BMB 401 Fall 2020

**Comprehensive Biochemistry**

**Class begins 9/2/20**

**Midterm Exam Times are 3-4 PM Eastern on these Fridays ONLY (Exam rooms TBA):**

*September 18, October 16, November 6, and December 4 from 3:30-4:30pm EST.*

*The 2-hour optional comprehensive 5th exam is scheduled for Friday December 11th 3:30-5:30pm.*

**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. The final is optional**.
  + The final may be used to substitute for **one** missed exam.
* **Computer with internet access:** 
  + Mozilla Firefox browser
  + QuickTime media player
* **Textbook: *Biochemistry: Eighth Edition,* Berg, Tymoczko & Stryer W. H. Freeman & Co, ed, but other, earlier editions are allowed, to save you money.**
* **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**](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 only.**
* **All exams *must* be taken at the posted time (Eastern time)**
* **Persons living in other time zones must test at the same time as persons who are testing in MI. (Eastern 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
* The fifth exam will consist of at least 53 questions that may consist of multiple choice, or true/false questions.
* The 5th exam will have a two-hour time limit
* Missed exams will count as zero unless the 5th exam replaces the missed exam.

**Students requiring accommodations for exams:**

* Persons requiring accommodations 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. The website for RCPD is: [**https://www.rcpd.msu.edu/**](https://www.rcpd.msu.edu/)

**Missed Exams: Make up exams are given SOLELY at the discretion of the instructor. The final may be used to make up for ONE missed exam.**

**Accessing Course Materials**

* **All course materials are online at https://d2l.msu.edu/**
  + **Video lectures are present in the Lessons tab**  and are streamed online u
  + **All video lectures are close captioned.**
  + **Lecture notes** in PowerPoint (PPT), PDF, or Keynote (KEY) format are present for download. It is recommended that you watch the lectures with these notes in hand.
  + **Transcripts** of the lectures are also posted and may be downloaded to use as notes.
* **Please note**: **it is strongly advised to watch lectures regularly to keep up with this course as you would for any in-person course. Please do not fall behind.**



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!

***Onward to a great semester!***

***With best regards and hopes for an excellent semester,***

Instructor: Dr. Kathleen M. Foley

Email: foleyk@msu.edu

**Class Schedule**

The following schedule is given as a guide to the topics that will be discussed. Please plan to watch one video per day, or per every other day – do not attempt to cram this class…

**Lecture Topics**

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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 – Material in this lecture will be on Exam IV.

**Exam IV, Covering Lectures 31-40**

**Exam V Optional Cumulative Exam**