BioC 3021-6021 Biochemistry
Spring Semester, 2015

Instructor
Janet L. Schottel, Professor
Department of Biochemistry, Molecular Biology and Biophysics
768 BioScience, St. Paul Campus
612-624-6275; schot002@umn.edu

Office hours: Tuesdays and Thursdays, 4:30 pm, B45 Ruttan Hall (after class)
Individual appointments can be arranged. Please contact me with questions or concerns.

Teaching Assistants
The teaching assistants will be available to answer questions about the course material. Their contact information and office hours are below. Any changes to their schedule will be announced in class.

Tia Gray (gray0480@umn.edu)
Office hours: Wednesdays 4:00 pm-5:00 pm Location: 4-118 MCB

Alex McQuown (mcquo006@umn.edu)
Office hours: Fridays 12:00 pm-1:00 pm Location: 4-118 MCB

Taylor Wilfahrt (wilf0043@umn.edu)
Office hours: Mondays 1:00 pm-2:00 pm Location: 4-118 MCB

Course Goals
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.

Student Learning Objectives
At the completion of this course, you should be familiar with the following topics:
- the structure and function of biological molecules that are important to living things
- energy flow in biological systems
- the fundamental metabolic pathways that describe how nutrients can be utilized for production of energy and for synthesis of new biological materials
- basic genetic processes at the molecular level
- applications of biochemical principles

Who Should Take This Course
BioC 3021 is intended for students in the College of Biological Sciences, pre-professional students, and others who need a comprehensive introduction to biochemistry. If you intend to declare an undergraduate major in Biochemistry, you should register for the alternative pair of biochemistry courses, BioC 4331 and BioC 4332, which provides a more extensive coverage of the subject. BioC 3021 will not satisfy the biochemistry requirement for Biochemistry majors.
BioC 6021 is intended for students who are currently in a graduate program or registering as a non-degree seeking graduate student. In addition to the normal course work, an extra project is required. If you are registered for BioC 6021, please see the BioC 6021 section of the Moodle site for instructions concerning your extra project. Access to the BioC 3021-6021 Moodle site will be through moodle.umn.edu. Your final course grade will be based on exam performance and satisfactory completion of the project.

Student Expectations
You should spend time every day studying biochemistry. Test yourself repeatedly on your ability to recall material by writing out important structures and metabolic pathways. As with learning another language, biochemistry has a vocabulary composed of structures, which you’ll need to know to communicate important concepts such as metabolic logic, enzyme mechanisms and the molecular basis for disease. You may find it helpful to study in small groups to discuss the material as well as quiz one another about key information.

You are expected to take an active role in your learning.
• Always attend class (http://policy.umn.edu/Policies/Education/Education/STUDENTRESP.html). Students who routinely skip class generally perform poorly on exams. Exams are based on the material covered in class, so it’s a definite advantage to know what was discussed!
• Expect to study at least 3-4 hours for each class session. The number of hours needed will vary from student to student, but plan to spend an adequate amount of time to read the textbook, work problems, memorize structures, make connections and generally understand the material.
• Start to study on day one of the course - not the day before an exam! There will be a considerable amount of memorization required in the course, and this will be very difficult if not impossible to do at the last minute.
• If you have questions, get help immediately. The teaching assistants have had one or more courses in biochemistry and are available to answer questions. I am available by e-mail, after class during my office hours, or by appointment.
• Develop an understanding of the material that can be used in every day life, long after the course is over.

Course Information
Lecture Time and Location
3:00 - 4:15 p.m., Tuesday and Thursday
B45 Ruttan Hall, St. Paul Campus

Prerequisites
A general biology course (Biol 1009, Biol 2002-2003, etc.) and one semester of organic chemistry (Chem 2301) are the prerequisites. Students who have had no organic chemistry will find themselves at a very serious disadvantage and should delay taking this course until the organic chemistry prerequisite has been completed.

We offer BioC 2011 for students who need a biochemistry course, but without an organic chemistry prerequisite. Check to see which course satisfies your program requirements.
If you are a Biochemistry major or intend to major in Biochemistry, you should take BioC 4331. BioC 3021 will not satisfy the biochemistry requirement for Biochemistry majors.

Textbook
*Essential Biochemistry* by Pratt and Cornely, 3rd edition (John Wiley and Sons, Inc., 2014)
This textbook is available for purchase at Coffman Union Bookstore, Minneapolis Campus, or at Books Underground, 7 Student Center, St. Paul campus.

