



Biochemistry 501
Introduction to Biochemistry
Spring 2020

Course Credits: 3

Course Website:

<https://canvas.wisc.edu/courses/175093>

Course Designation and Attributes:

Breadth - Physical Sci. Counts toward the Natural Sci req

L&S Credit - Counts as Liberal Arts and Science credit in L&S

Meeting Time and Location:

Lecture – MWF - 12:05 pm – 12:55 pm

January 22 – May 1, 2020

Room 125 Ag Hall , 1450 Linden Drive

Or online anytime

Spring Instruction begins January 22, 2020

Spring Break is 03/14/2020-3/22/2020

Last class day is 05/01/2020

Final exam Wednesday, 5/06/2020 from 7:45-9:45 am

Final exam location: To Be Announced

Instructional Mode:

Classroom instruction and online

Credit hour designation:

50 minutes of classroom or online instruction carries the expectation of a minimum of two hours of out of class student work for every class period over approximately 15 weeks. Additional information about expectations and optional learning opportunities for student work are included below.

Teaching Team and Office Hours:

Note: Office hours are times reserved by instructors allowing students to talk to instructors directly about course material. We would like you to visit us.

Professors:

Dr. Samuel Butcher, MWR, 1:10 pm – 2:10 pm;
141E DeLuca Biochemistry Laboratories, 433 Babcock Dr.,
sebutcher@wisc.edu

Dr. Richard Amasino, MWR, 1:10 pm – 2:10 pm;
215B DeLuca Biochemistry Laboratories, 433 Babcock Dr.,
amasino@biochem.wisc.edu

Dr. Jill Wildonger, MWR, 1:10 pm – 2:10 pm;
2204 Biochemical Sciences Building, 440 Henry Mall,
wildonger@wisc.edu

Course Coordinator and Lecturer:

Dr. Mario Pennella, MW, 1:10-2:10 pm; TR 12:00– 1:15pm;
1142E DeLuca Biochemistry Building, 420 Henry Mall,
mpennella@wisc.edu

Teaching Assistants (schedule meetings by email):

Josie Mitchell, jpwerner2@wisc.edu

Yunyun Zhu, yzhu338@wisc.edu

COURSE INFORMATION

Course Description: Biochemistry 501 is a three-credit course. We will examine the chemical and physical processes that occur within living organisms.

Course Requisites: Chem 341 or 343 or concurrent enrollment or graduate student.

Learning Outcomes:

1. Students will be able to demonstrate an understanding of the basic principles of biochemistry for a range of topics spanning the structural and catalytic components of cells, catabolism and bioenergetics, anabolism and bio-signaling, and the transfer of genetic information.

2. Evaluate how biochemistry relates to other scientific disciplines and to contemporary issues in our society.
3. Synthesize knowledge and use insight to better understand biological systems.

Piazza – class discussion board over course material

We will use Piazza (free and found on Canvas course site) for students to post questions and collaborate to respond to these questions. Students can post anonymously (must select option) and instructors will monitor students answers/questions, endorse student answers, and edit or delete any posted content. The purpose of Piazza is to provide relatively rapid feedback to student questions by other students and instructors. You can access Piazza via the Canvas course: https://canvas.wisc.edu/courses/153423/external_tools/65

PeerWise – Assessment (Exam) questions

“PeerWise is an online repository of multiple-choice questions that are created, answered, rated and discussed **by students**. At the beginning of the semester, PeerWise begins with an empty repository. This grows gradually as the course progresses and students author and contribute relevant questions and comments. All activity remains anonymous to students, however instructors are able to view the identity of question and comment authors and have the ability to delete inappropriate questions. ” PeerWise is free.

Part of your grade in this course will be dependent upon your participation in PeerWise. Each student will be required to contribute one question and one comment over the entire semester. You will be assigned a Unit (based on email) and must generate a question by the due date to receive credit (see guidelines on Canvas). In addition, requirements for commenting on a question and answering questions over the semester are found within the guideline on Canvas. The course coordinator will post an invitation to PeerWise on Piazza during the second week of the course.

