



Biochemistry II
The University of Toledo
Department of Chemistry and Biochemistry
CHEM 3510-001, 091

Instructor:	Matthew Wohlever	Instructor Phone:	419-530-8401
Email:	matthew.wohlever@utoledo.edu	Offered:	Spring 2022
Office Hours:	M 11:00 – 11:55, M 1:00 – 2:20, F 11:00 – 11:55 and by appointment	Course Website:	Blackboard Learn
All office hours are remote on Blackboard Collaborate		Class Location:	Wolfe 1205
Office Location:	Wolfe Hall 3210B	Class Day/Time:	MWF 10:00 – 10:55 A.M.
		Credit Hours:	3

CATALOG/COURSE DESCRIPTION

Continuing study of the chemistry of living systems. Topics include the metabolism of carbohydrates, lipids and amino acids, energy transductions and photosynthesis, mechanisms and regulation of nucleic acid and protein synthesis.

COURSE OVERVIEW/ TEACHING METHODOLOGY

In Biochemistry II, we will build upon the foundations of structure and mechanism learned in Biochemistry I and use them to understand the molecular details of the conserved metabolic pathways that living cells use to extract and use energy and carry out the synthesis and degradation of biological molecules required to maintain homeostasis.

There will be readings from the textbook assigned for each class, and the lecture and discussion will assume that you have already done the reading. The electronic textbook (Lehninger Principles of Biochemistry 8th Ed) and homework is on the Macmillan Achieve platform (<https://achieve.macmillanlearning.com/courses/hugupa/>). Problem sets, quizzes and exams will cover all material in the assigned readings (whether or not it is discussed in class) as well as material covered in class that is not in the textbook. The course will cover Chapters 13-28 of Lehninger.

This course is listed as face-to-face instruction and this will be my primary instructional focus. I will attempt to record and post lectures using Echo 360. These recordings are provided as a supplement to the course, but are not to be utilized as the primary form of instruction. Students are responsible for all material covered in lecture regardless of whether or not there is a technology issue with recording the lecture, camera resolution, or audio quality.

STUDENT LEARNING OUTCOMES

1. Describe and analyze the overall chemical logic, individual reactions, component enzymes, and metabolites of the catabolic and anabolic metabolic pathways for carbohydrates, lipids, amino acids, and nucleotides.
2. Describe the capture, conservation and transduction of energy through the major metabolic pathways, including the roles of phosphoryl group transfer potential and reducing power.
3. Understand the roles that coenzymes play in enzyme mechanisms, including coenzyme A, NADH/NADPH, FAD, PLP, and TPP.
4. Describe and analyze how metabolic pathways are regulated and how they intersect and interact with one another in the regulation of homeostasis and the response to changing conditions.
5. Describe the key steps involved in the metabolism and regulation of biochemical information through the processes of DNA replication and repair, RNA synthesis and editing, and protein synthesis, post-translational modification, and degradation.



PREREQUISITES AND COREQUISITES

The prerequisite for this course is a C- or better in Biochemistry I (CHEM 3510). Students not satisfying the prerequisite will be dropped from the course.

TEXTS AND ANCILLARY MATERIALS

COURSE MATERIALS Required: Macmillan Achieve Biochemistry access code, which includes integrated e-book version of Nelson, D.L. and Cox, M.M. Lehninger Principles of Biochemistry (8th Edition, 2021). Macmillan Achieve and the integrated Lehninger text are used for both CHEM 3510 and CHEM 3520. You only have to purchase one of the following two options.

1. If you are only taking CHEM 3520: Purchase a single semester access code (ISBN 9781319230906) for \$99.99 online at the Macmillan Student Store or for \$114.29 at the bookstore.
2. If you want a physical copy of the book in addition to the access code/e-book, there are several options. The bookstore is offering a hard copy (loose-leaf) version of the textbook bundled with a single semester Achieve access code for \$160.00. ISBN 9781319408886. The Macmillan Student Store has other options for hard copies available (loose-leaf or paperback print copy bundled with one or two semester Achieve access code).

- Whichever option you choose, you will retain access to the electronic textbook through Macmillan VitalSource for 4 years.

- Reading assignments begin immediately and the first problem set due Wednesday January 26 at 11:59 pm, so you should create an Achieve account and enroll in the course on Achieve without delay so you can access the book and begin working on the assignments. Note that there is a 14-day “grace period” that allows you to access the materials and begin work on the class if you are unable to pay for access right away.

