

# **Bi281H Honors Biology I: Biochemistry and Cell Physiology**

## **Fall 2022, 5 credits**

**Lecture Instructor:** Dr. David Garcia, [dmgarcia@uoregon.edu](mailto:dmgarcia@uoregon.edu)

**Lab Instructor:** Dr. Laurel Pfeifer-Meister, [lpfeife1@uoregon.edu](mailto:lpfeife1@uoregon.edu)

**Class meetings:** MWF 10:00am-10:50am, Tykeson 32

**Lab meetings** (one of the following): T 9:00-11:50, T 1:00-3:50, W 1:00-3:50, R 9:00-11:50, or R 1:00-3:50, Klamath 21

**Course Materials:** (1) Pratt & Cornely *Essential Biochemistry* (5th edition, previous editions will also work, readings will also be listed below for 4<sup>th</sup> edition). Online material is not required. (2) iClickers

**Website:** All course content will be available on Canvas. To access our course Canvas site, log into [canvas.uoregon.edu](https://canvas.uoregon.edu) using your DuckID. If you have questions about using Canvas, visit the [Canvas support page](#). Canvas and Technology Support also is available by phone (541-346-4357) or by [live chat on the Live Help webpage](#).

### **Course description**

The 280H sequence introduces biology with a cellular, molecular and genetic emphasis. The aim of the sequence is to integrate the teaching of biological principles with an understanding of how those principles were arrived at. Each course emphasizes the scientific reasoning used to arrive at key conclusions, and each gives practice in this kind of thinking. Each course includes both lectures and a weekly 3-hour lab period. The main ideas in the lectures and the lab exercises are linked to allow students to grasp the same concepts in different contexts. The lab exercises minimize mechanical data collection, instead encouraging analysis and deduction.

BI 281H asks how cells work, focusing first on the properties of proteins that make them major structural elements and catalysts within cells. The course then examines a central challenge that cells face: how to convert consumed energy into a form capable of driving the energy-requiring reactions that life depends on. Throughout, the course asks how cells coordinate their repertoire of chemical reactions so as to be both energetically efficient and able to respond effectively to changes in their surroundings.

### **Course pre-requisites**

C-, P or better in CH223, CH226H or equivalent.

### **Expected Learning outcomes**

1. Survey key molecular and cellular features shared by all organisms on earth, revealing how life can be understood in physical and chemical terms.
2. Begin to develop intuition and analytical tools to think about life quantitatively and molecularly.
3. Introduce several key, universal systems that are shared across organisms including serine proteases, hemoglobin, glycolysis/gluconeogenesis, the citric acid cycle, the electron transport chain, and ATP synthase.
4. Apply quantitative reasoning and analysis to biological science problems.

## Estimated student workload

In addition to attending class (3hr/week) and lab (3 hr/week) and participating in these activities, students are expected to spend 2hr/week reading materials for online lecture quizzes (generally from the textbook) and lab handouts, ~3.5 hr/week completing pre-lab assignments, lab reports and lab puzzles, and 3hr/week on ungraded practice problems to prepare for the three exams. After accounting for weeks with no labs or lecture due to holidays, this is ~140 hours of work for the term. Together, with 10 hours for engaging with the teaching staff in office hours, review sessions or via email, a total of 150 hours of engagement is expected in the course. Please plan accordingly.

## Absences

This is a face-to-face course. Attendance is important because we will develop our knowledge through in-class activities that require your active engagement. We'll have discussions, small-group activities, and do other work during class that will be richer for your presence, and that you won't be able to benefit from if you are not there. Students may miss five classes this term and one lab session, regardless of the reason with no penalty. This means we do not have "excused" or "unexcused" absences. Please stay home and use one of your five lecture absences or one lab absence if you are sick.

We know our UO community will still be navigating COVID-19, and some students will need to use some of their absences to isolate and rest if they get COVID. We made our absence policy with this in mind, so please use your absences with care so they're there for you if you need them. Students with COVID are encouraged to seek guidance and resources at [UO's COVID-19 Safety Resources webpage](#).