Discussion sections (optional): A team of former 501 undergraduates and graduate students will lead optional discussion sections. Although attendance is optional, we strongly encourage you to attend one or more sections each week. We have noticed that students who attend discussion sections score, on average, ~5% higher on exams compared to students who don't attend. The discussion sections will provide an opportunity to study for the course in a small group. We encourage you to bring questions. In addition, extra study guide materials, such as

additional problems designed to reinforce the important points from the lectures, will be provided. *You do NOT need to sign up for the discussion sections.* Days, times, and locations of the discussion sections can be found in the ‘Course Orientation’ module within the Canvas course site.

Textbook - Recommended (Not Required): Lehninger Principles of Biochemistry, by Nelson and Cox, 7th edition (earlier editions suitable as well). We will not assign readings or homework directly from the textbook. However, many of you may find the book to be a useful study guide and reference. To facilitate use of the book as a study guide and reference, the lectures will closely follow this textbook and the parts of the book relevant to lecture will be referenced by providing page numbers or by providing the number of the figures in the book that correspond to the images used in lecture. (The figures are labeled sequentially in each chapter; thus, Figure 22-5 is the 5th figure in Chapter 22.) Here are your options for textbook access.

1. Use reserve copies. We keep a few copies of the textbook on reserve at Steenbock and Helen C White libraries.
2. Buy a used book. There should be some 6th edition used books available. Furthermore, an old copy of the 4th or 5th edition will be suitable for almost all of the material we cover in the course.
3. The publisher is offering a variety of versions of the book (rent or buy, e-book or hardcopy), along with online resources. The online resources include access to a resource called SaplingPlus, which has a variety of problems that may be of use in learning the material. An additional resource includes a study guide and solutions manual. The publisher website is:

<https://store.macmillanlearning.com/us/product/Lehninger-Principles-of-Biochemistry/p/1464126119?searchText=lehn>

Grading:

40 Quizzes (each worth 0.25%)	10%
PeerWise	2%
4 Exams (The lowest score will be dropped)	78%
Cumulative Portion of Final Exam (Includes all Units)	10%
Total	100%

We will drop the lowest exam score for students who take all of the exams for the four sections, excluding the cumulative portion of the final. ***The cumulative portion of the final will not be dropped.*** If you do not take an exam, your score for that exam will be 0% and you will not be allowed to drop that score.

A = 90 – 100%
AB = 86 – 89.9%
B = 80 – 85.9%
BC = 76 – 79.9%
C = 65% – 75.9%
D = 55% – 64.9%
F = 0% – 54.9%

Quizzes: You will be assigned one 4-question quiz for each lecture (~40 quizzes total, excludes lecture 1 from Unit 1). Links to quizzes can be found within each Unit within the Modules section of the Canvas course site or the Course Summary link on the Canvas course site. A quiz will open after each class and will close at noon the day of the next class meeting unless otherwise noted on Canvas. ***If you miss the deadline for a quiz you will only receive 50% credit for completing the quiz based on questions answered correctly. Once a Unit is finished, quizzes will be closed and no makeups will be allowed.*** The answers to the quiz will be accessible soon after the submission deadline. **Please pay attention to the deadlines for the quizzes.**

NOTE: If you re-take a quiz after the deadline, then the quiz will be counted as late. **DO NOT re-take quizzes after the deadline** passes if you already took at quiz for full credit.

Exams: There will be three evening exams given after the completion of Units 1, 2, and 3 (exam date/time below). These exams will have 33 questions and students will be allowed 75 minutes to complete the exam. The final exam will have the Unit 4 exam (33 questions) plus a cumulative part (20 questions) that is comprehensive, covering **ALL SECTIONS (UNITS 1-4) OF THE COURSE**. You will have 120 minutes to complete the Unit 4 and cumulative exam. Exams are multiple choice and true/false questions; a sample exam for each section is provided within each Unit module on the Canvas course site.