- To enroll in the course on Achieve, go to this link: <https://achieve.macmillanlearning.com/courses/hugupa/>. You will be prompted to log in or create an account. After doing so, you will be given the option to purchase access to the course, enter a previously purchased access code, or enroll in the course using the 14-day grace period (and purchase/enter an access code before the grace period is over).

TECHNOLOGY REQUIREMENTS

Students will need a computer with reliable internet access, a webcam, and a microphone to access course material, participate in class sessions and office hours, and take quizzes and exams.

- All course material and activities will be linked from the course Blackboard page. Students should also check their rockets.utoledo.edu e-mail daily and use this e-mail address for all course-related correspondence.
- Students are responsible for making sure their operating system and browser can access course material on the following platforms: Blackboard, Echo360, Blackboard Collaborate Ultra, and Macmillan Achieve. Documentation for Blackboard, Echo360, and Blackboard Collaborate Ultra can be found here:

<http://utlv.screenstepslive.com/s/student>.

System requirements for Macmillan Achieve can be found here:

<https://macmillan.force.com/macmillanlearning/s/achieve>.

- Students will be required to download and use the Respondus Lockdown Browser and Monitor for secure quizzes and exams and webcam-based proctoring. Information on Respondus Lockdown Browser can be found here:

<http://utlv.screenstepslive.com/s/student/m/61901>.

- Important links for technical assistance:

- UT Online Help Desk: <https://www.utoledo.edu/dl/helpdesk/>

- Macmillan Achieve: <https://macmillan.force.com/macmillanlearning/s/achieve>

OVERVIEW OF COURSE GRADE ASSIGNMENT

The course is divided into three main sections:

- 1) The central dogma (chapters 24-28)



- 2) Carbohydrate metabolism (chapters 13-16, 19, & 20)
- 3) Lipid, nucleic acid, and amino acid metabolism (chapters 17, 18, & 21-23)

Each section will have one quiz worth 50 points, and one midterm worth 100 points. Exams and quizzes are closed book and closed note. You may drop the lowest quiz and the lowest midterm exam score. This results in 100 points available on quizzes and 200 points available for the midterm exams. There will be 10 homework assignments. There are 110 homework points available, but you will scored out of 100 points. There is a comprehensive final exam worth 100 points.

Below is a tentative breakdown of points for the semester, with a total of 500 points available. This is subject to change based on exam performance, lecture participation, and covid.

Points

Quizzes (3 x 50 points, drop lowest)	100 points
Midterm exams (3 x 100 points, drop lowest)	200 points
Homework (110 points available)	100 points
Comprehensive Final exam (not droppable)	100 points

Grading

Your final grade will be based on your percentage of the total points possible. A breakdown of the grade cut-off percentages are as follows:

- A - Total score is $\geq 85\%$
- B - Total score is between 75 and 84%
- C - Total score is between 65 and 74%
- D - Total score is between 55 and 64%
- F - Total score is < 55

The cut-off percentage for grades at the end of the semester may decrease, but will not increase.

Quizzes

Quizzes will be taken Blackboard and will require you to use Respondus Lockdown Browser and have a webcam enabled for remote proctoring. You will also need a photo ID and a calculator. Each quiz should take ~30' and it will only be available from 10:00 AM – 10:30 AM during our normal class time. Because everyone might not have a laptop to bring to lecture, we will not have class in person on the days of the three quizzes. You may take the quiz in your apartment/dorm/home. I will upload a recorded lecture for the remaining material that day. You are responsible for material covered in the recorded lecture.

Midterm and Final Exams

Midterm and final exams will be taken in class. The midterms are worth 100 points and will be closed book and closed note. You will have the entire class period for the exam. You may drop your lowest midterm score. Exams will be passed back at the end of class.

To avoid having the third midterm directly before the final exam, the final exam will be in two parts. The first part will be the third midterm covering chapters 17, 18, & 21-23. This will be worth 100 points and will count as one of your droppable midterms. The second part of the final exam will be a comprehensive exam of the entire semester worth 100 points. This portion of the exam will not be droppable. The two sections of the exam will be clearly marked. You will have two hours to complete both sections of the exam.



Exam Regrades

Exam regrade requests are due within 7 days of the exams scores being posted on blackboard. Regrade requests must be submitted in writing and include a description of why you are requesting a regrade. I will personally regrade the *entire* exam. You may gain or lose points with this regrade.