The textbook will be on reserve at Wilson Library on the Minneapolis campus. You can find it on the Course Reserves tab on the U Libraries Web site under “Services” ([https://www.lib.umn.edu/services/reserves](https://www.lib.umn.edu/services/reserves)) or ask at the desk.

Calculators
Only scientific calculators (capable of basic math and ln/log conversions) will be allowed for the exams. **No programmable or graphing calculators can be used.** No iPods, cell phones or other electronic devices will be allowed during an exam. Use of a prohibited device during an examination is considered Scholastic Dishonesty and falls under the University Conduct Code.

iClickers
We will use iClickers during most of the class sessions, so be sure to bring your iClicker with you to each class, **beginning Thursday, January 22.**
The purpose of using iClickers is to more readily assess your understanding of the material, clear up misconceptions and promote discussion.
There are about 24 class meetings in which I anticipate we’ll use the iClickers. Up to 1 point will be awarded for each class session in which you participate in the iClicker questions. Up to 20 points total will be awarded during the semester. If you forget your iClicker or if it runs out of power, you won’t receive points for that day. There are no make-ups for iClicker questions.

*iClicker Registration:*
Register your iClicker in the course Moodle site. The registration box is in the left margin of the main page. The iClicker Student Guide can be found on the Moodle site.

*Tips for Buying an iClicker: New vs used? Where can I buy an iClicker?*
You can purchase a new iClicker2 from the bookstore, or look into buying a used one. An older version of the iClicker will work as well.

Examinations
There will be three mid-term examinations and one final examination. Each exam will cover approximately one-fourth of the course. Although the final exam will focus mainly on topics covered in the last quarter of the course, it also will include questions based on material from the entire course. Dates of the examinations are listed in the lecture schedule. All examinations will be closed book. While examinations are in progress, students may not consult the textbook, reference books, class notes, any other unauthorized summary of information, or another student's examination paper.

Quizzes and Problem Sets
There will be 8 quizzes and 4 problem sets during the semester. See the lecture schedule for the quiz dates and due dates for the problem sets.
Policy on Make-up Work for iClicker Questions, Quizzes and Exams
There are no make-ups for iClicker questions. Only 20 of the class sessions that use the iClickers will be counted, which will allow for a couple of missed classes for whatever reason.

If a legitimate excuse causes you to miss a quiz or midterm exam at the scheduled time, contact the instructor immediately to determine if a makeup will be allowed. Legitimate excuses include verified illness, participation in intercollegiate athletic events, subpoenas, jury duty, military service, bereavement, and religious observances. Such circumstances do not include voting in local, state, or national elections. Conflicts with work schedules or vacations are not excuses for missing exams. Documentation (letter from a doctor stating that you were sick, police reports, etc.) will be required to support the request. For complete information, please see:
http://policy.umn.edu/Policies/Education/Education/MAKEUPWORK.html

Grades
The course is divided into four sections. Each section of the course will be worth 100 points, which includes the exam, 2 quizzes, a problem set, and the iClicker questions. Anyone who earns 85% or more of the total points is guaranteed a course grade of at least an A-, 75% or above at least a B-, and 65% or above at least a C-. Plus and minus grades will be assigned on either side of the grade cutoff lines. The instructor reserves the option of lowering the grade cutoffs, but they will not be raised. In order to make the assignment of course grades as fair as possible, special pleas for consideration of extenuating personal circumstances cannot be taken into account.

<table>
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<tr>
<th>Each Section</th>
<th>Exam</th>
<th>85 points</th>
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<tbody>
<tr>
<td></td>
<td>2 quizzes; 3 points each</td>
<td>6</td>
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<tr>
<td></td>
<td>Problem set</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>iClicker questions</td>
<td>5</td>
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<table>
<thead>
<tr>
<th>Section Total</th>
<th>100 points</th>
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</thead>
<tbody>
<tr>
<td>Course Total</td>
<td>400 points</td>
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The University utilizes plus and minus grading on a 4.00 cumulative grade point scale in accordance with the following:
A  4.0 - Represents achievement that is outstanding relative to the level necessary to meet course requirements
B  3.0 - Represents achievement that is significantly above the level necessary to meet course requirements
C  2.0 - Represents achievement that meets the course requirements in every respect
D  1.0 - Represents achievement that is worthy of credit even though it fails to meet fully the course requirements
S  Represents achievement that is satisfactory, which is equivalent to a C- or better.

