

**INTRODUCTION TO BIOCHEMISTRY**  
**MCB 2000**  
**FALL 2016**

Dr. Mary K. Bruno

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Office hours: By appointment

**\*\*\*Note.** Wednesday 4:00-5:00 PM will be for small group weekly content review in TLS 263

Lecture TA: Nick Legendre

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**Lecture:** MWF—11:15 AM-12:05 PM

**Room:** AUST 108

**Labs:** TLS 265, 277

Text: *Biochemistry A Short Course—**Third edition***

J.L. Tymoczko, J.M. Berg, L.Stryer

W.H. Freeman and Company, 2015

The text can be purchased in any **ONE** of the following formats:

Biochemistry: A Short Course (**Bound**)

Biochemistry: A Short Course (**Loose-Leaf**)

Biochemistry: A Short Course (**ebook**)

**On-line:** **LaunchPad:** [www.macmillanhighered.com/launchpad/tymoczko3e](http://www.macmillanhighered.com/launchpad/tymoczko3e)

Offers a variety of learning resources and tools to aid in your understanding of course content.  
Available on a trial basis for 21 days prior to purchase.

(Not required, but strongly encouraged)

**Review Sessions for exams: Date, Time, Location to be announced**

## COURSE AIMS

This course is divided into 2 sections directed toward:

- (1) Examining structure-function relationships in macromolecules
- (2) Understanding metabolic pathways and their regulation

## LEARNING OBJECTIVES

After completing this course, you should be able to:

- (1) Discuss the relationship between structure and function of macromolecules.
  - a. What contributes to the structure of a macromolecule and how does structure dictate its function?
  - b. How do macromolecules interact with each other and their environment?
  - c. Provide examples to illustrate your understanding.
- (2) Identify factors that affect enzyme catalysis *in vivo* and *in vitro*. Define and calculate  $K_m$ ,  $V_{max}$ , and  $k_{cat}$  for an enzymatic reaction. Why are enzymes regulated *in vivo*?
- (3) Integrate metabolic pathways with the demand for energy.
  - a. How does the cell extract energy from macromolecules?
- (4) Compare and contrast changes in metabolic pathways in response to different physiological conditions such as fasting, exercise, diet.
  - a. How is glucose and energy homeostasis maintained?
  - b. Outline differences between catabolic and anabolic pathways.
  - c. How are metabolic pathways regulated
- (5) Apply and relate course content to problems in biology and medicine.
- (6) Demonstrate basic skills in the laboratory, including the use of instrumentation and biochemical techniques.

## HELPFUL STRATEGIES REGARDING THE COURSE:

This course can be challenging because of the amount of information that will be covered and the many interrelationships. Each lecture topic builds from an earlier one. The following are recommended to help you with the course:

1. Make use of the course outline (not the same as the syllabus) posted on HuskyCT to help you structure and identify the main points of each lecture. Filling in the course outline with key words and phrases as the course progresses will help you in reviewing for the exams and final.
2. Review lecture content before reading the text in detail to know what to emphasize in your reading. Read the assigned reading more carefully after lecture as a means of reinforcement. Because this is a one semester course, we will not be able to cover all of the material in each reading assignment. Material not discussed in lecture will not be on an exam, unless specific mention is made.
3. Review lecture and text material on a regular basis—retention is better in smaller, repetitive doses rather than trying to pull an all-nighter. Often students will underestimate the time that they will need to study for an exam. Although, some of the material does require sheer memorization, much of it requires understanding.
4. When reviewing the notes or lecture material,
  - Identify the main concept. Why is this important to know? What practical application does it have? How do the factual details relate to conceptual understanding?
  - Begin to make connections with other parts of the course. Each lecture topic builds from an earlier one.
5. **Seek out help**—sooner rather than later—if you fall behind or are having difficulty. **New this semester** is a weekly review / question/answer session that I will conduct on Wednesdays from 4:15-5:30. If you prefer to meet individually, please email me for an appointment or see the Lecture TA during his/her office hours. You may also schedule individual appointments with the Lecture TA.

