

## Syllabus for the Biochemistry I Lecture - online Summer 2019

**Course ID:** BIOL446 or CHEM446 or BIOL446G or CHEM446G

**Instructor:** Dr. Sigrid Jacobshagen, Office: Kelly Thompson Hall 3011, Research Lab: EBS 3125  
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Office Hours: By appointment either via skype, phone, whatsapp or face-to-face

**Textbook:** "BIOCHEMISTRY" by Berg, Tymoczko, (Gatto) and Stryer, W.H. Freeman and Company, New York, eighth edition (2015) or seventh edition (2012) or sixth edition (2007). The eighth and seventh editions come in different versions: as hardcover, as loose-leaf or as e-book with or without additional interactive features. Any version of the eighth, seventh or sixth edition is acceptable. The subjects in the textbook that are covered in class do not differ much between the different editions.

**Course Description:** The lecture explores the chemical nature of living organisms. It discusses the basic biochemical macromolecules by relating their structure with their function in the cell. Most emphasis will be on proteins. The lecture also introduces to metabolism and discusses some of the basic pathways.

**Prerequisite:** Introduction to Organic Chemistry (CHEM 314) or Organic Chemistry I (CHEM 340).  
**Note:** Students who have not taken a college-level biology course or who want to brush up on their basic biology are strongly encouraged to do so either through a text book on biology like some of the freely available ones on the internet or by other texts or videos on the internet.

**Learning Outcomes:** After finishing the course, the student will be able to describe the four classes of macromolecules that are found in all living organisms and the monomers they are synthesized from. The student will be able to explain how the three-dimensional structure of each macromolecule class determines its biological function and how the process of evolution has shaped their development. The student will be able to discuss enzymes in terms of their kinetics, catalytic strategies and regulation as well as interpret thermodynamics of chemical reactions in a cell. In addition, the student will be able to describe some of the general principles that govern metabolism and explain some basic metabolic pathways. The student will also be able to describe the biochemical basis for a human genetic disorder.

**About the course:** At the core of the course will be a series of lectures in form of slide presentations with audio commentary by the instructor in Mediasite that can be accessed through the BLACKBOARD course site. The lectures will be posted in groups that cover the material for 5 days and therefore for one exam. The material will be similar in amount to what would be presented in the respective 1 hour and 40 minutes daily lecture time for a comparable face-to-face course. Questions on the material should be posted on the Discussion Board, where all students are encouraged to help find the answers. The instructor will also post questions on the discussion board that students are required to answer.

## Course Topics:

Introduction:	(7 <sup>th</sup> ed.)
Chemical Bonds in Biochemistry, Acid-Base Concept	Ch. 1
Biomolecules:	
Protein Composition and Structure	Ch. 2
Exploring Proteins and Proteomes	Ch. 3
Nucleic Acids	Ch. 4, 5, 6
Protein Function: Hemoglobin	Ch. 7
Enzymes: Basic Concepts and Kinetics	Ch. 8
Enzymes: Catalytic Strategies	Ch. 9
Enzymes: Regulatory Strategies	Ch. 10
Carbohydrates	Ch. 11
Lipids, Membrane Structure and Function	Ch. 12, 13
Metabolism:	
Basic Concepts and Design	Ch. 15
Glycolysis, Citric Acid Cycle	Ch. 16, 17
Oxidative Phosphorylation	Ch. 18

## Exams:

There will be three intermediate exams of 100 pts each and a final exam of 150 pts. The final exam will have a comprehensive component by containing questions worth 50 pts on material already covered by the previous exams. Each exam will be given as a proctored exam with a period of two days during which a student can take it. The Division of Extended Learning and Outreach (DELO) Testing Center at WKU will contact you about it or you can take the initiative and go to its website, which has all the information about finding a location and reserving space for testing ([www.wku.edu/testing](http://www.wku.edu/testing)).

## Assignments:

There will be three assignments. One will be on enzyme kinetics worth 10 pts. It will require the analysis of enzyme activity data in order to calculate kinetic parameters. The assignment is **due by July 22**. Another assignment will be on protein function worth 30 pts. For this assignment, each student will have to choose a protein, which when defective will cause a human disease. Each student will then have to write a paper of about four double-spaced pages on the function of this protein and how its defect leads to the disease. The emphasis of the paper must be on the biochemical aspects. Information may be gained from the textbook, from research articles or reviews, by searching the internet, by using sites like Wikipedia or the National Institutes of Health, or by using any other possible source. However, **the paper must be written in the student's own words. Do not cite word for word from your source. And also do not plagiarize!** Plagiarism is "to use, and pass off as one's own, someone else's writing or speech". If a student plagiarizes, this student will have 20 pts subtracted instead of any points added. Grading of the assignment will be based on logic and scientific correctness in addition to the thoroughness with which the subject is covered. The name of the protein chosen and the disease it is causing is **due by July 19**. The paper is **due by July 29**. A third assignment will require the student to critique the protein assignment that was turned in by another student according to a hand-out. The critique will be worth 10 pts and is **due by August 5**. In addition to these assignments, there might be some other activities that would require student participation and could result in some further points needed by each student.

