**BioC 2011, Spring 2015**

09:45 – 11:00 am Tu, Th Jackson Hall 2-137

**Purpose:** To survey the fundamentals of chemistry and biochemistry as they apply to the organization, function and regulation of living systems, especially humans.

**Required Textbook:** Fundamentals of General, Organic, and Biological Chemistry" by McMurry, Balantine, Hoeger, and Peterson. Pearson Publishers, ISBN 978-0-321-75083-9. You can use either the seventh edition (2013) or the sixth edition (2010), you might be able to find a good price on a used copy at the bookstore or online

**Prerequisites:** Chem 1015 and Biol 1009 are required. We will expect you to be familiar with the material taught in these courses. For example, you should have a working knowledge of the structures of atoms, chemical bonds, chemical reactions, acids and bases, and pH. If you do not have a good background in these areas, or if you took Chem 1015 more than four years ago, or if you did not earn a good grade in Chem 1015, you will probably have to devote extra time in order to master this prerequisite material.

**Course Content:** This course is intended for students who need an introduction to biochemistry for majors in agriculture, dental hygiene/therapy among others. Students in the College of Biological Sciences, pre-professional students, and other students who need a more comprehensive biochemistry course should take BioC 3021 or BioC 4331, which provide a more extensive coverage of the subject.

This course will introduce you to the discipline of biochemistry and provide a foundation for understanding the chemistry of biological systems. We will discuss the structure and function of proteins, nucleic acids, lipids, and carbohydrates; the principles of chemical equilibria, enzyme catalysis, and bioenergetics; fundamental metabolic pathways; and the chemical nature of genetic information storage and transmission. In this course, you will become familiar with the structure and function of biological molecules that are important to living things, be familiar with some of the fundamental metabolic pathways that describe how nutrients can be utilized for production of energy and for synthesis of new biological materials, and understand how genetic processes are accomplished at the molecular level.

**Instructor:** Dr. Ian M. Armitage
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**Teaching Assistants:**
The teaching assistants for this course are undergraduate biochemistry majors who have completed advanced courses in biochemistry. They will provide you with information on how they can be contacted and when and where they will be available to help you.
Student Learning Outcomes: Following successful completion of this course, each student should be capable of scholarly discussions of the following topics:

- the general principles of the biochemistry and of energy flow in biological systems,
- the chemical structures and function of the various classes of biomolecules
- the molecular basis of genetics and gene expression,
- chemical processes that occur in the human body, and
- examples of the relevance of biochemistry in today’s society
- effectively communicate biochemical information in oral and written form.

Student Expectations: As a student in this course, you are expected to take an active role in your learning.

- You are expected to arrive on time and not leave early.
- You should use the text to clarify concepts that are unclear to you.
- You should ask questions in lecture to help clarify concepts.
- You should adhere to the University of Minnesota Student Conduct Code found at http://regents.umn.edu/sites/default/files/policies/Code_of_Conduct.pdf

Course Web Site: A Moodle site will be set up that contains course information and a bulletin board.

email Course Notices: Course information will regularly be sent out by email. Please be sure to check your umn.edu mailbox frequently.

Examinations: There will be three midterm examinations and one final examination. Each exam will cover approximately one fourth of the course. The final exam will contain 100 points on material covered in the last quarter of the course, it also will include 50 points based on material from the entire course. Dates of the midterm examinations are listed in the lecture schedule below. All examinations will be closed-book. While examinations are in progress, students may not consult the textbook, reference books, class notes, any other written summary of information, or another student's examination paper!

Electronic Devices: Unless informed otherwise, no electronic devices of any kind, including calculators, iPods, Blackberrys, and cell phones, may be used during any examinations. Use of a prohibited device during an examination is considered Scholastic Dishonesty and falls under the University Student Conduct Code.

Make up Exams: Students are to make every effort to take exams at the times listed in the syllabus. Make up exams will be given only to students who are sick on the day of the exam or who experience a substantial unanticipated difficulty such as an illness or a death in the family. Being sick before an exam
is not a valid reason for missing an exam. Interviews, vacations, family trips, etc. are to be scheduled around your coursework, not vice versa.

