

BIOC 4540, Biochemistry I – Fall 2026

SAGE 116 – T and Th from 11:10-12:30 PM

Instructor information: Dr. Patrick Horn

Office Location / Phone

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Email

Patrick.horn2@unt.edu or via Canvas

Please use course number, BIOC 4540 or
Biochemistry Course in subject line

Research Website

<https://cos.unt.edu/biology/people/patrick-horn.html>

Office Hours

Tuesday 1-2 pm

Thursday 9-10 am, 1:30-2:30 pm

Or by appointment, please email me in advance.

Times subject to change based on availability.

Additional office hours are likely to be announced
and available prior to exams.

Electronic Resources

Canvas <https://unt.instructure.com/>
contains links to other resources!

This syllabus represents a written agreement between us. Occasionally, it may be necessary to revise this syllabus to meet student needs or university-related closures. I reserve the right to revise this syllabus if the need arises. Advance notification will be provided to you.

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Course Calendar (Summary)

This course is divided into 5 Units. Please see Canvas for additional details/resources.

Wk	Date	Unit #	Topics	Lehninger Chap #
1	T, Aug 18	1	L1 – Intro to Course; Biochemistry, Metabolism, & Macromolecules	1-3
	Th, Aug 20		L2 – Foundations: Principles of Biochemistry; Organic Review: Functional Groups; Non-Covalent Interactions; Electron Pushing, Nucleophiles/Electrophiles; Canvas Pre-Assessment due Sun Aug 23	
2	T, Aug 25		L3 – Water, pH, Buffers, Acid-Base Reactions	
	Th, Aug 27		L4 – Amino Acids	
3	T, Sept 1	2	L1 – Protein Structure 1: Intro, 1°, 2°, and 3° Structure	3-6
	Th, Sept 3		L2 – Protein Structure 2: Folding, Motion, Stability, PTMs	
4	T, Sept 8		L3 – Protein-Ligand, Protein-Protein Interactions	
	Th, Sept 10		L4 – Protein Analysis (Biochemical Techniques) Amino Acid Quiz	
5	T, Sept 15		Lecture Overflow + Problem Workday + Review: Units 1,2	
	Th, Sept 17		Exam 1 (Covers Units 1-2)	1-6
6	T, Sept 22	3	L1 – Intro to Enzyme Structure; Cofactors [Fall 2026 → Virtual Lectures, PJH traveling; No in-person class]	6, 13
	Th, Sept 24		L2 – Enzyme Thermodynamics	
7	T, Sept 29		L3 – Kinetics	
	Th, Oct 1		L4 – Kinetics/Inhibition	
8	T, Oct 6		L5 – Catalysis	
	Th, Oct 8		L6 – Regulation	
9	T, Oct 13		Lecture Overflow + Problem Workday + Review: Unit 3	
	Th, Oct 15		Exam 2 (Covers Unit 3)	
10	T, Oct 20	4	L1 – Carbohydrates, Glycoproteins, Proteoglycans	7-8, 10-11
	Th, Oct 22		L1 + L2 – Lipids	
11	T, Oct 27		L2 – Lipids	
	Th, Oct 29		L3 – Nucleotides & Nucleic Acids, Structure & Biochemistry	
12	T, Nov 3	5	Enzyme Project Tutorial & Workday Enzyme Project Part 1 Due Friday Nov 6	
	Th, Nov 5	4	Exam 3 (Covers Unit 4) – no problem / review day for this unit	7-8, 10-11
13	T, Nov 10	5	L1 - Protein (Metabolic) Engineering (+ Engagement Activity)	Suppl. Readings
	Th, Nov 12		L2 - Protein (Metabolic) Engineering (+ Engagement Activity)	
14	T, Nov 17		L3 - Protein (Metabolic) Engineering (+ Engagement Activity)	
	Wed, Nov 18		Wed: Project videos due 11:59 PM	
	Th, Nov 19		Thurs: Virtual “Enzyme Conference” [No In-person class]	
	Fri, Nov 20		Fri: Peer reviews and project poster due 5:00 PM	
15	T/Th, Nov 24-26		THANKSGIVING BREAK – NO CLASS	
16	T, Dec 1		Problem Workday + Review: Units 1,2,4	
	Th, Dec 3		Problem Workday + Review: Units 3, 5 (Pre-Finals Day) Post-Assessment due Thurs Dec 4	
17	Th, Dec 10	1-5	Final Exam (Exam 4) during final exam time 10:30 a.m. - 12:30 p.m. (~70% Comprehensive*, ~30% Unit-5)	

