

## **MEDS3020 syllabus – Fall, 2020**

### **Syllabus**

MEDS3020 is a one-semester course designed to introduce students to the basic tenets of biochemistry. The topics that will be discussed have been chosen to comply with the guidelines for the biochemistry component of the medical college admission test (MCAT), which was incorporated into the 2015 offering of the MCAT. The course will be taught in three components: the first is protein structure and function, enzyme mechanisms, and enzyme kinetics. The second component is nucleic acid biochemistry, including DNA replication and repair, synthesis of RNA (transcription), synthesis of proteins (translation), regulation of gene expression, and molecular techniques. The third component includes biochemical thermodynamics and an introduction to metabolism, which includes glycolysis, gluconeogenesis, TCA cycle, oxidative phosphorylation, glycogen metabolism, and fatty acid metabolism. The course will emphasize the relationship of biochemistry to disease, and will discuss, in particular, sickle cell anemia, prion diseases, collagen disorders, thalassemia, cancer in relation to mutations in DNA repair, toxins that affect RNA and protein synthesis, diabetes (both type 1 and type 2), glycogen storage diseases, mitochondrial disorders, and abnormalities in fatty acid oxidation.

### **Meeting Times**

The class will meet virtually on Mondays, Wednesdays and Fridays, starting at 3:35 pm. Classes will end by 4:30 pm. The first class will begin at 3:35 pm, on August 24, 2020. The class will be presented using WebEx, and directions will be forthcoming on how to access the live stream. The classes will also be recorded and posted, usually within 24 hours. It is possible Echo360 will be used to record the lectures, and information about the recording medium used will be discussed on the first day of class.

Each individual professor will set up their office hours, and discuss them with you when they first meet the class.

### **Grading Policies and Test Information**

There will be three exams and 12 online quizzes (5 points each) during the quarter. The first exam is worth 50 points (September 23, 2020), the second worth 50 points (November 2, 2020), and the third exam will be 80 points (date to be determined, during exam week). Previous knowledge is assumed on each exam. The online quizzes test material presented during the previous week, plus important concepts that may have been taught in earlier weeks. There are 10 questions per quiz, and you will have 20 minutes to complete the quiz. Most quizzes are on Sundays and will be available between 4 and 9 pm, but check the schedule as some quizzes are on weeknights. The dates of the quizzes are August 30, September 8, September 13, September 20, October 4, October 11, October 18, October 25, November 8, November 15, November 22, and November 30. The quiz on November 30 will be available between 5 and 10 pm. Students who have a conflict with the quiz times should notify Dr. Lieberman as soon as possible.

Students are expected to take the exams when scheduled. Any unexcused absence will result in a grade of zero for that exam, and absences must be approved in advance. If ill, a doctor's note will be required to have a valid absence from an exam, and the doctor must have been seen on the day of the exam. Anyone caught cheating on an exam will receive a zero for the exam, and will be reported to the Office of Student Conduct in the Provost's office.

The total points in the course will be 240 (60 from the online quizzes, and 180 from the multiple-choice exams). It is anticipated that the course will be graded on a curve, but there are certain targets that will guarantee a certain grade. A final score of 216 points or more will guarantee a grade in the "A" range; a final score of 192 points or more will guarantee a grade in the "B" range; a final score of 168 points or more will guarantee a grade in the "C" range; and a final score of 144 points or more will guarantee a grade in the "D" range. Thus, even if all students score above 216 points for the year, all students will receive an A or A- grade. If the exams are more difficult than anticipated, then these numbers may drop, but there is no guarantee that such an adjustment will occur.

### **Schedule**

The attachment contains the course schedule for the semester. Chapters which will be covered during the lectures are indicated on the schedule. The days for online quizzes will have the quiz available from 4:00 to 9:00 pm only. Let me know if you have any questions. If you have a valid excuse for not taking the quiz when it is available you need to let Dr. Lieberman know (lieberma@ucmail.uc.edu) at least 48 hours in advance. The full schedule is appended at the end of the document.

