

	*Department of Biology *BIO2010: Introduction to Cellular Biology and Biochemistry *Lecture (3 units) + Lab (1 unit)
	Spring 2022

Meeting days: M/W/F	Instructor: Dr. Heidi Woelbern
Meeting times: 11:00-11:55 (I) 12:15-1:10 (II)	Phone: 619-849-2925
Meeting location: Latter 2	Email: heidiwoelbern@plnu.edu
Final Exam: 10:30-1:00pm Mon (I) 10:30-1:00pm Wed (II)	Office location: Rohr Science 164
Additional info:	Office Hours: LINK (select an appointment slot which will set up a meeting reminder for both of us)

PLNU Mission

To Teach ~ To Shape ~ To Send

Point Loma Nazarene University exists to provide higher education in a vital Christian community where minds are engaged and challenged, character is modeled and formed, and service is an expression of faith. Being of Wesleyan heritage, we strive to be a learning community where grace is foundational, truth is pursued, and holiness is a way of life.

COURSE DESCRIPTION

An introduction to the principles of cell biology, molecular biology, and biochemistry. Topics include the chemical basis of life, basic membrane functions and membrane transport, basic metabolic pathways including cellular respiration and photosynthesis, cell division, and expression of the genetic material. Lecture and lab. Offered every semester.

Prerequisite(s): Must have a previous course in high school or university-level chemistry.

COURSE LEARNING OUTCOMES

The overarching goal of this course is to prepare students for subsequent in-depth coursework in Biology, Biology-Chemistry, and health sciences.

Students will be able to:

- 1) Understand basic principles of the inner function of cells, including how cells obtain and use energy through cellular respiration and/or photosynthesis, how membranes regulate cellular composition, how cells organize and communicate within a multicellular organism, and how genetic material is copied and converted to phenotypic information. (Program learning outcome #1)
- 2) Apply content to various scenarios in order to describe how a cell would react under changing environmental conditions, and relate problems associated with malfunctions in various important cellular processes. (Program learning outcome #1)
- 3) Evaluate current bioethical issues from an understanding of science and our moral responsibilities as Christians. (Program Learning Outcome #3)

- 4) Utilize skills and techniques critical to experimentation in a cell and molecular biology laboratory setting. (Program learning outcome #1)
- 5) Design scientific experiments with appropriate controls and analyze scientific data, demonstrating knowledge of the purpose, experimental method, data, and basic statistical interpretation. (Program learning outcome #1)
- 6) Demonstrate critical thinking skills related to scientific methods, data analysis, and conclusions. (FELO 1d; *Select questions on the final exam will be used to assess FELO 1d. Critical Thinking: Students will be able to examine, critique, and synthesize information in order to arrive at reasoned conclusions.*)

REQUIRED TEXTS AND RECOMMENDED STUDY RESOURCES

1. **Textbook + Online Learning Platform:** Brooker et al, (3rd edition) Principles of Biology. Buying options dependent on your major:
 - A. **Biology, Biochemistry, and Environmental Science majors**, along with most **pre-med students**, will need the text for multiple courses with Connect access for 1 semester. Thus you should purchase the loose leaf printed version of the text (that you can use for multiple semesters) with a 1 semester Connect code (that you need for BIO2010): **ISBN = 9781264079803**
 - B. **Applied Health, Dietetics, Chemistry**, or other majors who only need 1 semester of biology (BIO2010). 1 semester Connect access with Etext: **ISBN = 9781307005448**

Note that even if you obtain the text from a separate source, you will still need to purchase the 1 semester Connect access for this course. This can be done through CANVAS once the course has been published.

2. **iClicker2** We will be using a polling system. This will allow you to answer questions posed during lecture. **ISBN: 9781498603041**
3. **Lab Manual** – is available as a course reader from University Readers. You must order and have your own reader (~\$25). **ISBN:9781793572097**

Note all the above can be obtained from our bookstore or online.

COURSE CREDIT HOUR INFORMATION

In the interest of providing sufficient time to accomplish the stated Course Learning Outcomes, this class meets the PLNU credit hour policy for a 4 unit class delivered over 15 weeks. It is anticipated that students will spend a minimum of 37.5 participation hours per credit hour on their coursework. For this course, students will spend an estimated 150 total hours meeting the course learning outcomes. The time estimations are provided in the Canvas modules.

ASSESSMENT AND GRADING

Point breakdown (tentative; may be altered slightly)

3 midterm exams	38%
1 final exam	17%
SmartBook assignments and other homework	10%
Peer teaching assignments / Team Learning activities	10%
Laboratory grade	20%
Class attendance and participation	5%
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TOTAL	100%

Exams – While BIO2010 can be taken as a course that meets the Foundational Explorations requirement for science, and is a requirement for the applied health sciences, it is most commonly the first biology course for students with declared majors in Biology or Biology-Chemistry. The content and concepts introduced in this course are foundational to virtually all subsequent courses in the program, thus it is essential that you maximize retention of the content and concepts beyond the exams.