* comprehensive = a subset of key topics throughout the course, to be announced as final exam approaches

Grading

An outline of how grades will be determined is outlined below using a 1000-point scale. An advantage of this scale is at any time you may take your points accumulated and divide them by total points to make it possible to see your % score. An Excel Calculator is also provided to help you calculate your grades. Canvas summed totals will be hidden as they do not accurately reflect the grading scheme.

Assessment Type	Maximum Points	% of Final Grade
Exams***	200 x 4 = 800	80
Engagement Points: (Canvas/In-Class Activities + iClicker Points)	75	7.5
Enzyme Project	125	12.5
Total Score	1000	100

Decimal point grades will be rounded to the nearest whole number (e.g., 894.5 = 895; 894.49 = 894). Then this grading scheme will be applied. No curve will be applied (if you are 1 point short, you are 1 point short).

A	895 – 1000+
B	795 – 894
C	695 – 794
D	595 – 694
F	< 595

Exams = 800 points (80% of final grade)

- Exams 1-4 are each worth 200 points (or 80% of your final grade).
- General format: around 25-30 multiple choice / T-F questions at ~5 points each (= 125 to 150 points). The remaining 50-75 points = short answer / free response questions. Additional details will be provided the week before each exam and this distribution may vary slightly for each exam depending on the content.
- ***Exam #4 (Final Exam) may also replace your lowest Exam 1-3 score (but only 1 exam). This is in addition to it counting as an exam. This gives you an opportunity to rebound from a poor exam but also stay engaged through the end of the course (i.e., Unit 5)

Here are 3 examples for various scenarios:

- Example 1: Your Exam 4 score is lower than any individual Exam 1-3
 - Exam scores (1 to 4) of 180, 191, 172, 165 (Before: 708 / 800 = ~89%)
 - Exam 4 = 165 → counts only as a single exam (After: 708 / 800 = ~89%)
- Example 2: Your Exam 4 score is higher than at least one of Exams 1-3
 - Exam scores (1 to 4) of 180, 191, ~~172~~(182), 182 (Before: 708 / 800 = ~89%)
 - Exam 4 = 182 would ALSO replace Exam 3 in this case (After: 725 / 800 = ~93%)
- Example 3: You missed Exam 2
 - Exam scores (1 to 4) of 180, 0(182), 172, 182 (Before = 534 / 800 = ~67%)
 - Exam 4 score would replace missing Exam 2 = 182 (Before = 716 / 800 = ~90%)
- If there is extra credit for an exam, the score may be greater than 200. More than 800 points may be accumulated for the exam section upon considering extra credit.
- See make-up policies regarding exam absences.

Amino Acid Quiz (extra credit on exam 1)

Knowing your amino acids is very important for this course. We will therefore have a quiz (see syllabus) prior to the first exam to test the memorization side and some basic understanding of these compounds. This will count towards your extra credit on exam 1. Details to follow.

Engagement Points = In-Class Activities, Canvas activities, HW = Max of 75 points (7.5 % of your final grade)*

The goal of engagement points is to keep you...well engaged in the course. Some will be completion grades, others based on correct answers. There will be more than 75 points available during the entirety of the course (see Canvas List of Engagement Activities). *There are a few ways to increase your Max Out score (>75 points), described below in Bonus Engagement Points. If you do not complete any of the Bonus Engagement Points activities 75 is your max score (even if you earned 120 points). Active participation is required for all activities. See late work policy for additional notes (in most cases not allowed).