Your success is genuinely important to us. If challenges come up for you this term around attendance, please contact us as soon as you can. Together we can identify what resources or strategies might be available to support you and your learning.

## Grading Policy

- Letter grades will be determined based on total points, not on individual exams and assignments. Getting:
  - >90% of the points (900) guarantees an A-
  - >80% (800), B-
  - >70% (700), C-
  - >60% (600), D-
  - And <60% (600), F

In the event that scores are skewed downward, the final scores will be curved with breaks between each bin determined by "jumps" in the grade data that separate groups of students. This curve is designed so that it can only help you. If the entire class receives >90%, every student would receive an A-.

- **Late policy: late work will not be accepted for most assignments** (e.g., pre-lecture quizzes, pre-labs, lab puzzles; this is because we immediately post keys for each assignment when the due date closes). Lab reports may be turned in late with a 10% deduction per day up to 1 week late.

## Summary of class components

Component	Points	Number	Total	% points
Clicker/Lecture attendance (*you may miss up to 5 classes)	1.5	25-5*	30	3%
Pre-class quizzes	2	25	50	5%
Exam 1	150	1	150	15%
Exam 2	150	1	150	15%
Final	300	1	300	30%
Pre-lab	5	8	40	4%
Lab report (*low score dropped)	20	9-1*	160	16%
Lab puzzles (*low score dropped)	20	7-1*	120	12%
<b>TOTAL</b>			1,000	100%

## Teaching Philosophy

- Trust students to take initiative for their own learning.
- Provide multiple opportunities per week for interactions with instructors.
- Be organized, clear, and consistent.
- Do not try to artificially limit student access to outside material: embrace that students will have access to the Internet and their peers, just as they will throughout their careers.
- Have many opportunities to get small numbers of points.

## People

- David Garcia (lecturer; [dmgarcia@uoregon.edu](mailto:dmgarcia@uoregon.edu))
- Laurel Pfeifer-Meister (lab instructor; [lpfeife1@uoregon.edu](mailto:lpfeife1@uoregon.edu))
- Natalie Jaeger (GE, [njaeger2@uoregon.edu](mailto:njaeger2@uoregon.edu))
- Matt Nardoci (GE, [mnardoci@uoregon.edu](mailto:mnardoci@uoregon.edu))
- Michael Shavlik (GE, [mshavlik@uoregon.edu](mailto:mshavlik@uoregon.edu))
- Sanjana Basak (Biology Tutor, [sbasak@uoregon.edu](mailto:sbasak@uoregon.edu))
- Kenzie Carnes (Biology Tutor, [kenziec@uoregon.edu](mailto:kenziec@uoregon.edu))
- Olivia Hougham (Biology Tutor, [oeg@uoregon.edu](mailto:oeg@uoregon.edu))

## Getting Help

- For questions about grades and personal issues, please email David or Laurel.
- Office Hours: see help session [page](#) on Canvas.

## **Detailed description of components (graded and ungraded)**

### **Clicker questions/lecture attendance (graded)**

- Objectives:
  - Expand on biochemical content
  - Develop skills to reason about biochemistry
  - Develop a community of scholars
  - Provide a low-stress way to accumulate points in the class
- What is it (typically)?
  - Lecture with embedded clicker questions to encourage active engagement and occasional worksheets
  - Need to answer at least one clicker question during the lecture time to get full attendance points
- When to do it?
  - In lecture on Monday, Wednesday, Friday from 10:00 to 10:50 am
  - You may miss up to five classes without penalty. If you forget your clicker but do show up to class, this will still be considered an unexcused absence.