The lowest Unit exam score out of the four Unit exams (including Unit 4) will be dropped. The three unit exams that are retained will count towards 78% of your final grade.

You must bring a photo ID to the exam and take the exam in the room assigned to you. Failure to take the exam in the correct room may result in a loss of a full letter grade from your exam score.

Exams are collected at the end of the exam period. Approximately 1 – 3 days after each exam, you will be able to view your grade on Canvas. The final semester grades for everyone will not be released until a few days after the exam. You will be able to view the questions you answered incorrectly at an exam viewing session the week following the exam. Times and locations will be announced after each exam. There will be no exam viewing session after the final.

Exam conflicts: We will try to accommodate students who have a legitimate conflict with a biochemistry exam. Our policy is to offer an exam *earlier that same day*. The times available for the early exam are 8-9:15am and 3-4:15pm. The location of the alternate exam is scheduled for room 1211 in the Biochemistry Sciences Building at 440 Henry Mall. **We do not offer late alternate exam times.** If you have an exam conflict, please go to the office of the course coordinator (room 1142E in the Biochemistry Building at 420 Henry Mall) and sign-up with your name, email, and reason you must take the exam early on the sign-up sheet outside the office. You will **NOT** be emailed a confirmation. Signing-up confirms a spot. There are a limited number of spots for times available. If the list is full, you will need to contact the course coordinator to determine if you can take the exam early. If you no longer need to take the exam early be sure to mark your name off to open spots for other students.

Alternate exam times for the final will only be available under special circumstances.

OTHER COURSE INFORMATION

Course Accessibility: The teaching team strives to provide everyone the opportunity to learn biochemistry. Please let the course coordinator (Mario Pennella, mpennella@wisc.edu) know if you have additional learning considerations relating to the curriculum, instruction, or assessment of this course that will enable you to engage in the course more fully. We will keep any information you share with us confidential. *If you are a McBurney student, see statement below and please contact the course coordinator to discuss your accommodations.*

Learn@UW: The course materials can be accessed through the Canvas course website via <https://learnuw.wisc.edu>. Here you can find textbook references, all lecture slides, practice problem sets and answers, recorded lectures, practice exams and answers, quizzes, and all course announcements regarding exam review

sessions, exam locations, and grades. Visit the Canvas course site frequently for course announcements.

Lecture Recordings: We will video record each lecture. The videos should be posted within 12 hours after class. **Media files can be accessed directly from the Canvas course site.**

Cell phones: Cell phones should be silenced when in the classroom. If you are on call for work or have a personal emergency, please lower the volume on your device and sit near an exit.

How to succeed in this class: To succeed it is important to study consistently and effectively. Here are some suggestions for effective studying.

- ▶ Before class, ***read the suggested chapter*** and lecture notes. Focus on general concepts rather than getting lost in the details. This “priming” exercise will make lecture easier to follow.
- ▶ ***Attend/watch class*** faithfully. As soon as possible after lecture, go over your notes and fill in parts that you do not fully understand using material from the textbook that applies to the topic covered in lecture. If you did not understand something, also review the lecture video and study the practice questions that are designed to help you learn important concepts.
- ▶ ***Writing is important to learning.*** Highlighting sentences with marker pen is not an effective way to transfer knowledge to the brain. Rather, putting concepts into your own words and writing them down results in your assimilating the concepts and recognizing relationships among concepts.
- ▶ Making ***flash cards*** is one version of using writing to learn concepts and recognize relationships. Picking out the most important concepts and putting them in your own words and writing them down is a powerful learning tool. Try pulling random cards from the stack and ask yourself “how do these ideas relate to each other?”
- ▶ ***Study groups*** are recommended. Although many concepts in biochemistry can be memorized, the majority must be learned. Discussing biochemistry with others is a good way to learn. Join a peer mentor tutoring group or attend the discussion sessions. Ask each other questions and explain answers in your own words.
- ▶ ***Complete the problem sets*** provided in the course packet. Research has shown that working through problems is one of the best ways to prepare for a multiple choice exam.
- ▶ Taking accurate and complete notes and asking questions are part of the learning process. If you do not understand a topic that was presented in

class, *ask questions*. You can submit questions and reply to questions through the Piazza discussion board on the Canvas course site.

