chapters 12-16)** and Ch17 - Transcription	None	
8	Ch17 – RNA Processing and Translation	Transcription/Translation	HW6 due Sunday
9	Ch18 – Control of Gene Expression in Bacteria	Gene Regulation & Expression Pt1	HW7 due Sunday
	Spring Break	None	
10	Ch19 – Control of Gene Expression in Eukaryotes	Gene Regulation & Expression Pt2	HW8 due Sunday
11	Ch20 - Biotechnology	Gene Regulation & Expression Pt3	**Quiz 3 (Ch17-19) open Tues-Fri** HW9 due Sunday
12	Ch20 – Biotechnology (cont.)	Biotechnology/GMOs Pt1; Connect to DNA Barcoding Lab	HW10 due Sunday
13	Ch21 – Genes and Development	Biotechnology/GMOs Pt2	HW11 due Sunday
14	Ch33 - Viruses	Exam Review	**Quiz 4 (Ch 20-21,33) open Tues-Fri** HW12 due Sunday
Finals	**Final Exam**		

Laboratory Schedule:

Week	Lab Experiment	Assignments Due
1	Lab Safety & Introduction and Ex. 1: Introduction to Microscope Use	**Pre-Lab**: Questions for Ex. 1 (2pts) Lab Safety Quiz (5 pts) Ex. 1 Worksheet (10 pts) Microscope proficiency (3 pts)
2	Ex. 5: Cell Division and the Eukaryotic Cell Cycle	**Pre-Lab**: Questions from Ex. 5 (*2 pts*) Exercise 5 Assignment (*15 pts*)
3	Ex. 2: Properties of Biological Membranes	**Pre-lab**: questions from Exercise 2 (*2pts*) Exercise 2 Assignment (*15 pts*)
4	Ex. 3: Characterizing the Relative Activity Rates of Enzymes	**Pre-Lab**: questions from Ex. 3 (*2 pts*) Exercise 3 Assignment (*15 pts*) **LAB QUIZ #1**
5	Ex. 6: Mendelian Genetics with Statistical Analysis	**Pre-Lab**: Questions for Ex. 6 (*2 pts*) Exercise 6 Assignment (*15 pts*)
6	Ex. 7: Human Genetics; DNA Barcoding Overview	**Pre-Lab**: Complete the pre-lab for Ex. 7 (2pts) Exercise 7 Assignment (15 pts)
7	Pipetting and DNA Extraction	**Pre-Lab**: Complete the Virtual DNA Extractions lab and answer the questions (*2 pts*) Associated Worksheet (*10 pts*) Bring Sample to Lab
8	Polymerase Chain Reaction and Primary Literature Activity	**Pre-Lab**: Complete the Virtual lab on PCR and answer the questions (*2 pts*) PCR Assignment (10 *pts*) **LAB QUIZ #2**
9	Gel Electrophoresis	**Pre-Lab**: Questions for lab exercise *(2pts)* Gel Electrophoresis Assignment (10 *pts*)
	Spring Break	
10	DNA Extraction and PCR Re-dos Poster Work Session	
11	Gel Electrophoresis Re-dos and DNA Sequencing	LAB QUIZ #3 **Pre-Lab**: questions for DNA sequencing (*2 pts*) DNA Sequencing Assignment *(10 pts)*
12	Bioinformatics (DNA Subway)	**Pre-Lab**: questions for Bioinformatics (*2 pts*) Bioinformatics Assignment *(10 pts)*
13	Poster Presentations iNaturalist Upload	LAB QUIZ #4 Completed Poster Due Before Lab *(40pts)*
14	Lab Final Exam	Lab Final Exam (*40 pts*)
Finals		

Appendix C: Sample PLTL Workshop

Biology 1111: Cellular Signaling Mechanisms Workshop

Learning outcomes:

- Interpret, evaluate, and create graphical representations of data.
- Explain the activities in the cell by relating cellular structure and cellular function.
- Describe the cellular response to its environment (e.g., membrane transport, signal transduction).
- Apply biological concepts in the assessment of contemporary issues.

Workshop goals:

- Identify signals, receptors, and secondary messengers using blood glucose regulation as a model of cell signaling.
- Understand how cellular responses cause physiological changes in the organism.

Workshop Sections:

1. Pre-workshop recap
2. Revising the Insulin Pathway
3. Full Insulin Signaling Pathway

Section 1: Pre-workshop Recap

Pre-workshop Information:
*Something that causes a response in a living organism is called a **signal**, or a **stimulus** (plural = stimuli). Many things can act as a stimulus: a molecule, a vibration from a sound, the presence or absence of light, a specific wavelength of light, a change in temperature, voltage, pH, and more. A stimulus can also be an internal change within a cell.*

*Most cellular structures that respond to stimuli are proteins. At the molecular level, a "response" is simply a change in the protein's shape. Responses can be broken down into two major categories: **activation** or **inhibition**. If a protein is activated by a stimulus, the stimulus change's the protein's shape in a way that enables it to carry out an activity. If a protein is inhibited by a stimulus, the stimulus changes the protein's shape in a way that makes it unable to carry out an activity.*

*Often, a stimulus and response we observe are connected by a complex network of multiple stimuli and multiple responses. Scientists construct diagrams called **signaling pathways** to represent these complex relationships. Let's use an E. coli as an example. When E. coli detect high concentrations of glucose, it changes the rotational patterns of flagella to move up the concentration gradient (**Figure 1**).*

<u>Interpreting signaling pathway diagrams</u>: In signaling pathway diagrams, stimuli and responses are connected by directional lines. If a stimulus activates something, the line ends in a pointed arrow. If

a stimulus inhibits something, the line ends in a flat cap (like the capital letter T). Dashed lines indicate a molecule moves or undergoes a chemical change.

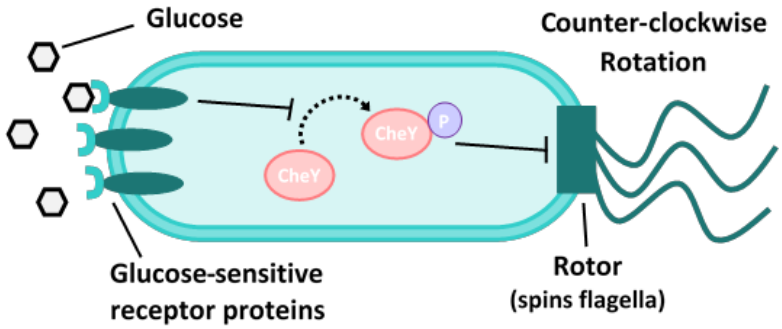


Figure 1. *This signaling pathway diagram explains how E. coli cells move toward glucose. The (1) glucose receptor, (2) CheY, and (3) the flagella rotor are all proteins or structures made of multiple proteins. CheY-P is a CheY protein that has been phosphorylated (it has a phosphate group attached). When the E. coli rotor spins the flagella counterclockwise, the cell is propelled forward in a straight line.*

Insulin and Glucose Homeostasis: Maintaining the "Right Amount" of Glucose

Let's switch from looking at a single cell to looking at animals, which are complex multicellular organisms. When the cells in an animal's tissues don't have enough glucose, they can't make enough ATP to carry out activities necessary for maintenance and reproduction. When they have too much glucose, the buildup can have toxic effects on the cells which lead to cell death.

In this workshop, we'll explore: How does a multicellular organism like an animal detect and respond to the presence of glucose in its body? How does a multicellular organism lower its blood sugar?

*As you know, blood is what transfers glucose from the stomach and intestines to every organ, tissue, and cell in the body. When glucose in the bloodstream enters specialized cells in the pancreas called pancreatic β-cells (beta cells), these cells synthesize, and release protein-based hormone molecules called insulin. Insulin is also a signal: the response insulin causes is lowered blood glucose levels (**Figure 2**).*

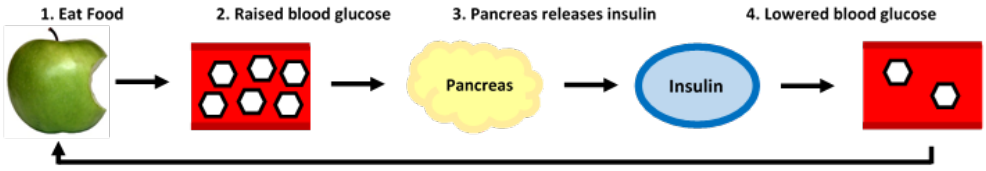


Figure 2. *The overall process of blood glucose levels becoming elevated after eating food and becoming lowered after β-cells in the pancreas release insulin.*

Share your responses to the pre-workshop questions with your group.

1__How does the activation or inhibition of a protein demonstrate the importance of a protein's shape?

2__According to Figure 1, how do *E. coli* cells detect glucose molecules and respond by moving toward the glucose molecules?

- Do phosphorylated CheY proteins activate or inhibit counterclockwise rotation of the rotor?
- After binding to a glucose molecule, do glucose receptor proteins activate or inhibit phosphorylation of CheY proteins?
- Synthesize your answers into one cohesive explanation of how *E. coli* cells detect and respond to glucose without using anthropomorphic language.

3__How do you think insulin lowers the concentration of glucose molecules in the blood? Propose a plausible biological mechanism that explains what happens between steps 3 and 4 from Figure 2.

- For example, do you think insulin is an enzyme that breaks down glucose? Does insulin activate enzymes that break down glucose? Does insulin cause glucose molecules to leave the blood stream another way?

The relationship between glucose and the release of insulin is not a simple two-step process. As in the *E. coli* example, the first stimulus and the final response are connected by a signaling pathway (**Figure 3**).