There will be 3 midterms (~100 pts each) and a final exam (~150 pts). Each exam will consist of multiple choice and short answer questions and/or calculation problems. All of science is cumulative such that scientific knowledge must build and expand upon previous knowledge. The same is true when learning science, you must remember and apply all that you have previously learned in order to completely understand and apply newer material. Thus, although the focus of each midterm will be on recent material, each should be thought of as a cumulative exam.

If you have a conflict with an exam date/time, you must let the instructor know well in advance. Makeup exams will be at the discretion of the instructor.

NOTE: The final exam must be taken at the scheduled place and time.

Homework: -- Homework, including the SmartBook assignments, will be assigned periodically throughout the semester. Late work will lose 10% per day up to 1 week late at which point a 0 will be given.

SmartBook assignments 10 x ~10 - 15 pts each – Your textbook comes with excellent, individualized learning tools to help you master the material.

To hold students accountable for the assigned reading, SmartBook assignments are on assigned reading that we have not yet covered in class. Having already been introduced to key terms and concepts, we will be ready to work together and focus on concepts and application of knowledge in class. There are also optional practice work through SmartBook that I have designed to provide additional opportunities to practice applying key concepts. These mirror concepts and higher order learning assessment that you will see in exams.

Peer teaching – Teaching is a great way to learn. On some days, for 10 - 15 minutes at the beginning of class, we will break into peer groups, where one student in the group will teach the others a particular topic, usually describing a key historical experiment that has allowed us to understand current biology related to our course. Topics are listed in the tentative course schedule. **The teaching student will be required to turn in their teaching slides / outline of the topic.** Points are awarded according to the

degree of preparedness, student evaluations, and the quality of the study guide / outline. **You are allowed to swap weeks with another student in your group, assuming you both agree, but you must inform me of the swap ahead of time.**

Team Learning Activities: On some days, we will do Team Activities to practice higher-level learning and application. The topics are listed in the schedule. Each student is responsible for reading and preparing any background materials in advance. There may be a short, individual quiz taken on the material prior to the activity to ensure that students are completing the required background work.

Laboratory experience – The BIO2010 lab is designed to expose the student to some of the essential tools of the scientist in a safe, controlled environment. Please see the separate lab syllabus for details.

Class participation - Class attendance and participation will be based on iClicker participation, attitude, and preparation / contribution in peer teaching and group activities. ***This is true for both in-class participation and participation if you are attending the course online due to quarantine.*** I require iClickers and have questions throughout the course that are answered during lecture. **Generally, I am looking for thought and participation, not whether or not you answered the question correctly. Everyone must have their own iClicker account and it must be registered with your student ID number.**

Grades will be based on the following:

Sample Standard Grade Scale Based on Percentages

A	B	C	D	F
A 93-100	B+ 87-89	C+ 77-79	D+ 67-69	F Less than 59
A- 90-92	B 83-86	C 73-76	D 63-66	
	B- 80-82	C- 70-72	D- 60-62	

A minimum grade of C in this course is required to advance to Genetics. (A grade of C - or lower is not acceptable for advancement to Genetics.)

STATE AUTHORIZATION

State authorization is a formal determination by a state that Point Loma Nazarene University is approved to conduct activities regulated by that state. In certain states outside California, Point Loma Nazarene University is not authorized to enroll online (distance education) students. If a student moves to another state after admission to the program and/or enrollment in an online course, continuation within the program and/or course will depend on whether Point Loma Nazarene University is authorized to offer distance education courses in that state. It is the student's responsibility to notify the institution of any change in his or her physical location. Refer to the map on [State Authorization](#) to view which states allow online (distance education) outside of California.

INCOMPLETES AND LATE ASSIGNMENTS

All assignments are to be submitted/turned in by the beginning of the class session when they are due—including assignments posted in Canvas. Incompletes will only be assigned in extremely unusual circumstances.

PLNU COPYRIGHT POLICY

Point Loma Nazarene University, as a non-profit educational institution, is entitled by law to use materials protected by the US Copyright Act for classroom education. Any use of those materials outside the class may violate the law.