Requests for make up exams must be accompanied by documentation (e.g., letters from university offices, doctors, police reports, bail bond receipts, etc.). A note saying you were seen at Boynton is not sufficient, you must have a note from a doctor saying you were sick. If your car breaks down on the way to an exam, you will be asked to document with a towing or repair receipt. You must contact the instructor either before the exam or within 24 hours after the exam with the reason for missing the exam.

**Workload Expectations:** For each credit of coursework, the University suggests that you spend two to three hours per week studying course material outside of class. That means six to nine hours per week for this course. To earn an A, you might need to spend more time than this!

The University defines each letter grade as follows:
- **A**: achievement that is outstanding relative to the level necessary to meet course requirements, 85% or more.
- **B**: achievement that is significantly above the level necessary to meet course requirements, 75 – 84%.
- **C**: achievement that meets the course requirements in every respect, 65 – 74%.
- **D**: achievement that is worthy of credit even though it fails to meet fully the course requirements, 55 – 64%.
- **F**: score less than 50% represents failure (or no credit) and signifies that the work was either (1) completed but at a level of achievement that is not worthy of credit or (2) was not completed and there was no agreement between the instructor and the student that the student would be awarded an I.

**Grading:** The course has 500 total points distributed as follows:

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<thead>
<tr>
<th></th>
<th>Points</th>
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<tbody>
<tr>
<td>Exam 1</td>
<td>100</td>
</tr>
<tr>
<td>Exam 2</td>
<td>100</td>
</tr>
<tr>
<td>Exam 3</td>
<td>100</td>
</tr>
<tr>
<td>Final Exam</td>
<td>150</td>
</tr>
<tr>
<td>Homework, 10% of final</td>
<td>50</td>
</tr>
<tr>
<td>Course Total</td>
<td>500</td>
</tr>
</tbody>
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At the end of the course, letter grades will be assigned according to the point distribution curve. However, anyone who obtains a total score of 85% or more of the total points (425 or more points out of 500 possible) is guaranteed a course grade of at least A-, 75% or above at least a B-, 65% or above at least a C- and 55% or above at least a D. Plus and minus grades will be assigned on either side of the grade cutoff lines. The instructor may lower the grade cutoffs scores if necessary.

**Homework:**

To provide you with early notification that you may be falling behind, I will make use of a total of eleven homework assignments, each is worth 5 points. The homework assignments must be turned in at the start of the next class period after they have been handed out/distributed. The latter dates are indicated on the Lecture Schedule by * date *. Homework assignments cannot be submitted by email without prior permission from the instructor and 1 point/day will be deducted for late submission with zero credit once the key has been posted by the next class period. This policy is destined to cause some stress. I’m open to suggestions of a better less stressful policy. Your top ten scores will be counted towards a total of 50 points, 10% of the final grade.
Regrades: Any errors or problems with grading should be brought to the instructor's attention within 48 hours of the return of the graded item. Requests for regrades must be made in writing: write a few sentences describing why you believe your answer was correct. No adjustments to the grade on that item will be made after one week. Only exams originally written in pen will be considered for regrades. If you want the option of submitting your exam for regrading, you must write the original exam in pen.

Incompletes: Grades of incomplete will be granted only to students who are receiving a passing grade and experience illness or other calamities that prevent them from finishing the course. The following conditions must be met:
1. the student’s achievement to date has been significant and satisfactory (i.e. much of the coursework is finished with a passing grade),
2. the instructor has a reasonable expectation that the student can successfully complete the unfinished work by the end of the next semester, and
3. the student and instructor have signed a contract (available in CBS Student Services, 223 Snyder) agreeing to the work yet to be completed and the timeframe for this completion.
You are not eligible for an incomplete if you are failing and want to try the course again another semester. You must be passing the course and have a compelling reason why you can not finish the work. Note that the I grade will automatically turn to an F grade if the conditions specified in the contract are not met within one year. See the CBS grading policy at: http://www.cbs.umn.edu/students/grades-and-grading-options.

Appropriate Use of Course Material
All material presented in this course is the intellectual property of the instructors or copyright assigned and is provided solely for use by the enrolled student. Students must not distribute lecture slides, figures, images, movies, audio recordings, exams, homework, text, or any other instructor-provided materials by any means without the permission of the instructor. This means you are not allowed to post anything from this course to any web site whatsoever.