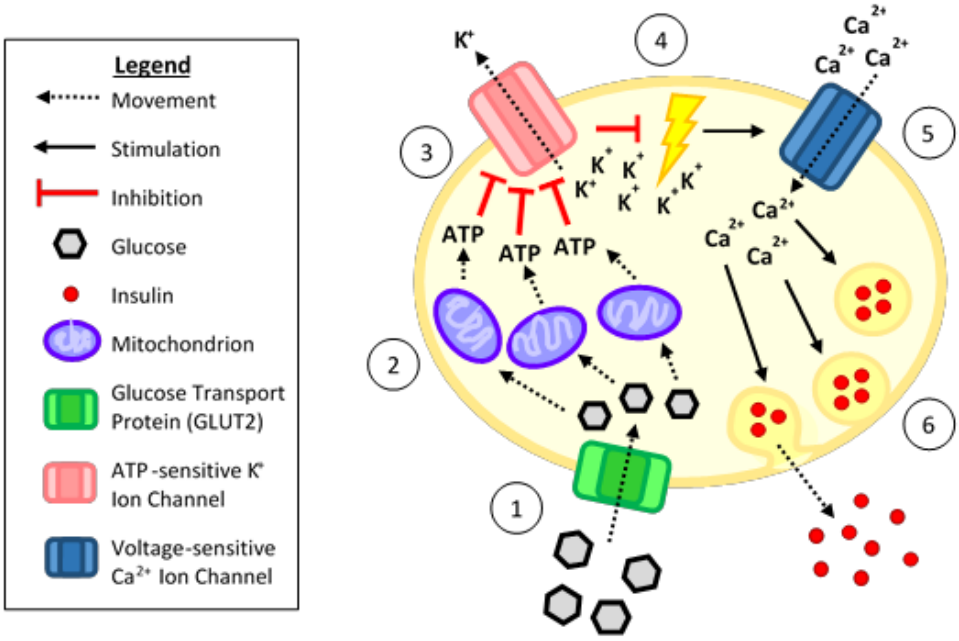


Figure 3. *Insulin signaling pathway inside a pancreatic β-cell.*

4__Using what you learned from the *E. coli* example, describe what is occurring in Figure 3. Describe what is occurring in each of the six steps and then synthesize your ideas into one cohesive explanation.

- Work in small groups, each group will be assigned step numbers.
- Take turns sharing and describing your explanations of what is happening at each step. Provide each other with feedback and evaluation.
- It's okay if you don't know the exact biological terminology for what is occurring. Simply describe what you're able to observe and infer.

5__How does your description of Figure 3 relate to your explanation of how insulin lowers glucose molecules in the blood (Question 3)?

- Make a list of similarities and differences between the information conveyed in Figure 2 and 3.
- What information is still needed to complete your answer to question 3?
- How can diagrams, like the one depicted in Figure 2, lead to misconceptions about complex biological processes?

6__Replace the generic Steps 2 and 3 from Figure 2 with the much more detailed signaling pathway information from Figure 3.

If β-cells release too many insulin molecules, the organism's cells won't be able to properly metabolize the glucose. However, if β-cells release too few insulin molecules, the organism's cells might be exposed to toxic amounts of glucose.

7__How do you think pancreatic β-cells "know" how to release "the right amount" of insulin?

Check-in
In the next section of the workshop, we'll provide you with more information about the cellular signaling pathway components involved in Steps 3 and 4 (From **Figure 2**).

8__Check-in with your classmates before moving to the next section.

- What questions do you still have?
- What are you uncertain about?
- Write down the questions so you can revisit them later.

Section 2: Revising the Insulin Pathway Diagram

This section we will explore the entire signaling pathway that connects **Steps 1-4 from Figure 2**. As we learn new information, we will continue to re-draw **Figure 2** into a more complex and scientifically accurate model.

Note: The purpose of this workshop is for you to become confident interpreting complex biological diagrams and figures. You will NOT be expected to remember and answer questions on the insulin pathway.

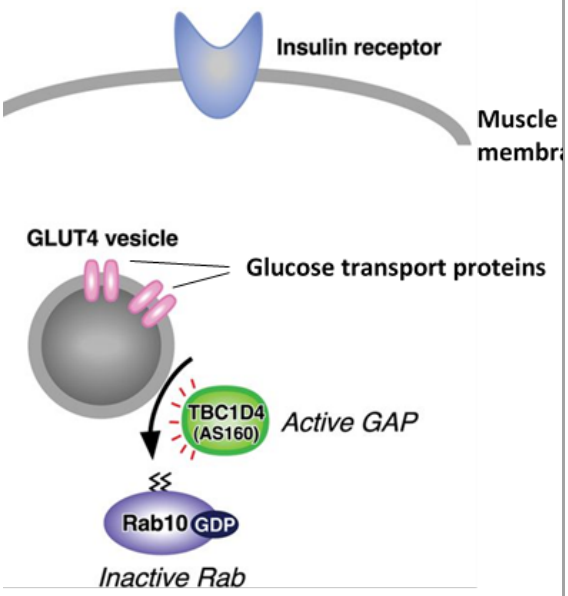
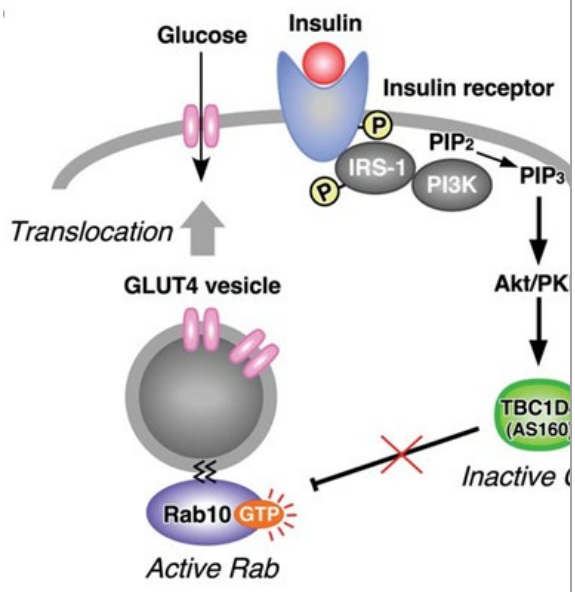
The Big Picture: Steps 3 and 4 (From Figure 2)
Pancreatic β-cells can readily absorb glucose from the bloodstream because their glucose transport proteins (GLUT2) are always embedded in their cell membranes. In contrast, other types of animal cells such as muscle and fat cells have GLUT4 transport proteins. GLUT4 proteins are usually sequestered within a lipid membrane vesicle inside the cell. Cells with GLUT4 proteins can only absorb glucose from the bloodstream once the vesicle merges with the outer cell membrane in a process called translocation. GLUT4 translocation is a response induced by insulin.

A scientist has constructed a model of the signaling pathway explaining how insulin induces GLUT4 translocation and glucose uptake. This introduces an important aspect of creating scientific models: while there are norms and standard practices used by most scientists, there may be times in which abandoning those norms better facilitates communicating your information to your audience.

The scientist has used two diagrams to represent different aspects of how GLUT4 translocation is regulated: what happens in a muscle/fat cell when insulin is absent, and what happens when insulin is present. They have abandoned two norms used when drawing signaling pathway models. That doesn't mean their signaling pathway is wrong. Rather, it means they are trying to communicate something specific and felt that the typical system of notation would not be as effective.

The important differences are:

i. Not every component of the pathway is present in both figures.
ii. They use a different system of arrows (stimulation, inhibition, movement) from most signaling pathway diagrams.
iii. Not every component of the signaling pathway is shown in its active form.

Figure 4A. No insulin in bloodstream	**Figure 4B.** Insulin in bloodstream
	

Your goal will be to combine the information present in **Figures 4A** and **4B** into a single figure that follows the standard cellular signaling pathway diagram conventions. Your pathway diagram should ultimately explain Question 3, "How does insulin cause blood glucose levels to decrease?".

First, carefully analyze **Figures 4A** and **4B** to determine the function of each component in the signaling pathway.

9__What are the functions of the components depicted in Figures 4A and 4B?

- Where do you see signals? Where do you see responses?
- Does the signal activate or inhibit something? How do you know?
- Are there components that are unnecessary to your interpretation of the figures? In other words, are there any components that you do NOT need defined before interpreting the figures?

10__Describe what is happening in Figure 4A and Figure 4B show.

- Specifically explain how insulin is detected and what happens in the cell that leads to GLUT4 translocation and the uptake of glucose molecules.

11__Use your description above to combine the important elements from Figures 4A and 4B into a single diagram.

- Work in small groups, each group should create their own combined diagram.
- Take turns sharing and describing your simplified pathway diagram. Provide each other with feedback and evaluation.
- Come up with a consensus diagram and draw it on one of the large white boards. Take a photo of it and add it below.

12__Revise your group's insulin signaling pathway diagram to replace the <u>generic Steps 3 and 4</u> from Figure 2 with the much more detailed information from Figure 4A/B.

Your figure depicting the signaling pathway through which insulin lowers blood glucose levels is now complete! Now let's summarize this information into words.

13__How is insulin used in the body to lower blood glucose?

- Use your revised diagram of the insulin signaling pathway to answer this question in your own words.
- Focus your summary on steps 2-4 from Figure 2
- You can describe the process in bullet form or as a paragraph (whatever works best for you)

14__How does your revised diagram or summary compare to your answer to Question 3 from the pre-workshop "How do you think insulin lowers the concentration of glucose molecules in the blood?"

- Is the simplified diagram and explanation wrong?
- How has your interpretation of the insulin pathway changed after reviewing Figures 3 and 4?
- What are some pros and cons to simplifying the explanation of this pathway?

Check-in

Before you move on, check in with your group on the following questions:

15__Check-in with your classmates before moving to the next section.

- What questions do you still have? Write down any new questions on the board.
- Can you answer any of the questions on your list?
- What do you feel confident about? What are you uncertain about?

