
 <p><b>POINT</b><sup>19</sup>  <b>LOMA</b><sup>02</sup> NAZARENE UNIVERSITY</p>	<p><b>DEPARTMENT OF BIOLOGY</b></p> <p><b>BIO2010: Cell Biology and Biochemistry Lecture (3 units)</b></p>
Spring 2023	

<b>Meeting days:</b> M/W/F	<b>Instructor:</b> Dr. Dave Cummings
<b>Meeting times:</b> 12:15-1:10 pm	<b>Phone:</b> 619-849-2642
<b>Meeting location:</b> Latter 2	<b>Email:</b> davidcummings@pointloma.edu
<b>Final Exam:</b> F 5/5/23 10:30 am	<b>Office location:</b> Rohr Science 176
<b>Additional info:</b> See separate lab syllabus	<b>Office Hours:</b> Mondays 2 – 5 pm

### **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.*

By the end of this course, 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. (PLO #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. (PLO #1)
- 3) Evaluate current bioethical issues from an understanding of science and our moral responsibilities as Christians. (PLO #3)
- 4) Utilize skills and techniques critical to experimentation in a cell and molecular biology laboratory setting. (PLO #1)

- 5) Design scientific experiments with appropriate controls and analyze scientific data, demonstrating knowledge of the purpose, experimental method, data, and basic statistical interpretation. (PLO #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 RESOURCES

1. **Textbook + Online Learning Platform:** Brooker et al. (3<sup>rd</sup> edition) Principles of Biology. Buying options depending on your major:
  - Option A. **Biology, Biology-Chemistry, and Environmental Science majors:** Hard copy with a 1-semester Connect code: **ISBN: 9781264079803** (looseleaf or hardcover)
  - Option B. **Applied Health, Dietetics, Chemistry,** or other majors: Etext with a 1-semester Connect code: **ISBN: 9781307005448** (looseleaf or hardcover options are fine as well, just more expensive)

*\*If you obtain the text from a separate source, you will need to purchase the 1-semester Connect access through CANVAS once the course has been published.*

2. **Lab Manual:** Available as a course reader from Cognella. Available in the University bookstore or online at <https://store.cognella.com/24942>. REQUIRED IMMEDIATELY.

## ASSESSMENT AND GRADING

Practice exams	140 pts (16%)
Regular exams	450 pts (45%)
SmartBook	120 pts (10%)
Peer teaching	40 pts (4%)
Laboratory experience	250 pts (25%)
<b>TOTAL</b>	<b>1,000 pts (100%)</b>

### Letter 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 (73%) in this course is required to advance to Genetics. A grade of C- (72%) or lower is not acceptable for advancement to Genetics.*

**Practice exams (160 points)** – Before each regular exam, you will take an open-notes/book practice exam (40 points each) in order to help you identify areas where more preparation is needed. Practice exams will be taken in Canvas using Honorlock.

**Regular exams (450 points)** – 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. Up to 10% of points on exams 2 and 3 and up to 33% of the final exam points may come directly from previous material (cumulative).

\*If you have a conflict with an exam date/time, you must let the instructor know at least one week in advance. Makeup exams will be at the discretion of the instructor. The final exam must be taken at the scheduled place and time.

**SmartBook (120 points)** – SmartBook assignments (10 points each) are on assigned reading that we have not yet covered in class. There are also optional practice problems through SmartBook that have been designed to provide additional opportunities to practice applying key concepts. These problems mirror concepts and higher-order learning assessments that you will see on exams.

**Peer teaching (40 points)** – On select days (see calendar), for 15-20 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. Topics are listed in the tentative course schedule. The teaching student will be required to turn in a study guide of the topic in outline format. Points are awarded according to the degree of preparedness and the quality of the study guide. 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. (4 x 10 points each)