### **Textbook**

The textbook for the semester will be Marks' Essentials of Medical Biochemistry, A Clinical Approach, 2<sup>nd</sup> edition, by Lieberman and Peet (ISBN = 978-1451190069). It should be available either in the University Bookstore or at Dubois Bookstore. You can also purchase the book from Amazon.com [http://www.amazon.com/gp/product/1451190069/ref=s9\\_psimh\\_gw\\_p14\\_d12\\_i4?pf\\_rd\\_m=ATVPDKIKX0DER&pf\\_rd\\_s=desktop-1&pf\\_rd\\_r=0XE5ATWF59663XYKFH55&pf\\_rd\\_t=36701&pf\\_rd\\_p=2079475242&pf\\_rd\\_i=desktop](http://www.amazon.com/gp/product/1451190069/ref=s9_psimh_gw_p14_d12_i4?pf_rd_m=ATVPDKIKX0DER&pf_rd_s=desktop-1&pf_rd_r=0XE5ATWF59663XYKFH55&pf_rd_t=36701&pf_rd_p=2079475242&pf_rd_i=desktop)

The book is available in an electronic format, or it can be rented.

### **Online Tutorial on Amino Acid structures and codes**

A student from a previous class sent me the following link that is useful for learning the structures and single letter and three letter codes for the amino acids. The site also has quizzes through which you can test yourself.

[http://www.biology.arizona.edu/biochemistry/problem\\_sets/aa/aa.html](http://www.biology.arizona.edu/biochemistry/problem_sets/aa/aa.html)

### **Problem Sets**

Each professor has crafted a set of discussion problems that should be answered on your own or within groups. The more difficult problems within the problem sets will be discussed in class, and the material covered on the problem set will appear on exams.

### Practice multiple-choice questions

There is a Module in Canvas (Practice Multiple-choice questions) that will take you to "exams" to test your knowledge on practice questions. After you do the test (or part of the test) you can see if you answered correctly or not, and see an explanation of the correct answer. These quizzes can be taken multiple times, and they do NOT count towards your grade - they are here for you to practice on. These questions are good for testing your overall knowledge, but are probably a little easier than the questions you will see on exams (there is little medical relevance to these practice questions, but they do test biochemistry).

### Supplemental Instructors

There is one supplemental instructor for the course, Dami Omojola, who participated in the course last year and did very well. Dami will inform you of the SI sessions at the first class session. There is an "Supplemental Instruction" module which will contain the materials she posts.

### Schedule

MWF schedule for MEDS 3020 – Fall 2020, 3:35 to 4:30 pm

| Date           | Topic                               | Professor   |
|----------------|-------------------------------------|---|
| 8/24/20        | Introduction, water, acids, bases   | Rosevear  |
| 8/26/20        | Buffers, structures                 | Rosevear  |
| 8/28/20        | More structures                     | Rosevear  |
| <b>8/30/20</b> | <b>Quiz 1 – online (4 – 9 pm)</b>   | <i>Covers material from Dr. Rosevear's first three lectures</i> |
| 8/31/20        | Amino acids and proteins            | Rosevear  |
| 9/2/20         | Proteins and structure-function     | Rosevear  |
| 9/4/20         | Hb and Mb                           | Rosevear  |
| <b>9/7/20</b>  | <b>NO CLASS – LABOR DAY</b>         |   |
| <b>9/8/20</b>  | <b>Quiz 2 – online (4 – 9 pm)</b>   | <i>Covers material from Dr. Rosevear's six lectures to date</i> |
| 9/9/20         | Finish HB, Mb, enzymes as catalysts | Rosevear  |
| 9/11/20        | Catalytic activity                  | Rosevear  |
| <b>9/13/20</b> | <b>Quiz 3 – online (4 – 9 pm)</b>   | <i>Covers material from Dr. Rosevear's 8 lectures to date</i>   |
| 9/14/20        | Regulation of enzyme activity       | Rosevear  |

