

## BMB 401 Spring 2021

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Comprehensive Biochemistry: [this is an online-only course for SS21](#)

### Important dates

- **Class begins 1/11/20**
- **Midterm Exams 3:00-4:00 PM Eastern Standard Time ONLY**
  - **February 5th**
  - **February 26th**
  - **March 26th**
  - **April 16th**

*There is no final exam for this fully online course.*

### Faculty

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

*email:* [foleyk@msu.edu](mailto:foleyk@msu.edu) This is the preferred form of communication as I am not in my office.

**Office hours** with Dr. Foley are by Zoom meeting only this semester. Tuesdays 6-7, and by appointment.

### 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.
- This is an online only course and a computer with internet access is needed
- The Mozilla Firefox or Google Chrome browsers tend to work best with this course.
- **Textbook:** *Biochemistry: Eighth Edition*, Berg, Tymoczko & Stryer W. H. Freeman & Co, ed, but other, earlier editions are allowed, to save you money. **There are copies of the 8<sup>th</sup> edition of our textbook on reserve in the on-campus Main Library.**

**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.

### **Assessment: All exams for Fall Semester 2020 will be online in d2l Quizzes.**

- All exams in the continental US must be taken at the posted time of 3:30 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 2:30 PM Central Time)*
- Anyone late by more than 15 minutes may be locked out of the exam.
- All midterm exams will consist of 43 questions that may consist of multiple choice, or true/false questions. Alternate exams may also contain short answer questions.
- All midterm exams have a one-hour time limit and a specified grace period that is given but may not appear on the d2l exam countdown clock.
- **No collaborating of any kind on exams is allowed and is considered to be academic dishonesty. This will be reported.**
- If academic dishonesty does **not** occur, all exams will remain **open book/open notes exams** this semester. However, if collaboration of any kind or accessing outside sources such as google or other search engines occurs, we will switch to Respondus with at least 2 weeks-notice given. **Do not risk losing the opportunity of our current format.**

**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.”*

### 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.

### 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](mailto:ithelp@msu.edu) (Note: my experience is that calling is generally faster and easier than email)

### 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**

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- 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**

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- 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**

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- 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**

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### **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.**

- What kind of reaction is happening?
- Is carbon lost or gained?
- Is ATP used or produced?

- Are electrons lost or gained from the substrate – and if so, what is the electron carrier?
- Are there cofactors needed in this reaction? Why?
- Where and when does this reaction happen?
- Why does this reaction make sense?
- Why are specific enzymes regulated?
- Why does the regulation of these enzymes by these effectors make sense?
- Why do things happen as they do in this pathway or cycle? And to go along with this question, what is the overall purpose of this pathway or cycle?

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!*

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

