



Department of Biology

## **BIO2010-2, -3 Cell Biology and Biochemistry**

Lecture (3 units) + Lab (1 unit)

*Spring 2024*

**Meeting days/times:** MWF 12:15-1:10 (-2) and 1:30-2:25 (-3)

**Meeting location:** Ryan Learning Center room 108

**Final Exam:** Monday 4/29, 10:30-1:00 (-2) and 1:30-4:00 (-3)

<b>Instructor title and name:</b>	Dr. Dave Cummings, Professor of Biology
<b>Email:</b>	davidcummings@pointloma.edu
<b>Office location and hours:</b>	Monday 3:30-5:30 pm Tuesday 1:30-3:30 pm Or by appointment Rohr Science 176

### **Catalog 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.

### **Learning Outcomes**

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

*After completing this course, students will be able to demonstrate the following:*

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. Students will demonstrate critical thinking skills related to scientific methods, data analysis, and conclusions. (Foundational Explorations learning outcome #1d).
7. Signature assignment will involve a student-designed lab and a formally written lab report summarizing the findings made in the lab.

### Required Books and Resources

1. Mastering Biology with Pearson [eText](#) for Campbell Biology in Focus (purchase 24 months if you are a Biology, Biology-Chemistry, or Environmental Science major, or only 18 weeks if your major is Applied Health, Dietetics, or Chemistry)
2. Lab Manual, purchased through the campus bookstore or directly through Cognella ([orders@cognella.com](mailto:orders@cognella.com)). ISBN:978-8-8233-1168-7

### Evaluation and Grading

Final grades will be rounded to the nearest whole percent and the final assigned letter grade will be non-negotiable. Please do not request that grades be changed except when errors in grading or math have taken place.

#### *Assignment weights*

Practice exams	140 (11.2%)
Midterm exams	450 (36%)
Final exam	150 (12%)
Mastering Biology assignments	180 (14.4%)
Peer teaching	80 (6.4%)
Laboratory grade	250 (20%)
<b>TOTAL</b>	<b>1250 (100%)</b>

#### *Conversion to letter grades*

93-100% = A  
 90-93% = A-  
 87-90% = B+  
 83-87% = B  
 80-83% = B-  
 77-80% = C+  
 73-77% = C  
 70-73% = C-  
 67-70% = D+  
 63-67% = D  
 60-63% = D-  
 ≤ 59% = F

**Practice exams** (140 pts) – As we near each exam, you will be given an opportunity to take a practice test on the content, similar to the practice exams students often take before a standardized test such as the MCAT, DAT, or GRE. These practice exams come with lower risk than in-class exams because the point value of each question is much lower and you can take the exams open-book/notes. The purpose is to test yourself before the real thing to identify areas where you need to brush up. Please note that the practice exams do NOT cover every topic that might be found on the in-class exams and the questions themselves are in fact different. These practice exams will be completed on your own (no collaborating) in Canvas and are due several days before the corresponding exam in order to assure that you have enough time to work on problem areas.

**Exams** (600 pts) – There will be 3 midterms and a final exam (150 pts ea). 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 and each will contain some cumulative questions.

**NOTE: If you have a legitimate 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. The final exam must be taken at the scheduled place and time, unless you have three or more exams that day, in which case the instructor may choose to move your exam to another day/time.**

**Homework** (180 pts) – Homework will include Mastering Biology pre-class and chapter review assignments. Late work will not be accepted.

**Mastering Biology pre-class assignments** (60 pts) – You will be expected to complete the chapter reading and a short pre-class assignment (~30 minutes) prior to the start of that week's chapter. This will help you be prepared to participate in class and to learn together as we address the more difficult parts of the chapter and work together in class to practice the learning objectives. Many of these contain short videos to view before answering questions. You are strongly encouraged to carefully watch all videos, taking notes along the way.

**Mastering Biology chapter review assignments** (120 pts) – After we have completed each chapter together in class, you will be assigned a more comprehensive set of questions designed to help you practice thinking about and applying what you have learned. These questions better reflect the type of knowledge and questions that you can expect to see on the exams.