Examples:

- **Attendance / Participation in iClicker Qs:**
 - o <https://student.iclicker.com/#/login> (You will be added automatically...but let me know if you have issues)
 - o Each lecture period should have 1+ iClicker question. Generally, there will be 1 iClicker question to start every class, "Problem of the Day", and then 1+ questions spaced throughout the class.
 - o To receive credit for that day, you must have answered 50% of iClicker questions (e.g., if we have 3 questions, you must have answered 2 of them; if we have 1 question and you missed it, you will then not receive credit for that day).
 - o Each day will be worth 1 pt (not a lot...I know...)
 - o **Bonus Engagement Points:**
 - First Half of Course (Aug 18-Sept 29; not counting exam days): iClicker participation in >8 of 12 classes = 3 bonus points.
 - Second Half of Course (Oct 1-Nov 17; not counting exam days) iClicker participation in >8 of 12 classes = 3 bonus points.
 - o If your iClicker fails, during class... please fill out a piece of paper with your name, student ID and answers and turn it in at end of class for credit (assuming >=50%). However, this should not be a regular occurrence otherwise it will not be counted.
- **Canvas "Quizzes"**
 - o I have built several "quizzes" in Canvas that test targeted concepts. Most of these take < 5 minutes.
 - o You may take them as many times as you wish prior to the due date. Your highest score is retained (i.e., these are performance-based and not completion grades).
 - o Points and due dates to be announced on Canvas for each "quiz."
- **Homework Sets**
 - o I will assign homework sets for each unit that integrate concepts and provide more application-based thinking.
 - o To automate the grading, the questions will be implemented into a Canvas-like quiz for feedback.
 - o Grades will be based on completion (i.e., answering all questions in quiz).
 - o The number of points per completion and due dates are to be announced for each assignment.
- **Pre- and post-assessment**
 - o These are useful tools to evaluate the cohort of students and your progress throughout the course.
 - o Participation in these assignments will be used as **bonus engagement points**
 - Pre-assessment = 3 bonus engagement points for completion. This assumes all questions are answered otherwise point deductions may occur. This assessment is timed.
 - Post-assessment = 1 bonus point for completion. Up to 2 additional bonus engagement points scaled based on performance. This assessment is timed.

Enzyme Project- “Conference Presentation”: Virtual Poster and Video (12.5% of your final grade)

The Enzyme Project is an opportunity for you to apply skills from the course to an “independent research project” and provides an alternative form of assessment (relative to exams). In previous semesters, students found it one of the most enjoyable parts of the course. Generally, grades are also very high (which seems to be something students care about :). We will discuss details around the middle of the semester (see syllabus). But the general idea is for you to choose an enzyme (choose something interesting to you!!!) and perform a short computer-based “research assignment” on it. There will be a guided write-up (in a poster format) and a set of online tools used to gather some of the information specific to your enzyme. ChatGPT won’t solve all your problems here. You will record a short ~3-minute research video to describe your enzyme/results. Then on the “Virtual Enzyme Conference Day” videos will be due, and you will provide positive-centric / constructive criticism peer reviews on three other videos. Posters will be formally due at the end of the week although most students have them completed prior to submission. Your participation in peer reviews will contribute to a completion grade, while the specific content will be graded by me and/or TAs per rubric. Extensive details are to be provided later.

Comments on Curving:

With the inclusion of bonus engagement points, extra credit on exams, and some completion-based grades that help boost overall scores, I do not intend to apply a class-wide curve (not I have ever provided a curve). The standards are set, and it will be your responsibility to achieve the best grade possible. There are no set numbers (quota) of A’s, B’s, C’s, D’s, or F’s. Rather this is a standards-based course.

