

Biochemistry 3063 Syllabus – Spring 2024

Nutritional Biochemistry

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Office Hours: Office hours will be by appointment either in person or via TEAMS. Please send me an email if you would like to discuss problem sets or any aspect of the course.

Course Description: There are two primary foci of this course: Metabolism as studied through the lens of popular diets such as the “Atkins Diet” and “Mediterranean Diet”, and the biochemistry of the vitamins and minerals. Special attention is placed on how metabolic pathways are altered in response to a change in diet (low carbohydrate). As various metabolic pathways are described, the chemistry, biology, and nutriture of carbohydrates, proteins, and lipids that are important to these various types of diets are described and discussed. This year, special emphasis will be placed upon how nutrition can impact COVID disease.

Prerequisites: NFS 183, BIOC 201, or BIOC 205 is a prerequisite for this course.

Lectures: TR 10:05 a.m. – 11:20 a.m. in Rowell 118.

All of the lectures from our in-person meetings will be recorded via TEAMS and posted to the course Brightspace site.

Attendance: Attendance is required. Attendance is 4% of your final grade. If you are ill, please send me a message by email. You can attend the class via TEAMS if you are well enough. Attending class via the TEAMS link is only for use if you are ill, quarantined, or have some other legitimate reason for not attending class in person such as participation in a UVM sanctioned event (e.g. sports, clubs, etc).

Class participation via Kahoot: This year I am doing something new. Once or twice a month we will have active learning sessions by using the Kahoot platform. Most of you probably have used this learning platform before. You will need to bring your cell phone to class and then you will be directed to the Kahoot website where you will enter a code. We will review lecture material in the forms of questions. You will need to enter your name to participate. If you don't want to use your real name during the Kahoot session, you can create an alias. After class, please send me an email stating the alias that you will use for the Kahoot sessions so that I can record it in the gradebook. For the times that we use Kahoot, I will video a lecture and place it on the course Brightspace site. You will need to watch the video before class. We will use class time to do the Kahoot exercise. There will be some lecture during these sessions as I will explain the answers to the questions. Participation in these sessions is worth 18% your grade. You don't need to get any of the questions correct, but you do need to participate. For each Kahoot session you are not present (unexcused absence) you will be penalized 12.5% of your class participation grade, which is worth 18% of the final grade. Students who are enthusiastic participants in class may ask me for a letter of recommendation regardless of your final grade in the course.

Review Material and Exam 1: I have posted three lectures that review important concepts from previous chemistry and biochemistry courses to the course Blackboard site. I invite you to watch these videos during the first two weeks of January and work on the associated problem sets. I will have office hours in January and will make this announcement via Blackboard. **Exam 1 will**

be on Friday, January 19th through January 21st via the course Brightspace site. The first exam is worth 4% of your final grade.

Course Textbook: The textbook for this course is *Advanced Nutrition and Human Metabolism*, 7th edition by Sareen Gropper and Jack Smith. This book was used last year for NFS 243, so most of you should have it. For students who have taken BIOC 205, students should have *Biochemistry*, 5th edition, by Garrett and Grisham, and can use this instead of the text by Gropper and Smith if you don't want to buy another textbook. For students who have taken BIOC 201, you can use that textbook as well. If you want to get the most out of the course, I highly recommend *Advanced Nutrition and Human Metabolism*, 7th edition. A supplemental textbook is *Lippincott's Illustrated Reviews: Biochemistry*, 8th edition, by Abali et al. This is the most recent edition. You can purchase this text at the UVM bookstore or through an online vendor. Older editions of *Lippincott* are just as good and can be purchased for very minimal expense (\$5) and I highly recommend *Lippincott* if you only want to invest minimally in a textbook.

Textbook Supplement: I will assign readings from the primary literature for each unit. These readings will be posted on Brightspace as PDF files.

Course Powerpoint slides: I will post the slides for the lectures by Monday afternoon prior to meeting in class on Tuesday. These slides will be in the "Lecture skeleton" folder on Brightspace under "Course Materials". I will provide a black and white hard copy version of this packet to be handed out in class. If you want color slides, you will have to print them out on your own. After each packet is finished, I will scan the notes and put them in a folder on Brightspace called "Lecture complete" after class.

Assigned Structures: You will have to know the structures of the 20 common amino acids, some of the coenzymes, and some structures of the metabolic intermediates that we study during the semester as determined by me. You will not have to draw them, but be able to recognize the structure.

Course Overview: The course will be divided into 5 units as described below.

Review Material: This material will be covered in video lectures that will be posted on the course BB site by January 1st, 2023. There will be 4 lectures. The 1st lecture is an introduction to the course. Lectures 2-4 cover basic concepts in biochemistry and organic chemistry that you have had in previous course work.

