Pharmaceutical Biochemistry II (PHM 281N)

Schedule: Lectures, Tuesday/Thursday 2-3 p.m. in PHR 2.110
Optional: Weekly Problem-Solving Sessions, TBA

Faculty:
Dr. Kevin Dalby  BME 6.202B
(471-9267) dalby@austinfo.utexas.edu
Dr. Seongmin Lee PHR 3.206D
(471-1785) SeongminLee@austin.utexas.edu

Teaching Assistants:

Course Texts:
Note: Exam questions may come from assigned text readings.

Web Resources:
The Canvas® web site for this course is located at:

http://courses.utexas.edu/

On login (with your UTEID) you will see a list of Canvas® websites for your current courses. Click on Pharmaceutical Biochemistry II to access the site. You are strongly encouraged to visit this site for additional resources associated with the courses (electronic quizzes, powerpoint presentation, previous exams, contacting faculty by Email, electronic versions of suggested and required readings). Messages sent to you via the Canvas® Website (Email and Notifications) are official mechanisms for communication in this course; be sure you understand the College Email policies.

The Discussion Board for this course is also on the Canvas® website. The Discussion Board will be used for posting questions, exchanging class information, and making class announcements. You may also contact faculty members directly via phone or Email.
Video Capture: This class is using UT's Echo360 system which records all of the audio and presentation materials (what is projected on the screen in class) for review later. To access this material, you will need to log into Canvas and click "EchoCenter" on the left side navigation menu.

Course Policies

1. Examinations:

There will be three 1-hr summary examinations throughout the semester, plus a comprehensive final administered during the Final Exam period. Exams will be given according to the following schedule:

<table>
<thead>
<tr>
<th>Exam Date &amp; Time</th>
<th>Location</th>
<th>Coverage</th>
<th>Faculty</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thursday, February 21</td>
<td>2.110</td>
<td>Lectures 1-9</td>
<td>Dalby</td>
<td>100 pts</td>
</tr>
<tr>
<td>Thursday, April 4</td>
<td>2.110</td>
<td>Lectures 10-17</td>
<td>Dalby/Lee</td>
<td>100 pts</td>
</tr>
<tr>
<td>Thursday, May 2</td>
<td>2.110</td>
<td>Lectures 18-25</td>
<td>Lee</td>
<td>100 pts</td>
</tr>
<tr>
<td>Final Exam</td>
<td>TBA</td>
<td>Lectures 1-25</td>
<td>Dalby, Lee</td>
<td>100 pts</td>
</tr>
</tbody>
</table>

# Points for Exams 1-3 are proportional to actual lectures given, and may be adjusted accordingly.

The format for the exam is entirely the prerogative of the faculty. **Students must arrive on time for examinations.** All instructions and corrections will be made at the beginning of the examination period and will not be repeated. Semester exams will begin promptly at the designated hour and will be picked up after exactly 1 hr. The final examination will last three hours. Students arriving after any students have completed the exam and left the room may not be allowed to sit for the exam and may receive a score of zero.

**No allowances will be made for an exam being missed, other than documented illness or emergency.** The student must contact the course coordinator for confirmation **prior to the exam.** If permission is granted to delay the exam, it is the student responsibility to complete the College Form titled “Student Request for Alternate Exam Time” for consideration and **final approval** by the Faculty member. In this event, the nature of the make-up will be at the discretion of the faculty (oral, written, increased weighting on the final, etc.). An unexcused absence from an exam may result in a grade of "zero" for that exam.

**Graded course examinations will be administered using ExamSoft®.** It is the student’s responsibility to ensure functionality (hardware, battery charge, sufficient memory, etc.) prior to each assessment. The examination should be downloaded prior to the exam within the specified time. Students should contact ExamSoft at support@examsoft.com or 1-866-429-8889 for issues and technical support.

1.A. Posting Class Scores & Keys:

Following the grading of each exam, score statistics and/or the exam key will be posted on Canvas.