### **Pre-class quizzes (graded)**

- Objectives:
  - Prime students for the in-class discussion and work
  - Provide a low-stress way to accumulate points in the class
- What is it?
  - Simple questions, designed to get you thinking about the material
  - Based on the assigned readings
  - You get 50% of the points just for taking the quiz
- When to do it?
  - Do the reading before taking the quiz
  - Quizzes open at 12 pm the day before class and close at 9:30 am the day of class

### **Homework (ungraded)**

- Objectives:
  - Provide skills practice
- What is it?
  - Questions covering the skills we cover in class
  - You will not turn this homework in; however, these problems provide essential practice for the skills in the class
- When to do it?
  - Post-class
  - Due dates are assigned for each assignment to help you pace yourself through the course
  - Keys will be posted on the due date for each assignment

## Exams and Final (graded)

- Objective:
  - Assess student understanding of the material (summative assessment)
- What is it?
  - In-person exams
  - You may work together with your peers to study for the exam; however, the exam will be closed note/closed peer/closed internet, thus, the work you show must be your own. Cheating will be strictly prohibited. If we find evidence of cheating, both students will receive a zero on the question (and if more extensive, potentially a zero on the entire exams, which cannot be dropped).
  - The questions will build in complexity. The first question in a block will be straightforward; the last question in a block will be more challenging and may integrate multiple concepts.
- When to do it?
  - Exams 1 and 2 will be held during class time (see schedule). Exam 1 will cover Unit 1 content. Exam 2 will cover Unit 2 content.
  - The Final will be on Thursday 12-8-22 from 10:15am-12:15pm in Tykeson 32. The Final will be cumulative, covering all material from Units 1-3.
  - also see [Course Schedule](#) for dates/times/locations/unit content covered in each exam

Note about exam grades: Your exam component will be calculated using Method #1 (in the table above) or Method #2 (lowest exam grade dropped; best exam grade  $\times 1.33 = 200$  pts; Final  $\times 1.33 = 400$  pts) — whichever gives a higher score. The second method is designed to help in the event that you do poorly on one of the exams by dropping that exam and placing higher weight on the other exam and final. We will automatically select the better score for you.

## Pre-lab quizzes (graded)

- Objectives:
  - Prime students for the lab each week
  - Provide a low-stress way to accumulate points in the class
- What is it?
  - *Asynchronous* assignment with several simple questions, designed to get you thinking about the experiments being performed
  - Based on the assigned readings and pre-lab videos
- When to do it?
  - Do the reading and watch the video before taking the quiz
  - Quizzes open at 4 pm the Thursday before the following weeks lab and closes at 9:00 am on Tuesdays for all lab sections

## Lab reports (graded)

- Objectives:
  - Explore the key principles of biochemistry and cell physiology introduced in lecture by encountering it from a different, and often “hands on,” perspective
  - Learn some basic biological lab techniques
  - Reinforce and elaborate upon topics through the manipulation of biological models, problem solving, and quantitative reasoning
- What is it?
  - Many questions designed to prompt additional questions from you. This process of posing questions and finding solutions is an important part of the scientific method.
  - Based on the activities performed during lab.
- When to do it?
  - Attend your *synchronous* lab section in person in Klamath 21.
  - Perform your experiment and answer the questions posed along the way.
  - Summarize your data and findings at the end of lab if time allows by answering the report questions, otherwise at home. Finish it prior to the following week’s lab (due at the beginning of your next lab section). Feel free to seek help on these questions during office hours or via email.

## Lab puzzles (graded)

- Objectives:
  - Another opportunity for you to demonstrate what you learned during lab by applying the concepts to novel situations.
  - Encourage group work and promote students teaching other students (the best way to learn).
- What is it?
  - Canvas quiz with a 120-minute time limit (intended to take 60 minutes) designed to be taken as a small group
  - Open book, open note, and open friend and a lower stake opportunity to prepare for the materials that will be asked about on the exams
  - Based on the activities performed during lab, but will often draw from the primary literature to introduce you to data from real experiments
- When to do it?
  - After completing your lab report and reaching out to the teaching staff with any questions you might have.
  - Anytime between Thursday at 4 pm (following lab) and Monday at midnight. Be sure to have a 2 hr window available once you start

## Course Schedule

Readings: page numbers for *Essential Biochemistry* 5<sup>th</sup> or 4<sup>th</sup> edition by Pratt & Cornely.

