



Department of Biology

**BIO2010 Cell Biology and Biochemistry**

Lecture (3 units) + Lab (1 unit)

*Spring 2024*

**Meeting days/times: MWF 11:00 – 11:55 am)**

**Meeting location: Taylor 312**

**Final Exam: Friday May 3<sup>rd</sup> 10:30 am – 1:30 pm**

INFORMATION	SPECIFICS FOR THE COURSE
<b>Instructor title and name:</b>	Dr. Heidi R. Woelbern
<b>Phone:</b>	619-849-2925
<b>Email:</b>	heidiwoelbern@pointloma.edu
<b>Office location and hours:</b>	Rohr Science 164: Office Hour <a href="#">Link</a>

**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.

**Foundational Explorations Mission**

PLNU provides a foundational course of study in the liberal arts informed by the life, death, and resurrection of Jesus Christ. In keeping with the Wesleyan tradition, the curriculum equips students with a broad range of knowledge and skills within and across disciplines to enrich major study, lifelong learning, and vocational service as Christ-like participants in the world's diverse societies and culture.

**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.

## Program and 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)

### Foundational Explorations Learning Outcomes (FELO)

1. Students will 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*).
2. Signature assignment will involve a student designed lab and a formally written lab report summarizing the findings made in the lab.

## REQUIRED TEXTS AND RECOMMENDED STUDY RESOURCES

1. Third Edition. Campbell et al, Pearson, 2020. Loose leaf text and ACCESS code can be found at the PLNU bookstore. However, you might get a better deal buying directly through Pearson. Please cost compare prior to purchasing.

**Biology, Biochemistry and Environmental Science majors** - obtain the loose leaf + ACCESS code: **ISBN = 9780135686065** (Loose leaf).

**Applied health, dietetics, chemistry, or other majors** who only need 1 semester of biology. Semester Connect access with Etext: **ISBN = 9780136781851**

*Note that even if you obtain the text from a separate source, you will still need to purchase the 1 semester Access for this course. This can be purchased through CANVAS using the MyLab and Mastering Tab.*

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 Cognella. You must order and have your own reader (~\$26). **ISBN:978-8-8233-1168-7**  
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 Mastering Biology 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.

**Mastering Biology assignments 10 x (10 pts each)** – Your textbook comes with excellent, individualized learning tools to help you master the material.

To hold students accountable for the assigned reading, Mastering Biology 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 summative homework assignments to be completed once we have finished a chapter, also administered through Pearson's Mastering Biology.

**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. **The teaching student will be required to turn in their 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**

<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>F</b>
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.)***

#### **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 [Traditional Undergraduate Records: Final Exam Schedules](#) site. If you find yourself scheduled for three (3) or more final examinations on the same day, you are authorized to contact each professor to arrange a different time for one of those exams. However, unless you have three (3) or more exams on the same day, no requests for alternative final examinations will be granted.

#### **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.

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### **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](mailto: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 class sessions is considered essential to optimum academic achievement. If the student is absent for more than 10 percent of class sessions, 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 withdrawal date or, after that date, receive an "F" grade.