Section 3: Full Insulin Cell Signaling Pathways

Models such as the figures you've seen in this workshop are extremely simplified versions of what "really" happens when insulin binds to insulin receptors. The figures you've seen so far only include cellular structures and organelles that are relevant to the singular pathway they represent.
In reality, insulin regulates *many* different processes. **Figure 5** below shows many of the pathways regulated in part by insulin. And yet, even this figure is relatively simplistic – it's representing a muscle or fat cell as only having a single insulin receptor, a single vesicle containing GLUT4 proteins, a single mitochondrion, etc. When in reality each cell will have multiple copies of each component.

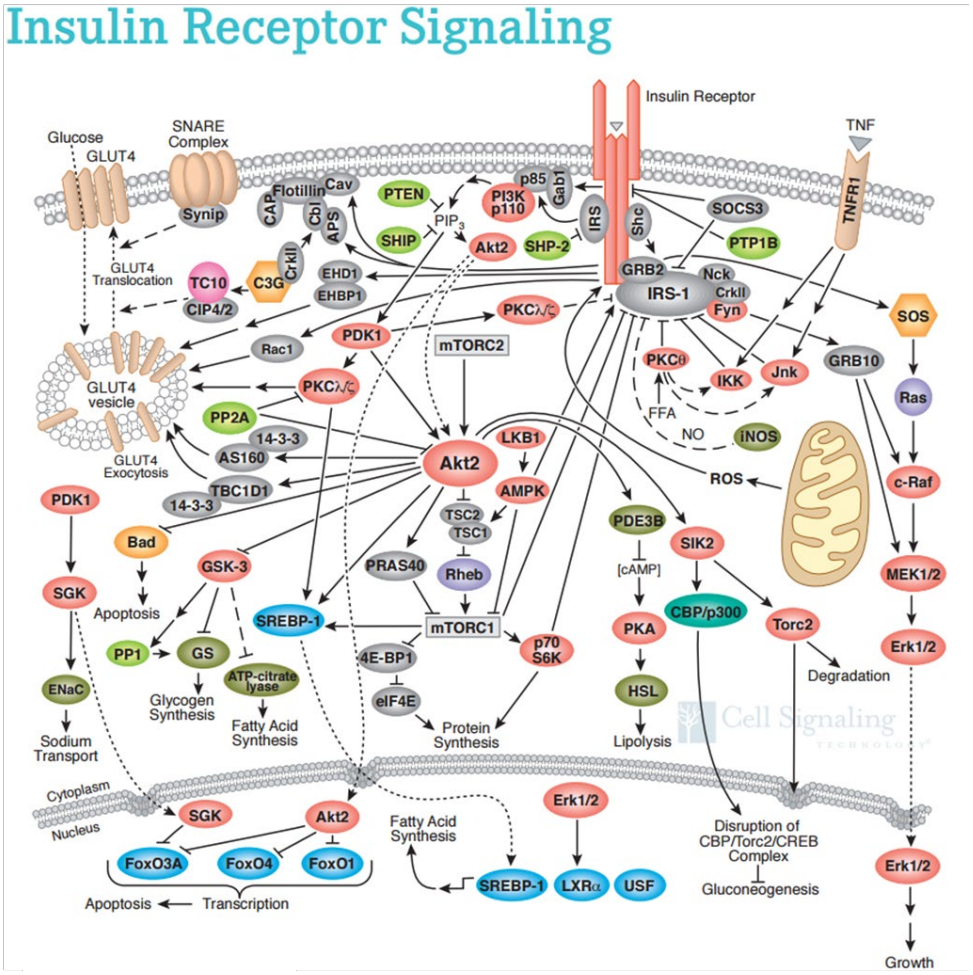


Figure 5. A map of the many signaling pathways regulated by insulin.

16__Find the pathway you've discussed in workshop today! Identify familiar components, then try to trace the pathway and connect them.

17__Use Figure 5 to identify whether insulin promotes or inhibits the following cellular processes:

- Protein Synthesis
- Cellular growth
- Lipid breakdown (Lipolysis)
- Glycogen synthesis
- Cell death (Apoptosis)

Workshop Wrap-up

Check your understanding of the concepts we explored in workshop today by discussing the following questions.

18__Throughout this workshop, we used words like "detect" and "respond" to describe what is happening at the cellular level. However, these phrases are anthropomorphic (projecting human attributes of consciousness and intention onto non-human organisms**). How would you rephrase the insulin pathway without using anthropomorphic language?**

- What causes the cell to “detect” a signal, like glucose or insulin?
- What happens in the cell when it “reacts” to a signal?

19__What do you think are the pros and cons of teaching biology students with simplified diagrams and models?

- Consider the goals of the lessons in which these models and diagrams and being used.
- What tradeoffs do instructors need to make?
- How does this compare to the process of science and experimental design? Think about why it’s important to control confounding variables.

20__Check the list of questions that you created earlier:

- Can you answer any of the questions on your list?
- What new questions do you have?
- How has this workshop affected your confidence in interpreting complex biological figures?
- What do you feel confident about? What are you uncertain about?

Biology 1111: Cellular Signaling Mechanisms
Pre-workshop Activity

Reminders About How to Complete Pre-workshop Activities

Expected time to complete: approximately 20-30 minutes (on average)

Do not consult any outside sources! The goal of pre-workshop activities is for you to assess your current level of knowledge, including your prior knowledge and opinions, about the topics covered in the activity. The goal is not to try and provide "correct" responses to the questions - this would require consulting outside sources if you do not know the answer or if you're not certain your answer is correct.

When you're responding to each of these questions, be explicit about the metacognitive work you're doing:

- What is the overall goal you're trying to achieve? Is this a straightforward knowledge request, or does it require deeper thought and more extensive problem-solving?
- What information did you use to answer the question or solve the problem?
  - What information did you observe, and what information did you infer?
  - What are your sources of information?
  - Why do you believe this information is both correct and relevant for solving the problem?
- How confident do you feel about your response? Why?

Signaling Pathways: Stimuli and Responses

Something that causes a response in a living organism is called a **signal**, or a **stimulus** (plural = stimuli). Many things can act as a stimulus: a molecule, a vibration from a sound, the presence or absence of light, a specific wavelength of light, a change in temperature, voltage, pH, and more. A stimulus can also be an internal change within a cell.

Most cellular structures that respond to stimuli are proteins. At the molecular level, a "response" is simply a change in the protein's shape. Responses can be broken down into two major categories: **activation** or **inhibition**. If a protein is activated by a stimulus, the stimulus change's the protein's shape in a way that enables it to carry out an activity. If a protein is inhibited by a stimulus, the stimulus changes the protein's shape in a way that makes it unable to carry out an activity.

1__How does the activation or inhibition of a protein demonstrate the importance of a protein's shape?
Connect this to any relevant lectures and lab discussions.

Often, a stimulus and response we observe are connected by a complex network of multiple stimuli and multiple responses. Scientists construct diagrams called **signaling pathways** to represent these complex relationships. Let's use an *E. coli* as an example. When *E. coli* detect high concentrations of glucose, it changes the rotational patterns of flagella to move up the concentration gradient (**Figure 1**).

Interpreting signaling pathway diagrams: In signaling pathway diagrams, stimuli and responses are connected by directional lines. If a stimulus activates something, the line ends in a pointed arrow. If a stimulus inhibits something, the line ends in a flat cap (like the capital letter T). Dashed lines indicate a molecule moves or undergoes a chemical change.

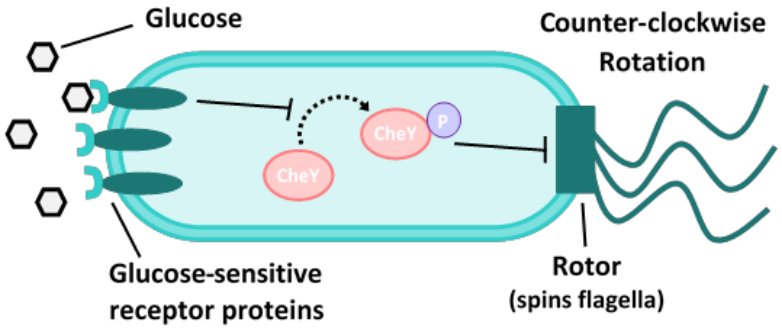


Figure 1. This signaling pathway diagram explains how *E. coli* cells move toward glucose. The (1) glucose receptor, (2) CheY, and (3) the flagella rotor are all proteins or structures made of multiple proteins. CheY-P is a CheY protein that has been phosphorylated (it has a phosphate group attached). When the *E. coli* rotor spins the flagella counterclockwise, the cell is propelled forward in a straight line.

2__According to Figure 1, how do *E. coli* cells detect glucose molecules and respond by moving toward the glucose molecules?

- Do phosphorylated CheY proteins activate or inhibit counterclockwise rotation of the rotor?
- After binding to a glucose molecule, do glucose receptor proteins activate or inhibit phosphorylation of CheY proteins?
- Synthesize your answers into one cohesive explanation of how *E. coli* cells detect and respond to glucose without using anthropomorphic language.

Insulin and Glucose Homeostasis: Maintaining the "Right Amount" of Glucose

Let's switch from looking at a single cell to looking at animals, which are complex multicellular organisms. When the cells in an animal's tissues don't have enough glucose, they can't make enough ATP to carry out activities necessary for maintenance and reproduction. When they have too much glucose, the buildup can have toxic effects on the cells which lead to cell death.

In this workshop, we'll explore: How does a multicellular organism like an animal detect and respond to the presence of glucose in its body? How does a multicellular organism lower its blood sugar?

As you know, blood is what transfers glucose from the stomach and intestines to every organ, tissue, and cell in the body. When glucose in the bloodstream enters specialized cells in the pancreas called pancreatic β-cells (beta cells), these cells synthesize, and release protein-based hormone molecules called insulin. Insulin is also a signal: the response insulin causes is lowered blood glucose levels (**Figure 2**).