PLNU ACADEMIC HONESTY POLICY

Students should demonstrate academic honesty by doing original work and by giving appropriate credit to the ideas of others. Academic dishonesty is the act of presenting information, ideas, and/or concepts as one's own when in reality they are the results of another person's creativity and effort. A faculty member who believes a situation involving academic dishonesty has been detected may assign a failing grade for that assignment or examination, or, depending on the seriousness of the offense, for the course. Faculty should follow and students may appeal using the procedure in the university Catalog. See [Academic Policies](#) for definitions of kinds of academic dishonesty and for further policy information.

PLNU ACADEMIC ACCOMMODATIONS POLICY

While all students are expected to meet the minimum standards for completion of this course as established by the instructor, students with disabilities may require academic adjustments, modifications or auxiliary aids/services. At Point Loma Nazarene University (PLNU), these students are requested to register with the Disability Resource Center (DRC), located in the Bond Academic Center (DRC@pointloma.edu or 619-849-2486). The DRC's policies and procedures for assisting such students in the development of an appropriate academic adjustment plan (AP) allows PLNU to comply with Section 504 of the Rehabilitation Act and the Americans with Disabilities Act. Section 504 prohibits discrimination against students with special needs and guarantees all qualified students equal access to and benefits of PLNU programs and activities. After the student files the required documentation, the DRC, in conjunction with the student, will develop an AP to meet that student's specific learning needs. The DRC will thereafter email the student's AP to all faculty who teach courses in which the student is enrolled each semester. The AP must be implemented in all such courses.

If students do not wish to avail themselves of some or all of the elements of their AP in a particular course, it is the responsibility of those students to notify their professor in that course. PLNU highly recommends that DRC students speak with their professors during the first two weeks of each semester about the applicability of their AP in that particular course and/or if they do not desire to take advantage of some or all of the elements of their AP in that course.

PLNU ATTENDANCE AND PARTICIPATION POLICY

Regular and punctual attendance at all **synchronous** class sessions is considered essential to optimum academic achievement. If the student is absent for more than 10 percent of class sessions (virtual or face-to-face), the faculty member will issue a written warning of de-enrollment. If the absences exceed 20 percent, the student may be de-enrolled without notice until the university drop date or, after that date, receive the appropriate grade for their work and participation. In some courses, a portion of the credit hour content will be delivered **asynchronously** and attendance will be determined by submitting the assignments by the posted due dates. See [Academic Policies](#) in the Undergraduate Academic Catalog. If absences exceed these limits but are due to university excused health issues, an exception will be granted.

Asynchronous Attendance/Participation Definition

A day of attendance in asynchronous content is determined as contributing a substantive note, assignment, discussion, or submission by the posted due date. Failure to meet these standards will result in an absence for that day. Instructors will determine how many asynchronous attendance days are required each week.

SPIRITUAL CARE

Please be aware PLNU strives to be a place where you grow as whole persons. To this end, we provide resources for our students to encounter God and grow in their Christian faith.

If students have questions, a desire to meet with the chaplain or have prayer requests you can contact the [Office of Spiritual Development](#)

USE OF TECHNOLOGY

In order to be successful in the online environment, you'll need to meet the minimum technology and system requirements; please refer to the [Technology and System Requirements](#) information. Additionally, students are required to have headphone speakers compatible with their computer available to use. If a student is in need of technological resources please contact student-tech-request@pointloma.edu.

Problems with technology do not relieve you of the responsibility of participating, turning in your assignments, or completing your class work.

Tentative Class Schedule: (A) indicates ASYNCHRONOUS

Week	Day	Topic (tentative)	Pre-class video	Assignment due
Week 1 Jan 11 - 14	Tue	Syllabus and course introduction	Course introduction video	
	Wed	CH 1 Scientific method	Scientific methods; the basics	
	Fri	CH 1 Data statistics CH 2 Valence + chemical bonding		Team Activity: Metabo-Herb Edpuzzle (CH2)
Week 2 Jan 18- 21	Mon	MARTIN LUTHER KING JR. DAY (NO CLASSES)		
	Wed	CH 2; Electronegativity and polar covalent bonds	Intro to the basics of electronegativity	Connect; SmartBook Ch. 2
	Fri	CH 3; Macromolecules; lipids and carbohydrates	Polymerization of biological macromolecules	
Week 3 Jan 24- 28	Mon (A)	CH 3; Peptide bonds + Amino Acids + Proteins	Functions and characteristics of proteins	Edpuzzle (CH 3)
	Wed	CH 3: Protein structure	Intro to protein structure	Connect; SmartBook Ch. 3
	Fri	CH 3; Team activity.	Protein structure	Peer teaching #1 (Feature Invest. Pages 51-53). Copy of slides / handout due on canvas before class.
Week 4 Jan 31- Feb 4	Mon	CH 4; Genomes and proteomes	Cell theory & basic properties of cells	
	Wed	CH 4; Organelles and protein targeting	Major aspects of organelles	Connect; SmartBook CH 4. Organelle matrix (assignment on canvas) due before class
	Fri	Exam #1; Chapters 1 – 4		
Week 5 Feb 7-11	Mon (A)	CH 5; Membrane fluidity, selective permeability, and membrane proteins	General membrane structure and the fluid mosaic model	Edpuzzle (CH 5)
	Wed	CH 5; Channels and membrane transport	Osmosis	Connect; SmartBook CH 5
	Fri	Finish CH 5 concepts Team activity; Review of exam 1.		Molecular modeling #2; aquaporin PT#2 (Feature Invest., Pgs 107-109). Copy of slides / handout due on canvas before class.
Week 6 Feb 14- 18	Mon	CH 6; Coupled transport, endergonic vs. exergonic reactions.	Laws of thermodynamics. Potential vs. kinetic energy	
	Wed	CH 6; Enzymes and cellular energy diagrams	Introduction to enzymes	Connect: SmartBook CH 6A
	Fri (A)	CH 6; Glycolysis and Tricarboxylic Acid (TCA) Cycle	Introduction to cellular respiration. Redox rxns	Oxidation of glucose matrix (optional) Edpuzzle (CH 6B)

