

BMB 401 Summer 2022

Comprehensive Biochemistry:

Important dates

- **Class begins: 5/16/22**
- **Midterm Exams are online on d2i, Thursdays ONLY 3:00-4:00 PM Eastern Time.**
 - **Exam I:** June 9th
 - **Exam II:** June 30th
 - **Exam III:** July 21st
 - **Exam IV:** August 11th

Students must not have obligations, including other classes, that prevent taking exams at these scheduled times.

Faculty

Course Instructor of Record: Assistant Professor **Dr. Kathleen Foley:**

email: foleyk@msu.edu This is the preferred form of communication as I am not in my office.

Office hours with Dr. Foley and our TA are by Zoom meeting only this semester.

- **Dr. Foley:** <https://msu.zoom.us/j/3064420155>
 - Tuesdays 12-1 PM Additional meetings available by appointment
- TA times to be announced.

Course Overview

In this course, we will cover the structures and functions of major biomolecules, to understand the roles of these molecules in metabolism. We will also cover the regulation and coordination of major metabolic pathways. This course has an emphasis on human metabolic pathways; other systems are covered when appropriate.

Goals

Students are expected to know the important principles of inter and intramolecular interactions, enzyme catalysis, thermodynamics, and pH. Students are also expected to know the structures and functions of important biochemical metabolites, including amino acids, monosaccharides, nucleic acids and the general structures of fatty acids, triacylglycerols, membrane lipids and cholesterol.

Students are expected to know the following pathways in depth:

- Glycolysis
- Gluconeogenesis
- TCA cycle
- Glycogen synthesis and catabolism
- Urea cycle
- Replication
- Transcription
- Translation

And have an appreciation for the function and the committed and regulated steps of the following pathways and processes:

- Major buffering systems
- Heme synthesis and catabolism
- Pentose phosphate pathway
- Fatty acid synthesis and catabolism
- Amino acid synthesis and catabolism
- Nucleic acid synthesis and catabolism
- Membrane lipid formation, including cholesterol synthesis and derivatives
- Lipid transport

Requirements

- All four mid/term exams must be taken.
- Students may not take this course with another obligation that overlaps exam times.
- This is an online course, with online exams. A computer and stable internet access are required.
- The Mozilla Firefox or Google Chrome browsers tend to work best with this course.
- **Textbook:** *Biochemistry: ninth Edition*, Berg, Tymoczko & Stryer W. H. Freeman & Co, ed, but other, earlier editions are allowed, to save you money.

Accessing Course Materials

- All course materials, and all grades will be online at <https://d2l.msu.edu>
- Video lectures are streamed online via YouTube links posted in Exam Content on d2l
- All video lectures are close captioned.
- Lecture notes are present in PowerPoint (PPT), PDF format for download.
- Transcripts of the lectures are also posted and may be downloaded to use as notes, so you do not have to write down every word from the lectures yourself.
- If you have trouble accessing course content or concerns regarding course content, please contact Dr. Foley by email.
- If you have general technical trouble either accessing d2l, or email, contact the appropriate help desk listed here:
 - Visit the MSU Help site for general problems <http://help.msu.edu>
 - Visit the Desire2Learn Help Site for d2l problems <http://help.d2l.msu.edu>
 - Call the MSU IT Service Desk, which is available 24 hours a day for any IT issue. These numbers are (517)432-6200, (844)678-6200, or e-mail at ithelp@msu.edu
(Note: my experience is that calling is generally faster and easier than email)

Exams and Grading: All exams in the continental US must be taken at the posted time of 3:00 PM Eastern Time (ET) This means that persons living time zones other than ET must test at the same time as persons who are testing in MI. (such as 2:00 PM Central Time)

- Your grade will be solely determined as the average of four (4) midterm exam.
- All midterm exams will consist of 43 questions that may consist of multiple choice, or true/false questions. Each question is worth 2.5 points.
- Makeup exams may also contain short answer questions.
- All midterm exams have a one-hour time limit showing on the exam clock and a 15-minute grace period that will not show on the exam clock.

Grading Scale:

This is the grading scale that will be used to determine your grade.

- 4.0 85-100
- 3.5 78.5-84.99
- 3.0 71-78.49
- 2.5 64.5-70.99
- 2.0 58-64.49
- 1.5 50.5-57.99
- 1.0 44-50.49
- 0.0 Below 44

Students requiring accommodations for exams:

- Persons requiring accommodations due to disability should contact the **Resource Center for Persons with Disabilities (RCPD) at Michigan State University** prior to the beginning of class to obtain a VISA form that states the accommodations required. This VISA should be sent to Dr. Foley. To make an appointment with a specialist at RCPD, call: (517) 353-9642 Or TTY: (517) 355-1293 or visit the RCPD website: <https://www.rcpd.msu.edu/>
- Persons living outside the continental US may request accommodations for purposes of alternate exam timing.