Rules, Rights & Responsibilities

See the Guide's to [Rules, Rights and Responsibilities](#)

ACADEMIC INTEGRITY

By enrolling in this course, each student assumes the responsibilities of an active participant in UW-Madison's community of scholars in which everyone's academic work and behavior are held to the highest academic integrity standards. Academic misconduct compromises the integrity of the university. Cheating, fabrication, plagiarism, unauthorized collaboration, and helping others commit these acts are examples of academic misconduct, which can result in disciplinary action. This includes but is not limited to failure on the assignment/course, disciplinary probation, or suspension. Substantial or repeated cases of misconduct will be forwarded to the Office of Student Conduct & Community Standards for additional review. For more information, refer to studentconduct.wiscweb.wisc.edu/academic-integrity/.

During an exam, if proctors have a concern, they may ask student(s) to move to the front of the classroom. If you are asked to move, this does not mean we are accusing you of cheating. Moving will help the proctors maintain proper visual contact of all students in the room. Please accommodate any such request made of you during the exam. In addition, we may videotape exams to determine if academic misconduct takes place.

ACCOMMODATIONS FOR STUDENTS WITH DISABILITIES

McBurney Disability Resource Center syllabus statement: "The University of Wisconsin-Madison supports the right of all enrolled students to a full and equal educational opportunity. The Americans with Disabilities Act (ADA), Wisconsin State Statute (36.12), and UW-Madison policy (Faculty Document 1071) require that students with disabilities be reasonably accommodated in instruction and campus life. Reasonable accommodations for students with disabilities is a shared faculty and student responsibility. Students are expected to inform faculty [me] of their need for instructional accommodations by the end of the third week of the semester, or as soon as possible after a disability has been incurred or recognized. Faculty [I], will work either directly with the student [you] or in coordination with the McBurney Center to identify and provide reasonable instructional

accommodations. Disability information, including instructional accommodations as part of a student's educational record, is confidential and protected under FERPA.” <http://mcburney.wisc.edu/facstaffother/faculty/syllabus.php>

DIVERSITY & INCLUSION

Institutional statement on diversity: “Diversity is a source of strength, creativity, and innovation for UW-Madison. We value the contributions of each person and respect the profound ways their identity, culture, background, experience, status, abilities, and opinion enrich the university community. We commit ourselves to the pursuit of excellence in teaching, research, outreach, and diversity as inextricably linked goals.

The University of Wisconsin-Madison fulfills its public mission by creating a welcoming and inclusive community for people from every background – people who as students, faculty, and staff serve Wisconsin and the world.”

<https://diversity.wisc.edu/>

Semester Schedule

Part 1: Structural and Catalytic Components of Cells – Prof. Butcher				
Lecture	Topic	Day of the Week	Date	Assignment Due
1	Overview of the Course, Chemical Principles, and Cellular Basics	Wednesday	January 22	
2	Structure and Properties of Water, pH, Buffers	Friday	January 24	
3	Amino Acids and Protein Primary Structure	Monday	January 27	Quiz 1
4	Protein Purification and Analysis	Wednesday	January 29	Quiz 2
5	Three Dimensional Structure of Proteins	Friday	January 31	Quiz 3
6	Protein Function	Monday	February 3	Quiz 4
7	Enzyme Properties, Mechanisms, and Kinetics	Wednesday	February 5	Quiz 5
8	Enzyme Structure, Function, and Regulation	Friday	February 7	Quiz 6
9	Enzyme Inhibition & Structure and Properties of Lipids	Monday	February 10	Quiz 7
10	Lipids as Signaling Molecules & Membrane Structure	Wednesday	February 12	Quiz 8
11	Membrane Proteins and Transporters	Friday	February 14	Quiz 9
		Monday	February 17	Quiz 10
Review Session	<i>Time and Location TBA *OPTIONAL* Will be recorded</i>			
Exam 1	<i>7:30 pm, Location TBA</i>	<i>Tuesday</i>	February 18	