**Reading guides** (extra credit) – The textbook we have selected is a very helpful resource for you and we want to encourage you to read prior to coming to class, and to read the textbook in a manner that helps you understand the major content and concepts, be able to explain key figures, and prepare the exams. We encourage you to use and fill out the reading guide when you are reading the text prior to class, and then go back after to revise, expand, and fix any

areas. You can think of this as a study guide to be used before and after class. The learning objectives at the back of each reading guide can be considered a pseudo-study guide. If you complete all of the reading guides for a given exam and submit (with obvious effort and completeness), you will be awarded 5 extra credit points applied directly to the exam.

**EdPuzzles** (optional) – Drs. Dorrell and Woelbern have created some excellent EdPuzzles that are available to you as you study the content and concepts of BIO2010. These are not required, but they are highly recommended.

**Peer teaching** (80 pts) – The process of explaining a topic to other students is one of the very best ways to learn it yourself. Most Fridays we will break into pre-assigned groups of three in which one student will spend 15 minutes explaining a pre-assigned topic to the other two students in the group. Each student will complete four PT assignments (20 pts ea) over the course of the semester. On your day to peer teach, you must prepare a study guide of the topic in outline format (NOT essay/paragraph format). It must include visual aids that do not come from the text book, and you must finish each session with three exam-type questions to test your partners understanding. This PT study guide must be typed and submitted to Canvas before class begins. Additionally, you must provide a printed hard copy for each of your partners at the time of teaching.

**Laboratory experience** (250 pts) – An essential part of any science curriculum is hands-on experience in the lab. 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.

*\*\*Lab reports will be taught and assessed as part of FELOs 1a, 1d, and 1e.*

**Tips for reading a textbook:**

- Keep the big picture in mind. Before reading, look at chapter organization. Read the subheadings and get a feel for the breadth and arrangement of topics covered.
- Go over the figures and special topics sections very closely. Be sure you can explain the “take-home message” and main ideas of each. These are critical to understanding biology and should not be considered “pages to skip”.
- Highlight words, phrases, and statements you know you will want to find again.
- Write comments to yourself that will help you study the material later.
- When you’ve finished a chapter, sometime before the exam, create a study guide that outlines the contents. This can then serve as a checklist for future studying.
- Your book has online materials that are very useful to help you learn: animations, videos, practice tests and quizzes, etc. We strongly recommend that you make use of these online resources.

### Tentative Class Schedule:

Week	Day	Topic (tentative) and Assignments Due	Textbook Reference
Week 1 Jan 8 -12	Mon	Syllabus and course intro	Course intro
	Wed	Scientific method  <input type="checkbox"/> Read CH1	1.1 and 1.3
	Fri	CH 1 Data statistics  CH 2 Valence + chemical bonding  <input type="checkbox"/> Read CH2 <input type="checkbox"/> PT1: The scientific method <input type="checkbox"/> CH2 Pre-class questions due by noon	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  <input type="checkbox"/> CH1-2 Review questions due by midnight	2.4 – 2.5
	Fri	Macromolecules: Carbohydrates  <input type="checkbox"/> Read CH3 <input type="checkbox"/> PT2: Functional groups and the four macromolecules <input type="checkbox"/> CH3 Pre-class questions due by noon	3.1 – 3.3
Week 3	Mon	Macromolecules: Lipids and nucleic acids	3.4 and 3.6

Jan 22-26	Wed	Macromolecules: Proteins: Peptide bonds, amino acids and levels of protein structure	3.5
	Fri	Cell structure overview (genomes, proteomes, organelles, etc)  <input type="checkbox"/> PT3: Eukaryotic cell structures and their functions <input type="checkbox"/> CH3 Review questions due by midnight	4.1 – 4.5
Week 4  Jan 29- Feb 2	Mon	Cell structure overview (genomes, proteomes, organelles, etc)  <input type="checkbox"/> Read CH4 <input type="checkbox"/> CH4 Pre-class questions due by noon <input type="checkbox"/> Practice exam 1 due by midnight	4.1 – 4.5
	Wed	Cell organization (protein transport and the extracellular matrix)  <input type="checkbox"/> CH4 Review questions due by midnight	4.6 – 4.8
	Fri	<b>EXAM 1: CH 1 - 4</b>	
Week 5  Feb 5-9	Mon	Introduction to cell membranes  <input type="checkbox"/> Reach CH5A (all but cell signaling) <input type="checkbox"/> CH5A Pre-class questions due by noon	5.1 – 5.2
	Wed	Transport across the membrane	5.3 – 5.5
	Fri	Membranes continued  <input type="checkbox"/> PT1: Membrane structure and transport <input type="checkbox"/> CH5A Review questions due by midnight	
Week 6	Mon	Modes of cell signaling: threshold	5.6