### **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](#).

### Tentative Class Schedule:

Week	Day	Topic (tentative)	Textbook Reference
Week 1 Jan 8 -12	Mon	Syllabus and course intro	Course intro
	Wed	Scientific method	1.1 and 1.3
	Fri	CH 1 Data statistics CH 2 Valence + chemical bonding	2.1 – 2.3
Week 2 Jan 15 - 19	Mon	<b>MARTIN LUTHER KING JUNIOR DAY (NO LECTURE)</b>	
	Wed	Electronegativity and polar covalent bonds	2.4 – 2.5
	Fri	Macromolecules: carbohydrates	3.1 – 3.3
Week 3 Jan 22- 26	Mon	Macromolecules: Lipids and nucleic acids	3.4 and 3.6
	Wed	Macromolecules: Proteins. Peptide bonds, amino acids and levels of protein structure.	3.5
	Fri	Peer Teaching #1. Copy of handout due on CANVAS before class.	
Week 4 Jan 29- Feb 2	Mon	Cell structure overview (genomes, proteomes, organelles, etc)	4.1 – 4.5
	Wed	Cell organization (protein transport and the extracellular matrix)	4.6 – 4.8
	Fri	<b>EXAM 1; CH 1 - 4</b>	
Week 5 Feb 5-9	Mon (A)	<b>ASYNCHRONOUS CLASS</b> EDPUZZLE on Membrane fluidity, selective permeability, and membrane proteins (due by 9:00 pm)	5.1 – 5.2
	Wed	Transport across the membrane	5.3 – 5.5
	Fri	Peer Teaching #2. Copy of handout due on CANVAS before class. Team activity and Review of exam 1.	
Week 6 Feb 12- 16	Mon	Modes of cell signaling: threshold	5.6 + Edpuzzle (due before class)
	Wed	Signaling cascades and secondary messengers	
	Fri	Metabolism, endergonic vs. exergonic reactions.	6.1 – 6.2
Week 7 Feb 19- 23	Mon	ATP and enzymes	6.3 – 6.5
	Wed	Cellular Respiration: Redox Reactions and Glycolysis	7.1 – 7.2 + Edpuzzle (EC)
	Fri	Cellular Respiration: Citric Acid Cycle + Oxidative phosphorylation	7.3 – 7.4
Week 8 Feb 26 – Mar 1	Mon	Cellular Respiration: Fermentation and Anerobic Respiration Team Activity -Fermentation and Cell Respiration	7.5 – 7.6
	Wed	Team Activity (cont.) Catch-up/Review Exam #2	
	Fri	<b>EXAM 2; CH 5 - 7</b>	

Week 9 Mar 4 - 8	<b>SPRING BREAK</b>		
Week 10 Mar 11-15	Mon	Photosynthesis: Light Reactions (Linear and Cyclic Electron Flow)	8.1 – 8.2
	Wed	Photosynthesis: Calvin Cycle and Generating Sugars	8.3 – 8.4
	Fri	Peer Teaching #3. Copy of handout due on CANVAS before class. Team activity - Identifying DNA as the genetic material	13.1
Week 11 Mar 18-22	Mon	DNA: Semi-conservative DNA replication and Meselson and Stahl experiments	13.2
	Wed	DNA Replication: DNA polymerase and bi-directional synthesis	13.2
	Fri	DNA and Chromosome Structure	13.3
Week 12 Mar 25 –29	Mon	CATCH UP DAY + EXAM REVIEW	
	Wed	<b>EXAM 3; CH 8 - 13</b>	
	Fri	<b>EASTER RECESS (NO LECTURE)</b>	
Week 13 April 1 - 5	Mon	<b>EASTER RECESS (NO LECTURE)</b>	
	Wed	Gene Expression: Overview + Transcription	14.1 – 14.2
	Fri	Gene Expression: RNA processing + Translation	14.3 – 14.4
Week 14 April 8 - 12	Mon	Gene Expression: Translation + Mutations	14.4 – 14.5
	Wed	Peer Teaching #4. Copy of handout due on CANVAS before class. Review EXAM 3 Results	
	Fri <b>(A)</b>	<b>ASYNCHRONOUS CLASS</b> Cell Cycle: Chromosomes and karyotyping	9.1 + 9.2
Week 15 April 15 - 19	Mon	Cell Cycle: Mitosis and Cancer, and mitosis – overview of cell cycle and CDKS	9.2 + 9.3
	Wed	Meiosis	10.1 – 10.4
	Fri	Genetics: Introduction to Mendelian Genetics and Punnett squares	11.1 – 11.2
Week 16 April 22- 26	Mon	Genetics: Relating genetic inheritance to events in meiosis	11.4
	Wed	Genetics: Non-Mendelian inheritance (X-linked inheritance)	11.3
	Fri	Final Exam Review Day	
<b>Final Exam BIO2010, FRIDAY MAY 3rd, 10:30 – 1:00 pm</b>			