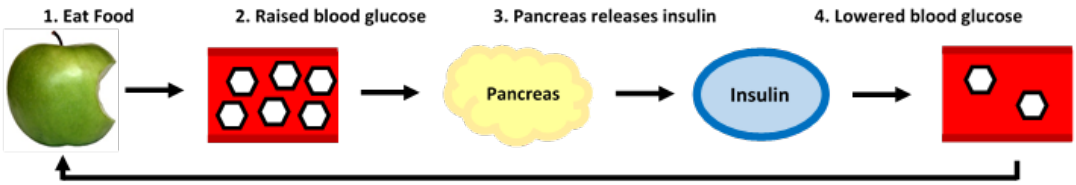


Figure 2. The overall process of blood glucose levels becoming elevated after eating food and becoming lowered after β-cells in the pancreas release insulin.

3__How do you think insulin lowers the concentration of glucose molecules in the blood? Propose a plausible biological mechanism that explains what happens between steps 3 and 4 from Figure 2.

- For example, do you think insulin is an enzyme that breaks down glucose? Does insulin activate enzymes that break down glucose? Does insulin cause glucose molecules to leave the blood stream another way?

Biology 1111: Cellular signaling Mechanisms
Post-workshop Activity

General Post-workshop Format
Each PLTL workshop will include activities that extend beyond the workshop. These activities will include:

- Reflecting on how the workshop went
- Solving any unfinished activities
- Identifying primary learning goals of the workshop activities
- Evaluating your understanding of relevant biology concepts
- Identifying areas of uncertainty or interest to discuss next week

Part 1: Recap and Reflect
Each week, the first part of your post-workshop activity will ask you to reflect on what you and your group accomplished during the workshop session.

For each page of the workshop section listed below, ***respond to the following prompts:***

- Provide a metacognitive review of each activity: what do you think were the intended learning outcomes? What did we want you to think about? To learn?
- How did the provided information, along with the types of questions you were asked, help you solve the problem(s) in the activity and achieve those learning outcomes?
- If your group completed a given activity during the workshop meeting, provide a brief synopsis of how your group solved the problem.
- If your group did not complete this activity during the workshop meeting, summarize your own metacognitive approach to solving the problem.

Section 1: Pre-workshop recap, Interpreting the insulin signaling pathway steps 2 and 3, Figures 1-3.

Section 2: Interpreting the insulin signaling pathway steps 3 and 4, Figure 4.

Section 3: Interpreting the full insulin signaling pathway in a more complex diagram, Figure 5.

- What activity did you feel most confident about during this workshop? What led to your confidence? How will you reproduce that same success next week?
    - Be metacognitive by reflecting on your performance during that activity.
    - Why were you confident? How well were you able to:
    - Figure out the goal of the problem?
    - Collect relevant information?
    - Apply your problem-solving strategy?

- What activity/activities did you feel least confident about during this workshop? What caused your lack of confidence, and how will you use that as an opportunity to learn and grow in the future?
    - Same as above: Be metacognitive and reflect on your performance.
    - What explains why you aren't satisfied with your understanding?
    - When will you get extra information or evaluation from your lecture or lab instructor?

Appendix D: Updated Advising Sheets for the Biology Major and Minor

THE OHIO STATE UNIVERSITY

Biology 1112
Biological Foundations 2: Molecular Machinery & Genetics
Autumn 2025 – 4 Credit Hours

Lecturer:
Email:
Office:
Student Hours:
other times scheduled by appointment

Course Coordinator:
Center for Life Sciences Education
Email:
Office:
Phone:

Class Meeting Schedule:
Lecture: Twice Weekly for 55 minutes
Laboratory: Once weekly for 165 minutes; *consult your BuckeyeLink schedule for specific time and day*
PLTL Workshop: Once weekly for 80 minutes; *consult your BuckeyeLink schedule for specific time and day*

Prerequisites:
1111; Coreq: Math 1048. Not open to students with credit for 1113x

Required Course Materials:
- Biological Science (8th Edition), 2024, by Freeman et al. ISBN: **978-0138224028.**
- Biology 1112 Laboratory Manual

Credit Hours and Work Expectation:
This is a 4-credit-hour laboratory course. According to Ohio State policy, students should expect around 6 hours per week of time spent on direct instruction in addition to 6 hours of homework to receive a grade of C average. *ASC Honors* provides an excellent guide to scheduling and study expectations.

Course Description:
An introductory exploration of life's cellular and genetic mechanisms, molecular biology, and metacognitive strategies. Includes a required weekly Peer Led Team Learning Workshop. Intended for student Majoring in STEM fields. Combined with Bio 1111, these courses will address content at similar depth and breadth as Bio 1113x.

General Education Natural Science (GEN) Expected Learning Outcomes
Students who successfully complete this course will fulfill the following GE Natural Science learning outcomes:

Foundations: Foundations: Natural Sciences	
Goals	**Expected Learning Outcomes**
GOAL 1: Successful students will engage in theoretical and empirical study within the natural sciences, while gaining an appreciation of the modern principles, theories, methods, and	**Successful students are able to …** **1.1** Explain basic facts, principles, theories and methods of modern natural sciences; describe and analyze the process of scientific inquiry.

modes of inquiry used generally across the natural sciences.	**1.2** Identify how key events in the development of science contribute to the ongoing and changing nature of scientific knowledge and methods.
	1.3 Employ the processes of science through exploration, discovery, and collaboration to interact directly with the natural world when feasible, using appropriate tools, models, and analysis of data
GOAL 2: Successful students will discern the relationship between the theoretical and applied sciences, while appreciating the implications of scientific discoveries and the potential impacts of science and technology.	**2.1** Analyze the inter-dependence and potential impacts of scientific and technological developments
	2.2 Evaluate social and ethical implications of natural scientific discoveries.
	2.3 Critically evaluate and responsibly use information from the natural sciences.

General Education Natural and Biological Science (GEL) Goals & Objectives

Goals/Rationale: Courses in natural sciences foster an understanding of the principles, theories and methods of modern science, the relationship between science and technology, and the effects of science and technology on the environment.

1. Students understand the basic facts, principles, theories and methods of modern science.
2. Students understand key events in the development of science and recognize that science is an evolving body of knowledge.
3. Students describe the inter-dependence of scientific and technological developments.
4. Students recognize social and philosophical implications of scientific discoveries and understand the potential of science and technology to address problems of the contemporary world.

In Biology 1112, students meet the GEN Foundations: Natural Sciences Learning Objectives in multiple ways. The course (especially when combined with Biology 1111 & 1114) is an in-depth study of the basic facts, principles, theories, and interrelationships within biology. Students gain an understanding of the foundations of modern biology by studying life, cell structure and function, bioenergetics, and genetics. Students explore the nonlinear process of science and how science relates and applies to contemporary issues and ethics. During the laboratory activities, students not only apply the biological concepts introduced in lecture, but also learn scientific reasoning and methods, collect and analyze qualitative and quantitative data, and practice scientific literacy and communication. While attaining these learning objectives students will gain an appreciation of the implications and impacts of scientific discoveries on science and technology.

Course Learning Outcomes:

Successful students will be able to…

1. The Cell
    a. explain the mechanisms and structures involved in mitotic and meiotic cell division and explain the different roles for and consequences of each.
    b. describe the functionality of cellular control mechanisms.
        i. describe how the loss/failure of cellular control mechanisms can lead to disease.
        ii. describe how genotypes and the environment influence the genetics of cancer.
2. Genetics
    a. explain the transfer and modification of heritable traits from parents to offspring via Mendelian inheritance.
    b. apply principles of Mendelian and non-Mendelian genetics to predict the outcomes of a variety of genetic crosses.
    c. explain the basis of and identify examples of non-Mendelian patterns of inheritance.
    d. describe the nature and expression of heritable information at the molecular level, including:

the Central Dogma, DNA replication, transcription, protein synthesis (translation).
    e. explain how gene expression is controlled in prokaryotes and eukaryotes (at transcription, post-transcription, translation, and post-translation levels).
    f. identify mutations in DNA and assess their impact on gene expression and diversity.
    g. explain chromatin structure, the histone code, and epigenetic inheritance.
    h. explain how differential gene expression relates to organismal development, including cellular reproduction, growth, and differentiation
    i. describe characteristics of viruses and bacteria (e.g., life history, genome type and content, exchange of genetic material).
    j. describe the experimental basis and select applications of recombinant DNA technology, including gene cloning, genetically modified organisms (GMOs), and gene editing (CRISPR)
3. Nature of biological science and society
    a. describe the development and evaluation of scientific explanations of natural phenomena.
    b. apply biological concepts in the assessment of contemporary issues.
    c. reflect on ethical implications of emerging biotechnology.
    d. explain how evolution accounts for the unity and diversity of life.
4. Skills & Competencies
    a. Process of Science
        i. apply the process of science to research questions, presented scenarios, historical experiments, and course lab experiments.
        ii. design an experiment
        iii. collect and organize both qualitative and quantitative data.
        iv. support or refute an argument or conclusion using experimental results.
    b. Scientific Communication
        i. refer to primary literature articles using proper paraphrasing and citation (compare and contrast primary, secondary, etc).
        ii. create properly formatted graphs, figures, and tables using data.
        iii. analyze and interpret qualitative and quantitative data
        iv. create discipline-appropriate documents (poster, presentation, or paper).
        v. identify plagiarism and avoid plagiarizing when writing.
    c. Literature
        i. evaluate the quality and accuracy of a written source.
        ii. locate scholarly articles using electronic databases.
        iii. distinguish between primary literature, secondary literature, and content created for mass media.
    d. Laboratory
        i. employ safe laboratory practices.
        ii. use a compound light microscope to view microorganisms; maintain microscope cleanliness.
        iii. use a pipette to measure small volumes.
        iv. understand the key steps and reagents in PCR.
        v. explain how gel electrophoresis works and interpret DNA separation on a gel.
        vi. prepare a dilution series.
        vii. demonstrate the ability to work effectively as a team.
    e. Metacognition
        i. determine effective study strategies to better prepare for assessments.
        ii. evaluate the effectiveness of study strategies and modify them as needed.