Feb 12-16		<input type="checkbox"/> Read CH5B (only cell signaling) <input type="checkbox"/> CH5B Pre-class questions due by noon	
	Wed	Signaling cascades and second messengers	
	Fri	Metabolism, endergonic vs. exergonic reactions  <input type="checkbox"/> PT2: Cell communication <input type="checkbox"/> CH5B Review questions due by midnight	6.1 – 6.2
Week 7 Feb 19-23	Mon	ATP and enzymes  <input type="checkbox"/> Read CH6 <input type="checkbox"/> CH6 Pre-class questions due by noon	6.3 – 6.5
	Wed	Cellular respiration: Redox reactions and glycolysis	7.1 – 7.2
	Fri	Cellular respiration: Citric acid cycle + oxidative phosphorylation  <input type="checkbox"/> Read Ch7 <input type="checkbox"/> PT3: Aerobic and anaerobic cellular respiration	7.3 – 7.4
Week 8 Feb 26 – Mar 1	Mon	Cellular respiration: Fermentation and anaerobic respiration  <input type="checkbox"/> Practice exam 2 due by midnight	7.5 – 7.6
	Wed	Catch-up/Review for exam #2  <input type="checkbox"/> CH6 and CH7 Review questions due by noon	
	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) <ul style="list-style-type: none"> <li><input type="checkbox"/> Read CH8</li> <li><input type="checkbox"/> CH8 Pre-class questions due by noon</li> </ul>	8.1 – 8.2
	Wed	Photosynthesis: Calvin cycle and generating sugars	8.3 – 8.4
	Fri	Photosynthesis continued <ul style="list-style-type: none"> <li><input type="checkbox"/> PT1: Photosynthesis</li> <li><input type="checkbox"/> CH8 Review questions due by midnight</li> </ul>	
Week 11 Mar 18-22	Mon	DNA: Semi-conservative DNA replication and Meselson and Stahl experiments <ul style="list-style-type: none"> <li><input type="checkbox"/> Read CH13</li> <li><input type="checkbox"/> CH13 Pre-class questions due by noon</li> </ul>	13.2
	Wed	DNA replication: DNA polymerase and bi-directional synthesis	13.2
	Fri	DNA and chromosome structure <ul style="list-style-type: none"> <li><input type="checkbox"/> PT2: DNA replication</li> <li><input type="checkbox"/> CH13 Review questions due by midnight</li> <li><input type="checkbox"/> Practice exam 3 due by midnight</li> </ul>	13.3
	Mon	Catch-up/Review for exam #3	

Week 12 Mar 25 –29	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  <input type="checkbox"/> Read CH14 <input type="checkbox"/> CH14 Pre-class questions due by noon	14.1 – 14.2
	Fri	Gene expression: RNA processing + translation  <input type="checkbox"/> PT3: Transcription and translation	14.3 – 14.4
Week 14  April 8 - 12	Mon	Gene expression: Translation + mutations	14.4 – 14.5
	Wed	Gene expression continued  <input type="checkbox"/> CH14 Review questions due by midnight	
	Fri	Cell cycle: Chromosomes and karyotyping  <input type="checkbox"/> Read CH9-10 <input type="checkbox"/> PT1: Transcription and translation (again)	9.1 + 9.2
Week 15  April 15 - 19	Mon	Cell cycle: Mitosis and cancer, and mitosis – overview of cell cycle and CDKS  <input type="checkbox"/> CH9-10 Pre-class questions due by noon	9.2 + 9.3
	Wed	Meiosis	10.1 – 10.4

	Fri	Genetics: Introduction to Mendelian genetics and Punnett squares  <input type="checkbox"/> CH9-10 Review questions due by midnight <input type="checkbox"/> PT2: The cell cycle and mitosis	11.1 – 11.2
Week 16  April 22- 26	Mon	Genetics: Relating genetic inheritance to events in meiosis  <input type="checkbox"/> Read CH11 <input type="checkbox"/> CH11 Pre-class questions due by noon	11.4
	Wed	Genetics: Non-Mendelian inheritance (X-linked inheritance)	11.3
	Fri	Catch-up/Review for final exam review  <input type="checkbox"/> PT3: Meiosis and Mendelian inheritance <input type="checkbox"/> CH11 Review questions due by midnight <input type="checkbox"/> Practice exam 4 due by midnight	
<b>Final Exam Monday April 29 @ 10:30 – 1:00 pm (-2), 1:30-4:00 pm (-3)</b>			

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## IMPORTANT UNIVERSITY 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.