Pre-class Quiz (Q): quiz to be done before class starts (numbers correspond to the lecture #)

Homework (numbers correspond to the week #)

### UNIT 1: BIOLOGY IS JUST CHEMISTRY

Week	Date	Topic	Reading 5th edition	Reading 4th edition	Quiz	HW	Lab
1	9/28	Molecular driving forces	10-12, 27-36 (1.3, 2.1, 2.2)	10-12, 24-32 (1.3, 2.1, 2.2)	<a href="#">Q1</a>	<a href="#">H1</a>	Life at the Molecular Level (due online at the beginning of lab wk 2; 10/4-6) <i>No pre-lab or lab puzzle.</i>
	9/30	Acids & Bases	37-46 (2.3, 2.4)	33-42 (2.3, 2.4)	<a href="#">Q2</a>		
2	10/3	Amino acids	86-95 (4.1)	86-94 (4.1)	<a href="#">Q3</a>	<a href="#">H2</a>	Pre-Lab (due 10/4 at 9am) Amino acids (due beginning of lab wk 3; 10/11-13) Puzzle (due 10/10 midnight)
	10/5	Protein structure	95-107 (4.2, 4.3)	94-103 (4.2, 4.3)	<a href="#">Q4</a>		
	10/7	Protein folding	107-113 (4.4, 4.5, 4.6)	104-108 (4.4, 4.5, 4.6)	<a href="#">Q5</a>		
3	10/10	Protein Recognition	184, 287-291 (6.4, 10.1)	170, 260-264 (6.4, 10.1)	<a href="#">Q6</a>	<a href="#">H3</a>	Pre-Lab (due 10/11 at 9am) Protein structure (due beginning of lab wk 4; 10/18-20) Puzzle (10/17 midnight)
	10/12	Enzymes I: Catalysts	167-179 (6.1, 6.2)	154-165 (6.1, 6.2)	<a href="#">Q7</a>		
	10/14	Enzymes II: mechanism of serine protease	180-188 (6.3, 6.4, 6.5)	166-175 (6.3, 6.4, 6.5)	<a href="#">Q8</a>		
4	10/19	<b>EXAM 1</b>	---	---	---		See below in Unit 2

### UNIT 2: MOLECULAR MACHINES

Week	Date	Topic	Reading 5th edition	Reading 4th edition	Quiz	HW	Lab
4	10/17	Enzymes III: Michaelis Menten analysis	198-208 (7.1, 7.2)	183-194 (7.1, 7.2)	<a href="#">Q9</a>	<a href="#">H4</a>	Pre-Lab (due 10/18 at 9 am) Enzyme Activity (due beginning of lab wk 5; 10/26-28)

	10/21	Enzymes IV: regulation Enzymes from 30,000 feet.	209-222 (7.3, 7.4)	195-206 (7.3, 7.4)	<a href="#">Q10</a>		Puzzle (due 10/24 midnight)
5	10/24	Hemoglobin cooperativity	126-135 (5.1, 5.2)	122-129 (5.1, 5.2)	<a href="#">Q11</a>	<a href="#">H5</a>	Pre-Lab (due 10/25 at 9 am) Enzyme Kinetics (due beginning of lab wk 6; 11/1-3) Puzzle (due 10/31 midnight)
	10/26	Hemoglobin allostery	126-135 (5.1, 5.2)	122-129 (5.1, 5.2)	<a href="#">Q12</a>		
	10/28	Cytoskeleton (Structure and Motor Proteins)	136-153 (5.3, 5.4)	130-146 (5.3, 5.4)	<a href="#">Q13</a>		
6	10/31	Membrane proteins	263-273 (9.2, 9.3)	240-248 (9.2, 9.3)	<a href="#">Q14</a>	<a href="#">H6</a>	Pre-Lab (due 11/1 at 9am) Allostery & Cooperativity (due beginning of lab wk 7; 11/8-10) Puzzle (due 11/7 midnight)
	11/2	Signaling	287-297 (10.1, 10.2)	260-268 (10.1, 10.2)	<a href="#">Q15</a>		
	11/4	REDOX review	428-432 (15.1)	385-389 (15.1)	<a href="#">Q16</a>		
7	11/9	<b>EXAM 2</b>	---	---	---		See below in Unit 3