Homework

There will be a graded homework due on Achieve each week (Wednesday at 11:59 PM). Each homework is worth 11 points and there are 10 problem sets (worth a total of $10 \times 11 = 110$ points). You may attempt each question unlimited times, but you will lose 5% of the points for the question for each incorrect attempt. Late problem sets will lose 20% of the possible credit per day until they are completed. $110 > 100$, so you can get the full 100 points for Achieve even if you don't get perfect scores on each assignment (or earn extra credit points).

Makeup Assignments

Exams must be taken at the date and time scheduled unless the student has a conflict that meets the criteria of the UT Missed Class Policy (personal emergencies, including, but not limited to, illness of the student or of a dependent of the student or death in the family; religious observances that prevent the student from attending class; participation in University-sponsored activities, approved by the appropriate University authority, government required activities, such as military assignments, jury duty, or court appearances).

- If you have a conflict with an exam or quiz that you know about in advance, contact me and I will arrange for you to take the exam early. It is your responsibility to contact me with documentation to make these arrangements as soon as you are aware of the conflict.
- For legal absences with no prior notice (such as medical emergencies), acceptable written documentation justifying the absence is required before an excused absence will be considered. Makeup exams will be considered on a case-by-case basis.

Midterm Grading

Midterm grades will reflect your performance when the midterm grades are due. This will include the first quiz, midterm, and homework assignments 1-4.

COURSE EXPECTATIONS

Academic Misconduct

- I take academic misconduct very seriously. The University of Toledo Policy on [academic misconduct](#) will be strictly enforced. Students are encouraged to study together and are permitted to work together on homework. However, each student must submit their own answers while logged into their own Achieve account.
- Quizzes and exams are closed book, closed notes. You are not permitted to use any notes, books, or other resources (electronic or physical) or consult any other people in the process of completing a quiz/exam. With the exception of a calculator, no other electronic devices besides the computer/tablet running Lockdown browser may be used during the quiz or exam. Quizzes/exams must be taken using Lockdown browser and a webcam must be enabled for remote proctoring. A photo ID (student ID or driver's license) is required for each quiz/exam.
- Any student caught cheating in any way or facilitating the cheating of others will receive a non-droppable 0 for that quiz/exam. A second violation or an egregious first violation will result in an F in the course and referral to the Dean's Office.
- Posting homework/quiz/exam questions online or searching for answers online (including but not limited to use of sites like Chegg or CourseHero) is not permitted and will be considered academic misconduct. Graded assignments are meant to assess how well you are learning the material, not your skills in internet searching or crowdsourcing.

Attendance and participation

Students are expected to attend every lecture and pay attention. Students are expected to carefully read any reading material administered during the semester. Please be considerate of me and of your fellow students by silencing your electronic devices and keeping conversation and other disruptions to a minimum. I know that some



students have class on the opposite side of campus immediately before or after lecture; if late arrival or departure from class is unavoidable, use the rear doors of the lecture hall and do not disturb your neighbors.

Reading assignments

- Sections from Lehninger will be assigned for each week, and links to the readings for each week can be found in that week's folder on Achieve. You are expected to complete the reading before each class. The course will be moving very quickly, so pacing yourself and keeping up with the reading is important. Problem sets, quizzes and exams will cover material in the assigned reading as well as material covered in lecture.
- Achieve also includes optional ungraded activities such as "skills you need" for each chapter, adaptive quizzes on chapter content, and links to definitions of key terms that will be of assistance in understanding the material from the readings.
- Students are responsible for all material covered in the assigned chapters. This includes material that is not explicitly discussed in lecture or material covered in lectures that is not in the textbook. It is *highly* recommended that you complete the reading *before* lecture.

Ungraded activities

In addition to the chapter skill checks, quizzes, and key terms mentioned above, there are other ungraded resources and activities (including 3D molecular structure tutorials, videos, and additional readings) that will be available for various topics Achieve. You are highly encouraged to take advantage of these resources as you study, but they will not count towards your grade.

Office hours

I will hold regularly scheduled virtual office hours in the Course Room on Blackboard Collaborate Ultra Mondays from 11:00 – 11:55 and 1:00 – 2:20, and Fridays from 11:00 – 11:55. Anyone may drop in during this time with no need for an appointment. Additional office hours may be scheduled by appointment.