## POLICIES FOR MCB 2000

### EXAMS

*This semester exams will be administered through the Testing Center. The dates and times are as follows:*

<b>Exam</b>	<b>Date</b>	<b>Times for Registration</b>
1	Sept 26 (Monday)	8:30 AM 9:45 AM 2:30 PM 3:40 PM 4:50 PM
2	Oct 17 (Monday)	8:30 AM 9:45 AM 2:30 PM 3:40 PM 4:50 PM
3	Nov 14 (Monday)	8:30 AM 10:00 AM 11:30 AM 1:00 PM 2:30 PM
4	Dec 6 <b>** (Tuesday)</b>	8:30 AM 10:00 AM 11:30 AM 1:00 PM 2:30 PM

**PLEASE READ the Instructions for how to register for an exam time slot as well as policy guidelines for the Testing Center. This info can be found at:**

<http://testingcenter.uconn.edu/students/>

**Note that your Student ID will be required to take the exam.**

Class will NOT be in session on exam dates. Any students with multiple time conflicts outside of regularly scheduled class times are encouraged to register for times that closely coincide with regular class times.

**ABSENCE FROM EXAM given at the Testing Center:**

**No exams will be given outside of the Testing Center except for approved accommodations or excused absences (illness, death in the family, interviews, or University-related events). Documentation must be provided in these cases. Also NOTE--If your work schedule conflicts with an exam date / times, please make changes in your work schedule in advance to accommodate an exam time. An exam administered outside the Testing Center will be a written exam in the format of short answer, short explanation. If you have such a conflict for any exam contact the faculty as soon as you learn of this conflict. Arrangements for a make-up exam need to be discussed with the instructor. If you miss an exam and do not make up an exam, then your final exam will automatically be counted twice. In this case, there is no option of dropping an exam. No exams will be administered prior to the exam dates listed on the syllabus. Make-up exams are to be completed within 1 week of the respective original exam date on the syllabus.**

**Please also note the following University statement regarding conflict due to religious observances:**

[On February 2, 2009, the University Senate passed a motion about religious observances which stipulated that "Students anticipating such a conflict should inform their instructor in writing within the first three weeks of the semester, and prior to the anticipated absence, and should take the initiative to work out with the instructor

a schedule for making up missed work.” For conflicts with final examinations, students should, as usual, contact the Office of Student Services and Advocacy.]

### **Rescheduling of the final exam requires the approval from of the Dean of Students Office**

Finals week for fall 2016 takes place from Monday, December 12th, through Sunday, December 18th. Students are required to be available for their exam and/or complete any assessment during the time stated in the Registrar's Office schedule. If you have a conflict with this time you must visit the Dean of Students Office to discuss the possibility of rescheduling this final.

The Dean of Students Office **REQUIRES** advance notice from students who have prior knowledge of a conflict (i.e., bunched finals, religious obligation, legal/medical appointments...) Please note that vacations, previously purchased tickets or reservations, graduations, social events, misreading the assessment schedule and over-sleeping are not viable reasons for rescheduling a final. **If you think that your situation warrants permission to reschedule, please contact the Dean of Students Office**

### **ACADEMIC MISCONDUCT STATEMENT:**

“Academic misconduct in any form is in violation of the University of Connecticut Student Conduct Code and will not be tolerated. This includes, but is not limited to: copying or sharing answers on tests or assignments, plagiarism, and having someone else do your academic work. Depending on the act, a student could receive an F grade on the test/assignment, F grade for the course, or could be suspended or expelled.”

### **DISABILITIES**

Any student with documented disabilities that he/she would like the faculty to be aware of should communicate that information in confidence to the faculty as soon as possible, preferably during the first week of classes. This would apply to **both** course exams, lab quizzes, and the lab practical. With regard to lab, special arrangements may need to be made to meet the approved accommodations. Therefore, it is important that the faculty and/or TA be informed as soon as possible. Any issues arising will be addressed in accordance with the policy of the University.

Please note the following paragraph from the Center for Students with Disabilities (CSD)

*“CSD engages in an interactive process with each student and reviews requests for accommodations on an individualized, case-by-case basis. Depending on the nature and functional limitations of a student’s documented disability, he / she may be eligible for academic accommodations. CSD collaborates with students and their faculty to coordinate approved accommodations and services for qualified students with disabilities. If you have a documented disability for which you wish to request academic accommodations and have not contacted CSD, please do so as soon as possible. The CSD is located in Wilbur Cross, Room 204 and can be reached at (860) 486-2020 or at [csd@uconn.edu](mailto:csd@uconn.edu). Detailed information regarding the process to request accommodations is available on the CSD website at [www.csd.uconn.edu](http://www.csd.uconn.edu).”*

## **POLICIES FOR MCB 2000**

### **EVALUATION:**

The **lecture portion** of the course is worth **75% of your grade**

#### ***Exams + Final:***

4 exams (400 points total): 35-40 multiple choice questions.

