

## Bi214 General Biology IV: Mechanisms: Summer 2022

This course is about how stuff works: the mechanisms by which biological processes, practiced by all cellular life, operate. Through a combination of lectures, problem solving, and laboratory exercises we will explore amino acid chemistry, the structures and functions of proteins, the genetics of biochemical pathways, and the structure and regulation of prokaryotic genes. Bi211 and Bi212, or the equivalent, and a full year of General Chemistry are prerequisites.

### Class Learning Objectives:

By the end of the term, students will be able to:

- provide an overview of the general structure and basic properties of the twenty amino acids
- predict generally and calculate specifically how the charge of an amino acid changes with pH
- explain how protein structure affects protein function by using hemoglobin as an example.
- interpret a binding affinity curve and make prediction about how well a protein binds its ligand
- explain the basic components of DNA's structure, and explain how tautomeric shifts cause mutations.
- describe how steps in metabolic pathways are controlled by genes and how disruption of a single gene impacts the final product, using yeast as an example
- predict the results of a complementation test between two mutants by examining the phenotype of their offspring
- explain how a gene's structure affects the rate of transcription
- explain how activators and suppressors regulate transcription and how that affects cellular pathways, using the lac operon as an example.

### More general skill sets:

- apply high-level problem solving to questions in molecular biology
- consider an experiment in some topics in molecular biology and predict the results
- consider cause and effects, such as the impact a mutation has to a protein's structure or to a metabolic pathway
- perform some basic techniques in molecular biology such as running a DNA gel and plating cultures

### Contact Info

#### **Instructors**

Dr. Connolly (Lecture)  
amyc@uoregon.edu

Katie Pérez (Lab Instructor)  
[kperez@uoregon.edu](mailto:kperez@uoregon.edu)

Emily Gustin  
(Lab Preparator)  
egustin@uoregon.edu

#### **BTUs/BULAs**

Gracie Cao  
gcao@uoregon.edu

Kaitlyn Wood  
[kwood3@uoregon.edu](mailto:kwood3@uoregon.edu)

Peter Weisel  
pweisel@uoregon.edu

### Class Set-Up

#### **Pre-Class Videos and Quiz:**

The lectures for the class will be delivered through pre-recorded videos. You will need to watch them and complete the corresponding module quiz before coming to class. You will be allowed two attempts for these module quizzes, but the first attempt must be completed by 11:59 PM the night before. The second attempt must be completed within one week, after that time the quiz is no longer available to take.

**Class: (Mon-Thurs: 9:00-10:50 am; Exams on Fri, Aug 26 and Fri, Sept 9 from 9:00-10:50 am in Willamette 110)**

Class time will consist of a brief review from the videos, discussing the module quiz, followed by practice problems that are substantially more challenging, meant to prepare you for the exams.

### **Labs (Tues/Thurs: 12:00-2:50 or 3:00-5:50 in Klamath 13)**

A pdf of the lab handout for the week can be found on Canvas. Among the pages are a series of preparation questions meant to prime you for the upcoming lab. These questions will be mirrored in an associated Canvas quiz that will be due the **night before the lab at 11:59 PM**. Beginning lab 2, the **pre-lab quizzes** will also contain some follow-up questions from the previous week's lab to puzzle through. You are welcome to ask for help during our office hours and work with your peers on this assignment. You must come to lab with a printed version of this pdf to fill out during our time together (printers are available to use with your Duck ID in all residence halls and the UO libraries). These **lab reports** will usually be turned in at the end of each lab. Associated with your lab grade is an attendance, courtesy, and active **participation** component. If you attend lab regularly (and on time), actively participate, and clean-up after yourself you should expect full credit. *Note: There is one lab that will require you to return to the lab two times; see schedule.*

<b>Lab Times</b>	<b>Lab Instructor</b>	<b>BULA</b>
Tues/Thurs: 12:00-2:50 PM	Katie	Kaitlyn/Gracie
Tues/Thurs: 3:00-5:50 PM	Katie	Peter

### **Exams**

#### **Time and Place:**

There will be two exams in this class. They will be on Fridays in our normal room at our normal time.