1.B. Post-Exam Remarks and Reconsideration Requests:

If there is a disagreement over the answer to a specific question, the student should present his/her exam plus a written explanation (with appropriate documentation) to the instructor within 72 hours of the listserv announcement of the posting of exam results & key as described above. Documentation may include statements from textbooks, handouts, packets, or current scientific reprints; lecture notes are not authoritative documentation. The explanation must be clear, rational, and concise. (This policy does not apply to addition or other grading errors).
1. C Final Exam Re-Examination Policy: The re-examination policy for this course will follow the General Information Catalog (GIC) policy for the University, which reads as follows: “Only a student who has a grade average of at least a C on all class work and lab work submitted before the final exam may request a temporary delay of the final course grade because he or she failed the final examination, which is the examination given during the final exam period as printed in the official examination schedule. If the petition is denied by the instructor (i.e., course coordinator), the student’s final course grade will remain as originally determined. If the petition is granted by the instructor (i.e., course coordinator), the grade on the reexamination will be substituted for the grade on the original exam in determining the student’s final course grade, provided the student earns at least a C on the reexamination. If the grade on the reexamination is less than a C, a final course grade of F must be recorded.”

2. On-Line Exams

Throughout the semester you may be assigned exam questions to be completed on Canvas. These are “open book” exams, but must be completed individually.

3. Course Grading:

There will be a total of 400 points for the course: 300 points (75 %) for in-class exams, quizzes, and online exams, and 100 points (25 %) for the final exam. The final letter grade assignments will be based on the following scale:

- A = 100%-93%
- A- = 92%-90%
- B+ = 89%-87%
- B = 86%-83%
- B- = 82%-80%
- C+ = 79%-77%
- C = 76%-73%
- C- = 72%-70%
- D+ = 69%-67%
- D = 66%-65%
- F = Below 65%

This scale may be curved more leniently in the final analysis of grades at the discretion of the instructors.

4. Academic Dishonesty:

The “Statement on Scholastic Dishonesty of the College of Pharmacy” reads as follows: “Pharmacy practitioners enjoy a special trust and authority based upon the profession's commitment to a code of ethical behavior in its management of client affairs. The inculcation of a sense of responsible professional behavior is a critical component of professional education, and high standards of ethical conduct are expected of pharmacy students. Students who violate University rules on scholastic dishonesty are subject to disciplinary penalties, including failure of the course involved and dismissal from the college and/or the University. Since dishonesty harms the individual, fellow students, and the integrity of the University and the College of pharmacy, policies of scholastic dishonesty will be strictly enforced in this class”.

Students are expected to work independently on all examinations and on all laboratory write-ups (unless specifically instructed otherwise). Any student caught cheating will be given a "zero" on the assignment (minimum). Any student suspected of dishonesty will be reported to the Dean of the College of Pharmacy and to the Dean of Students, as per University regulations. Students are expected to have read and understood the current issue of the General Information Catalog published by the Registrar's Office for information about procedures and about what constitutes scholastic dishonesty. Students are also expected to be familiar with and abide by the College Honor Code, and will be expected to sign the Honors Statement at the end of each examination.
5. Students with Disabilities

The University of Texas at Austin provides upon request appropriate academic accommodations for qualified students with disabilities. All University rules concerning accommodations must be followed, including the student arranging for special accommodations prior to each examination. In the absence of such prearrangement, the student will be expected to take the exam with the rest of the class at the regularly scheduled exam time. For more information, contact the Office of the Dean of Students at 471-6259, 471-4641 TTY.

6. Campus Carry

Students should familiarize themselves with the information provided by the University regarding the implementation of “Campus Carry” legislation. You will find an information sheet specifically for students (as well as sheets for parents, visitors, faculty, and staff) at http://campuscarry.utexas.edu/info-sheets."
# Schedule of Pharmaceutical Biochemistry (PHM 281N)

