BCH 380 – Fundamentals of Biochemistry – Spring 2018

Instructor: Dr. Sandy Ross (sandy.ross@umontana.edu)

Rooms/times: Sec. 1 All students: MWF 10:00-10:50 HS 207
Sec. 3 discussion: Tues. 10:00-10:50 Chem 212
Sec. 5 discussion: Thur. 10:00-10:50 Chem 212

Office hours: MWF 11:00-11:50 (ISB 219) and by appointment.

Teaching assistant: Mr. Vikash Kumar (vikash.kumar@umontana.edu)
(office hours and location TBA)

Required Text: “Biochemistry: A Short Course” by Tymoczko, Berg and Stryer, 2nd ed.

Expected Outcomes

• understand the chemical and thermodynamic properties of biomolecules
• know the main classes of biomolecules, including structure, synthesis and function
• understand the catalytic and regulatory strategies of enzymes
• understand the production, use and regulation of energy in the cell
• understand how biomolecular reactions are integrated into cellular metabolism

Prerequisites: Biochemistry is a sub-discipline of chemistry, so students should have a good working knowledge of general chemistry and organic chemistry. The logic of biochemistry is clearest if you understand the underlying chemical principles. Students should review basic chemical concepts and organic reactions on their own early in the course.

Course Requirements

Students are expected to attend all lectures and discussion sections. Students are expected to study the text carefully and should read the relevant material before the corresponding lectures. Questions will be assigned for each chapter. Homework, however, will be neither collected nor graded.

Students are encouraged to participate in class discussions as well as meet outside of class in study groups. Refer to the course Moodle page for other course resources.

Lecture and discussion format

The Monday, Wednesday, and Friday lectures will cover material from the text and additional materials will be available on Moodle. The lecture schedule and discussion topics may be subject to change. Additionally, each student is required to attend his/her small-group discussion section, which is scheduled on either Tuesday or Thursday. Material covered in the discussion periods will typically be of clinical/medical or physiological relevance; students are responsible for this material on subsequent quizzes and exams. The discussion sessions will also serve as a time to ask questions and to clarify course material and to administer weekly quizzes on weeks without exams.
Grading

There will be weekly quizzes or equivalent assignments given in discussion sessions. In addition, there will be four exams: three one-hour exams and one comprehensive final exam. The lowest score of the three midterm exams will be dropped, but the final exam score cannot be dropped. There will be no exceptions. The course grade is determined from the exams and quiz scores as follows:

2 highest out of 3 midterm exams: 50%
8 highest out of 10 weekly quizzes: 25%
Final exam: 25%

Final grades will be assigned as follows: 90-100% = A, 80-89% = B; 70-79% = C; 60-69% = D; below 60% = F. Plusses and minuses may be used for grades at the discretion of the instructor.

Missed Quizzes and Exams

The two lowest (or missed) quiz grades will be dropped. Makeup quizzes will not be given. Exceptions will only be made for unusual circumstances and in accordance with the general absence policies and procedures, as described in the UM course catalog. There is no extra credit.

General Policies

University policies on drops, adds, changes of grade option, or change to audit status will be strictly enforced in this course. These policies are described in the current UM catalog. Briefly: If you are taking the course for a non-traditional grade (credit/no credit), note that university policy is that a “CR” grade is given in lieu of A through D- grade; an “NCR” grade is given in lieu of an F grade.

The use of any external device including electronic devices such as calculators and translators for quizzes and exams requires the advanced approval of the instructor.

Academic honesty

All students must practice academic honesty. Academic misconduct is subject to an academic penalty by the course instructor and/or a disciplinary sanction by the University. All students need to be familiar with the Student Conduct Code: (http://www.umt.edu/vpsa/policies/student_conduct.php).

All exams and quizzes are ‘closed book’, that is, you may not use any notes in print, audio, or electronic form. Please turn off and put away all cell phones, calculators, MP3 players and other electronic devices prior to the start of exams and quizzes.

Special accommodations

The University of Montana assures equal access to instruction through collaboration between students with disabilities, instructors, and Disability Services for Students. If you think you may have a disability adversely affecting your academic performance, and you have not already registered with Disability Services, please contact Disability Services in Lommasson Center 154 or 406.243.2243. I will work with you and Disability Services to provide an appropriate modification.
Tentative lecture topics schedule (chapters are based on 2\textsuperscript{nd} edition of text)

<table>
<thead>
<tr>
<th>WEEK 1</th>
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<tbody>
<tr>
<td>M 1/22</td>
<td>Introduction, Chapter 1</td>
</tr>
<tr>
<td>W 1/24</td>
<td>Chapter 2 – water, pH, buffers</td>
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<tr>
<td>F 1/26</td>
<td>Chapter 2 – water, pH, buffers</td>
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*No Discussion Sections in first week*