Exam 1: Friday August 26; 9:00-10:50 am in Willamette 110

Final Exam: Friday September 9; 9:00-10:50 am in Willamette 110

#### **Exam Policies:**

- Materials:  
Exams will be closed book, closed notes. You will need a scientific calculator for at least exam 1 and the final.
- Make up exams after the Exam Window:  
Unless there is an academic conflict, an emergency, or some unusual extenuating circumstances, make-up exams will not be given. All other requests are subject to the following policy: Exam 1: No make-up exam will be given, instead student will need to be graded by Method 2 (see below). Final: Since the final contains material you must be tested over it can't be dropped. So if you miss the final, either a 0 will be given or a flat penalty of 15%.

To help prevent the circulation of exams, the final exam will not be made available.

## Office Hours/Help Sessions

All office hours will be held in Klamath 5

<b>Office Hours</b>	<b>Instructor/TA</b>
Monday 4:00-5:00	Kaitlyn Wood
Tuesday 8:00-9:00	Katie Pérez
Tuesday 11:30-12:30 (prioritize questions from 12:00 lab students first)	Dr. Connolly
Wednesday 12:00-1:00	Peter Weisel
Wednesday 3:00-4:00	Gracie Cao
Wednesday 4:00-5:00	Kaitlyn Wood
Thursday 8:00-9:00	Katie Pérez
Thursday 11:30-12:30 (prioritize questions from 12:00 lab students first)	Dr. Connolly
Friday 12:00-1:00	Peter Weisel
Friday 1:00-2:00	Gracie Cao

## Communication Guidelines

In order for the teaching staff to effectively help a number of student, please use the following guidelines:

### **I. Lecture Content:**

If you have questions about module quizzes, or problem sets, and content in general, please do the following in the following order.

1. Come to office hours or use slack to ask a question. (The teaching team will be monitoring it frequently).  
Slack Link for Summer 2022 class here: [https://join.slack.com/t/slack-pqs8954/shared\\_invite/zt-1drtc598k-OCKumwQ2AIQUIISl5b90cA](https://join.slack.com/t/slack-pqs8954/shared_invite/zt-1drtc598k-OCKumwQ2AIQUIISl5b90cA)
2. Email Dr. Connolly

### **II. Lab Content:**

For lab questions specifically, please do the following in the following order

1. Use remaining lab time to work through lab reports, since help is readily available.
2. Email Katie
3. Email Dr. Connolly

Finally, we will also communicate with you through our Canvas site. Announcements can be automatically forwarded to your UO email, and can even reach you by text. Check and adjust your settings under Account > Notifications.

### **III. Grading Questions**

- A. **Module quiz and exam** grading questions, errors, and requests should be sent to Dr. Connolly, within one week.
- B. Questions about **lab report grades** and **pre/post-lab quizzes** should be directed to Katie. Requests for regrades must occur within one week of receiving the grade.

## Grading Breakdown

I will calculate everyone's grades using both methods below. Whichever method produces the higher score, will be the one that is used to determine your letter grade.

Content	Method 1 (What Canvas shows)	Method 2
Module Quizzes (one a day except exam weeks) with lowest two dropped.	10%	10%
Exam 1	25%	Dropped
Final	30%	55%
Lab Attendance, Courtesy, & Participation (lowest dropped)	5%	5%
Pre-Lab & Post-Lab (lowest score dropped)	15%	15%
Lab Reports (lowest score dropped)	15%	15%

## Grading Scale

A+	A	A-	B+	B	B-	C+	C	C-	D	F
100 and above	93-99	90-92	87-89	83-86	80-82	77-79	73-76	70-72	60- 69	59 and below

### Notes on Assigning Grades:

- The above grading scale will be used to determine your grades. We may draw any one of these cut offs lower than what's outlined above. We will never draw the cut offs higher than what's above.
- The exact cut offs for grades that are on the cusp (i.e. 92.1-92.9) will vary by year. It depends upon where there are natural breaks in the grade line up. These cut offs won't be made public.
- A + grades are special and are rewarded in cases of outstanding performance. Like the first bullet point mentions, this cut off could be lower than stated above, but this will depend upon the particulars of the class and is up to instructor discretion.
- **At the end of the term do not ask for your grade to be bumped or for extra assignments or extra credit.** I endeavor to make the class fair for everyone, and cannot grant these kinds of requests.