Academic Honesty: It is expected that all students follow the code of academic honesty. No cheating of any kind will be tolerated. Students found to be cheating on an exam, will receive a zero for that exam, and will be reported. Further actions may include dismissal from the university.

- University policy regarding academic honest can be found here: <https://www.msu.edu/~ombud/academic/integrity/index.html>
- No request for a grade increase, other than that due to grading error, will be honored. Your final grade will be that which you have fairly earned.
- **Incidences of academic dishonesty will not be tolerated and will be reported.**

Spartan Code of Honor: The Associated Students of Michigan State University (ASMSU) adopted the following Spartan Code of Honor:

“As a Spartan, I will strive to uphold values of the highest ethical standard. I will practice honesty in my work, foster honesty in my peers, and take pride in knowing that honor is worth more than grades. I will carry these values beyond my time as a student at Michigan State University, continuing the endeavor to build personal integrity in all that I do.”

Class Schedule

*Please Note: it is strongly advised to watch lectures regularly to keep up with this course as you would for any in-person course. This means to watch 1 lecture per day or 1 per every other day to finish the lectures by the weekend before each exam. Then you can use the week of the exam to do the practice exams, and review lectures as needed. **Please do not fall behind- do not attempt to cram this class, it's the best way to experience maximal aggravation and certain failure.***

Lecture Topics

- 1 Introduction to the Course, Basic Biochemical Concepts
- 2 Basic Principles II Four classes of Macromolecules, Inter- and Intra-molecular Interactions
- 3 Polar Nature of Water, Acid Base Chemistry, Buffers
- 4 Basic Thermodynamics
- 5 The Central Dogma
- 6 Amino Acids Structure and function
- 7 Protein Structure Hierarchy
- 8 Protein Folding, Degradation, Amyloidosis
- 9 Exploring Topics in Homology
- 10 Myoglobin and Hemoglobin Structure, Function, Pathology

Exam I, Covering Lectures 1-10

- 11 Heme Synthesis, Degradation, Clinical Importance of Bilirubin
- 12 Enzymes I: Nomenclature, Kinetics
- 13 Enzymes II: Kinetics continued, Profile of Carbonic Anhydrase, Enzyme Regulation
- 14 Vitamins, Coenzymes, Cofactors
- 15 Carbohydrate Structure and Nomenclature
- 16 Glycolysis I: Glucose as a Fuel Source
- 17 Glycolysis II: The Use of Other Fuel Sources
- 18 Gluconeogenesis,
- 19 The Pyruvate Dehydrogenase Complex, Overview of the TCA Cycle

Exam II, Covering Lectures 11-19

- 20 TCA Cycle, Enzymes and Regulation
- 21 Electron Transport Chain
- 22 ATP Synthesis, Mitochondrial poisons
- 23 Glycogen Metabolism I
- 24 Glycogen Metabolism: Regulation
- 25 Pentose Phosphate Pathway
- 26 Lipids I: Fatty Acid Catabolism
- 27 Lipids II: Additional topics in Fatty Acid Oxidation
- 28 Lipids III: Steroid Synthesis
- 29 Lipids IV: Cholesterol Transport
- 30 Lipids V: TAG and Phospholipid Synthesis

Exam III, Covering Lectures 20-30

31 Protein Metabolism; The Urea Cycle

32 Amino Acid Metabolism

33 Nucleic Acid Metabolism I: Nucleotide Structure, Function and Synthesis I

34 Nucleic Acid Metabolism I: Synthesis II; Pathology

35 DNA Structure II; Replication I

36 Replication II: Mutation and Repair

37 Transcription

38 Transcriptional Regulation

39 Translation

40 Metabolism Overview

Exam IV, Covering Lectures 31-40

Notes to help you do well in this class

The following are supplied on d2l to help you:

- Closed Captioned lecture videos
- Transcripts of every word spoken in the lecture videos
- Lecture notes in PPT and PDF form
- Self-assessments for each lecture (think of this as homework that is not-for-credit and make sure to do it!)
- Practice exams and keys (Word docs)
- Online Mock Exams in d2l (in the Quizzes section under assessments) These open at 9 AM the Tuesday before each exam and will close, and remain closed at 9 AM on exam day.

Previous Students' Advice to reduce the time it takes to watch a lecture and take notes – Students have said that this method is actually faster in the long run, and makes it easier to understand the overall concepts better.

1) Watch each lecture all the way through once without taking notes to follow along and get an idea of what is being said, and what is most important to know.