Unit 1: The Mediterranean Diet: This unit will cover the importance of essential fatty acids in the diet with a focus on the ratio of omega 6 to omega 3 fatty acids. We will explore the nutritional biochemistry of antioxidants that are rich in this diet such as vitamin C, vitamin E, selenium, and iodine. We discuss the importance of fiber in this diet and the mechanism by which it lowers cholesterol. The micromineral magnesium will be introduced. We may discuss alcohol metabolism.

Unit 2: Low Carbohydrate Diets (The Atkins Diet, Keto Diet). This unit will review basic carbohydrate metabolism including glycolysis, gluconeogenesis, and the TCA cycle. This unit will explore how high carbohydrate diets can lead to the synthesis of fat and we will look in depth at key enzymes in carbohydrate and fat metabolism. Some important B-vitamins involved in carbohydrate metabolism will be discussed time permitting.

Unit 3: Obesity and Diabetes: This unit will describe the causes of the development of type II diabetes, dysregulation of carbohydrate and fat metabolism, and current treatments. Hormones such as ghrelin and leptin that help regulate satiety and fat metabolism will be discussed.

Unit 4: Biochemistry of the B-complex vitamins (excluding B9 and B12) will be discussed. The biochemistry of the pentose phosphate pathway and the importance of thiamin will also be discussed. Vitamin K will be discussed in this unit.

Unit 5: We will explore the remaining B-vitamins as related to protein catabolism. There will be a focus on the biochemistry of vitamin B6 as it relates to amino acid metabolism, vitamin B9, and vitamin B12. Choline will also be discussed. Amino acid catabolism including the branched-chain amino acids and high protein diets will be discussed in this unit. Time permitting, we will discuss vitamins A and D. **If time runs out**, there will be a bonus lectures on vitamins A and D posted on Brightspace and this material would be for bonus questions on the exam.

Maybe some day: Life extension diets (caloric restriction). This unit will explore the science behind why caloric restriction has been shown to extend life in some organisms. There will be a focus on the biochemistry of oxidants and antioxidants including vitamin C, vitamin E, selenium, manganese, various phytochemicals, and iodine (connected with selenium).

Explanation of how your grade will be determined this semester:

Exam 1: Please take note. You can either complete the review material during the first two weeks of January, or the first week of class. In either case, the first exam will be on **Friday, January 19th through January 21st**. It is worth 4% of your final grade and consists of material that you have had in previous biochemistry and chemistry courses. **All exams will be conducted on the course Brightspace site.**

Grading:

Attendance	4%
Participation via Kahott	18%
Exam 1 Review:	4%
Exam 2:	18%
Exam 3:	18%
Exam 4:	18%
Exam 5:	20%
Total	100%

Exam 5: Please note that Exam 5 occurs during the final exam period and will be longer than the other exams and will therefore be weighted slightly heavier compared to exams 2, 3, and 4.

Note on Grading: The University has a Letter Grade/Quality Point Equivalent system for calculating cumulative grade point average. The scheme for implementing this system in this course is available from the Registrar's Office. Mid-term progress reports/warning letters will be issued (after the 2nd exam) for students with a C- or below. **Please note that I reserve the right to change any individual bracket by +/- 2%.**

Percentage	Letter Grade
100 - 97	A+ (4.0)
96 - 93	A (4.0)
92 - 90	A- (3.67)
89 - 87	B+ (3.33)
86 - 83	B (3.00)
82 - 80	B- (2.67)
79 - 77	C+ (2.33)
76 - 73	C (2.00)
72 - 70	C- (1.67)
69 - 67	D+ (1.33)
66 - 63	D (1.00)
60 - 62	D- (0.67)
< 60	F (0.00)

Grade Appeals: If you would like to contest a grade, please follow the procedures outlined in this policy: <http://www.uvm.edu/~uvmppg/ppg/student/gradeappeals.pdf>

Calculator Policy: The policy of the Department of Biochemistry is that graphing calculators (those that can store formulas) are not allowed for use on exams. Scientific calculators without the ability to store formulas are the only types of calculators permissible for exams. I recommend TI-30XA calculators (Texas Instruments). This calculator is available for \$10 from Staples.

University Student-Athlete Policy: "Students participating in intercollegiate athletics should plan their schedules with special care, recognizing the primary importance of all of their university academic responsibilities. Each semester, members of UVM varsity and junior varsity teams are responsible for submitting their planned schedule of athletic competitions in writing to their instructors by the end of the second full week of classes. Students and instructors should then discuss potential conflicts between course requirements and intercollegiate competitions. When an unavoidable conflict exists, the student and instructor should seek a resolution which permits the student to address the course requirement and participate in the athletic competition. The instructor has final authority on this matter."