For additional information, please refer to:
http://policy.umn.edu/Policies/Education/Education/GRADINGTRANSCRIPTS.html

Incomplete:
Grades of incomplete will be granted only to students who experience extraordinary circumstances such as extended illness, serious accidents or other emergencies that prevent them from finishing the course. According to University policy, the "I" grade indicates that the instructor:
1) Believes that legitimate reasons due to extraordinary circumstances exist to justify extending the deadline for course completion. Examples of extraordinary circumstances include extended illnesses, serious accidents or other emergencies. The student must provide
documentation such as a letter from his/her physician to support the claim of extraordinary circumstances.

2) Has a reasonable expectation that the student can successfully complete unfinished course work within a specified time frame.

Furthermore, the instructor and student acknowledge that the "I" is not given to help a student improve their grade in the course. The instructor and student must complete and submit the CBS Incomplete Form found at: http://www.cbs.umn.edu/learn/undergraduates/students/policies-procedures-forms. This contract states the terms for removing the incomplete grade and must be agreed upon before this grade will be given.

**A-F versus S-N grading option:**
You may choose either A-F or S-N grading options for this course in accordance with the requirements of your major. According to University grading policy, a grade of S will be considered equivalent to a letter grade of C- (GPA = 1.7) or higher. A grade of N will be equivalent to scores corresponding to letter grades of D+, D or F.

**Re-grading Requests**
Any requests for re-grading an exam or correcting a scoring error must be done within one week of when the exam was returned.

Be aware that the graded exams will be scanned before handing back. The scanned exams will be used for comparison in cases of re-grading requests. If an altered exam is turned in for re-grading, the student will receive a grade of zero on the exam or a failing grade in the course.

**Disability Accommodations**
The University is committed to providing quality education to all students regardless of ability. Determining appropriate disability accommodations is a collaborative process. You as a student must register with Disability Services and provide documentation of your disability. The course instructor must provide information regarding a course's content, methods, and essential components. The combination of this information will be used by Disability Services to determine appropriate accommodations for a particular student in a particular course. For more information, please reference Disability Services: http://ds.umn.edu/student-services.html (180 McNamara, 612-626-1333).

**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/.

**Appropriate Student Use of Class Notes and Course Materials**
Any notes, slides, presentations, handouts or other materials distributed in class or made available on the course website are for your use only. It is forbidden to disseminate class materials or to accept compensation for taking and distributing class materials. This means you may not post class materials on any web site. For additional information, please see: http://policy.umn.edu/Policies/Education/Education/STUDENTRESP.html.
E-mails
University of Minnesota regulations require that e-mail correspondence be sent using your assigned “__@umn.edu” address. Occasionally, course information will be sent to the entire class via e-mail, so be sure to check your umn.edu mailbox frequently.

Moodle Site – access through moodle.umn.edu
The course web site provides access to lecture outlines, images, practice exams, exam keys, and the grade book. Announcements and other supplementary course material will be posted there as well.

Additional University Policies
Student Conduct Code
The University seeks an environment that promotes academic achievement and integrity, that is protective of free inquiry, and that serves the educational mission of the University. Similarly, the University seeks a community that is free from violence, threats, and intimidation; that is respectful of the rights, opportunities, and welfare of students, faculty, staff, and guests of the University; and that does not threaten the physical or mental health or safety of members of the University community.

As a student at the University you are expected adhere to Board of Regents Policy: Student Conduct Code. To review the Student Conduct Code, please see: http://regents.umn.edu/sites/default/files/policies/Student_Conduct_Code.pdf.

Note that the conduct code specifically addresses disruptive classroom conduct, which means "engaging in behavior that substantially or repeatedly interrupts either the instructor's ability to teach or student learning. The classroom extends to any setting where a student is engaged in work toward academic credit or satisfaction of program-based requirements or related activities." This policy applies to in-class meetings as well as postings on the course web site.