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<tr>
<th>WEEK 2</th>
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<tbody>
<tr>
<td>M 1/29</td>
<td>Chapter 3 – amino acids</td>
</tr>
<tr>
<td>W 1/31</td>
<td>Chapter 4 – protein structure</td>
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<tr>
<td>F 2/2</td>
<td>Chapter 6 – enzyme properties</td>
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*Discussion Sections: Tu 1/30 and Th 2/1 organic chemistry review & Quiz 1*

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<tr>
<th>WEEK 3</th>
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<tbody>
<tr>
<td>M 2/5</td>
<td>Chapter 7 – enzymes kinetics</td>
</tr>
<tr>
<td>W 2/7</td>
<td>Chapters 7, 8 – mechanisms and inhibitors</td>
</tr>
<tr>
<td>F 2/9</td>
<td>Chapter 8 – mechanisms and inhibitors</td>
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*Discussion Sections: bicarbonate buffer system & Quiz 2*

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<tr>
<th>WEEK 4</th>
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<tbody>
<tr>
<td>M 2/12</td>
<td>Chapter 9 – hemoglobin</td>
</tr>
<tr>
<td>W 2/14</td>
<td>Chapter 10 – carbohydrates/polysaccharides</td>
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<tr>
<td>F 2/16</td>
<td><strong>EXAM 1 – Chapters 1-4, 6-9</strong></td>
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*Discussion Sections: help sessions for exam 1*

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<tr>
<th>WEEK 5</th>
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<tbody>
<tr>
<td>M 2/19</td>
<td><strong>NO CLASS – Presidents Day</strong></td>
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<tr>
<td>W 2/21</td>
<td>Chapter 11 – lipids</td>
</tr>
<tr>
<td>F 2/23</td>
<td>Chapter 12 – membranes</td>
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*Discussion Sections: Hair protein structure and tricothiodystrophy & Quiz 3*

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<tr>
<th>WEEK 6</th>
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<tbody>
<tr>
<td>M 2/26</td>
<td>Chapter 12 – membrane Function</td>
</tr>
<tr>
<td>W 2/28</td>
<td>Chapter 13 – signal transduction</td>
</tr>
<tr>
<td>F 3/2</td>
<td>Chapter 15- thermodynamics, ATP, vitamins</td>
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*Discussion Sections: Salmonella lipid A Structure & Quiz 4*

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<th>Week 7</th>
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<tbody>
<tr>
<td>M 3/5</td>
<td>Chapter 16 – metabolism overview &amp; glycolysis</td>
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<tr>
<td>W 3/7</td>
<td>Chapter 16 – glycolysis</td>
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<tr>
<td>F 3/9</td>
<td>Chapter 17 – gluconeogenesis</td>
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*Discussion Sections: Imatinib – a tyrosine kinase inhibitor & Quiz 5*
WEEK 8
M 3/12 Chapter 18 – citric acid cycle
W 3/14 Chapter 19 – citric acid cycle
F 3/16 EXAM 2 – Chapters 10-13, 15-17
Discussion Sections: help sessions for exam 2

WEEK 9
M 3/19 Chapter 20 – electron transport chain
W 3/21 Chapter 21 – oxidative phosphorylation & PMF
F 3/23 Chapter 21 – oxidative phosphorylation & PMF
Discussion Sections: fermentation – merry microbes & Quiz 6

WEEK 10 – SPRING BREAK

WEEK 11
M 4/2 Chapter 24 – glycogen metabolism
W 4/4 Chapter 25 – glycogen synthesis
F 4/6 Chapter 26 – pentose phosphate shunt
Discussion Sections: metal toxicity and citrate & Quiz 7

WEEK 12
M 4/9 Chapter 27 – fatty acid oxidation
W 4/11 Chapter 28 – fatty acid synthesis
F 4/13 Chapter 33 – nucleotides and nucleic acids
Discussion Sections: diabetes & Quiz 8

WEEK 13
M 4/16 Chapter 34 – DNA replication
W 4/18 Chapter 35 – DNA repair and recombination
F 4/20 EXAM 3 – Chapters 18-34
Discussion Sections: help sessions for exam

WEEK 14
M 4/23 Chapter 36 – transcription in prokayotes
W 4/25 Chapter 37 – transcription in eukaryotes
F 4/27 Chapter 38 – RNA processing
Discussion Sections: breast cancer and DNA repair & Quiz 9

WEEK 15
M 4/30 Chapter 39 – translation
W 5/2 Chapter 40 – translation
F 5/4 Review for final (last day of classes)
Discussion Sections: review for final & Quiz 10

FINAL EXAM: ~80% Comprehensive and 20% Chapters 35 – 40
10:10-12:10 5/9/18 in HS 207