Grading and Evaluation:

Graded assignments may come in three forms, and students should note the expectations for each in the descriptions of our class assignments below:

- **Independent Work ( )**: Strictly non-collaborative, original-individual work. You may discuss this assignment only with your instructor. Discussions with other individuals, either in person or electronically, are strictly prohibited and constitute academic misconduct.
- **Required Collaboration ( )**: An explicit expectation for collaboration among students either in-class or outside (i.e., group work).
- **Optional Collaboration ( )**: Students are permitted, but not required, to discuss the assignment or ideas with each other. However, all submitted work must be one's original and individual creation.

Assignment	Points	Assignment Type
Midterm Exam	100	
Final Exam	100	
Quizzes (4 @ 25 pts)	100	
Mastering Biology Homework	100	
Top Hat	75	
In-class Activities	50	
SALG	5	
Lab Assignments	265	
PLTL Workshops (10 @ 10 pts)	100	
Total Points Possible	**905**	

Exams (200 points):

There will be one midterm exam during class at the midpoint of the semester and one final exam during finals week following the semester. The final exam will only cover material following the midterm exam. Material will be drawn from the lectures, lecture activities, Mastering Biology assignments, and Quizzes. All questions will be multiple-choice style and will focus on application of the course material.

Quizzes (100 points):

There will be four 25-point quizzes evenly distributed throughout the semester, with the purpose of providing students practice opportunities for the exams. Quizzes will be taken outside of class but must be completed individually. Quizzes will be available over a three-day period, but each quiz is timed and must be completed in one session. Questions will be short-answer style and will focus on application of the course material.

Mastering Biology homework (100 points):

Weekly homework assignments will be available within Mastering Biology. Each weekly assignment will become available one week in advance and must be completed by Sunday evening at 11:59PM (see lecture schedule for exact dates). Mastering Biology assignments are designed to reinforce material covered in lecture throughout the week and may require you to apply and synthesize material learned throughout previous weeks. Most assignments will take 45-60 minutes to complete and can be worked on incrementally. Plan in advance– loss of power or internet access is not an excuse for a makeup or extension. Additional optional Mastering Biology assignments (ungraded) will also be available throughout the semester. The percentage of points you earn within Mastering Biology throughout the semester will be converted to course points at the end of the semester. (e.g. 100% in Mastering = 100 points).

Top Hat (75 points):

Top Hat questions will be administered in every lecture throughout the semester. Questions will typically be worth 1 point each, graded for participation, correctness, or a combination of both.

Proper registration is required prior to the second lecture of the semester. At least 90 total questions will be administered, providing ample leeway in earning the total points. As such, no make-up opportunities will be available for missed lectures or nonfunctional technology. Points will be updated on Carmen at the end of the semester. Prior to that, current points can always be viewed in the Top Hat gradebook.

In-class Activities (50 points):

During most lectures throughout the semester, we will complete various additional learning activities that either provide extra practice on lecture material or are designed to enhance scientific literacy. Selected activities will be submitted to Carmen and graded for participation, correctness, or a combination of both. All graded activities must be submitted to Carmen individually, but you may work on them with other students in the class. You will be given until 11:59PM the day the activity is assigned to complete it and turn it in. No make-up opportunities will be available for missed lecture activities, but more than 50 total points will be available throughout the semester.

Laboratory/Recitation Assignments (265 points):

The laboratory portion of this course is integral to the learning experience and **is mandatory**. The laboratory experience includes a combination of both inquiry-based traditional labs and a DNA Barcoding Course Based Undergraduate Research Experience (CURE). The DNA Barcoding CURE is an authentic research project in which students collect live specimens, characterize them using common genetic research techniques, and ultimately submit the results to a public database. You must come prepared to all lab sessions. This includes wearing appropriate clothing and footwear, having completed the pre-lab assignment, and having read and understood the lab you will be conducting that day. (See schedule below, as labs are not in the same order that they appear in the lab manual)

Pre-lab assignments (11 @ 2pts each):

Most labs will have a pre-lab that must be submitted on Carmen by the start of the lab period. These questions may be answered using your lab manual and any provided materials. Once laboratory has begun, no further pre-lab activities will be accepted.

Lab Assignments/Exercises (11 @ 10-15 pts each):

Students will complete lab exercises in cooperative groups, based on the lab manual and other lab exercises related to the DNA Barcoding project. All group members are expected to contribute equally. Groups are required to turn in one lab summary. All lab group members will receive the same score for each graded lab summary as long as all members participated equally in the work each day. Not contributing equally may result in loss of some or all credit for a lab. These lab summaries are due by 1 hour after the end of the lab period unless otherwise stated in the syllabus or announced by your Lab Instructor.

Lab Quizzes (30 pts) and Lab Exam (40pts):

The lab quizzes and exams will be taken individually, not as part of your lab group. Lab quizzes and the lab exam will be administered at the beginning of lab/recitation on the days listed in the schedule below.

DNA Barcoding Poster (40pts):

Students will work in groups to design and present a poster on their findings throughout the DNA Barcoding CURE, including methods used, results obtained, and discussion and interpretation of results. This research-style poster is intended to provide students experience with authentic scientific communication. The poster project and associated assignments are explained in detail in the Research Poster Guidelines document on Carmen and will be discussed by your instructor in lab.

PLTL Activities (100 points):

In total, there are 10 PLTL workshops throughout the semester. Each workshop consists of 3 activities, a pre-workshop, workshop, and post-workshop activities. In preparation for PLTL workshops, there is an assignment "Introduction to Peer-led Team Learning (PLTL)" (worth 10 points) to be completed by the end of week 1.

1. Pre-workshop activities (2.5 pts each) → Due before the start of workshop. These should be submitted individually to Carmen.
2. Workshop activities (5 pts each) → Completed as a group during the PLTL workshop session. Students will submit their answer sheets to Carmen at the end of their workshop. Note: If you are more than 20 minutes late to the workshop, you will not be permitted to attend and will be marked absent.
3. Post-workshop activities (2.5 pts each) → Due by Sunday at 11:59 pm following the workshop and submitted individually to Carmen. This activity includes reflecting on the knowledge gained in the workshop, identifying knowledge still desired, and an extension of the workshop material. **Note: You must attend the workshop in order to earn credit for completing the post-workshop assignment.**

SALG (5 points):

At the end of the course, 5 points will be assigned based on participation in a survey, the Student Assessment of Learning Gains (SALG). Grades on the SALG will be based solely on completion.

Your Final Grade:

Your final grade will be based on the percentage of the 895 points that you earn during the course of the semester as described above. Please note that we do not grade the course on a curve and Carmen does not round averages up to the next nearest percentage point, so 92.11% and 92.97% both earn the grade of A-. Final letter grades will be determined by the grade scale below:

Grade Scale:

A	A-	B+	B	B-	C+	C	C-	D+	D	E
100 – 93.0%	92.9 – 90.0%	89.9 – 87.0%	86.9 – 83.0%	82.9 – 80.0%	79.9 – 77.0%	76.9 – 73.0%	72.9 – 70.0%	69.9 – 67.0%	66.9 – 60.0%	59.9 – 0%

Posting of Grades:

All grades will be posted on Carmen. After grades are posted you have 10 working days to challenge any grade or inquire regarding an unposted or missing grade. **After that time, grades are final.** To challenge or inquire about a missing grade, contact your laboratory instructor.

*****IMPORTANT*****

Make sure that all of your grades are properly posted on Carmen as you receive them. Challenges about grades, particularly after the end of the semester, will not be entertained after the 10-day grace period.

Late Assignments:

All assignments are due on the date and time prescribed in the course schedule. Late work will not be accepted except in rare (and documentable) circumstances.

Absences:

If you are too ill to take an exam or must miss for another legitimate unscheduled reason, you must contact the Course Coordinator within 24 hours of the exam. Make up exams will be given only to students who produce, at the make up or before, documentation of a legitimate reason (at the time of the absence) for missing the exam. Valid excuses are limited to problems that are beyond the student's control, such as military duty, intercollegiate athletic or academic activities, funerals, etc. Medical excuses will be considered only if you have been treated by a medical professional on the day of the exam (excuses from the student health center website will not be accepted). Lack of transportation, loss of electricity, travel

plans, etc. are not considered valid excuses. If you anticipate having to miss an exam due to attendance at a university sanctioned event or other qualifying conflict, you must contact the Course Coordinator at least one week in advance of the exam.

If you have no documentation to support your absence, or your absence from the exam is not for an excused reason, you will still be offered the opportunity for a makeup exam, with a 25% overall deduction on your exam score if arrangements are made within 24 hours of the original exam.
The format of makeup exams is at the discretion of the instructors. All makeup exams must be made up within one week of when the original exam was given.

Note: Check the date and time of the final examination now and make sure that this time does not conflict with your future plans. No early final exams will be given. The only makeup exam will be held on Wednesday, December xx at 9:00 a.m. and is available only in emergency situations and with prior approval of the Course Coordinator.

Make-Up Workshops and Lecture Activities: Both the lecture and workshop are integral parts of this course. If you miss a class, you must contact your instructor (lecture or workshop, as appropriate) within 48 hours of their missed class in order to be eligible to complete a make-up assignment. All make-up work requires a valid written excuse from a doctor, therapist, athletic coach, or other person involved with the absence (preferably before the event occurs, if it's a planned absence). We will consider one absence for every student to be excused without documentation, however students must contact their instructor within 48 **hours** of their missed workshop to receive the make-up exercise. Therefore, it is essential that you contact your instructor immediately if you miss a workshop, or if you know in advance that you cannot attend class on a specific date.

Policies for lab absences are detailed below in the Lab Policies section.

Make-up work must be completed and received within one week of the original assignment date (unless very unusual circumstances apply), or else you forfeit all points for that workshop.