### 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.

### 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.

### 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 you have questions, a desire to meet with the chaplain or have prayer requests you can contact your professor or the [Office of Spiritual Life and Formation](#).

### 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.

### **Artificial Intelligence (AI) Policy**

You are allowed to use Artificial Intelligence (AI) tools (e.g, ChatGPT, iA Writer, Marmot, Botowski) to generate ideas, but you are not allowed to use AI tools to generate content (text, video, audio, images) that will end up in any work submitted to be graded for this course. If you have any doubts about using AI, please gain permission from the instructor.

### **PLNU Academic Accommodations Policy**

PLNU is committed to providing equal opportunity for participation in all its programs, services, and activities. Students with disabilities may request course-related accommodations by contacting the Educational Access Center (EAC), located in the Bond Academic Center ([EAC@pointloma.edu](mailto:EAC@pointloma.edu) or 619-849-2486). Once a student's eligibility for an accommodation has been determined, the EAC will issue an academic accommodation plan ("AP") to all faculty who teach courses in which the student is enrolled each semester.

PLNU highly recommends that students speak with their professors during the first two weeks of each semester/term about the implementation of their AP in that particular course and/or if they do not wish to utilize some or all of the elements of their AP in that course.

Students who need accommodations for a disability should contact the EAC as early as possible (i.e., ideally before the beginning of the semester) to assure appropriate accommodations can be provided. It is the student's responsibility to make the first contact with the EAC.

## **Language and Belonging**

Point Loma Nazarene University faculty are committed to helping create a safe and hospitable learning environment for all students. As Christian scholars we are keenly aware of the power of language and believe in treating others with dignity. As such, it is important that our language be equitable, inclusive, and prejudice free. Inclusive/Bias-free language is the standard outlined by all major academic style guides, including MLA, APA, and Chicago, and it is the expected norm in university-level work. Good writing and speaking do not use unsubstantiated or irrelevant generalizations about personal qualities such as age, disability, economic class, ethnicity, marital status, parentage, political or religious beliefs, race, gender, sex, or sexual orientation. Inclusive language also avoids using stereotypes or terminology that demeans persons or groups based on age, disability, class, ethnicity, gender, race, language, or national origin. Respectful use of language is particularly important when referring to those outside of the religious and lifestyle commitments of those in the PLNU community. By working toward precision and clarity of language, we mark ourselves as serious and respectful scholars, and we model the Christ-like quality of hospitality.

You may report an incident(s) using the [Bias Incident Reporting Form](#).

## **Sexual Misconduct and Discrimination**

In support of a safe learning environment, if you (or someone you know) have experienced any form of sexual discrimination or misconduct, including sexual assault, dating or domestic violence, or stalking, know that accommodations and resources are available through the Title IX Office at [pointloma.edu/Title-IX](http://pointloma.edu/Title-IX). Please be aware that under Title IX of the Education Amendments of 1972, faculty and staff are required to disclose information about such misconduct to the Title IX Office.

If you wish to speak to a confidential employee who does not have this reporting responsibility, you can contact Counseling Services at [counselingservices@pointloma.edu](mailto:counselingservices@pointloma.edu) or find a list of campus pastors at [pointloma.edu/title-ix](http://pointloma.edu/title-ix).

## **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.

## **Loma Writing Center**

The Loma Writing Center exists to help all members of the PLNU community cultivate transferable writing skills to engage their academic, professional, personal, and spiritual communities. We work toward this goal by conducting one-on-one consultation sessions, supporting writing education across the PLNU community, and participating in ongoing writing center research.

Getting feedback from the Loma Writing Center while you’re in the process of working on an assignment is a great way to improve the quality of your writing and develop as a writer. You are encouraged to talk

with a trained writing consultant about getting started on an assignment, organizing your ideas, finding and citing sources, revising, editing for grammar and polishing final drafts, and more. For information about how to make in-person or online appointments, see [Loma Writing Center webpage](#) or visit the Loma Writer Center on the first floor of the Ryan Library, room 221.