

COURSE SYLLABUS
GMS 5905: FUNDAMENTALS OF BIOCHEMISTRY AND MOLECULAR BIOLOGY
DISTANCE LEARNING
COURSE COORDINATOR: Dr. Kevin D. Brown

Fall Semester, 2019

Credit: four (4) hours

Course Description: GMS 5905 is a graduate-level course that surveys the structure, function, and metabolism of amino acids, proteins, carbohydrates, lipids, and nucleic acids. It introduces concepts in cell structure, replication and growth, and metabolic regulation.

Prerequisites: Organic Chemistry (CHM 2210 and 2211, CHM 2215 and 2216, or their equivalents at other universities) or consent of course coordinator. In certain cases, with permission, CHM 2211 or CHM 2216 may be taken concurrently.

Text: *Lehninger Principles of Biochemistry, 7th edition*, by David L. Nelson and Michael M. Cox. New York: W.H. Freeman and Company, 2012. Textbooks may be bought at the Health Center Bookstore (Room MG-15) and are also available in several other local, commercial bookstores. A few copies are currently on reserve in the Health Center Library, located in the Communicore building.

Web Page: This syllabus, lecture notes, lecture videos, expanded policies, and other information about the course are available on the "Canvas E-Learning" site, <http://elearning.ufl.edu>. All course notes, video supplements, and announcements are available only at the Canvas site.

Lecture Notes: **ALL** faculty lecture notes for this course are available **ONLY** at the "Canvas E-Learning" site. All other course-related files can also be found there.

Tests and Grading: Grades will be based on student performance on four quizzes and two manuscript reviews within the semester. Each quiz is worth 100 points, each manuscript review is worth 100 points. Grades will be assigned based on the total number of points a student scores over the semester (600 total points available),

Multiple Choice Quiz: Quizzes 1-4 will be held (see syllabus below) during a reserved 42 hr time window extending from Friday to Saturday on established testing dates. Quizzes are available from 9:00 am on Friday to 9:00 pm on the following Saturday. Quizzes are 60 mins long, 25 multiple choice questions (4 points/question). Quizzes will cover the material discussed in the lecture videos and the lecture notes. Questions are not drawn exclusively from the textbook but the text can provide a useful alternate view of material covered in lectures that many students find useful

These quizzes will be administered using ProctorU (www.proctoru.com), I have included a PDF file explaining the process of signing up for ProctorU. Note, this on-line proctoring service requires a computer that is connected to the internet and has a web-cam. You are expected to take the exam on a computer that is **HARD-WIRED** to the internet to avoid being dropped during the exam. If your connection is dropped, ProctorU cannot re-establish your connection.

Manuscript Reviews: Manuscript Reviews will allow for assessment of student's ability to critically review the literature pertinent to materials presented in lecture. There will be two (2), 100 point each Manuscript Reviews each semester, one presenting a paper pertinent to Quiz 2 material, the second pertinent to Quiz 4 material.

Please note a folder within the Modules tab marked Manuscript review documents. Within this folder will be i) a PDF file of the manuscript assigned to Review #1 or #2; ii) a videotaped review of Manuscript #1 or #2 by a faculty member, and iii) the questions to be answered for Manuscript Review #1 or #2. Answers to the questions posed should be formatted as either MSWord documents (.doc or docx) or PDF files and are to be emailed to Dr. Brown using the Canvas email system. Manuscript Review 1 is due on or before 11:00 pm (EDT) on November 7, Manuscript Review 2 is due on or before 11:00 pm (EDT) on November 29. Failure to submit your Manuscript Review on time will result in a 20% penalty.

Make-up exams: It is anticipated that, given the wide latitude we have provided in scheduling exams, all students will be able to set their schedules to take all four exams during the indicated testing dates. Make-up exams can be provided given adequate documentation of a need to miss an exam, and will only be granted with the permission of the Course Director. It is anticipated that the need to make-up an exam will be a rare event.

Make-up exams will take place from Monday, December 2 at 9:00 AM (Eastern time) to 9:00 PM Tuesday, December 3. Grades will be calculated based on exam scores recorded as of the end of the make-up period - there will be no make-up of the make-up exam and there will be no make-up of Manuscript reviews.

Students requesting special-needs testing accommodation must first register with the Dean of Students Office, which will provide documentation to the student, who then must provide this documentation to the course coordinator.

Contact Information: Questions about course organization and operation, including exams and grades, should be directed to Dr. Brown using the Canvas email system. Dr. Brown can also be contacted at kdbrown1@ufl.edu. Please put “Distance BCH4024” in the subject line of the email so your email does not get overlooked.

Faculty:

Dr. Kevin D. Brown (KDB) kdbrown1@ufl.edu

Dr. William L. Zeile (“WLZ”) wzeile@ufl.edu

Dr. Daniel L. Purich (“DLP”) dlpurich@ufl.edu

Faculty office phone numbers are available on the Departmental Webpage (<http://biochem.med.ufl.edu>), however, email is the preferred contact method.

Supplemental Instruction: Teaching Assistants (TAs) will be assigned to this course. The TA will be responsible for answering questions posted on the “Discussion” board on Canvas and can be contacted using the Canvas email system.