1/15/2019

<table>
<thead>
<tr>
<th>Lecture</th>
<th>Date</th>
<th>Topic(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Jan 22</td>
<td>Introduction <em>(Dalby)</em></td>
</tr>
<tr>
<td>2</td>
<td>Jan 24</td>
<td>Cholesterol metabolism and steroids <em>(Dalby)</em></td>
</tr>
<tr>
<td>3</td>
<td>Jan 29</td>
<td>Cholesterol metabolism and steroids <em>(Dalby)</em></td>
</tr>
<tr>
<td>4</td>
<td>Jan 31</td>
<td>Cholesterol metabolism and steroids <em>(Dalby)</em></td>
</tr>
<tr>
<td>5</td>
<td>Feb 5</td>
<td><em>In class questions and review (Dalby)</em></td>
</tr>
<tr>
<td>6</td>
<td>Feb 7</td>
<td>Plasma Lipoproteins and metabolism <em>(Dalby)</em></td>
</tr>
<tr>
<td>7</td>
<td>Feb 12</td>
<td>Plasma Lipoproteins and metabolism <em>(Dalby)</em></td>
</tr>
<tr>
<td>8</td>
<td>Feb 14</td>
<td>Plasma Lipoproteins and metabolism <em>(Dalby)</em></td>
</tr>
<tr>
<td>9</td>
<td>Feb 19</td>
<td><em>In class questions and review (Dalby)</em></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Lecture</th>
<th>Date</th>
<th>Topic(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>Feb 26</td>
<td>Protein metabolism <em>(Dalby)</em></td>
</tr>
<tr>
<td>11</td>
<td>Feb 28</td>
<td>Protein metabolism <em>(Dalby)</em></td>
</tr>
<tr>
<td>12</td>
<td>March 5</td>
<td>Protein metabolism <em>(Dalby)</em></td>
</tr>
<tr>
<td>13</td>
<td>March 7</td>
<td><em>In class questions and review (Dalby)</em></td>
</tr>
<tr>
<td>14</td>
<td>March 12</td>
<td>Nucleotide metabolism (1) <em>(Lee)</em></td>
</tr>
<tr>
<td>15</td>
<td>March 14</td>
<td>Nucleotide metabolism (2) <em>(Lee)</em></td>
</tr>
</tbody>
</table>

**Exam 1 on Feb 21 Covering Lectures 1-9 (Dalby)**

<table>
<thead>
<tr>
<th>Lecture</th>
<th>Date</th>
<th>Topic(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
<td>March 26</td>
<td>Nucleic Acids - Structure (1) <em>(Lee)</em></td>
</tr>
<tr>
<td>17</td>
<td>March 28</td>
<td>Nucleic Acids - Structure (2) <em>(Lee)</em></td>
</tr>
<tr>
<td>18</td>
<td>April 2</td>
<td>DNA synthesis (1) <em>(Lee)</em></td>
</tr>
</tbody>
</table>

**Spring Break March 18-23**

<table>
<thead>
<tr>
<th>Lecture</th>
<th>Date</th>
<th>Topic(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>19</td>
<td>April 9</td>
<td>DNA synthesis (2) <em>(Lee)</em></td>
</tr>
<tr>
<td>20</td>
<td>April 11</td>
<td>DNA synthesis (3) <em>(Lee)</em></td>
</tr>
<tr>
<td>21</td>
<td>April 16</td>
<td>Transcription (1) <em>(Lee)</em></td>
</tr>
<tr>
<td>22</td>
<td>April 18</td>
<td>Transcription (2) <em>(Lee)</em></td>
</tr>
</tbody>
</table>

**Exam 2 on April 4 Covering Lectures 10-17 (Dalby/Lee)**

<table>
<thead>
<tr>
<th>Lecture</th>
<th>Date</th>
<th>Topic(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>23</td>
<td>April 23</td>
<td>DNA damage and mutagenesis (1) <em>(Lee)</em></td>
</tr>
<tr>
<td>24</td>
<td>April 25</td>
<td>DNA-targeting anticancer drugs (1) <em>(Lee)</em></td>
</tr>
<tr>
<td>25</td>
<td>April 30</td>
<td>DNA repair (1) <em>(Lee)</em></td>
</tr>
</tbody>
</table>

**Exam 3 on May 2 Covering Lectures 18-25 (Lee)**

* These lectures may be replaced with in- or out-of-class activities.
Learning Objectives
Pharmaceutical Biochemistry
(PHM 281N)

Learning Objectives to Dr. Dalby’s Section:

Review Material
At the end of this course and after reviewing the reading and review material you should be able to:

1. Cholesterol Metabolism and Steroids
   Describe why cholesterol is important
   Describe the basic physical and chemical properties of cholesterol
   Describe how cholesterol is synthesized in the body
   Describe how cholesterol levels are regulated in the body
   Describe how statins work to lower cholesterol
   Describe the synthesis and properties of bile salts and acids
   Describe enterohepatic circulation
   Distinguish between mineralocorticoid and glucocorticoid activity
   Know the receptor-mediated mechanism of corticosteroid action
   Explain the selectivity of mineralocorticoids