- Final exam (100 points) includes new material since the previous exam + a **cumulative section**. 50-60 multiple choice questions.
- This results in a total of 5 exam grades. The lowest one of the 4 in-class exams will be dropped and replaced by the final exam score if your score on the final is higher. If your final exam score is not higher, the lowest exam grade will not be replaced.

**NOTE: AN EXAM AVERAGE ON THE 4 EXAMS + FINAL THAT IS < 55% WILL RESULT IN FAILURE FOR THE COURSE, IRRESPECTIVE OF THE LABORATORY GRADE.**

For example, a student's exam average must be 275/500 points or better to pass the course, irrespective of the laboratory grade.

The **laboratory portion** of the course will comprise **25% of your grade**.

The laboratory is will introduce you to standard methods and instrumentation widely used in research. In MCB 2000, the labs will reinforce concepts covered in the first part of the course—largely related to protein purification and characterization in addition to enzyme kinetics. Experiments that address concepts in metabolism are difficult to incorporate due to constraints of cost and time.

Lab policies will be discussed separately in your respective lab sections.

**Your final grade in the course will be based on the lecture component (exam average >55%) plus your lab grade.**

A student's course average (lecture average + lab) will typically be reflected in the following letter grade distribution:

>92	A	76-77	C+	56-61	D- (see Note above)
88-91	A-	72-75	C	< 55	F
86-87	B+	68-71	C-		
82-85	B	66-67	D+		
78-81	B-	62-65	D		

**Additional note:** It is your responsibility to review your exam either with the instructor or with the lecture TA within a timely manner. If you wish to review an exam, you may email the instructor or the lecture TA for an appointment to do so. Exam reviews should be done within 2 weeks of taking the exam. **NO review of exams 1-4 will be possible at the end of the semester due to time constraints in calculating and submitting grades.**

### **TAPING LECTURES AND USE OF COURSE CONTENT:**

Lecture content (notes, presentations, recordings) study guides, exam questions are **"for your own personal use and no other**. You are not authorized to post them on-line or make any commercial use of them without **written permission.**"

## **INFORMATION REGARDING THE UNIVERSITY'S POLICIES ON DISCRIMINATION AND HARASSMENT**

*The following paragraph has been provided by the University for inclusion in syllabi:*

### ***Policy Against Discrimination, Harassment and Related Interpersonal Violence***

“The University is committed to maintaining an environment free of discrimination or discriminatory harassment directed toward any person or group within its community – students, employees, or visitors. Academic and professional excellence can flourish only when each member of our community is assured an atmosphere of mutual respect. All members of the University community are responsible for the maintenance of an academic and work environment in which people are free to learn and work without fear of discrimination or discriminatory harassment. In addition, inappropriate amorous relationships can undermine the University’s mission when those in positions of authority abuse or appear to abuse their authority. To that end, and in accordance with federal and state law, the University prohibits discrimination and discriminatory harassment, as well as inappropriate amorous relationships, and such behavior will be met with appropriate disciplinary action, up to and including dismissal from the University. Additionally, to protect the campus community, all non-confidential University employees (including faculty) are required to report assaults sexual assaults, intimate partner violence, and/or stalking involving a student that they witness or are told about to the Office of Institutional Equity. The University takes all reports with the utmost seriousness. Please be aware that while the information you provide will remain private, it will not be confidential and will be shared with University officials who can help.”

More information is available at:

<http://equity.uconn.edu>

<http://titleix.uconn.edu>

<http://provost.uconn.edu/syllabi-references/>

<b>DATE</b>	<b>LECTURE TOPIC</b>	<b>LECTURE NUMBER</b>	<b>READING</b>	<b>LAB (week of)</b>
Aug 29	Course Preview & Unifying Principles		Chapt 1	Check-in; Lab Policies
Aug 31	Water & atomic interactions How and why structures form	1	Chapt 2	
Sept 2	Water, acids, bases, and buffers	2	Chapt 2	
Sept 5	LABOR DAY NO CLASS			Biochem Basics
Sept 7	Water, acids, bases, and buffers	3		
Sept 9	Amino acids-properties	4	Chapt 3	
Sept 12	Protein structure, folding, interactions	5	Chapt 4	Buffers, pH, Titration of Amino Acids
Sept 14	Protein structure, folding, interactions <a href="http://www.nature.com/uidfinder/10.1038/464828a">www.nature.com/uidfinder/10.1038/464828a</a>	6	Chapt 4 See link under lecture topic	
Sept 16	Hemoglobin & myoglobin: Structure & function, Intro to Allostery	7	Chapt 9	
Sept 19	Hemoglobin & myoglobin: Structure & function, Intro to Allostery	8		Ion Exchange Chromatography
Sept 21	Introduction to catalysis Basic thermodynamics	9	Chapt 6	
Sept 23	Introduction to enzyme catalysis	10	Chapt 7 pp. 111-118	
<b>Sept 26</b>	<b>EXAM 1 Testing Center Lectures 1-8</b>			Photometry
Sept 28	Enzyme kinetics- Michaelis-Menten Eqn	11		
Sept 30	Enzyme kinetics & Lineweaver –Burk plots	12	Chapt 8 pp.131-141	
Oct 3	Allosteric enzymes as information sensors	13	Chapt 7 pp. 118-125	Kinetic Studies of Alkaline Phosphatase
Oct 5	Regulation of enzyme activity	14	Lecture Notes	
Oct 7	Lipids Membrane structure	15	Chapt 11 Chapt 12	
Oct 10	Signal transduction--GPCR	16	Chapt 13 pp. 225-233	Kinetic Studies of Alkaline Phosphatase
Oct 12	Signal transduction--Receptor Tyrosine Kinases	17	Chapt 13 pp. 233-241	
Oct 14	Introduction to metabolism, Bioenergetics	18	Chapt 15	
<b>Oct 17</b>	<b>EXAM 2 Testing Center Lectures 9-17</b>			Separation of Proteins Part I: Chromatography
Oct 19	Introduction to metabolism, Bioenergetics	18		
Oct 21	Glycolysis—the pathway	19	Chapt 16	
Oct 24	Glycolysis--regulation	20		Separation of Proteins: Part II: SDS-PAGE
Oct 26	Pyruvate Dehydrogenase Complex	21	Chapt 18	
Oct 28	TCA cycle	22	Chapt 19	
Oct 31	TCA cycle	23		Separation of Proteins: Part III: Western Blot and Protein Assay
Nov 2	Electron transport Oxygen metabolism & toxicity	24	Chapt 20	

<b>DATE</b>	<b>LECTURE TOPIC</b>	<b>LECTURE NUMBER</b>	<b>READING</b>	<b>LAB (week of)</b>
Nov 4	Oxidative phosphorylation	25	Chapt 21	
Nov 7	Oxidative phosphorylation	26		Affinity Purification Hen egg Lysozyme
Nov 9	<u>Anabolic reactions:</u> Glycogen synthesis	27	Chapt 25	
Nov 11	Biosynthesis of fatty acids Pentose phosphate pathway	28	Chapt 28 Chapt 26	
<b>Nov 14</b>	<b>EXAM 3 Testing Center Lectures 18-26</b>			Anti-oxidants
Nov 16	Biosynthesis of fatty acids Pentose phosphate pathway	29		
Nov 18	Biosynthesis of triglycerides and phospholipids: Esterification	30	Chapt 29 pp. 523-529	
<b>Nov 21- Nov 25</b>	<b>Thanksgiving Break</b>			
Nov 28	Cholesterol & steroid biosynthesis	31	Chapt 29 pp. 529-544	<b>Lab Practical</b>
Nov 30	<u>Catabolic reactions:</u> Glycogen breakdown	32	Chapt 24	
Dec 2	Gluconeogenesis	33	Chapt 17	
Dec 5	Gluconeogenesis	34		NO LABS
<b>Dec 6 (Tuesday)</b>	<b>EXAM 4 Testing Center Lectures 27-31</b>			
		35	Chapt 27 pp.489-495	
Dec 7	Oxidation of fatty acids & Ketogenesis	36	Chapt 27 pp.497-502	
Dec 9	Integration of metabolism	37		
TBA	<b>FINAL EXAM: Lectures 32-37 &amp; Cumulative Portion</b>			