Discussion boards

If you have a question about the course material, it's likely that your classmates do too. Rather than e-mailing me with a question about material, please post your questions in the group discussion section on blackboard. If you e-mail me a question about the course material, I will answer it by posting in the discussion section of blackboard. For more personal matters, such as grades, students are of course welcome to contact me by e-mail. The purpose of this policy is to allow me to be a better teacher by reducing my e-mail burden. Furthermore, one of the best ways to master material is to teach it to others. You are strongly encouraged to monitor class discussions on blackboard and respond when you know the answer.

UNIVERSITY POLICIES

Institutional Classroom Attendance Policy

Please be aware that the university has implemented an attendance policy, which requires faculty to verify student participation in every class a student is registered at the start of each new semester/course. For this course, if you have not attended/participated in class (completed any course activities or assignments) within the first 14 days, I am required by federal law to report you as not attended. Unfortunately, not attending/participating in class impacts your eligibility to receive financial aid, so it is VERY important that you attend class and complete course work in these first two weeks. Please contact me as soon as possible to discuss options and/or possible accommodations if you have any difficulty completing assignments within the first two weeks.

Policy Statement on Non-Discrimination on the Basis of Disability (ADA): The University is an equal opportunity educational institution. Please read [The University's Policy Statement on Nondiscrimination on the Basis of Disability Americans with Disability Act Compliance](#). Students can find this policy along with other university policies listed by audience on the [University Policy webpage](#) (<http://www.utoledo.edu/policies/audience.html/#students>).



Academic Accommodations: The University of Toledo embraces the inclusion of students with disabilities. We are committed to ensuring equal opportunity and seamless access for full participation in all courses. For students who have an Accommodations Memo from the Office of Accessibility and Disability Resources, I invite you to correspond with me as soon as possible so that we can communicate confidentially about implementing accommodations in this course.

For students who have not established accommodations with the Office of Accessibility and Disability Resources and are experiencing disability access barriers or are interested in a referral to health care resources for a potential disability, please connect with the office by calling 419.530.4981 or sending an email to StudentDisability@utoledo.edu.

ACADEMIC AND SUPPORT SERVICES

Please follow this link to view a comprehensive list of [Student Academic and Support Services](http://www.utoledo.edu/studentaffairs/departments.html) (<http://www.utoledo.edu/studentaffairs/departments.html>) available to you as a student

SAFETY AND HEALTH SERVICES FOR UT STUDENTS

Please use the following link to view a comprehensive list [Campus Health and Safety Services](#) available to you as a student.

INCLUSIVE CLASSROOM STATEMENT

In this class, we will work together to develop a learning community that is inclusive and respectful. Our diversity may be reflected by differences in race, culture, age, religion, sexual orientation, gender identity/expression, socioeconomic background, and a myriad of other social identities and life experiences. We will encourage and appreciate expressions of different ideas, opinions, and beliefs so that conversations and interactions that could potentially be divisive turn, instead, into opportunities for intellectual and personal development.

Undergraduate Policies: <http://www.utoledo.edu/policies/academic/undergraduate/>

Graduate Policies: <http://www.utoledo.edu/policies/academic/graduate/>

COURSE SCHEDULE

Day	#	Date	Topic	Textbook	Assessments
Section 1: The Central Dogma					
W	1	1/19	Genes & chromosomes	Chapter 24	
F	2	1/21			
M	3	1/24	DNA Metabolism	Chapter 25	
W	4	1/26			Homework #1
F	5	1/28			
M	6	1/31	RNA Metabolism	Chapter 26	
W	7	2/2			Homework #2
F	8	2/4			
M	9	2/7	Protein Metabolism	Chapter 27	
W	10	2/9	Quiz #1 - Chapters 24-26 Recorded Lecture		Quiz #1 Homework #3
F	11	2/11			
M	12	2/14	Regulation of Gene Expression	Chapter 28	
W	13	2/16			Homework #4
F	14	2/18			
Section 2: Carbohydrate Metabolism					
M	15	2/21	Bioenergetics & Metabolism & Review Session	Chapter 13	
W	16	2/23	Midterm Exam I - Chapters 24-28		Midterm Exam #1
F	17	2/25			
M	18	2/28	Glycolysis	Chapter 14	
W	19	3/2			Homework #5