2. Plasma Lipoproteins and lipid metabolism
   Describe the pathway (from food-to fat or muscle cells) for the digestion of dietary lipids
   Describe the function of all the lipases we encounter
   Describe the roles of the enzymes secreted by the pancreas.
   Describe what chylomicrons are
   Describe the physical properties, composition and structures of the plasma lipoproteins
   Describe the function of key apolipoproteins
   Outline the metabolism of chylomicrons
   Compare the metabolism of VLDLs to chylomicrons
   Outline the production of LDL from VLDL
   Outline the metabolism of LDLs
   Describe the role of endocytosed cholesterol on cellular cholesterol homeostasis
   Describe the metabolism of HDLs and their role in cholesterol homeostasis
   Define hyperchylomicronemia

3. Protein Metabolism
   List the essential and nonessential amino acids
   Describe how body and dietary proteins are utilized to assimilate amino acids
   List the proteolytic enzymes involved in protein digestion
   Explain the specificity and mechanism of activation of the proteolytic enzymes
   Correlate some clinical problems with abnormal protein digestion and amino acid absorption
   Define nitrogen Balance
   Describe several genetic errors or diseases associated with nitrogen metabolism
   Describe the role of the urea cycle in detoxifying ammonia produced during amino acid metabolism
   Describe Hartnup Disorder, Cystinuria, Cystic Fibrosis and Kwashiorkor
   Describe the processes of amino acid catabolism to produce ATP
   Describe the processes of amino acid catabolism to produce glucose and ketone bodies
   Describe several products of amino acid metabolism with important biological functions
   Describe the genetic code
Describe prokaryotic translation
Describe eukaryotic translation
Describe how and why cells degrade proteins
Learning Objectives to Dr. Lee’s Section:

Reading Material (Selected from the chapters below)
Chapter 9: Nucleic Acids
Chapter 10: DNA Replication
Chapter 11: Transcription

Upon successful completion of this portion of the course, students should be able to:

1. Nucleic Acid Structures
   * Define bases, nucleosides, nucleotides, DNA, and RNA
   * Explain Watson-Crick and Hoogsteen base pairings
   * Describe various double helical DNA structures
   * Describe forces stabilizing nucleic acid structures
   * Describe the mechanism of action of camptothecin, a topoisomerase inhibitor

2. Nucleotide Metabolism
   * Define the de novo pathways and the salvage pathways
   * Describe de novo synthesis of purine ribonucleotides
   * Describe the purine salvage pathway
   * Describe biosynthesis of pyrimidine ribonucleotides
   * Describe the formation of deoxyribonucleotides
   * Describe the function of ribonucleotide reductase
   * Describe biosynthesis of nucleotide coenzymes
   * Describe the catalytic mechanism of thymidylate synthase
   * Explain the mechanism of action of 5-FU

3. DNA replication
   * Outline fundamental rules of DNA replication
   * Describe the role of DNA polymerases in DNA synthesis
   * Discuss how DNA replication proceeds accurately
   * List and describe the functions of proteins required in DNA replication
   * Describe the mechanism of DNA ligase reaction
   * Describe the role of hemi-methylation in DNA replication

4. DNA Repair
   * Discuss the types of DNA damage
   * List DNA damaging agents
   * Discuss why DNA damages can cause mutations
   * Describe the fates of oxidative, alkylative, and deaminative DNA damages
   * Describe base-excision repair
   * Describe nucleotide-excision repair
   * Describe direct repair
   * Describe mismatch repair
   * Outline the role of DNA glycosylases, endonucleases, ligases, and polymerases in DNA repair

5. Transcription and Its Regulation
   * How do transcription and DNA synthesis differ? How are they the same?
   * What descriptors are used to refer to the DNA strand that is copied in transcription? The other DNA strand?
*How are transcribed regions of DNA recognized in prokaryotes? In eukaryotes?
*What is the function of the sigma factor in prokaryote RNA polymerase? What carries out the corresponding function in eukaryotes?
*What sub-unit of the prokaryote RNA polymerase is targeted by rifamicin and analogs?
*What distinguishes constitutive and regulated gene expression?
*What is an operon? Be able to sketch out the lac operon and describe how it functions.
*What are transcriptional repressors and activators?
*How does Transcription terminate in prokaryotes? In eukaryotes?
*What structural features allow regulatory proteins to recognize DNA? To recognize each other?
*How does the organization of eukaryotic DNA affect the way it is transcribed?
*How do DNA and histone modifications regulate transcription?