**Grades:**

Exam 1	100 pts	July 15-16
Exam 2	100 pts	July 23-24
Exam 3	100 pts	July 31-August 1
Final Exam	150 pts	August 7-8
Assignments	50 pts	
<b>total</b>	<b>500 pts</b>	

<b>Grading scale:</b>	90% or above	guaranteed an A
	80-89.9%	guaranteed at least a B
	70-79.9%	guaranteed at least a C
	60-69.9%	guaranteed at least a D
	below 60%	failing

**Bonus points:** Students will be able to earn up to 10 extra points for taking part in the discussion board by asking biochemical questions and by providing answers for the biochemical questions of other students or the instructor.

**G-component requirement for graduate students:** Every graduate student must submit an extra paper. The student must choose a research article (not a review article) from a recent issue of a biochemistry journal. The student will read the article carefully and will answer a number of questions about the purpose, data, conclusions, etc. according to a hand-out. Grading of the extra paper will be through pass or fail. If a graduate student does not submit the extra paper or gets a failed grade for the submitted paper, the graduate student will get a failed grade for the course. The particular research article chosen by the student should be agreed upon with the instructor by **July 26**. The extra paper is **due by August 2**. **Do not plagiarize here either!** If a student plagiarizes in this graduate student assignment, the student will receive a final grade that is lowered by one grade level.

**Technical problems or problems due to inexperience in taking online courses:** Students with technical problems should call the WKU Help Desk (**270-745 7000**) and students with inexperience can contact WKU Online Student Services ([www.wku.edu/online/services/index.php](http://www.wku.edu/online/services/index.php)).

**Announcement by the WKU DELO Testing Centers:**

"WKU DELO Testing Centers does not charge a fee; however, the WKU Remote Proctoring Network includes proctor locations who charge for the proctoring services as well as those who do not charge. Students are responsible for payment of any proctoring fees if they choose to use a proctor who charges a fee for this service. Students are also responsible for any additional fees that might be associated with the use of a particular proctoring site, such as parking fees."

**Announcement by the Student Accessibility Resource Center:**

"In compliance with University policy, students with disabilities who require academic and/or auxiliary accommodations for this course must contact the Student Accessibility Resource Center located in Downing Student Union, Room 1074. The SARC can be reached by phone number at 270-745-5004 [270-745-3030 TTY] or via email at [sarc.connect@wku.edu](mailto:sarc.connect@wku.edu). Please do not request accommodations directly from the professor or instructor without a faculty notification letter (FNL) from The Student Accessibility Resource Center."

**Tentative Lecture Schedule**

<b>Date</b>	<b>Topic</b>	<b>Ch.</b>
July 8	Weak Bonds & Buffers & Macromolecules	1, 2
July 9	Amino Acids & Peptides	2
July 10	Protein Structure 1 & 2	2
July 11	Methods in Protein Biochemistry 1 & 2 & 3	3
July 12	Nucleic Acids 1 & 2 & 3	4, 5, 6
<b>July 15 to 16</b>	<b>FIRST EXAM</b>	
July 16	Hemoglobin 1 & 2	7
July 17	Enzymes Overview & Energetics of Reactions & Catalysis Energetics	8
July 18	Kinetics of Enzymes 1 & 2	8
July 19	Kinetics of Enzymes 3 & Catalytic Strategies 1	8,9
July 22	Catalytic Strategies 2 & Regulatory Strategies for Enzymes	9,10
<b>July 23 or 24</b>	<b>SECOND EXAM</b>	
July 24	Carbohydrates 1 & 2	11
July 25	Carbohydrates 3 & Lipids and Membranes 1	11,12
July 26	Lipids and Membranes 2 & 3	12
July 29	Membrane Channels and Pumps 1	13
July 30	Membrane Channels and Pumps 2	13
<b>July 31 to Aug 1</b>	<b>THIRD EXAM</b>	
Aug. 1	Intro to Metabolism 1 & 2	15
Aug. 2	Glycolysis 1 & 2	16
Aug. 5	Glycolysis 3	16
Aug. 6	Citric Acid Cycle, Oxidative Phosphorylation 1	17,18
Aug. 7	Oxidative Phosphorylation 2 & 3	18
<b>Aug. 7 to 8</b>	<b>FINAL EXAM</b>	