

## BIOC 4540, Biochemistry I – Fall 2025

### SAGE 116 – T and Th from 11-12:20 PM

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#### Instructor information: Dr. Patrick Horn

##### Office Location / Phone

Life Sciences Complex Bldg B 422 (Office)  
Office Phone 940-565-4074

##### Email

[Patrick.horn2@unt.edu](mailto:Patrick.horn2@unt.edu) or via Canvas

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

##### Research Website

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

#### Office Hours

Wednesday 12:30-2:00 pm (in person)

Thursday 1:00-2:00 pm (in person)

Or by appointment, please email me in advance.

Times subject to change based on availability and additional office hours may be available prior to exams.

#### Electronic Resources

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

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**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 19	1	L1 – Intro to Course; Biochemistry, Metabolism, & Macromolecules	1-3
	Th, Aug 21		L2 – Foundations: Principles of Biochemistry; Organic Review: Functional Groups; Non-Covalent Interactions; Electron Pushing, Nucleophiles/Electrophiles; <b>Pre-Assessment due Sun Aug 24</b>	
2	T, Aug 26		L3 – Water, pH, Buffers, Acid-Base Reactions	
	Th, Aug 28		L4 – Amino Acids	
3	T, Sept 2	2	L1 – Protein Structure 1: Intro, 1°, 2°, and 3° Structure	3-6
	Th, Sept 4		L2 – Protein Structure 2: Folding, Motion, Stability, PTMs	
4	T, Sept 9		L3 – Protein-Ligand, Protein-Protein Interactions	
	Th, Sept 11		L4 – Protein Analysis (Biochemical Techniques) <b>Amino Acid Quiz</b>	
5	T, Sept 16		Problem Workday + Review: Units 1,2	
	Th, Sept 18		<b>Exam 1 (Covers Units 1-2)</b>	1-6
6	T, Sept 23	3	L1 – Intro to Enzyme Structure; Cofactors	6, 13
	Th, Sept 25		L2 – Enzyme Thermodynamics	
7	T, Sept 30		L3 – Kinetics	
	Th, Oct 2		L4 – Kinetics/Inhibition	
8	T, Oct 7		L5 – Catalysis	
	Th, Oct 9		L6 – Regulation	
9	T, Oct 14		Problem Workday + Review: Unit 3	
	Th, Oct 16		<b>Exam 2 (Covers Unit 3)</b>	
10	T, Oct 21	4	L1 – Carbohydrates, Glycoproteins, Proteoglycans	7-8, 10-11
	Th, Oct 23		L1 + L2 – Lipids	
11	T, Oct 28		L2 – Lipids	
	Th, Oct 30		L3 – Membranes, Membrane Proteins, Membrane Transport	
12	T, Nov 4	5	L4 – Nucleotides & Nucleic Acids, Structure & Biochemistry	
	Th, Nov 6		Project Tutorial & Workday / Intro to Protein Engineering <b>Enzyme Project Part 1 Due Friday</b>	
13	T, Nov 11	4	<b>Exam 3 (Covers Unit 4) – no problem / review day for this unit</b>	7-8, 10-11
	Th, Nov 13	5	Engagement Activity 1 – Protein Engineering	Suppl. Readings
14	T, Nov 18		Engagement Activity 2 – Protein Engineering / AI	
	Wed, Nov 19		<b>Wed: Project videos, write-ups due 11:59 PM</b>	
	Th, Nov 20		<b>Thurs: Virtual “Enzyme Conference”</b>	
	Fri, Nov 21		<b>Fri: Peer reviews due 5:00 PM</b>	
15	T, Nov 25		THANKSGIVING BREAK – NO CLASS	
	Th, Nov 27		THANKSGIVING BREAK – NO CLASS	
16	T, Dec 2		Problem Workday + Review: Units 1,2,4	
	Th, Dec 4		Problem Workday + Review: Units 3, 5 (Pre-Finals Day) <b>Post-Assessment due Thurs Dec 4</b>	
17	T, Dec 9	1-5	<b>Final Exam (Exam 4) during final exam time 10:30 a.m. - 12:30 p.m. (70% Comprehensive*, 30% Unit-5)</b>	

\* 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- please do not use Canvas summed totals (typically I will hide this value to avoid confusion).

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
<b>Total Score</b>	<b>1000</b>	<b>100</b>

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).

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 considering extra credit.

### 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 19-Sept 30; not counting exam days): iClicker participation in >8 of 12 classes = 3 bonus points.
    - Second Half of Course (Oct 2-Nov 20; 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 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 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.
    - Post-assessment = 1 bonus point for completion. Up to 2 additional bonus engagement points scaled based on performance.
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## **Enzyme Heterogeneity Project- "Conference Presentation": Virtual Poster and Video (12.5% of your final grade)**

The Enzyme Heterogeneity 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. 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 short ~3-minute research videos to describe your enzyme/results. Then on the “Enzyme Conference Day” videos and posters will be due, and you will provide positive-centric / constructive criticism peer reviews on three other videos. Grades will be determined by your participation in peer reviews, 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 reasonable 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 2025 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 have access to a textbook do better in the course but there is a myriad of online resources, usually available free of charge. I also acknowledge that the cost of these textbooks can be a financial burden for students.

Recommend textbook:

- Most of my lectures will use pictures and problems from Lehninger’s Principles of Biochemistry 7<sup>th</sup> and 8<sup>th</sup> 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

Other suitable textbooks: Lehninger's Principles of Biochemistry 7<sup>th</sup> ed. You may substitute an equivalent text such as Biochemistry, 6<sup>th</sup>, 7<sup>th</sup> or 8<sup>th</sup> ed. Berg, Tymoczko, Gatto and Stryer; Garrett and Grisham's "Biochemistry", 4<sup>th</sup> ed.; Voet, Voet and Pratt's "Fundamentals of Biochemistry" 3<sup>rd</sup> ed.; Matthews et al "Biochemistry" 4<sup>th</sup> 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 your declared Biological Sciences major and C or higher in CHEM 2380. If major is outside of Biological Sciences, must complete foundation requirements for the Biology BA and C or higher in CHEM 2380. If you do not meet these requirements, 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 11:00 to 12:20. 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 both in person and virtually at the designated times (see Page 1) or by appointment.

Please try to use these office hours assigned but 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 may provide additional office hours as exams approach based on need and my availability.

## 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), 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 Conference and write-up:** 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 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 use GenAI (e.g., Google Gemini) to generate some practice questions. 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:

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