Academic Integrity: Offenses against the UVM Code of Academic integrity are taken very seriously and suspected violations of the code will be forwarded to the Center for Student Ethics and Standards for further investigation. All students should read The University of Vermont's Code on Academic Integrity. This Code is available as a PDF file at the following web address: www.uvm.edu/policies/student/acadintegrity.pdf

Please take the time to read this policy. I will be following this policy strictly when dealing with cases of academic misconduct.

Code of Student Rights and Responsibilities:
www.uvm.edu/~uvmppg/ppg/student/studentcode.pdf

FERPA Rights Disclosure: The purpose of this policy is to communicate the rights of students regarding access to, and privacy of their student educational records as provided for in the Family Educational Rights and Privacy Act (FERPA) of 1974.
<http://www.uvm.edu/~uvmppg/ppg/student/ferpa.pdf>

Religious Holidays: The following statement is the University's policy on religious holidays: "Students have the right to practice the religion of their choice. Each semester students should submit in writing to their instructors by the end of the second full week of classes their documented religious holiday schedule for the semester. Faculty must permit students who miss work for the purpose of religious observance to make up this work."

ACCESS Policy: In keeping with University policy, any student with a documented disability interested in utilizing accommodations should contact ACCESS, the office of Disability Services on campus. ACCESS works with students and faculty in an interactive process to explore reasonable and appropriate accommodations via an accommodation letter to faculty with recommended accommodations as early as possible each semester. Contact ACCESS: A170 Living/Learning Center; [802-656-7753](tel:802-656-7753); access@uvm.edu; or www.uvm.edu/access.

Promoting Health & Safety:

The University of Vermont's number one priority is to support a healthy and safe community:

Center for Health and Wellbeing <http://www.uvm.edu/~chwb/>

Counseling & Psychiatry Services (CAPS) Phone: (802) 656-3340

C.A.R.E. If you are concerned about a UVM community member or are concerned about a specific event, we encourage you to contact the Dean of Students Office (802-656-3380). If you would like to remain anonymous, you can report your concerns online by visiting the Dean of Students website at <http://www.uvm.edu/~dos/>

Final exam policy: The University final exam policy outlines expectations during final exams and explains timing and process of examination period.

<http://www.uvm.edu/academics/catalogue2013-14/?Page=allpolicies.php&SM=policymenu.html&policy=Exams>

Class Logo: In the first year that I taught this course there was a contest to design a class logo for this course. The prize was \$100. The winning student design is shown below. Right beside it is a logo for a NASA for the Johnson Space Center's Nutritional Biochemistry Laboratory to study how omega-3 fatty acids affected bone density

(see https://blogs.nasa.gov/ISS_Science_Blog/2010/11/18/post_1290098111740/). **This year, I am doing something different.** Each student can provide ONE image that could represent the course, a lecture, a unit, a week in the course, or anything. I will use these images to enhance the course in the future. If you submit an image, you will earn **up to 2%** bonus towards your final grade. Your image must be a turned in as a digital image (jpeg, tiff, png). If you draw your image by hand, it should be high quality.



Lecture Schedule: The lecture schedule is given on below **and it is subject to change.**

Date	Lecture	Topic
1-16	5	Kahoot Review
1-18	6	Unit 1
1-19/1-21	Exam 1 on review material through Brightspace	
1-22	Last Day to add classes without permission of instructor	
1-23	7	Unit 1
1-25	8	Unit 1
1-29	Add/Drop, Pass/No Pass, Audit Deadline	
1-30	9	Unit 1
2-1	10	Unit 1
2-6	11	Unit 1
2-8	12	Unit 1
2-13	13	Unit 1
2-16/2-23	Exam 2 on unit 1 through Brightspace	
2-15	14	Unit 2
2-20	15	Unit 2
2-22	16	Unit 2
2-27	17	Unit 2
2-29	18	Unit 2
3-5	Town Meeting Day	NO CLASS
3-7	19	Review
3-7/3-16	Exam 3 on unit 2 through Brightspace	
3-12	Spring Break	NO CLASS
3-14	Spring Break	NO CLASS
3-19	20	Unit 3
3-21	21	Unit 3
3-26	22	Unit 3
3-28	23	Unit 3
4-1	Last Day to Withdraw (receive a W)	
4-2	24	Unit 3
4-4	25	Unit 3
4-9	26	Unit 3

4-11	27	Unit 4/5
4-12/4-19	Exam 4 on Unit 3 through BB	
4-16	28	Unit 4/5
4-18	29	Unit 4/5
4-23	30	Unit 4/5
4-25	31	Unit 4/5
4-30	32	Unit 4/5
5-2	33	Unit 4/5
5-2	Images due for extra credit	

5-3 Last Day of Classes

The 5th exam will be on units 4/5 and will occur on the Final Exam Day scheduled by the Registrar. This day has not yet been announced on the UVM calendar. This exam, like your other exams, will be on the course Brightspace site.