Excused absences include, but are not limited to:

1. Illness and injury
2. Mental health
3. Disability-related concerns
4. Military service
5. Death in the immediate family
6. Religious observance
7. Academic field trips
8. Participation in university sanctioned concert or athletic event
9. Participation in university disciplinary hearings

If you have a reason to miss class that is not listed above, please reach out to the instructor to discuss your options. It is the intention of the Center for Life Sciences Education to remain supportive of the needs of each of our students. Students who do not contact their instructor within 48 hours of the missed class will not be eligible for make-up work.

PLTL Workshop, Assignments, and Grading Policy

Each week in PLTL, you will work with 7-10 other students in your course to solve carefully designed biology problems with the help of a peer leader. Your peer leader is an undergraduate student who previously excelled in Biology and has been trained to facilitate collaborative problem-solving. The work you do in PLTL each week will be integrated with your lecture and laboratory activities, and vice versa.

PLTL Learning Outcomes: In addition to achieving the Biology 1112 learning outcomes in PLTL, students in PLTL can expect to:

1. Develop and strengthen a suite of logical problem-solving skills including scientific argumentation, metacognitive thinking, and creative thinking
2. Develop and strengthen skills necessary for success in the sciences such as communication, collaboration, and conflict resolution
3. Learn to more accurately self-evaluate their course content mastery and learning achievements
4. Learn to effectively identify and achieve personalized learning goals

PLTL Attendance Policy

- Attendance to PLTL workshops is REQUIRED.
  - If you miss more than 2 unexcused workshops, then your final grade will drop by 1/3rd of a letter grade.
    - Example: Final grade will change from B- to C+.
  - If you miss 5 or more unexcused workshops, then your final grade will drop by 2/3rds of a letter grade
    - Example: Final grade will change from B- to C.
- If you are absent or know ahead of time that you will be absent to a workshop, contact your Peer Leader or Dr. O'Brien (obrien.501@osu.edu) as soon as possible to discuss whether your absence is excusable.
  - Connecting to your workshop through Zoom is an option, but you must contact your peer leader as soon as possible to set up the Zoom meeting.
- We will automatically drop the lowest score for each type of assignment (pre-workshop, workshop, and post-workshop).
  - There are no make-up assignments for missed PLTL workshops, regardless of whether the absence is considered excused or unexcused.
- PLTL workshops will start during Week 2 of the semester.

Lab Policies

Laboratory and Recitation: Laboratory and recitation are an integral part of course. They are designed to complement as well as supplement the lecture. You may first encounter something in lab before you have it in lecture or vice versa. It is expected that you come prepared to lab having read the chapter in the lab manual that will be presented. Labs do not necessarily go in the order presented in the manual—check the schedule on the syllabus. Recitation is a scheduled opportunity for students to ask questions and have concepts and information clarified by the TA. Students should be prepared with questions about lecture and/or lab. Make the most of recitation by bringing your lecture notes to lab and taking additional notes over material presented by the TA.

Lab Safety: Eating, drinking, and the use of cell phones (including text messaging) are all prohibited in the lab room. Open-toe shoes and flip-flops cannot be worn in the lab room.

Lab Worksheets: All Pre-lab assignments are due in Carmen BEFORE your lab starts.
The lab worksheets are typically due 48 hours after lab is held (48hrs after your lab's start time). Worksheets submitted late will be penalized 25% of the worksheet's total points per 24-hr period starting immediately after the deadline (**0-24 hours late** – 25%; **24-48 hours** – 50%, **48-72 hours** – 75%; **72+ hours** – 0 points earned). Lab worksheets are typically submitted as a group, and always to the appropriate assignment in Carmen.

Lab Quizzes: Quizzes will be administered on paper at the start of lab by your TA (10 pts each). The lowest score is dropped.

Missed Labs: Lab is an integral part of this course. If you miss a lab, you must contact your lab instructor within **48 hours** of the missed lab to be eligible to complete a make-up assignment. All make-up work requires a **valid written excuse** from a doctor, therapist, athletic coach, or other personnel involved with the absence (preferably *before* the event occurs, if it's a planned absence).

Make-up lab work must be completed and received before the start time of the next lab period, or else you forfeit all points for that lab.
Anyone who misses three or more labs/recitations (excused or unexcused) in a given semester will receive a failing grade for the course.

Excused absences include, but are not limited to: Illness and injury, mental health, disability-related concerns, military service, death in the immediate family, religious observance, academic field trips, participation in university sanctioned concerts or athletic events, participation in university disciplinary hearings.
If you have a reason to miss lab that is not listed above, please reach out to the lab or lecture instructor to discuss your options. It is the intention of the Center for Life Sciences Education to remain supportive of the needs of each of our students.

You are expected to attend each lab for the *full lab period:**

- If you arrive 15 minutes late or more, you will be considered absent.
- Students who are less than 15 minutes late to lab/recitation repeatedly (3+) will have one absence counted toward the lab attendance (failure) policy.

****Class scheduling conflicts (e.g., inadequate transit times) are not valid excuses to arrive late to lab and/or to leave lab early.***

Disability Services:

The university strives to maintain a healthy and accessible environment to support student learning in and out of the classroom. If you anticipate or experience academic barriers based on your disability (including mental health, chronic, or temporary medical conditions), please let us know immediately so that we can privately discuss options. To establish reasonable accommodations, we may request that you register with Student Life Disability Services. After registration, make arrangements with the Course Coordinator as soon as possible to discuss your accommodations so that they may be implemented in a timely fashion. Only the course coordinator is authorized to complete SLDS accommodations. This

will help us ensure that your individual needs will be met appropriately and fairly. SLDS contact information: slds@osu.edu; 614-292-3307; slds.osu.edu; 098 Baker Hall, 113 W. 12th Avenue.

If you are isolating while waiting for a COVID-19 test result, please let me know immediately. Those testing positive for COVID-19 should refer to the Safe and Healthy Buckeyes site for resources. Beyond five days of the required COVID-19 isolation period, I may rely on Student Life Disability Services to establish further reasonable accommodations. You can connect with them at slds@osu.edu; 614-292-3307; or slds.osu.edu.

Religious Accommodations:

Ohio State has had a longstanding practice of making reasonable academic accommodations for students' religious beliefs and practices in accordance with applicable law. In 2023, Ohio State updated its practice to align with new state legislation. Under this new provision, students must be in early communication with their instructors regarding any known accommodation requests for religious beliefs and practices, providing notice of specific dates for which they request alternative accommodations within 14 days after the first instructional day of the course. Instructors in turn shall not question the sincerity of a student's religious or spiritual belief system in reviewing such requests and shall keep requests for accommodations confidential.

With sufficient notice, instructors will provide students with reasonable alternative accommodations with regard to examinations and other academic requirements with respect to students' sincerely held religious beliefs and practices by allowing up to three absences each semester for the student to attend or participate in religious activities. Examples of religious accommodations can include, but are not limited to, rescheduling an exam, altering the time of a student's presentation, allowing make-up assignments to substitute for missed class work, or flexibility in due dates or research responsibilities. If concerns arise about a requested accommodation, instructors are to consult their tenure initiating unit head for assistance.

A student's request for time off shall be provided if the student's sincerely held religious belief or practice severely affects the student's ability to take an exam or meet an academic requirement and the student has notified their instructor, in writing during the first 14 days after the course begins, of the date of each absence. Although students are required to provide notice within the first 14 days after a course begins, instructors are strongly encouraged to work with the student to provide a reasonable accommodation if a request is made outside the notice period. A student may not be penalized for an absence approved under this policy.

If students have questions or disputes related to academic accommodations, they should contact their course instructor, and then their department or college office. For questions or to report discrimination or harassment based on religion, individuals should contact the Office of Institutional Equity.

Policy: Religious Holidays, Holy Days and Observances

Weather or Other Short-Term Closing:

Should in-person classes be canceled, students will be notified as to which alternative methods of teaching will be offered to ensure continuity of instruction for this class. Communication will be via Carmen announcements and course-wide email.

Section Changes:

All section changes and adds are completed by the course coordinator. Due to the need to keep up-to-minute availability of seats in each workshop, the lecturer and workshop instructors are unable to sign any permission forms.

Instructor Feedback and Response Expectations

- **Email response**: The CLSE's expectation of instructors is that emails will be responded to within one business day. If your email is sent during the evening or over the weekend, you may not receive a response until the next business day.
- **Class announcements**: I will send important class-wide messages through the Announcements tool in Carmen. Please check your notification preferences (go.osu.edu/canvas-notifications) to ensure you receive these messages.
- **Graded assignments:** Assignments will be graded and returned to you within one week after they were due. All scores are posted on Carmen no later than the day the graded assignment is returned.

Course Technology

For help with your password, university e-mail, Carmen, or any other technology issues, questions, or requests, contact the OSU IT Service Desk. Standard support hours are available at https://ocio.osu.edu/help/hours, and support for urgent issues is available 24x7.

- **Self-Service and Chat support:** http://ocio.osu.edu/selfservice
- **Phone:** 614-688-HELP (4357)
- **Email:** 8help@osu.edu
- **TDD:** 614-688-8743

Carmen

- Carmen, Ohio State's Learning Management System, will be used to host materials and activities throughout this course. To access Carmen, visit Carmen.osu.edu. Log in to Carmen using your name.# and password. If you have not setup a name.# and password, visit my.osu.edu.
- Help guides on the use of Carmen can be found at https://resourcecenter.odee.osu.edu/carmen
- **This online course requires use of Carmen (Ohio State's learning management system) and other online communication and multimedia tools. If you need additional services to use these technologies, please request ac56commodations with your instructor.**
- Carmen accessibility

CarmenZoom

- Office hours will be held through Ohio State's conferencing platform, CarmenZoom. A separate guide to accessing CarmenZoom and our office hours is posted on the course Carmen page under Files.
- Students may use the audio and video functions if a webcam and microphone are available. If not, there is still a chat function within CarmenZoom for the student to live chat with the professor or TA in the virtual office hours room.
- Carmen Zoom help guide

TurnItIn

- Students at The Ohio State University are accountable for the integrity of the work they submit. Therefore, you should be familiar with the guidelines provided by the Committee on Academic Misconduct (COAM) and Section A of OSU's Code of Student Conduct in order to meet the academic expectations concerning appropriate documentation of sources. In addition, OSU has made TurnItIn, a learning tool and plagiarism prevention system, available to instructors. For this class, you will submit your papers to TurnItIn from Carmen. When grading your work, I will interpret the originality report, following Section A of OSU's Code of Student Conduct as appropriate. For more information about TurnItIn, please see the vendor's guide for students. Note that submitted final papers become part of the OSU database.