Scholastic Dishonesty
You are expected to do your own academic work and cite sources as necessary. Failing to do so is scholastic dishonesty. Scholastic dishonesty means plagiarizing; engaging in unauthorized collaboration on academic work; taking, acquiring, or using test materials without faculty permission; submitting false or incomplete records of academic achievement; acting alone or in cooperation with another to falsify records or to obtain dishonestly grades, honors, awards, or professional endorsement; altering, forging, or misusing a University academic record; fabricating or falsifying data, research procedures, or data analysis; or cheating on assignments or examinations. Examples of cheating on exams include looking at another student’s paper during an exam, talking to another student during a test, referring to unauthorized notes during the test, use of a prohibited electronic device, or requesting re-grading of an exam that has been altered.

Office for Student Conduct and Academic Integrity
If it is determined that a student has cheated, he or she may be given a failing grade for the examination or a failing grade for the entire course, depending upon the nature and severity of the infraction, and may face additional sanctions from the University. For additional information, please see: http://policy.umn.edu/Policies/Education/Education/INSTRUCTORRESP.html.

The Office for Student Conduct and Academic Integrity has compiled a useful list of Frequently Asked Questions pertaining to scholastic dishonesty:
http://www1.umn.edu/oscai/integrity/student/index.html.
In all cases of academic misconduct, a report will be filed with the Office for Student Conduct and Academic Integrity (http://www1.umn.edu/oscai/).

**Use of Personal Electronic Devices in the Classroom**
Using personal electronic devices in the classroom setting can hinder instruction and learning, not only for the student using the device but also for other students in the class. To this end, the University establishes the right of each faculty member to determine if and how personal electronic devices are allowed in the classroom. For complete information, please reference: http://policy.umn.edu/Policies/Education/Education/STUDENTRESP.html.

**Sexual Harassment**
"Sexual harassment" means unwelcome sexual advances, requests for sexual favors, and/or other verbal or physical conduct of a sexual nature. Such conduct has the purpose or effect of unreasonably interfering with an individual's work or academic performance or creating an intimidating, hostile, or offensive working or academic environment in any University activity or program. Such behavior is not acceptable in the University setting. For additional information, please consult Board of Regents Policy: http://policy.umn.edu/Policies/hr/HRMisc/SEXUALHARASSMENT.html

**Equity, Diversity, Equal Opportunity, and Affirmative Action**
The University will provide equal access to and opportunity in its programs and facilities, without regard to race, color, creed, religion, national origin, gender, age, marital status, disability, public assistance status, veteran status, sexual orientation, gender identity, or gender expression. For more information, please consult Board of Regents Policy: Equity, Diversity, Equal Opportunity, and Affirmative Action.

**Academic Freedom and Responsibility**
Academic freedom is a cornerstone of the University. Within the scope and content of the course as defined by the instructor, it includes the freedom to discuss relevant matters in the classroom. Along with this freedom comes responsibility. Students are encouraged to develop the capacity for critical judgment and to engage in a sustained and independent search for truth. Students are free to take reasoned exception to the views offered in any course of study and to reserve judgment about matters of opinion, but they are responsible for learning the content of any course of study for which they are enrolled.*

Reports of concerns about academic freedom are taken seriously, and there are individuals and offices available for help. Contact the instructor, the Department Chair, your adviser, the associate dean of the college, or the Vice Provost for Faculty and Academic Affairs in the Office of the Provost.

*Language adapted from the American Association of University Professors "Joint Statement on Rights and Freedoms of Students".

**Consolidated Course Policies**
A list of University course policies can be found at: http://policy.umn.edu/Categories/PolicyAlpha.cfm
# BioC 3021-6021 Lecture Schedule