|                 |   |   |
|-----------------|---|---|
| 9/16/20         | Regulation of enzyme activity/Fibrous proteins                  | Rosevear  |
| 9/18/20         | Fibrous proteins  | Rosevear  |
| <b>9/20/19</b>  | <b>Quiz 4 – online (4-9 pm)</b>                                 | <i>Covers material from Dr. Rosevear's 11 lectures do date</i>                                  |
| 9/21/20         | Problem set discussion  | Rosevear  |
| <b>9/23/20</b>  | <b><i>EXAM 1 on ROSEVEAR material</i></b>                       |   |
| 9/25/20         | Finish nucleic acid structure, start DNA replication            | Cartwright  |
| 9/28/20         | Nucleic acid structure  | Cartwright  |
| 9/30/20         | Finish DNA replication  | Cartwright  |
| 10/2/20         | DNA mutation & repair   | Cartwright  |
| <b>10/4/20</b>  | <b>Quiz 5 – online (4 – 9 pm)</b>                               | <i>Covers material from Dr. Cartwright's four lectures to date</i>                              |
| 10/5/20         | Transcription   | Cartwright  |
| 10/7/20         | Transcription   | Cartwright  |
| 10/9/20         | Translation   | Cartwright  |
| <b>10/11/20</b> | <b>Quiz 6 – online (4-9 pm)</b>                                 | <i>Covers material from Dr. Cartwright's six lectures (does <b>NOT</b> include translation)</i> |
| 10/12/20        | Translation   | Cartwright  |
| 10/14/20        | Regulation of gene expression                                   | Cartwright  |
| 10/16/20        | Regulation of gene expression                                   | Cartwright  |
| <b>10/18/20</b> | <b>Quiz 7 – online (4-9 pm)</b>                                 | <i>Covers material from Dr. Cartwright's ten lectures to date</i>                               |
| 10/19/20        | Finish regulation of gene expression/start molecular techniques | Cartwright  |
| 10/21/20        | Molecular techniques  | Cartwright  |
| 10/23/20        | Molecular techniques  | Cartwright  |
| <b>10/25/20</b> | <b>Quiz 8 – online (4-9 pm)</b>                                 | <i>Covers material from Dr. Cartwright's 13 lectures to date</i>                                |
| 10/26/20        | Problem set discussion  | Cartwright  |
| 10/28/20        | Intro to metabolism   | Lieberman   |
| 10/30/20        | Intro, start TCA cycle  | Lieberman   |
| <b>11/2/20</b>  | <b><i>EXAM 2 on Cartwright material</i></b>                     |   |

|   |  |  |
|---|--|--|
| 11/4/20   | Finish TCA cycle   | Lieberman  |
| 11/6/20   | Start ox-phos  | Lieberman  |
| <b>11/8/20</b>  | <b>Quiz 9 – online (4-9 pm)</b>                            | <i>Covers material from Dr. Lieberman's first three lectures</i>                 |
| 11/9/20   | Finish ox-phos   | Lieberman  |
| <b>11/11/20</b>   | <b>NO CLASS – VETERAN's DAY</b>                            |  |
| 11/13/20  | Glycolysis   | Lieberman  |
| <b>11/15/20</b>   | <b>Quiz 10 – online (4-9 pm)</b>                           | <i>Covers material from Dr. Lieberman's first five lectures</i>                  |
| 11/16/20  | Glycolysis   | Lieberman  |
| 11/18/20  | Gluconeogenesis  | Lieberman  |
| 11/20/20  | Glycogen metabolism  | Lieberman  |
| <b>11/22/20</b>   | <b>Quiz 11 – online (4-9 pm)</b>                           | <i>Covers material from Dr. Lieberman's first eight lectures</i>                 |
| 11/23/20  | Glycogen metabolism  | Lieberman  |
| 11/25/20  | Fatty acid oxidation                                       | Lieberman  |
| <b>11/26/20</b>   | <b>NO CLASS - THANKSGIVING</b>                             |  |
| <b>11/30/20</b>   | <b>Quiz 12 – online (5 – 10 pm)</b>                        | <i>Covers material from Dr. Lieberman's lectures through glycogen metabolism</i> |
| <b>11/30/20</b>   | <b><i>Fatty acid oxidation – ONLINE; no inperson</i></b>   | Lieberman  |
| <b>12/2/20</b>  | <b><i>Problem set discussion – ONLINE: no inperson</i></b> | Lieberman  |
| <i>To be determined – Final Exam (exam week 12/3 through 12/8/20)</i> | <i>No separate metabolism exam – all on the final exam</i> |  |