- Please know that I view TurnItIn first and foremost as a teaching tool to make you a better writer. You will see in your individual originality reports exactly what the instructors see. We WANT you to look at this report as soon as you submit your assignments. If you see an issue, please correct it right away, before we start grading the assignment. You can resubmit without penalty as many times as you want prior to the established due date for any assignment. After the due date, the late policy is in effect.

TopHat

- TopHat is a web-based response system that allows students to use their own devices provide responses in the classroom. This course uses Top Hat to promote active engagement, allow for synchronous feedback, and monitor attendance.
- TopHat help guide

Discussion and Communication Guidelines

The following are expectations for how we should communicate as a class. Above all, please remember to be respectful and thoughtful.

- **Tone and civility**: Let's maintain a supportive learning community where everyone feels safe and where people can disagree amicably. Remember that sarcasm doesn't always come across online and is not always appreciated in-person. The instructional team work very hard to provide a positive learning experience. Please keep this in mind and remain civilized and respectful in your class communications.
- **Citing your sources**: When we have academic discussions, please cite your sources to back up what you say.

Issue Resolution:

The CLSE believes that student concerns are usually most effectively addressed by the staff closest to the situation. Therefore, students are ordinarily expected to address issues or concerns first with their instructors. If the issue cannot be resolved by your instructor, or for some reason you feel that you absolutely cannot address your concern with your instructor, please feel free to contact the Course Coordinator or Assistant Director Adam Andrews (andrews.171@osu.edu).

Building Emergency Action Plan:

Each building on campus has a Building Emergency Action Plan (BEAP) outlining that specific building's specific procedures to be followed in the event of a range of emergency situations, including fire, weather, terrorism, chemical spills, etc. It is the role of every Buckeye to help keep each other safe and to be aware of these procedures. You can find all of the campus BEAPs at https://dps.osu.edu/beap.

Lyft Ride Smart:

Lyft Ride Smart at Ohio State offers eligible students discounted rides, inside the university-designated service area, from 7 p.m. to 7 a.m. Prices may be impacted by distance, traffic, time of day, special events and prime time surcharges. To qualify for program discounts, users must select "shared ride" when booking in the Lyft app. For more information, visit: https://ttm.osu.edu/ride-smart.

Mental Health:

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 a student's ability to participate in daily activities. The Ohio State University offers services to assist you with addressing these and other concerns you may be experiencing. If you or someone you know are suffering from any of the aforementioned conditions, you can learn more about the broad range of confidential mental health services available on campus via the Office of Student Life's Counseling and Consultation Service (CCS) by visiting ccs.osu.edu or calling 614-292-5766. CCS is located on the 4th Floor of the Younkin Success Center and 10th Floor of Lincoln Tower. You can reach an on call counselor when CCS is

closed at 614-292-5766 and 24 hour emergency help is also available 24/7 by dialing 988 to reach the Suicide and Crisis Lifeline.

Title IX:

Title IX makes it clear that violence and harassment based on sex and gender are Civil Rights offenses subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories (e.g., race). If you or someone you know has been sexually harassed or assaulted, you may find the appropriate resources at http://titleix.osu.edu or by contacting the Ohio State Title IX Coordinator at titleix@osu.edu.

Diversity:

The Ohio State University affirms the importance and value of diversity in the student body. Our programs and curricula reflect our multicultural society and global economy and seek to provide opportunities for students to learn more about persons who are different from them. We are committed to maintaining a community that recognizes and values the inherent worth and dignity of every person; fosters sensitivity, understanding, and mutual respect among each member of our community; and encourages each individual to strive to reach his or her own potential. Discrimination against any individual based upon protected status, which is defined as age, color, disability, gender identity or expression, national origin, race, religion, sex, sexual orientation, or veteran status, is prohibited.

Academic Misconduct:

It is the responsibility of the Committee on Academic Misconduct to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term "academic misconduct" includes all forms of student academic misconduct wherever committed, illustrated by, but not limited to, cases of plagiarism and dishonest practices in connection with examinations. Instructors report all instances of alleged academic misconduct to the committee (Faculty Rule 3335-5-487). For additional information, see the Code of Student Conduct http://studentlife.osu.edu/csc/. We will adhere to this policy.

- Unless otherwise specified for a particular assignment, all submitted work should be a student's own unique effort. Collaborative efforts are not permitted unless expressly sanctioned for a particular assignment.
- Unless otherwise specified for a particular assignment, use of AI-generated materials for course submissions is not permitted.
- Reusing past work: In general, you are prohibited in university courses from turning in work from a past class to your current class, even if you modify it. If you want to build on past research or revisit a topic you've explored in previous courses, please discuss the situation with me.
- Using others' verbatim words without the use of quotation marks *and* citation is plagiarism. Paraphrased work requires citation to denote the use of others' ideas. Copying other's words without quotation while using citations is still considered plagiarism.
- Use of any technology during a quiz or exam (including but not limited to cell phones, smart watches, headphones, electronic dictionaries, etc.) is strictly prohibited.

Copyrighted Class Materials:

Course Schedule: Spring 2026

Schedule and assignments subject to change with as much advance notice as possible

Week	Lecture Topic	PLTL Workshop	Assignments Due
1	Course Intro and Ch12 – Mitosis and the Cell Cycle	None	
2	Ch12 – Cancer and Ch13 - Meiosis	1111 Wrapper & Metacognition	HW1 due Sunday
3	Ch13 (cont.) and Ch14 – Mendelian Genetics	Cancer & Mitosis	**Quiz 1 (Ch12-13) open Tues-Fri** HW2 due Sunday
4	Ch14 (cont.) – Extensions of Mendelian Genetics	Meiosis & Inheritance	HW3 due Sunday
5	Ch15 – DNA Replication and Repair	History of DNA	HW4 due Sunday
6	Ch16 – The Central Dogma	Exam Review	**Quiz 2 (Ch14-16) open Tues-Fri** HW5 due Sunday
7	**Midterm Exam (Chapters 12-16)** and Ch17 - Transcription	None	
8	Ch17 – RNA Processing and Translation	Transcription/Translation	HW6 due Sunday
9	Ch18 – Control of Gene Expression in Bacteria	Gene Regulation & Expression Pt1	HW7 due Sunday
	Spring Break	None	
10	Ch19 – Control of Gene Expression in Eukaryotes	Gene Regulation & Expression Pt2	HW8 due Sunday
11	Ch20 - Biotechnology	Gene Regulation & Expression Pt3	**Quiz 3 (Ch17-19) open Tues-Fri** HW9 due Sunday
12	Ch20 – Biotechnology (cont.)	Biotechnology/GMOs Pt1; Connect to DNA Barcoding Lab	HW10 due Sunday
13	Ch21 – Genes and Development	Biotechnology/GMOs Pt2	HW11 due Sunday
14	Ch33 - Viruses	Exam Review	**Quiz 4 (Ch 20-21,33) open Tues-Fri** HW12 due Sunday
Finals	**Final Exam**		

Laboratory Schedule:

Week	Lab Experiment	Assignments Due
1	Lab Safety & Introduction and Ex. 1: Introduction to Microscope Use	**Pre-Lab**: Questions for Ex. 1 (2pts) Lab Safety Quiz (5 pts) Ex. 1 Worksheet (10 pts) Microscope proficiency (3 pts)
2	Ex. 5: Cell Division and the Eukaryotic Cell Cycle	**Pre-Lab**: Questions from Ex. 5 (*2 pts*) Exercise 5 Assignment (*15 pts*)
3	Ex. 2: Properties of Biological Membranes	**Pre-lab**: questions from Exercise 2 (*2pts*) Exercise 2 Assignment (*15 pts*)
4	Ex. 3: Characterizing the Relative Activity Rates of Enzymes	**Pre-Lab**: questions from Ex. 3 (*2 pts*) Exercise 3 Assignment (*15 pts*) **LAB QUIZ #1**
5	Ex. 6: Mendelian Genetics with Statistical Analysis	**Pre-Lab**: Questions for Ex. 6 (*2 pts*) Exercise 6 Assignment (*15 pts*)
6	Ex. 7: Human Genetics; DNA Barcoding Overview	**Pre-Lab**: Complete the pre-lab for Ex. 7 (2pts) Exercise 7 Assignment (15 pts)
7	Pipetting and DNA Extraction	**Pre-Lab**: Complete the Virtual DNA Extractions lab and answer the questions (*2 pts*) Associated Worksheet (*10 pts*) Bring Sample to Lab
8	Polymerase Chain Reaction and Primary Literature Activity	**Pre-Lab**: Complete the Virtual lab on PCR and answer the questions (*2 pts*) PCR Assignment (10 *pts*) **LAB QUIZ #2**
9	Gel Electrophoresis	**Pre-Lab**: Questions for lab exercise *(2pts)* Gel Electrophoresis Assignment (10 *pts*)
	Spring Break	
10	DNA Extraction and PCR Re-dos Poster Work Session	
11	Gel Electrophoresis Re-dos and DNA Sequencing	LAB QUIZ #3 **Pre-Lab**: questions for DNA sequencing (*2 pts*) DNA Sequencing Assignment *(10 pts)*
12	Bioinformatics (DNA Subway)	**Pre-Lab**: questions for Bioinformatics (*2 pts*) Bioinformatics Assignment *(10 pts)*
13	Poster Presentations iNaturalist Upload	LAB QUIZ #4 Completed Poster Due Before Lab *(40pts)*
14	Lab Final Exam	Lab Final Exam (*40 pts*)
Finals		

GE Rationale: Foundations: Natural Science (4 credits)

Requesting a GE category for a course implies that the course fulfills **all** expected learning outcomes (ELOs) of that GE category. To help the reviewing panel evaluate the appropriateness of your course for the Foundations: Natural Sciences, please answer the following questions for each ELO.