Final Comments on Assignments:

If by now you did not figure it out, this is an intense course...well, let me offer some words of encouragement. Biochemistry is FREAKIN awesome! Yes, it is challenging. I still struggle everyday with many aspects of understanding and applying this difficult subject. But I am always learning, and willing to learn more. You have an opportunity to put together, synthesize, synergize, <insert other buzz words here>, etc. most of your hard-earned tuition dollars in this course. You have the opportunity to prepare yourself for professional school, graduate school, or just to be the “Well, actually...” person (i.e., Oscar- “Does anybody still get this reference?”) at the dinner table. You literally get to find out more about this crazy world works. There are tons of great videos/explanations online (many of these people are way funnier and provide well-crafted explanations than me). But my promise to you is to do everything reasonably to help you succeed in your goals. Are you still reading? Hmm...okay, good for you. Very few students make it this far....

There are plenty of opportunities to be successful. So be successful!

Course Textbook

Fall 2026 Note: A textbook is recommended but not required. There are a few reasons for this but mostly it is in response to the variety of ways people learn. Typically, **students that actively engage (i.e., read and study!) with a textbook usually obtain a higher course score.** However, there are a myriad of online resources, usually available free of charge. I also acknowledge that the cost of these textbooks may be a financial burden.

Recommend textbook:

- Most of my lectures will use pictures and problems from Lehninger’s Principles of Biochemistry 7th and 8th edition. However, I also pull information from other textbooks and lots of online resources including websites, primary research papers, review articles, and my own research.
- There are multiple packages set up in the bookstore that include the textbook (either online or print) and access to Achieve learning software (discussed below). **Achieve access is not necessary to be successful in this course and during this course only adds access to online reading.** Previous semesters showed that the additional activities provided by Achieve (at a cost) did not significantly improve student performance.
 - Package 1

- UNT BOOKSTORE- Nelson: ***Lehninger Prin of Biochemistry Access*** (1 Term code) 9781319230906
- Includes: electronic access to Achieve (1 semester term) and includes on-line access to the full text and student solutions manual.
- Package 2
 - UNT BOOKSTORE- Nelson: ***Lehninger Prin of Biochemistry Access*** (2 term code) 9781319322328
 - Includes: Same as package 1, but access to Achieve for 2 semesters.
- Package 3
 - UNT BOOKSTORE- Nelson: ***Principles of Biochemistry (LL) W/Access*** 9781319458669
 - Includes: Same as Package 2, but also includes a paper copy of the textbook
- Full Textbook Name: D.L. Nelson and M.M. Cox, *Lehninger Principles of Biochemistry*, 8th edition, 2021, MacMillan Learning Publishers

Dr. Root typically teaches the spring Biochemistry 2 course- he uses Biochemistry, eighth edition, by Berg, Tymoczko, Gatto, & Stryer. ISBN# 9781464126109

Other suitable textbooks: Lehninger's *Principles of Biochemistry* 7th ed. You may substitute an equivalent text such as *Biochemistry*, 6th, 7th or 8th ed. Berg, Tymoczko, Gatto and Stryer; Garrett and Grisham's *"Biochemistry"*, 4th ed.; Voet, Voet and Pratt's *"Fundamentals of Biochemistry"* 3rd ed.; Matthews et al *"Biochemistry"* 4th ed. These textbooks are expensive and if you do not want to purchase the current edition you might consider substituting the previous edition. I will do my best to teach you as much as possible in the class, but it will be your responsibility to fill in the gaps and review topics using these and whatever resources you think are necessary to achieve the course objectives. Additional readings from other sources may be assigned as necessary. Access to those resources will be provided by me as needed.

Achieve is an online learning platform that gives you digital access to the book. It also has some useful tutorials, problem sets, but is not required for this course nor do I use the problem sets (rather they are integrated into Canvas for free). I will open up a course (see Canvas link) that you may optionally enroll in to provide some organization, but no grades will be taken using Achieve.