F	20	3/4			
			Spring Break		
M	21	3/14	Gluconeogenesis & Pentose phosphate pathway	Chapter 15	
W	22	3/16			Homework #6
F	23	3/18			
M	24	3/21	Citric acid cycle	Chapter 16	
W	25	3/23	Quiz #2 - Chapters 13-15 Recorded Lecture		Homework #7
F	26	3/25			
M	27	3/28	Oxidative phosphorylation & Photosynthesis	Chapters 19-20	
W	28	3/30			Homework #8
F	29	4/1			
M	30	4/4	Review Session second half of class		
Section 3: Lipid, Nucleic Acid, and Amino Acid Metabolism					
W	31	4/6	Midterm Exam II – Chapters 13-16 & 19-20		Midterm Exam #2
F	32	4/8	Lipid metabolism & Lipid Biosynthesis	Chapters 17 & 21	
M	33	4/11			
W	34	4/13			Homework #9
F	35	4/15			
M	36	4/18	Amino acid & nucleotide metabolism & biosynthesis	Chapter 18 & 22	
W	37	4/20	Quiz #3 - Chapters 17 & 21 Recorded Lecture		Homework #10
F	38	4/22			
M	39	4/25			
W	40	4/27	Hormonal regulation of metabolism	Chapter 23	
F	41	4/29			
		5/2	Final Exam 10:15-12:15 50% Exam # III (Chapters 17, 18, 21, 22) 50% Comprehensive Exam		

SPECIAL COURSE EXPECTATIONS DURING COVID-19

Maintaining a safe campus during the ongoing COVID-19 pandemic remains a top priority. UToledo continues to follow the guidance of the U.S. Centers for Disease Control and Prevention and Ohio Department of Health to keep our campus safe.

ATTENDANCE

The University of Toledo has a missed class policy. It is important that students and instructors discuss attendance requirements for the course. Before coming to campus each day, students should take their temperature and complete a self-assessment for symptoms of COVID-19, such as cough, chills, fatigue or shortness of breath. Anyone with a temperature at or above 100.0 degrees Fahrenheit or who is experiencing symptoms consistent with COVID-19 should not come to campus and contact their primary care physician or the University Health Center at 419.530.5549. For more information on the symptoms of COVID-19, please go to <https://www.cdc.gov/coronavirus/2019-ncov/symptoms-testing/symptoms.html>

COVID-19 testing for sick students is available on both Main Campus and Health Science Campus. Call 419.383.4545 for an appointment. Absences due to COVID-19 quarantine or isolation requirements are considered excused absences. Students should notify their instructors and follow the protocols summarized in this document on Navigating COVID-Related Course Concerns.

In the event that you have tested positive for COVID-19 or have been diagnosed as a probable case, please review the CDC guidance on self-isolation and symptom monitoring, and report the disclosure to the Division of Student Affairs by emailing StudentAffairs@utoledo.edu or by connecting with their on-call representative at 419.343.9946.



Disclosure is voluntary and will only be shared on a need to know basis with staff such as in the Office of Student Advocacy and Support, The Office of Residence Life, and/or the Office of Accessibility and Disability Resources to coordinate supportive measures and meet contact tracing requirements.

FACE COVERINGS

Face coverings are required while on campus, except while eating, alone in an enclosed space, or outdoors practicing social distancing. Students will not be permitted in class without a face covering. If you have a medical reason preventing you from wearing a face covering due to a health condition deemed high-risk by the CDC, submit an online application to request an accommodation through the Office of Accessibility and Disability Resources. Students will need to provide documentation that verifies their health condition or disability and supports the need for accommodations. Students already affiliated with the Office of Accessibility and Disability Resources who would like to request additional accommodations due to the impact of COVID-19, should contact their accessibility specialist to discuss their specific needs. You may connect with the office by calling 419.530.4981 or sending an email to StudentDisability@utoledo.edu.

VACCINATION

Doctors and other health care professionals agree that the best way to protect ourselves and each other is to get vaccinated. Case data clearly show that vaccines remain highly effective at preventing serious illness from COVID, including the highly contagious delta variant. If you have not yet received your COVID vaccine, the University encourages you do so as soon as possible. No appointment is needed to get the shot at the UTM Outpatient Pharmacy, University Health Clinic or Main Campus Pharmacy. Once you receive the COVID vaccination, please register on the COVID Vaccine Registry site at: <https://utvaccinereg.utoledo.edu/>.

SPECIAL NOTES

It's important to note, that based on the unpredictability of the COVID-19 virus, things can change at any time. So please be patient and understanding as we move through the semester. I also ask that you keep me informed of concerns you may have about class, completing course work/assignments timely and/or health concerns related to COVID.