### UNIT 3: FIGHTING ENTROPY

Week	Date	Topic	Reading 5th edition	Reading 4th edition	Quiz	HW	Lab
7	11/7	Sugar I: glycolysis	366-382 (13.1)	329-344 (13.1)	<a href="#">Q17</a>	<a href="#">H7</a>	Pre-Lab (due 11/8 at 9am) Membrane Permeability and Transport (due beginning of lab wk 8; 11/15-17) Puzzle (due 11/14 midnight)
	11/11	Veterans Day, no lecture	--	--	--		
8	11/14	Sugar II: gluconeogenesis	383-386, 393-395 (13.2, 13.5)	344-347, 353-355 (13.2, 13.5)	<a href="#">Q18</a>	<a href="#">H8</a>	Pre-Lab (due 11/15 at 9am) Metabolism (due online 11/23 10 am)



	11/16	Citric Acid Cycle	403-416 (14.1, 14.2, 14.3)	362-374 (14.1, 14.2, 14.3)	<a href="#">Q19</a>		Puzzle (due 11/21 midnight)
	11/18	Citric Acid Cycle	416-421 (14.1)	374-379 (14.4)	<a href="#">Q20</a>		
9	11/21	OXPHOS I: Electron transport	432-442 (15.2)	390-398 (15.2)	<a href="#">Q21</a>	<a href="#">H9</a>	No Lab (Thanksgiving)
	11/23	OXPHOS II: Electron transport	443-450 (15.3, 15.4)	399-405 (15.3, 15.4)	<a href="#">Q22</a>		
	11/25	Thanksgiving, no lecture	---	---	---		
10	11/28	Photosynthesis (light rxn)	458-470 (16.1-16.2)	411-422 (16.1, 16.2)	<a href="#">Q23</a>	<a href="#">H10</a>	Pre-Lab (due 11/29 at 9 am) Respiration (due online 12/2 10 am) <i>No lab puzzle.</i>
	11/30	Photosynthesis (dark)	471-477 (16.3)	422-428 (16.3)	<a href="#">Q24</a>		
	12/2	Metabolism at high level	---	---	<a href="#">Q25</a>		
11	12/8	FINAL EXAM (Tykeson 32 Thursday 10:15-12:15)	---	---	---	---	---

## Community

**This class is governed by the UO community standards.**

- Respect the dignity and essential worth of all individuals.
- Promote a culture of respect.
- Respect the privacy, property, and freedom of others.
- Reject bigotry, discrimination, violence, or intimidation of any kind.
- Practice personal and academic integrity and expect it from others.

## *Cheating*

You are expected to do your own work. Cheating, plagiarism and any other form of academic dishonesty will not be tolerated. Group work is encouraged throughout this class, however, the work you turn in should be your own interpretation of the group discussion. Exactly copying text and/or graphs is not permitted. Please refer to the University of Oregon [Student Conduct Code](#).

## Other Course Policies

Class rosters are provided to us with your legal name. We will gladly honor your request to address you by an alternate name or gender pronoun. Please advise us of this preference early in the quarter (or before) so that we may address you properly.