Part 2: Energy Production: Catabolism and Bioenergetics – Prof. Amasino				
Lecture	Topic	Day of the Week	Date	Assignment Due
1	Thermodynamics and Bioenergetics	Monday	February 17	
2	Glycolysis	Wednesday	February 19	
3	After Glycolysis: Fermentation or Citric Acid Cycle	Friday	February 21	Quiz 1 & Quiz 2
4	Citric Acid Cycle	Monday	February 24	Quiz 3
5	Catabolism of Lipids	Wednesday	February 26	Quiz 4
6	Nitrogen Utilization	Friday	February 28	Quiz 5
7	Mitochondrial Electron Transport	Monday	March 2	Quiz 6
8	ATP Synthesis	Wednesday	March 4	Quiz 7
9	Photosynthesis	Friday	March 6	Quiz 8
10	Metabolism and Evolution	Monday	March 9	Quiz 9
		Friday	March 13	Quiz 10
<i>Review Session</i>	<i>Time and Location TBA *OPTIONAL* Will be recorded</i>			
<i>Exam 2</i>	<i>7:30 pm, Location TBA</i>	<i>Tuesday</i>	March 10	

Part 3: Energy Storage and Usage: Anabolism and Bio-signaling – Dr. Pennella				
Lecture	Topic	Day of the Week	Date	Assignment Due
1	Overview of metabolism; Carbohydrate metabolism: Fed vs. Unfed states;	Wednesday	March 11	
2	<u>Unfed state:</u> Glucagon signaling, Glycogen breakdown and Fatty acid mobilization	Friday	March 13	Quiz 1
3	Gluconeogenesis and Ketogenesis	Monday	March 23	Quiz 2
4	<u>Fed state:</u> Insulin signaling; glucose transport and uptake; glycogen synthesis	Wednesday	March 25	Quiz 3
5	Pentose Phosphate Pathway (PPP)	Friday	March 27	Quiz 4
6	Lipid metabolism: Fatty Acid (FA) synthesis and regulation;	Monday	March 30	Quiz 5
7	Biosynthesis of Eicosanoids, Phospholipids (PL), Triacylglycerols (TAGs)	Wednesday	April 1	Quiz 6
8	Cholesterol: synthesis, regulation and transport	Friday	April 3	Quiz 7
9	Nitrogen Metabolism: Biosynthesis of Amino Acids, Metabolites, and Nucleotides	Monday	April 6	Quiz 8
10	Integration of Metabolism and Review	Wednesday	April 8	Quiz 9 and 10
Review Session	<i>In-class *OPTIONAL* Will be recorded</i>	<i>Wednesday</i>	<i>April 8</i>	
Exam 3	<i>7:30 pm, Location TBA</i>	<i>Thursday</i>	<i>April 9</i>	

Part 4: Genetic Information Transfer – Prof. Wildonger				
Lecture	Topic	Day of the Week	Date	Assignment Due
1	Introduction to Information Transfer	Friday	April 10	
2	DNA and Chromosome Structure	Monday	April 13	Quiz 1
3	DNA Replication	Wednesday	April 15	Quiz 2
4	Mutagenesis and Repair	Friday	April 17	Quiz 3
5	DNA Recombination	Monday	April 20	Quiz 4
6	Gene Regulation & Epigenetics	Wednesday	April 22	Quiz 5
7	Transcription	Friday	April 24	Quiz 6
8	RNA Processing	Monday	April 27	Quiz 7
9	Translation	Wednesday	April 29	Quiz 8
10	Molecular Techniques	Friday	May 1	Quiz 9
		Monday	May 4	Quiz 10
<i>Review Session</i>	<i>Time and Location TBA *OPTIONAL* Will be recorded</i>			
<i>Final Exam (covering Units 1-4)</i>	<i>Location TBA</i>	<i>Wednesday 7:45-9:45am</i>	<i>May 6</i>	