A. Foundations

Please explain in 50-500 words why or how this course is introductory or foundational in the study of Natural Science.

In combination with the proposed Biology 1111, Biology 1112 will share identical course outcomes with Biology 1113, a TAG course taken as an introduction to the biological sciences by STEM majors. The course is taught from a traditional introductory biology textbook and has only a co / prerequisite of college algebra. The course is intended as a foundation to further study in the life sciences.

Course Subject & Number: Biology 1112

B. Specific Goals for Natural Sciences

GOAL 1: Successful students will engage in theoretical and empirical study within the natural sciences, gaining an appreciation of the modern principles, theories, methods, and modes of inquiry used generally across the natural sciences.

Expected Learning Outcome 1.1: Successful students are able to explain basic facts, principles, theories and methods of modern natural sciences; describe and analyze the process of scientific inquiry. Please link this ELO to the course goals and topics and indicate *specific* activities/assignments through which it will be met. *(50-700 words)*

As shown in the course outcomes, the content and approach of this course is significantly, but not entirely, based around the foundational biological information students need as a foundation for upper-level life science courses. Successful students will be able to...

1. The Cell
    a. explain the mechanisms and structures involved in mitotic and meiotic cell division and explain the different roles for and consequences of each.
    b. describe the functionality of cellular control mechanisms.
        i. describe how the loss/failure of cellular control mechanisms can lead to disease.
        ii. describe how genotypes and the environment influence the genetics of cancer.
2. Genetics
    a. explain the transfer and modification of heritable traits from parents to offspring via Mendelian inheritance.
    b. apply principles of Mendelian and non-Mendelian genetics to predict the outcomes of a variety of genetic crosses.
    c. explain the basis of and identify examples of non-Mendelian patterns of inheritance.
    d. describe the nature and expression of heritable information at the molecular level, including: the Central Dogma, DNA replication, transcription, protein synthesis (translation).
    e. explain how gene expression is controlled in prokaryotes and eukaryotes (at transcription, post-transcription, translation, and post-translation levels).
    f. identify mutations in DNA and assess their impact on gene expression and diversity.
    g. explain chromatin structure, the histone code, and epigenetic inheritance.
    h. explain how differential gene expression relates to organismal development, including cellular reproduction, growth, and differentiation
    i. describe characteristics of viruses and bacteria (e.g., life history, genome type and content, exchange of genetic material).
    j. describe the experimental basis and select applications of recombinant DNA technology, including gene cloning, genetically modified organisms (GMOs), and gene editing (CRISPR)

Students will be assessed on these outcomes through summative assessments such as exams and quizzes, and through formative assessment included in the weekly lab activities, Mastering Biology, PLTL Workshops, TopHat questions and other in-class activities.

Course Subject & Number: Biology 1112

Expected Learning Outcome 1.2: Successful students are able to identify how key events in the development of science contribute to the ongoing and changing nature of scientific knowledge and methods. Please link this ELO to the course goals and topics and indicate specific activities/assignments through which it will be met. *(50-700 words)*

Students will learn about the key events in history through examination of multiple areas of study, including but not limited to, Gregor Mendel's work in developing the modern theory of heredity, and the progression of experiments that led to Gene Theory. Griffith's experiments with bacteriophage led Hershey and Chase to hypothesize the nature of the gene which eventually led to Watson and Crick discovering the structure of DNA. This close examination of four decades' work then continues though more modern experiments leading up to CRISPR and other examples of modern biotechnology. Students will experience this walk through almost a century of historical experimentation, looking at those foundational experiments as well as some that offered insights but ultimately proved to be incorrect, modeling for students the true nature of scientific development.

Summative assessment will happen through exams and quizzes, while formative assessment will happen utilizing the PLTL Workshops, TopHat and other in-class lecture activities.

Course Subject & Number: Biology 1112

Expected Learning Outcome 1.3: Successful students are able to employ the processes of science through exploration, discovery, and collaboration to interact directly with the natural world when feasible, using appropriate tools, models, and analysis of data. Please explain the 1-credit hour equivalent experiential component included in the course: e.g., traditional lab, course-based research experiences, directed observations, or simulations. Please note that students are expected to analyze data and report on outcomes as part of this experiential component. *(50-1000 words)*

This course will include a 165-minute weekly in-person laboratory experience led by either a faculty member or teaching associate that will be correlated with the content of the lecture. Approximately 30 minutes per week will be devoted to a recitation or lecture review.

Weekly activities will come in two varieties: approximately half of the weekly activities will follow a traditional inquiry approach utilizing the existing lab activities from Biology 1113 while the other half of the lab experience will be a *Course-Based Undergraduate Research Experience (CURE)*. The CURE is an authentic research experience that allows students to participate in a novel process, develop their own hypotheses, design an experiment, collect and analyze data, and ultimately present their findings in an appropriate scientific context over the span of six weeks. The instructor in a CURE course serves more as a research mentor than a traditional instructor.

While the traditional laboratory activities are more structured, we strive to ensure our labs are not 'cookbook', but rather endeavor in each to have students practice the art of developing hypotheses, designing small-scale experiments and collecting data through a genuine inquiry process.

Students will submit pre-lab activities before each lab session and a group-written laboratory report at the end of the lab. Lab quizzes will assess students' knowledge of appropriate laboratory terminology and practices.

The skills and competencies outcomes will largely be a feature of the laboratory portion of the course.

1. Skills & Competencies
    a. Process of Science
        i. apply the process of science to research questions, presented scenarios, historical experiments, and course lab experiments.
        ii. design an experiment
        iii. collect and organize both qualitative and quantitative data.
        iv. support or refute an argument or conclusion using experimental results.
    b. Scientific Communication
        i. refer to primary literature articles using proper paraphrasing and citation (compare and contrast primary, secondary, etc).
        ii. create properly formatted graphs, figures, and tables using data.
        iii. analyze and interpret qualitative and quantitative data
        iv. create discipline-appropriate documents (poster, presentation, or paper).
        v. identify plagiarism and avoid plagiarizing when writing.
    c. Literature
        i. evaluate the quality and accuracy of a written source.
        ii. locate scholarly articles using electronic databases.
        iii. distinguish between primary literature, secondary literature, and content created for mass media.
    d. Laboratory
        i. employ safe laboratory practices.
        ii. use a compound light microscope to view microorganisms; maintain microscope cleanliness.
        iii. use a pipette to measure small volumes.
        iv. understand the key steps and reagents in PCR.
        v. explain how gel electrophoresis works and interpret DNA separation on a gel.
        vi. prepare a dilution series.
        vii. demonstrate the ability to work effectively as a team.

GOAL 2: Successful students will discern the relationship between the theoretical and applied sciences, while appreciating the implications of scientific discoveries and the potential impacts of science and technology.

Expected Learning Outcome 2.1: Successful students are able to analyze the inter-dependence and potential impacts of scientific and technological developments. Please link this ELO to the course goals and topics and indicate *specific* activities/assignments through which it will be met. *(50-700 words)*

The course's progression through the historical understanding of the nature of DNA and the theoretical concepts of Gene Theory will progress to its applications in various examples of modern biotechnology.

2j. describe the experimental basis and select applications of recombinant DNA technology, including gene cloning, genetically modified organisms (GMOs), and gene editing (CRISPR)

3. Nature of biological science and society
    a. describe the development and evaluation of scientific explanations of natural phenomena.
    b. apply biological concepts in the assessment of contemporary issues.
    c. reflect on ethical implications of emerging biotechnology.

Assessment will happen summatively though course exams and quizzes, and formatively through PLTL Workshops, and in-lecture discussions and activities.

Expected Learning Outcome 2.2: Successful students are able to evaluate social and ethical implications of natural scientific discoveries. Please link this ELO to the course goals and topics and indicate *specific* activities/ assignments through which it will be met. *(50-700 words)*

A topic like biotechnology lends itself perfectly to the discussion of ethical implications for society. With CRISPR advancements seemingly coming almost daily, students will explore the consequences of genetic manipulation at various levels: is it acceptable to cure diseases, to change one's phenotypic appearance, to design the 'perfect' offspring? Historical context to the eugenics movement will be discussed.

3. Nature of biological science and society
    b. apply biological concepts in the assessment of contemporary issues.
    c. reflect on ethical implications of emerging biotechnology.

Students will be assessed through formative assignments such as the PLTL workshops, as well as in-lecture discussion and activities.

Expected Learning Outcome 2.3: Successful students are able to critically evaluate and responsibly use information from the natural sciences. Please link this ELO to the course goals and topics and indicate *specific* activities/ assignments through which it will be met. *(50-700 words)*

As part of the DNA Barcoding CURE, students will be expected to generate a scientific-style poster to communicate their results. The poster project will require students to identify and evaluate appropriate background information as relevant to their project.

4. Skills & Competencies
    b. Scientific Communication
        i. refer to primary literature articles using proper paraphrasing and citation (compare and contrast primary, secondary, etc).
        ii. create properly formatted graphs, figures, and tables using data.
        iii. analyze and interpret qualitative and quantitative data
        iv. create discipline-appropriate documents (poster, presentation, or paper).
        v. identify plagiarism and avoid plagiarizing when writing.
    c. Literature
        i. evaluate the quality and accuracy of a written source.
        ii. locate scholarly articles using electronic databases.
        iii. distinguish between primary literature, secondary literature, and content created for mass media.