Week 7 Feb 21-25	Mon	CH 6; Oxidative phosphorylation		
	Wed	CH 6; Fermentation and Cell respiration activity Team Activity -Fermentation and Cell Respiration	Electron transport chain review video	Connect: SmartBook CH 6B
	Fri	Team Activity (cont.) Catch-up/Review Exam #2		PT #3 (Feature Invest., Pgs 143-145). Copy of slides / handout due on canvas before class.
Week 8 Feb 28– March 4	Mon	Exam #2; Chapters 5 – 6		
	Wed	CH 7; Photosynthesis; light reactions (linear and cyclic)	Introduction to photosynthesis	Connect: Smartbook CH 7
	Fri	CH 7; Photosynthesis; Calvin cycle and generating sugars		
Week 9 Mar 7-11	SPRING BREAK			
Week 10 Mar 14-18	Mon (A)	CH 8; threshold and cell signaling concepts	Introduction to cell signaling; leptin	EdPuzzle (CH 8)
	Wed	CH 8; Signaling cascades and secondary messengers	5 modes of cell signaling	Connect; SmartBook CH 8
	Fri	Team Activity - Identifying DNA as the genetic material	Griffith's experiments	
Week 11 Mar 21-25	Mon	CH 9; Semi-conservative replication and Meselson and Stahl experiments	The structure of the DNA helix	
	Wed	CH 9; DNA polymerase restrictions and bi-directional synthesis	How to make replication rapid	Connect; SmartBook CH 9
	Fri	CH 9; Bi-directional synthesis activity	Mutations and proofreading	
Week 12 Mar 28 – April 1	Mon	CATCH UP DAY + REVIEW		
	Wed	Exam #3; Chapters 8 – 9		
	Fri	CH 10; Transcription	Overview of central dogma and gene expression stages	
Week 13 April 4 – 8	Mon	CH 10; Transcription and translation	RNA processing	
	Wed	CH 10; Translation	EPA sites in translation	Connect; SmartBook CH 10 Intro to Molecular Biology assignment
	Fri	CH 10; Catch-up and discuss mutations	Mutations and effects on phenotype	PT #4 (Feature Invest., Pgs 218-220). Copy of slides / handout due on canvas before class.

Week 14 Apr 11 – 15	Mon (A)	CH 14; Chromosomes and sister chromatids	Karyotyping	Edpuzzle (CH 14)
	Wed	CH 14; Cell, cycle, cancer, and mitosis	Overview of cell cycle and CDKs	Connect; SmartBook CH 14
	Fri	EASTER RECESS (NO LECTURE)		
Week 15 Apr 18- 22	Mon	EASTER RECESS (NO LECTURE)		
	Wed	CH. 14: Meiosis		Creating a need for meiosis (due before class)
	Fri	CH 15; Introduction to Mendelian Genetics and Punnett squares		
Week 16 April 25- 29	Mon	CH 15; Relating genetic inheritance to events in meiosis		
	Wed	CH 15; Non-Mendelian inheritance		Connect; SmartBook CH 15
	Fri	Final Exam Review Day		
Final Exam (BIO2010 section 1)			MONDAY, May 2nd ; 10:30 - 1:00pm	
Final Exam (BIO2010 section 2)			WEDNESDAY, May 4th; 10:30 - 1:00pm	

FINAL EXAMINATION POLICY

Successful completion of this class requires taking the final examination **on its scheduled day**. The final examination schedule is posted on the [Class Schedules](#) site.