BIOL 430 Biological Chemistry

***SUMMER 2012* (05/29/2012 - 07/06/2012)**

This is a 4 credit course designed for Biology MA and MS majors to satisfy upper level elective (4xx) requirements.

Course Description

A lecture-, discussion- and project-based course that focuses on basic aspects of biochemistry. The course starts with an introduction to biochemical systems (molecules, reactions and reaction mechanisms), followed by an overview of major metabolic pathways. An emphasis is placed on the importance of biochemistry in human health and disease, and the importance of modern research on metabolism.

General Course Information

Professor Dr. Mauricio Bustos
Department of Biological Sciences, UMBC
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Class will meet 0101 TThFr.....9:00am- 11:50am (Janet & Walter Sondheim 207)
Prerequisites: BIOL 303, or BIOL 302, or CHEM 351, or CHEM 352, or instructor approval

Required textbook: *Fundamentals of Biochemistry*, Donald Voet, Judith Voet, Charlotte Pratt. 3rd Edition. ISBN 0-471-21495-. *John Wiley & Sons.*

Associated webpage: http://www.wiley.com/college/voet

Grading policy:

Midterm Exams (5 exams; drop one)
100%

Scores and letter grades. Letter grades will be assigned according to the absolute scale shown below without "curving":

A: 85-100 %
B: 70-85 %
C: 55-70 %
D: 45-55 %
F: < 45 %

Learning Objectives

At the end of the course students will be expected to:

1. Have accumulated a demonstrable amount of basic knowledge of biochemicals and the general organizational principles that rule metabolic pathways, as well as an operational knowledge of the value and power of biochemical analysis *(--> these integration goals will be supported by lectures, reinforced by mastery quizzes, and evaluated by two traditional-style, in-class tests)*,
2. Have gained enough confidence in their own knowledge of biochemistry to interact with a group of peers during open informal debate *(--> this subtle skill will be facilitated by participation in in-class discussions and on line discussion groups)*,
3. Have improved self-confidence in biochemistry, which is a subject often shunned by regular biology majors due to the high level of abstraction it requires *(--> self-confidence will arise from the learning plan as a whole)*.

Role of the Instructor

Students taking this course should realize that they will have a responsibility for active participation in learning and self-motivation. The role of the instructor in the learning environment will be to:

- Highlight key ideas that are elaborated in greater detail in the course textbook, and present them in a context of everyday utility by citing examples of how biochemistry influences normal human and animal physiology (e.g. what happens to the foods we eat after they enter our bodies), and how it underlies the origin of many diseases and their cures.
- Explain how to interpret abstract definitions and concepts in terms of the behavior of physical entities, such as molecules and enzymes
- Show how rigorous experimentation leads to new knowledge and understanding about physical entities i.e. molecules, that cannot be perceived directly through our senses
- Be available to provide advice and encouragement
- Give honest feedback on performance
- Maintain an appropriate learning environment in class and on line
- Make all supporting learning aids available on time

Syllabus

(white background: Classroom sessions; orange background: OL-online material)

Session Date	Topics	Readings
5/29	Explain class organization Introduction to ***Biochemistry in Health & Disease***	R1
OL1	Water: Physical & chemical properties.	R2
5/29	Principles of thermodynamics	R3
5/29	Blood pH buffering system	R4
OL2	Amino acids	R5
OL3	Protein Structure	R6
5/31	Cooperativity in protein function: Hemoglobin and allosterism	R7
5/31	Enzymatic Catalysis	R8
6/1	Enzyme Kinetics	R9
6/1	Review	
6/5	**Exam 1 (9-10:15 AM) Covers readings R1-R9**	
6/7	Enzyme Kinetics (conclusion) & Introduction to metabolism	R10-R11
OL4	Carbohydrates	R12
6/8	Glycolysis & the Pentose Phosphate Pathway (shunt)	R13
6/12	Glycogen metabolism	R14
6/12	Gluconeogenesis	R15
6/14	Review	
6/14	**Exam 2 (9-10:15 AM) Covers readings R10-R15**	
6/15-6/19	Amino acid metabolism	R16
OL5	Lipids	R17
6/19	Lipid metabolism	R18
6/21OL6	Nucleotides	R19
6/21OL7	Nucleic acid structure	R20
6/22 OL8	Synthesis of purine ribonucleotides	R21
6/22 OL 9	Synthesis of pyrimidine ribonucleotides and deoxynucleotides	R22
6/26	Review	
6/26	**Exam 3 (9-10:15 AM) Covers readings R16-R21**	
6/26	Citric acid cycle	R23
6/28	Mitochondrial electron transport chain	R24
6/28	ATP synthesis-Oxidative phosphorylation	R25
6/28	Photosynthesis	R26

6/29-7/3	Metabolic Integration; Warburg effect	R27
6/29-7/3	Metabolic Control & Engineering: ***Supermouse***	R28
7/5	Review	
7/5	**Exam 4 (9-10:15 AM; LH1) Covers readings R22-R25**	
7/6	Review	
7/6	**Exam 5 (10:40-11:50 AM; LH1) Covers readings R26-R28**	

Midterm Exams (1-5)

All exams will be sit-down multiple choice (35 questions). See the Syllabus for exam dates and coverage.

Important information

The principal learning tools for the class will comprise a suite of annotated mini lectures, implemented as Powerpoint presentations and narrated Flash videos, and the course textbook. The course management software Blackboard will be used as central repository for the course, and as a communication platform. Class materials will be found in the Course Documents area of Blackboard. Please notice that this syllabus may undergo multiple revisions even after the first day of class. Changes and amendments to the syllabus will be announced in the Announcements area of Blackboard, in class, and through the on-line Group Discussion Board.

Participation

Participation in class and on-line, through the Discussion Board, is an essential component of the learning experience. While the instructor will encourage students to express their views, the students themselves must make an effort to break the ice. Participation takes place along two equally-weighted dimensions: attendance and awareness. On-line, participation will be judged from the frequency and quality of feedback by each student on the Blackboard Discussion Board, both as questions posted and answers volunteered. In class, attendance will be measured by random roll calls. Awareness will be judged from the willingness to participate in open discussions, also in the form of questions and answers. Although there is no formal grade assigned for participation, a good standing in this category will be rewarded with up to 2.5 % points to help students with borderline scores get a higher final letter grade for the course.

Reading List

The following chapter and page references are for Voet, Voet, & Pratt 3rd ed.

R1	Chapter 1: pp 1-19
R2	Chapter 1: pp 12-19; Ppt lecture & excel file on “Types of reactions”
R3	Chapter 2
R4	Chapter 2: Box 2-1; Chapter 7: pp 177-197
R5	Chapter 4
R6	Chapter 6
R7	Chapter 7: pp 177-197
R8	Chapter 11: pp 323-357

R9	Chapter 12: pp 364-377
R10	Chapter 12: pp 377-394; Chapter 14 pp 449-475
R11	Chapter 8
R12	Chapter 15
R13	Chapter 16: pp 530-552
R14	Chapter 16: pp 552-560
R15	Chapter 21: pp 732-747
R16	Chapter 9: pp 245-263
R17	Chapter 20: pp 677-714
R18	Chapter 17
R19	Chapter 18 pp 597-619
R20	Chapter 18 pp 618-635; Chapter 19
R21	Chapter 3
R22	Chapter 24
R23	Chapter 23 pp 817-839
R24	Chapter 23 pp 817-839
R25	Chapter 22
R26	Special reading (article PDF posted on Blackboard course)
R27	Special reading (article PDF posted on Blackboard course)
R28	Special reading (article PDF posted on Blackboard course)