## Spring Semester, 2015

<table>
<thead>
<tr>
<th>Lecture</th>
<th>Date</th>
<th>Topic</th>
<th>Quizzes/Problem Sets</th>
<th>Textbook Chapter(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Section 1</strong></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>01 T</td>
<td>01/20</td>
<td>Chemical Bonds and Properties of Water</td>
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<td>2</td>
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<tr>
<td>02 Th</td>
<td>01/22</td>
<td>pH, pK and Buffers</td>
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<td>2</td>
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<tr>
<td>03 T</td>
<td>01/27</td>
<td>Amino Acids and Peptides</td>
<td>Quiz 1</td>
<td>4</td>
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<tr>
<td>04 Th</td>
<td>01/29</td>
<td>Primary Structure and Protein Purification</td>
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<td>4</td>
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<tr>
<td>05 T</td>
<td>02/03</td>
<td>Secondary, Tertiary and Quaternary Protein Structures</td>
<td>Quiz 2</td>
<td>4</td>
</tr>
<tr>
<td>06 Th</td>
<td>02/05</td>
<td>Proteins: Structure and Function</td>
<td>Problem Set 1</td>
<td>4, 5</td>
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<tr>
<td>07 T</td>
<td>02/10</td>
<td><strong>FIRST MID-TERM EXAM</strong></td>
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<tr>
<td><strong>Section 2</strong></td>
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<tr>
<td>08 Th</td>
<td>02/12</td>
<td>Carbohydrates</td>
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<td>11</td>
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<tr>
<td>09 T</td>
<td>02/17</td>
<td>Lipids and Membranes</td>
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<td>8</td>
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<tr>
<td>10 Th</td>
<td>02/19</td>
<td>Nucleotides and Nucleic Acids</td>
<td>Quiz 3</td>
<td>3, 20</td>
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<tr>
<td>11 T</td>
<td>02/24</td>
<td>Thermodynamics and Introduction to Enzymes</td>
<td></td>
<td>1, 6</td>
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<tr>
<td>12 Th</td>
<td>02/26</td>
<td>Enzyme Kinetics</td>
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<td>7</td>
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<tr>
<td>13 T</td>
<td>03/03</td>
<td>Enzyme Mechanisms</td>
<td>Quiz 4</td>
<td>6</td>
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<tr>
<td>14 Th</td>
<td>03/05</td>
<td>Introduction to Metabolism</td>
<td>Problem Set 2</td>
<td>12</td>
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<tr>
<td>15 T</td>
<td>03/10</td>
<td><strong>SECOND MID-TERM EXAM</strong></td>
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<tr>
<td><strong>Section 3</strong></td>
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<tr>
<td>16 Th</td>
<td>03/12</td>
<td>Glycolysis</td>
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<td>13</td>
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<tr>
<td>17 T</td>
<td>03/24</td>
<td>Citric Acid Cycle</td>
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<td>14</td>
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<tr>
<td>18 Th</td>
<td>03/26</td>
<td>Electron Transport and Oxidative Phosphorylation</td>
<td>Quiz 5</td>
<td>15</td>
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<tr>
<td>19 T</td>
<td>03/31</td>
<td>Photosynthesis</td>
<td></td>
<td>16</td>
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<tr>
<td>20 Th</td>
<td>04/02</td>
<td>Gluconeogenesis and Glycogen Metabolism</td>
<td></td>
<td>13</td>
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<tr>
<td>21 T</td>
<td>04/07</td>
<td>Pentose Phosphate Pathway</td>
<td>Quiz 6</td>
<td>13</td>
</tr>
<tr>
<td>22 Th</td>
<td>04/09</td>
<td>Lipid Metabolism</td>
<td>Problem Set 3</td>
<td>17</td>
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<tr>
<td>23 T</td>
<td>04/14</td>
<td><strong>THIRD MID-TERM EXAM</strong></td>
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<tr>
<td><strong>Section 4</strong></td>
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<tr>
<td>24 Th</td>
<td>04/16</td>
<td>Nitrogen Metabolism</td>
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<td>18</td>
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<tr>
<td>25 T</td>
<td>04/21</td>
<td>Integration of Metabolism and Signal Transduction</td>
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<td>10, 19</td>
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<tr>
<td>26 Th</td>
<td>04/23</td>
<td>DNA Replication, Mutation and Repair</td>
<td>Quiz 7</td>
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<tr>
<td>27 T</td>
<td>04/28</td>
<td>RNA Synthesis and Processing</td>
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<td>21</td>
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<tr>
<td>28 Th</td>
<td>04/30</td>
<td>Regulation of Transcription</td>
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<tr>
<td>29 T</td>
<td>05/05</td>
<td>Protein Synthesis and Modification</td>
<td>Quiz 8</td>
<td>22</td>
</tr>
<tr>
<td>30 Th</td>
<td>05/07</td>
<td>Recombinant DNA Techniques and Applications</td>
<td>Problem Set 4</td>
<td>3</td>
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</tbody>
</table>

**FINAL EXAM:** 10:30 am - 12:30 pm  
Saturday, May 16, in B45 Ruttan Hall

*This syllabus is subject to change.*  
Last updated on 01/14/2015.