**Laboratory experience (250 points)** – 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.

## PLANNED CLASS SCHEDULE

Week	Day	Topic (tentative)	Pre-class video	Assignment due
Week 1	Tue 1/10	Syllabus and course introduction	Course introduction	
	Wed 1/11	CH 1 Scientific method	Scientific method	
	Fri 1/13	CH 1 Data and statistics CH 2 Valence and chemical bonding		
Week 2	Mon 1/16	<b>MARTIN LUTHER KING JR. DAY (NO CLASSES)</b>		
	Wed 1/18	CH 2 Electronegativity and polar covalent bonds	Intro to the basics of electronegativity	SmartBook CH 2
	Fri 1/20	CH 3 Macromolecules: lipids and carbohydrates	Polymerization of biological macromolecules	PT1: The Scientific Method
Week 3	Mon 1/23	CH 3 Peptide bonds, amino acids, proteins	Functions and characteristics of proteins	
	Wed 1/25	CH 3 Protein structure	Intro to protein structure	SmartBook CH 3
	Fri 1/27		Protein structure	PT2: Four Macromolecules
Week 4	Mon 1/30	CH 4 Genomes and proteomes	Cell theory & basic properties of cells	SmartBook CH 4
	Wed 2/1	CH 4 Organelles and protein targeting	Major aspects of organelles	Practice Exam 1 due by midnight
	<b>Fri 2/3</b>	<b>Exam #1: Chapters 1 – 4</b>		
Week 5	Mon 2/6	CH 5 Membrane fluidity, selective permeability, and membrane proteins	General membrane structure and the fluid mosaic model	
	Wed 2/8	CH 5 Channels and membrane transport	Osmosis	SmartBook CH 5
	Fri 2/10	Finish CH 5 concepts Review of exam 1		PT3: Membrane Transport
Week 6	Mon 2/13	CH 6 Coupled transport, endergonic vs. exergonic reactions	Laws of thermodynamics Potential vs. kinetic energy	

	Wed 2/15	CH 6 Enzymes and cellular energy diagrams	Introduction to enzymes	SmartBook CH 6A
	Fri 2/17	CH 6 Glycolysis and tricarboxylic acid (TCA) cycle	Introduction to cellular respiration Redox rxns	PT1: Enzymes
Week 7	Mon 2/20	CH 6 Oxidative phosphorylation		SmartBook CH 6B
	Wed 2/22	CH 6 Fermentation and Cellular respiration	Electron transport chain review	PT2: Aerobic Cellular Respiration
	Fri 2/24	Catch-up/Review for Exam #2		Practice Exam 2 due by midnight
Week 8	<b>Mon 2/27</b>	<b>Exam #2: Chapters 5 – 6</b>		
	Wed 3/1	CH 7 Photosynthesis: light reactions (linear and cyclic)	Introduction to photosynthesis	SmartBook CH 7
	Fri 3/3	CH 7 Photosynthesis: Calvin cycle and generating sugars		PT3: Light and Dark Reactions of Photosynthesis
Week 9	SPRING BREAK 3/6-3/10			
Week 10	Mon 3/13	CH 8 Threshold and cell signaling concepts	Introduction to cell signaling; leptin	
	Wed 3/15	CH 8 Signaling cascades and second messengers	Modes of cell signaling	SmartBook CH 8
	Fri 3/17		Griffith's experiments	PT1: Signaling cascades and second messengers
Week 11	Mon 3/20	CH 9 Semi-conservative replication Meselson and Stahl experiments	The structure of the DNA helix	
	Wed 3/22	CH 9 DNA polymerase restrictions and bi-directional synthesis	How to make replication rapid	SmartBook CH 9
	Fri 3/24	CH 9 Bi-directional synthesis activity	Mutations and proofreading	PT2: DNA Replication
Week 12	Mon 3/27	CATCH UP DAY + REVIEW		PT3: Mutations and Proofreading Practice Exam 3 due by midnight
	<b>Wed 3/29</b>	<b>Exam #3: Chapters 7 – 9</b>		

	Fri 3/31	CH 10 Transcription	Overview of central dogma and gene expression stages	
Week 13	Mon 4/3	CH 10 Transcription and translation	RNA processing	
	Wed 4/5	CH 10 Translation	EPA sites in translation	SmartBook CH 10
	Fri 4/7	EASTER BREAK 4/6-4/10		
Week 14	Mon 4/10	EASTER BREAK 4/6-4/10		
	Wed 4/12	CH 10 Catch-up and discuss mutations	Mutations and effects on phenotype	
	Fri 4/14	CH 14 Chromosomes and sister chromatids	Karyotyping	PT1: Transcription and Translation (Gene Expression)
Week 15	Mon 4/17	CH 14 Cell cycle, cancer, and mitosis	Overview of cell cycle and CDKs	
	Wed 4/19	CH 14 Meiosis		SmartBook CH 14
	Fri 4/21	CH 15 Introduction to Mendelian Genetics and Punnett squares		PT2: Mitosis and Meiosis
Week 16	Mon 4/24	CH 15 Relating genetic inheritance to events in meiosis		PT3: Mendelian Genetics
	Wed 4/26	CH 15 Non-Mendelian inheritance		SmartBook CH 15
	Fri 4/28	Final Exam Review Day		Practice Exam 4 due by midnight on Wed 5/3

<b>Fri 5/5</b>	<b>FINAL EXAM (10:30 am – 1 pm)</b>
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## **POLICY STATEMENTS**

### **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 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 16 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.

### **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.

### **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 **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](mailto: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.

### **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.

### **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.