Course Description and Purpose

Official Course Description:

4540. Biochemistry I. 3 hours. Chemistry and biochemistry of carbohydrates, lipids, amino acids and proteins, and nucleic acids; biochemical energetics, enzyme catalysis, vitamins and coenzymes, and their interrelationships in energy-producing cycles and pathways. Prerequisite(s): Completion of Foundation requirements for the declared biological sciences major and C or higher in CHEM 2380. If major is outside of biological sciences, foundation requirements for the biology BA and C or higher in CHEM 2380 must be completed. If these requirements are not met, department consent is required.

Broad Learning Objectives

- Be able to understand, describe, and apply biochemical terms.
- Be able to demonstrate knowledge and critical thinking in basic and advanced concepts in biochemistry, i.e., how the structures of the major biomolecules found in living organisms relate to and control their functions. Specific course topics: thermodynamics, water and buffers; amino acids and proteins; enzyme mechanisms and kinetics; nucleic acids; and carbohydrates, lipids and membrane transport; biochemical techniques.
- Be able to integrate skills from previous/current biology and chemistry coursework.
- Be able to build and use scientific communication skills with your peers.

Course Delivery Format

Lectures will be delivered in person T/Th 11:10 to 12:30. During the lecture period, it will be mostly lecture with occasional iClicker + think-pair-share type activities. Do I love the sound of my own voice? Absolutely not! But it is what it is, and I do have lots of cool science I want to share with you. Lectures will not be recorded/streamed unless instructor is sick and/or cannot make class. If you are absent from class, I recommend checking in with your classmates for additional notes. I will also help however I can. There are also lots of great help videos online that you can make extensive use of to be successful. Finally, Canvas provides lots of additional resources to help learn the material.

Canvas

We will be using Canvas as our primary learning management software. I will post nearly all materials on Canvas. This includes a copy of lecture PowerPoints (and a PDF version), some engagement activities, potentially some extra credit, and additional notes/documents for exams. Due dates and grades will also be available.

Office Hours

Office hours will be conducted in person at the designated times (see Page 1) or by appointment. Please try to use these office hours. However, if you cannot make these then please email to schedule an alternative time. Finally, I am much more effective if you have a scheduled time (as opposed to a drop-in) and give me a heads-up on what you want to discuss. I typically provide additional office hours as exams approach based on need and my availability (e.g., the afternoon before the exam).

Attendance and Late Work

Summary: Your attendance and participation are valued and important to your success in this course. You are responsible for all material that is discussed or assigned during the class. Communication is Important!

- Official UNT Policy on Excused Absences: <https://policy.unt.edu/policy/06-039>
- Reasonable accommodation will be made for make-up exams and other assignments due to university excused absences. Please communicate with me early! Don't just assume I will fix things after-the-fact. Missing class does not automatically result in extensions on assignments or exam due dates.
- Attendance during class is captured using in-class activities that do count towards your grade which require your presence (see grading section above and late work policy below). However, there are plenty of other engagement points to account for the occasional missed class.
- It is the student's responsibility to seek out other classmates (and Canvas!) to obtain the information (e.g., lecture notes, relevant announcements, etc.) if they missed class. You are welcome to check in with me about helping with course content (e.g., office hours) for which you missed.
- **Late Work policy - Individual types of assessments:**
 - **Exams:** Only excused absences will be allowed. Professor should be contacted ASAP. Failure to contact professor in a timely manner will result in a missing exam grade.
 - **Make-up exams will only be given in extreme circumstances that involve serious illness (hospitalization), death in your immediate family, or incarceration. Make-up exams will typically be open response or oral exams.** We have a final exam that can replace a dropped

exam to account for the unexpected illness. I highly recommend you attend all exams if able. Please note- I care about your health—*even if you do not believe me or have had variable experiences in the past*—and this policy is to try and provide a level playing field throughout the semester.