### Philosophy on Grading Structure:

- Module quizzes and lab assignments have high class averages, but the exams tend to be more difficult. Exams you must work on your own, but the assignments can be completed with the help of instructors and other students. It is therefore essential that you come to class and office hours to make sure you are earning these assignment points. Not only are they important for your learning the material, they will serve as a booster for your exam scores if need be.
- After the class has taken an exam, the exam will be evaluated as a whole to see if there were any problems that a number of people missed, and see if we can award some kind of partial or full credit there.
- If an average of at least 70% on the exam is not achieved by the class as a whole, the exam will be curved to at least 70%. Hopefully, you'll all work together and achieve scores as a class higher than that!

## Grading Policies:

**Module Quizzes, Pre/Post- Lab Quizzes and Lab Reports:** Canvas quizzes submitted any time after 11:59 PM of the day its due will **receive a flat 15% deduction** off the total points. Late policies are strict because 1) you need to come to class prepared 2) the answers will be revealed the day after the associated class, and 3) answers for lab quizzes will be discussed in the labs and 4) for the labs it's essential that you have read and thought about the lab prior to coming. Unless otherwise noted, lab reports are turned in the following week at the start of lab. Late labs reports will also receive at flat 15% dedeuction. You have **one week to turn in a late assignment before it becomes a 0**. But the last week of class, everything must be turned in by **Thursday September 8 at 11:59 PM**.

Extensions: As much as I would like to help you out as situations arise, we are not offering extensions on assignments (unless a serious emergency arises) for the reasons mentioned above when discussing late policies. Additionally, with such a large class size, these requests become hard to manage. So don't worry too much if you're having a bad day and accrue a late penalty, because 1) you can turn it in late for a **15% deduction** and 2) your **lowest score (lab quiz and lab reports) or two lowest scores (module quizzes) are dropped**.

**Exams:** Requests to examine grading errors or to regrade quizzes and reports must be sent to your Dr. Connolly **within one week** of your receiving the graded assignment for consideration, and must be accompanied by a written explanation.

**Lab Attendance:** Labs are not easily made up because a great deal of prep goes into setting them up and taking them down each week. If you have to miss a lab for some reason, the grading structure is set up so you can drop the lowest grade for each component of the lab (attendance, lab quiz, report).

### **Accommodations for students with disabilities:**

If you have a documented disability and anticipate needing accommodations in this course, please provide Dr. Connolly and your lab instructor with a notification letter from the Accessible Education Center stating your approved accommodations. If you have flexibility on attendance or due dates, it is imperative that you reach out to your instructor early on to discuss an arrangement with how you are going to handle missed days or late assignments.

### **Required Supplies**

- Scientific Calculator
- There is no book this term. Instead we are providing links to open access (Free!) textbooks and other material where it's available in the modules to support your understanding. You can find these in the modules as "Supplemental reading." So if you want to read/learn about the same information from a different source, I'd encourage you to go check these pages out.
- We are providing pdf's of each lab exercise. You must print these out prior to coming to lab.

### **Class Conduct and Academic Honesty**

I expect you to hold yourself to high ethical standards. When students model trustworthy behavior, it makes it easier for me to be more lenient during times when a student may run into a real trouble and need help. It should go without saying that, all work submitted in this course must be your own. Instances of suspected cheating or plagiarism on exams, quizzes, and reports will be referred to the Office of Student Conduct and Community Standards. Your instructors take these cases seriously. Academic misconduct could result in a failing mark for quiz, exam, report or for the course. For definitions of violations, a description of the hearing process, and a summary of penalties for findings of academic misconduct, go to <http://policies.uoregon.edu/vol-3-administration-student-affairs/ch-1-conduct/student-conduct-code>

### **Mental Health Resources**

If you are struggling and need someone to talk to, there are mental health resources available to you as a UO student. Please follow the links here.

<https://counseling.uoregon.edu>

<https://counseling.uoregon.edu/mental-health-resources>

### **Academic Disruption**

In the event of a campus emergency that disrupts academic activities, course requirements, deadlines, and grading percentages are subject to change. Information about changes in this course will be communicated as soon as possible by email, and on Canvas. If we are not able to meet face-to-face for labs, students should immediately log

onto Canvas and read any announcements and/or access alternative assignments. Students are also expected to continue coursework as outlined in this syllabus or other instructions on Canvas.

### Class Schedule

The topics below are open to change, but the exam times and lab and module due dates will stay constant unless some unforeseen event arises.