Academic Misconduct: Examples of inappropriate conduct include, but are not limited to: copying from another student, permitting another student to copy, the use of written or electronic crib sheets, collaborating with other students to answer a question, receiving information from another student about an examination when taking an examination late. In cases of misconduct, the instructor will take appropriate actions, which could include filing a report with the Office for Student Academic Integrity. Violations will elicit penalties such as a failing grade for the examination or a failing grade for the entire course, depending upon the nature and severity of the infraction. To review the Regent’s policy on academic conduct, please refer to http://regents.umn.edu/sites/default/files/policies/Academic_Misconduct.pdf

Mental Health Services: As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance and may reduce your ability to participate in daily activities. University of Minnesota services are available to assist you. You can learn more about the
broad range of confidential mental health services available on campus via the Student Mental Health Website: [http://www.mentalhealth.umn.edu](http://www.mentalhealth.umn.edu).

**Accommodations:** Students with disabilities that might hinder their ability to participate in the full range of class activities should contact the instructor as soon as possible. Additional information on accommodation is also available from Disability Services in 230 Gateway (V/TTY) 624-4037.

**Problems in the course?** For any concerns, contact the instructor.

**Spring 2015 Lecture Schedule**

* date * Indicates homework due date at the start of class

1  
Tu 1/20  
Course Introduction. Then General Chem Part I: atoms, elements, Periodic Table
2  Th 1/22  
Part II: Compounds, Bonds: including covalent, ionic, hydrogen
3  *Tu 1/27*  
Acids and Bases
4  Th 1/29  
Carbon Chemistry
5  *Tu 2/3*  
Chemical Reactions and Thermodynamics
6  Th 2/5  
Oxidation/Reduction reactions & Classes of Biochemical Compounds
7  *Tu 2/10*  
Cells/structure and Amino Acids/Proteins

8  Th 2/12  
Exam 1 (100 points)

9  
Tu 2/17  
Protein Structure continued
10  Th 2/19  
Enzyme Kinetics I & Vitamins
11  *Tu 2/24*  
Mechanisms of Enzyme Action II
12  Th 2/26  
Introduction to Carbohydrates
13  *Tu 3/3*  
Introduction to Lipids; Membrane Structure & Function
14  Th 3/5  
Chemical Messengers & Generation of Biochem Energy I  Chapter 20
15  *Tu 3/10*  
Generation of Biochem Energy II, Oxidative Phosphorylation

16  Th 3/12  
Exam II (100 points)

17  Tu 3/17  
SPRING BREAK
18  Th 3/19  
SPRING BREAK
19  Tu 3/24  
Glucose Catabolism – glycolysis  Carbohydrates Metabolism I

20  Th 3/26  
The Citric Acid Cycle  Carbohydrate Metabolism II
21  *Tu 3/31*  
Fatty Acid Oxidation  Carbohydrate Metabolism III)
22  Th 4/2  
Energy Storage: Lipogenesis & Glycogenesis  Lipid Metabolism
23  *Tu 4/7*  
Control of Blood Glucose I: Glycogenolysis; Adaptation to Fasting;
Control of Blood Glucose II: Gluconeogenesis & Ketone Bodies/ Diabetes
24  Th 4/9  
Amino Acid Metabolism, & Nitrogen Balance Cholesterol & Lipoprotein Metabolism
24  *Tu 4/14*  
Cholesterol & Lipoprotein Metabolism & Integration of Metabolism

25  Th 4/16  
Exam III (100 points)

26  Tu 4/21  
Photosynthesis –ends metabolism
27  Th 4/23  Nucleic Acids & Protein Synthesis I
28  *Tu 4/28* Nucleic Acids & Protein Synthesis II “Central Dogma of Molecular Biology”
29  Th 4/30  DNA Replication, Transcription and Transcriptional Regulation
30  *Tu 5/5*  Transcription and Transcriptional Regulation
31  Th 5/7  Cancer Lecture “DNA Damage and DNA Repair” & “Prevalence of Cancer”

LAST DAY OF INSTRUCTION

Friday, May 15 10:30 – 12:30 PM Final Exam (150 points)