- **iClicker in-class questions:** late work NOT accepted; given there will be many of the semester; make-ups not possible with this type of activity.
- **Canvas engagement activities:** due dates will be provided, and, in most cases, late work will not be accepted or there will be a penalty for points received (if late).
- **Homework problem sets:** these would only be graded for completion credit by due date. Late work NOT accepted given ample time to complete.
- **Enzyme Poster and Video:** Due dates will be provided, and late work policy provided on assignment.
- **Extra credit:** if extra credit is available, late work NOT accepted.
- **Anything out of Achieve** is not graded and therefore no late work requirements.

Any technical issues should be well documented and will be evaluated on a case-by-case basis. Please don't wait until the last-minute prior for engagement activities. In almost all cases, you will have ample time to complete and therefore will receive a NO in response to an extension.

Academic Integrity

Academic Integrity Standards and Consequences. According to [UNT Policy 06.003](#), Student Academic Integrity, academic dishonesty occurs when students engage in behaviors including, but not limited to cheating, fabrication, facilitating academic dishonesty, forgery, plagiarism, and sabotage. A finding of academic dishonesty may result in a range of academic penalties or sanctions ranging from admonition to expulsion from the University.

Posting Materials Online

Please don't post any materials from this course to other online sites. My teaching goal is to make sure each of you gets your tuition dollars' worth and that through hard work will learn a great deal of biochemistry. I'd rather you come to talk to me for help with problems than using Chegg, AI, and/or other homework services.

ODA Policy

UNT makes reasonable academic accommodation for students with disabilities. Students seeking accommodation must first register with the Office of Disability Accommodation (ODA) to verify their eligibility. If a disability is verified, the ODA will provide a student with an accommodation letter to be delivered to faculty to begin a private discussion regarding one's specific course needs. Students may request accommodation at any time; however, ODA notices of accommodation should be provided as early as possible in the semester to avoid any delay in implementation. Note that students must obtain a new letter of accommodation for every semester and must meet with each faculty member prior to implementation in each class. For additional information see the ODA website (<https://disability.unt.edu/>).

AI Usage Policy

Limited Use of Generative AI (GenAI) Software

Throughout the semester, you will use specific Generative AI (GenAI) tools for certain assignments, with guidance on responsible use. These assignments help build ethical resilience and GenAI literacy, preparing you for careers in a GenAI-oriented workforce. I have used GenAI (e.g., Google Gemini) to generate questions in some circumstances for the class as well as utilizing it where appropriate for my research. I will always disclose how I use GenAI, and I expect the same from you. In accordance with the UNT Honor Code, unauthorized use of GenAI tools is prohibited. Using GenAI content without proper credit or substituting your own work with GenAI undermines the learning process and violates academic integrity. If you're unsure whether something is allowed, please seek clarification.

Student Support Services

UNT provides mental health resources to students to help ensure there are numerous outlets to turn to that wholeheartedly care for and are there for students in need, regardless of the nature of an issue or its severity. Listed below are several resources on campus that can support your academic success and mental well-being:

- Tutoring (<https://learningcenter.unt.edu/tutoring>)
- Academic Success Center (<https://www.unt.edu/success/asc>)
- Life Sciences Resource Center (<https://cos.unt.edu/biology/undergraduate-programs/life-sciences-resource-center.html>)
- Libraries (<https://library.unt.edu/>)
- Writing Lab (<https://writingcenter.unt.edu/>)
- Student Legal Services (<https://studentaffairs.unt.edu/student-legal-services>)
- Wellness (<https://www.unt.edu/wellness/index.html>)
- Counseling and Testing Services (<https://studentaffairs.unt.edu/counseling-and-testing-services>)
- Care Team (<https://studentaffairs.unt.edu/care>)
- Food Pantry (<https://studentaffairs.unt.edu/food-pantry>)
- Dean of Students (<https://studentaffairs.unt.edu/dean-of-students>)
- Registrar (<https://registrar.unt.edu/registration>)
- Financial Aid (<https://financialaid.unt.edu/>)
- Career Center (<https://studentaffairs.unt.edu/career-center>)