Open inquiry, freedom of expression, and respect for differences are fundamental to a comprehensive and dynamic education. We are committed to upholding these ideals by encouraging the exploration, engagement, and expression of divergent perspectives and diverse identities. Classroom courtesy and sensitivity are especially important with respect to individuals and topics dealing with differences of race, culture, religion, politics, sexual orientation, gender, gender variance, and nationalities. Our remote classroom is a learning environment, and as such should be a safe, inclusive and respectful place. Being respectful also includes using preferred pronouns for your classmates. Disrespecting fellow students as well as combative approaches, tones and/or actions are not acceptable. Please make me aware if there are classroom dynamics that impede your (or someone else's) full engagement.

**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, 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.

**Crises happen.** If you are having problems that are interfering with your ability to do the work in this class, please let me know promptly. We are willing to make arrangements when the need is real and when you have done your best to deal with the situation in a timely manner. Make this request in writing to Laurel (lpfeifel@uoregon.edu), preferably ahead of time.

**Academic integrity.** We expect students to complete assignments and exams in a manner consistent with academic integrity as outlined in the Student Conduct Code: <https://policies.uoregon.edu/vol-3-administration-student-affairs/ch-1-conduct/student-conduct-code>. This includes cheating (“any act of deception by which a student misrepresents or misleadingly demonstrates that the student has mastered information on an academic exercise that the student has not mastered”), and plagiarism (“using the ideas or writings of another as one’s own.”) Finally, you do not have permission to post any course related material on outside private or public websites (i.e. coursehero, chegg, groupme, etc.). We have a zero tolerance policy for academic dishonesty. All persons involved in academic dishonesty will be disciplined in accordance with University regulations and procedures.

**Discrimination and Harassment.** Any student who has experienced sexual assault, relationship violence, sex or gender-based bullying, stalking, and/or sexual harassment may seek resources and help at [safe.uoregon.edu](https://safe.uoregon.edu). To get help by phone, a student can also call either the UO’s 24-hour hotline at 541-346-7244 [SAFE], or the non-confidential Title IX Coordinator at 541-346-8136. From the SAFE website, students may also connect to Callisto, a confidential, third-party reporting site that is not a part of the university. Students experiencing any other form of prohibited discrimination or harassment can find information at [respect.uoregon.edu](https://respect.uoregon.edu) or [aaeo.uoregon.edu](https://aaeo.uoregon.edu) or contact the non-confidential AAEO office at 541-346-3123 or the Dean of Students Office at 541-346-3216 for help.

**Reporting.** We are Assisting Employees under the University’s Prohibited Discrimination and Retaliation Policy. As such, if you disclose to us, we will respond to you with respect and kindness. As part of that support, we will direct students who disclose prohibited discrimination and harassment, including sexual harassment or violence, to resources that can help and will only report the information shared to the university administration if the student requests that the information be reported (unless someone is in imminent risk of serious harm or a minor). Please note the difference between ‘privacy’ and ‘confidentiality.’ As an Assisting Employee we can offer privacy because we are not required to report certain information to the university. However, we cannot be bound by confidentiality in the same way that a counselor or attorney is. Confidential resources such as these means that information shared is protected by federal and state laws. Any information that we as assisting employees receive may still be accessed by university or court proceedings.

For information about our reporting obligations as an employee, please see [Employee Reporting Obligation](#) on the Office of Investigations and Civil Rights Compliance (OICRC) website. Students experiencing sex or gender-based discrimination, harassment or violence should call the 24-7 hotline 541-346-SAFE [7244] or visit [safe.uoregon.edu](https://safe.uoregon.edu) for help. Students experiencing all forms of prohibited discrimination or harassment may contact the Dean of Students Office at 541-346-3216 or the non-confidential Title IX Coordinator/OICRC at 541-346-3123. Additional resources are available at [investigations.uoregon.edu/how-get-support](https://investigations.uoregon.edu/how-get-support).

We are also a mandatory reporter of child abuse. Please find more information at [Mandatory Reporting of Child Abuse and Neglect](#).