2) Watch the lecture again to take notes, (or highlight the lecture transcript).

Most importantly: Please do not try to just memorize! It's important to understand *what* is happening and *why*. Memorization without understanding is a ticket to exam failure and poor retention of course information.

Please think about the following when watching lectures:

- What is the overall purpose of this pathway or cycle?
- What kind of reaction is happening at each step?
 - Is carbon lost or gained?
 - Is ATP used or produced?
 - Are electrons lost or gained from the substrate – and if so, which electron carrier is being used?

- Are there cofactors needed in this reaction? Which ones? Why?
- Where and when does this pathway happen?
 - Why does this make sense?
- Which enzymes are regulated in this pathway?
 - Why does the regulation of these enzymes make sense?
 - Why do the effectors of this enzyme (positive or negative regulators) make sense for this enzyme and this pathway?

By **understanding** these things, biochemistry may become much easier for you. Rote memorization alone is **not** the way to succeed in this course. Understanding the *what and why* is critical for understanding and retention.

I hope this helps!

I look forward to having you in class! This is a challenging course that provides great insight into many fundamental biochemical processes. Have a great semester, and please let me know if you have questions. I am here to help, so please do not hesitate to contact me!

Please also take a moment to look over the following:

"We want to this to be a safe and inclusive class for students and faculty, and we want make sure that students know of resources that are available if they do not feel that way. The BMB department has developed this community standards document as a way to encourage positive, encouraging, and respectful ways of interacting with each other. If there is anything that you would like discuss, that would be great. I have attached a survey link in d2l where you can input any thoughts or reaction (anonymously) to this document. It would be very helpful if you could take the time to fill it out, as we want this to be a good outline for a safe and inclusive learning environment that serves students, faculty, and staff well. Thank you.



In all things, please be kind and respectful to others.

***With best regards and hopes for an excellent and safe semester,
Dr. Kathleen M. Foley***

Biochemistry and Molecular Biology



COMMUNITY STANDARDS

Biochemistry and Molecular Biology (BMB) is committed to fostering the education of students and postdocs in a welcoming and supportive environment.

All members of the BMB community are expected to treat each other in a respectful, professional manner. We are all responsible for holding to those standards both on and off campus (e.g. at conferences, meetings or field work). In addition to following University policies, we ask all members of BMB to support and adhere to our community norms of respectful and responsible conduct.

EXPECTED CONDUCT

BMB has established the following standards of conduct:

- Act ethically and with integrity
- Be fair and respectful to others
- Be welcoming and inclusive of all people
- Manage, supervise, instruct and advise responsibly
- Protect, preserve and responsibly use University resources and property
- Promote physical and mental health & safety
- Promote a culture of compliance with legal requirements
- Preserve academic freedom
- Ethically conduct research, teaching and community engagement
- Acknowledge conflicts of interest
- Carefully manage public, private and confidential information

UNACCEPTABLE BEHAVIOR

BMB will ask Michigan State University authorities to take action in case of:

- Sexual harassment, sexual assault, stalking and relationship violence
- Bullying behavior
- Discrimination
- Retaliation
- Unethical research, including falsification of data or information
- Scholastic dishonesty
- Unauthorized use, including misuse of, facilities, equipment or services
- Theft, property damage or vandalism
- Violation of University rules
- Violation of local, state or federal laws

MSU SANCTIONS FOR UNACCEPTABLE BEHAVIOR

Sanctions will be commensurate with the nature and severity of the offense. Consideration will be taken of persistence of violations and the impact of the offense on other people. Sanctions may include:

- Warning
- Probation
- Restitution
- Reassignment of work activities
- Paid or unpaid leave of absence
- Termination of employment

REPORTING MISCONDUCT AND MORE INFORMATION

MSU's Office of Institutional Equity (OIE):

The OIE serves to uphold and advance our shared values through oversight and application of civil rights policies.

The Anti-Discrimination Response and Investigations team supports, responds to, and investigates reports related to discrimination and harassment based on race, ethnicity, color, national origin, sex, disability, religion, age, gender, gender identity, sexual identity, height, marital status, political persuasion, sexual orientation, veteran status, or weight.

The Relationship Violence and Sexual Misconduct Response and Investigations team supports, responds to, and investigates relationship violence and sexual misconduct, including dating violence, gender-based harassment, sexual assault, and stalking.

<https://civilrights.msu.edu/response-and-investigations/index.html>

The College of Natural Science Diversity, Equity and Inclusion website lists comprehensive resources relating to Relationship Violence and Sexual Misconduct, Discrimination, and Conflict Resolution.

<https://natsci.msu.edu/diversity-equity-and-inclusion/reporting/>

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