Necessary Time Commitment and Management:

As a distance learning class, it is expected that each student manages his/her own time. Recognize, however, that GMS 5905 is a demanding graduate course and will require a substantial and diligent time commitment to do well. On-campus, GMS 5905 is a 4 lecture / week course, such a time commitment should be similar for the distance learning students. We have had numerous distance learning students who have done quite well in the past, but do not underestimate the rigorous nature of this course and content.

**COURSE OUTLINE FOR
GMS 5905: FUNDAMENTALS OF BIOCHEMISTRY AND MOLECULAR BIOLOGY**

| <u>Lecture</u> | <u>Lecturer</u> | <u>Lecture Topic</u> |
|-----------------------|-----------------------------------|--|
| 1 | DLP | PROTEIN STRUCTURE - Water structure, Ionization, pH and Buffers |
| 2 | DLP | PROTEIN STRUCTURE - Amino Acids as Protein Building Blocks |
| 3 | DLP | PROTEIN STRUCTURE - Peptides - Bonding, Ionization, and Sequencing |
| 4 | DLP | PROTEIN STRUCTURE - Interactions Among Amino Acid Side Chains |
| 5 | DLP | PROTEIN STRUCTURE - Understanding Protein Structure |
| 6 | DLP | PROTEIN STRUCTURE - Protein Folding, Unfolding, and Misfolding |
| 7 | DLP | PROTEIN STRUCTURE - Protein Binding Interactions (Hemoglobin) |
| 8 & 9 | DLP | How Enzymes Work |
| 10 & 11 | DLP | PROTEIN STRUCTURE - Enzyme Kinetics |
| Q-1 | Friday, 9/6- Saturday, 9/7 | QUIZ 1 [LECTURES 1 THRU 11] |
| 12 | DLP | CARBOHYDRATES - Structure & Function |
| 13 | DLP | INTRO TO METABOLISM - Basics of Pathway Organization, Regulation and Bioenergetics |
| 14 | DLP | NITROGEN METABOLISM - Digestion and Amino Acid Absorption |
| 15 | DLP | NITROGEN METABOLISM - Mobilization of Amino Acids |
| 16 | DLP | NITROGEN METABOLISM - Ammonia Assimilation |
| 17 | DLP | NITROGEN METABOLISM - Urea Cycle: Averting Ammonia Toxicity |
| 18 | DLP | NITROGEN METABOLISM - Biosynthesis of Nonessential & Specialized Amino Acids |
| 19 | DLP | NITROGEN METABOLISM - Pyrimidine Nucleotide Biosynthesis |
| 20 | DLP | NITROGEN METABOLISM - Purine Nucleotide Biosynthesis Salvage & Degradation Transporters |
| 21 | WLZ | Lipids |
| 22 | WLZ | Biological Membranes |
| 23 | WLZ | Membrane Proteins |

Q-2 Friday, 10/4 – Saturday, 10/5 QUIZ 2 [LECTURES 12 THRU 23]

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| 24 | WLZ | Membrane Protein Transporters |
| 25 | WLZ | Membrane Protein Signaling 1 |
| 26 | WLZ | Membrane Protein Signaling 2 |
| 27 | WLZ | Introduction to Metabolism Part 2 |
| 28 | WLZ | Glycolysis |
| 29 | WLZ | Gluconeogenesis |
| 30 | WLZ | Glycogen Metabolism |
| 31 | WLZ | Regulation of Carbohydrate Metabolism |
| 32 | WLZ | Cellular Respiration |
| 33 | WLZ | The Citric Acid Cycle |
| 34 | WLZ | Electron Transport |
| 35 | WLZ | Oxidative Phosphorylation |
| 36 | WLZ | Introduction to Lipid Metabolism |
| 37 | WLZ | Ketones and Fatty Acid Synthesis |
| 38 | WLZ | Regulation of Fatty Acid Metabolism |
| 39 | WLZ | Cholesterol Synthesis |
| 40 | WLZ | Plasma Lipoproteins |

Q-3 Friday, 11/1 - Saturday, 11/2 EXAM 3 [LECTURES 24 THRU 40]

Manuscript Review #1 DUE 11/7 @ 11:00 pm

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| 41 | KDB | DNA Structure and Genome Organization |
| 42 | KDB | DNA Replication |
| 43 | KDB | Prokaryotic Transcription and Gene Control |
| 44 | KDB | Eukaryotic Transcription and Gene Control |
| 45 | KDB | RNA Processing |
| 46 | KDB | Protein Synthesis (Translation I and II) |

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| 47 | KDB | Post Translational Modifications and Protein Targeting |
| 48 | KDB | DNA Damage & Repair |
| 49 | KDB | Recombination and Transposition |
| 50 | KDB | Growth Factor Signaling |
| 51 | KDB | Cell Cycle Mechanics |
| 53 & 54 | KDB | Cancer Biology |

Q-4 Friday, 11/22 – Saturday 11/23 EXAM 4 [LECTURES 41 THRU 54]

Manuscript Review #2 DUE 11/29 @ 11:00 pm

MAKE-UP (Requires Course Director prior approval): Monday, 12/2 – Tuesday, 12/3