<b>Important Due Dates</b>	
<b>Module Quizzes:</b>	
Attempt 1: Night before by 11:59 PM	
Attempt 2: One week of original due date by 11:59 PM	
<b>Pre-lab Quizzes:</b>	
One Attempt: Night before by 11:59 PM	
<b>Lab Report:</b> Due in lab the following period	
<b>Date</b>	<b>Topic</b>
M Aug 15	Module 1-1: <ul style="list-style-type: none"> <li>• Introduction</li> <li>• Amino Acid Structure, Polarity and Solubility</li> </ul>
T Aug 16	Module 1-2: <ul style="list-style-type: none"> <li>• Acid-Base Chemistry</li> </ul>
<b>No Lab</b>	
W Aug 17	Module 1-3: <ul style="list-style-type: none"> <li>• Acid-Base Properties of Diprotic Amino Acids</li> </ul>
H Aug 18	Module 1-4: <ul style="list-style-type: none"> <li>• Acid-Base Properties of Triprotic Amino Acids</li> <li>• Polypeptide Properties, Primary Structure</li> </ul>
<b>Lab 1: Amino Acid Lab</b>	
M Aug 22	Module 2-1: <ul style="list-style-type: none"> <li>• Secondary Structure (Alpha Helices and Beta-Pleated Sheets)</li> </ul>
T Aug 23	Module 2-2: <ul style="list-style-type: none"> <li>• Tertiary and Quaternary Structure</li> </ul>
<b>Lab 2: Protein Structure Lab</b>	
W Aug 24	Module 2-3: <ul style="list-style-type: none"> <li>• Hemoglobin and Myoglobin: structure/function, binding curve and cooperativity;</li> <li>• Hemoglobin cooperativity, properties of heme</li> </ul>
H Aug 25	Module 2-4: <ul style="list-style-type: none"> <li>• Hemoglobin Allostery</li> </ul>
<b>REVIEW SESSION:</b> Time TBD	
<b>Lab 3: Hemoglobin Lab</b>	
<b>FRIDAY Aug 26</b>	<b>EXAM DAY 9:00-10:50</b> Modules 1-1 through 2-4 and Lab 1- Lab 3 <i>*Bring Calculator</i>

M Aug 29	<p>Module 3-1:</p> <ul style="list-style-type: none"> <li>• DNA Structure, Synthesis</li> <li>• Mutations</li> </ul>
T Aug 30	<p>Module 3-2:</p> <ul style="list-style-type: none"> <li>• Metabolic Pathways</li> <li>• Conditional Mutants</li> </ul>
	<b>Lab 4: DNA Lab</b>
W Aug 31	<p>Module 3-3:</p> <ul style="list-style-type: none"> <li>• Complementation Tests</li> </ul>
H Sept 1	<p>Module 3-3: Complementation Tests II</p>
	<p><b>Lab 5: Complementation Lab</b> (turn lab into box Tuesday before your normal lab time)</p> <p>You will need to return to lab <i>twice</i>. First return: Return on <u>Friday</u> to complete Activity 2 step 5; Activity 3 step 6 and 7. Second return: <u>Monday</u> Activity 3 step 8</p>
M Sept 5	<b>Labor Day</b>
T Sept 6	<p>Module 4-1: Transcription in Proka You will need to return to lab <i>twice</i>. First return: Return on <u>Friday</u> to complete Activity 2 step 5; Activity 3 step 6 and 7.</p> <ul style="list-style-type: none"> <li>• Second return: Monday: Activity 3 step 8 ryoates</li> </ul>
	<b>No Lab</b>
W Sept 7	<p>Module 4-2:</p> <ul style="list-style-type: none"> <li>• Lac Operon: Negative and Positive Regulation</li> </ul>
H Sept 8	<p>Module 4-3:</p> <ul style="list-style-type: none"> <li>• Lac Operon: Positive Regulation</li> </ul> <p><b>REVIEW SESSION</b>: Time TBD</p>
	<b>Lab 6: Lac Operon Lab</b>
<b>FRIDAY</b> Sept 9	<p><b>Final EXAM DAY 9:00-10:50</b> Comprehensive: Module 1-1- Module 4-3 and Lab 1- Lab 5 <i>*Bring Calculator</i></p>