# Biochemistry 263 Syllabus – Spring 2020
# Nutritional Biochemistry

**Lectures:** TR 10:05 a.m. – 11:20 a.m. in Given C443

**Instructor:** Robert Hondal, Ph.D. Department of Biochemistry. Given Building, B413. Phone: 656-8282. Email: Robert.Hondal@uvm.edu Office hours will be by appointment. Please send me an email to schedule an appointment.

**Course Description:** A special emphasis of this course is the biochemistry of all of the vitamins and some of the major minerals and microminerals important for human nutrition. In addition, there is special emphasis on important metabolic pathways in the context of various popular diets such as the "Atkins Diet" and "Mediterranean Diet", and how these pathways are altered in response to a change in diet. As such, this course also describes the chemistry, biology, and nutriture of carbohydates, proteins, and lipids that are important to the various types of diets that are discussed.

**Prerequisites:** PBIO 185, NFS 183, BIOC 201, or BIOC 205 is a prerequisite for this course.

**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. A supplemental textbook is *Lippincott's Illustrated Reviews: Biochemistry*, 7th edition, by Denise R. Ferrier. 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 BB as PDF files.

**Course Powerpoint slides:** I will post the slides for the lectures by Monday of each week in the "Lecture skeleton" folder on BB. I will provide a black and white version of this packet before 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 BB 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.

**Course Overview:** The course will be divided into 7 units as described below.

**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 the B vitamins involved in fatty acid metabolism (B2 and B3) as well as the antioxidants that are rich in this diet such as vitamin C, vitamin E, selenium, and iodine. 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:** Biochemistry of the B-complex vitamins (excluding B9 and B12) fat-soluble vitamins (A, D, and K), calcium, and phosphorous will be discussed.

**Unit 4:** Biochemistry of the pentose phosphate pathway and the importance of thiamin.

**Unit 5:** High protein diets (Dukan diet/paleo diet). This unit will examine protein catabolism in the liver and muscle tissues. There will be a focus on the biochemistry of vitamin B6 as it relates to amino acid metabolism, vitamin B9, and vitamin B12. The urea cycle and the catabolism of the aromatic amino acids will be explored and described. Choline will also be discussed.

**Unit 6:** Amino acid catabolism including the branched-chain amino acids.

**Unit 7:** 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.

**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:**

**Assessment:** There will be an online assessment of your biochemistry knowledge from your previous course work in biochemistry. Please complete this assessment before class begins on Tuesday. You only have to complete this assessment to get 1% of your grade. Incorrect answers will not hurt your grade. The assessment is done so I can become more familiar with things students know and do not know.

**Fake Nutrition News Assignment:** Every day we are immersed in nutrition news. Some of it is real, and some of it is false or "fake nutrition news". How can you tell which is "real" and which is "fake"? For this assignment, I want you to find a news story from the web about magnesium, copper, iron and zinc. You will find one story in each quarter of the course (one before each exam) as outlined in the course schedule on the final pages. I have posted an example on BB. The grading for this assignment is given below. **I will post some information about each of these nutrients on BB and you will be responsible for this information for the exam.**

1. Copy and paste the URL and the title of the story onto a PPT slide. **(10%)**

2. Write a brief synopsis of the story (1 paragraph). This synopsis should also be on a PPT slide. It could be on the same slide or if you need more space, continue onto the next slide. **(45%)**

3. Tell me how you determined how the web article was "fake nutrition news" (1 paragraph). **(45%)**

4. The whole file (somewhere between 2 and 3 PPT slides) should be emailed to me by the due date. **I will NOT ACCEPT LATE ASSIGNMENTS.**

**Grading:**

| | |
|---|---|
| Assessment | 1% |
| Magnesium Fake News | 2.75% |
| Copper Fake News | 2.75% |
| Iron Fake News | 2.75% |
| Zinc Fake News | 2.75% |
| Exam 1: | 22% |
| Exam 2: | 22% |
| Exam 3: | 22% |
| Exam 4: | 22% |
| Total | 100% |

**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

**Food in Class/Food Allergies:** Please let me know via email if you have a food allergy that affects your health and safety. I will be giving out food in class as a reward for answering the review questions that I cover as part of the lecture. I try to make these foods related to what we are discussing. For example, when we cover vitamin C, I will be handed out oranges as a reward for answering a question. You may immediately consume your reward in class if you wish.

**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; access@uvm.edu; or www.uvm.edu/access.

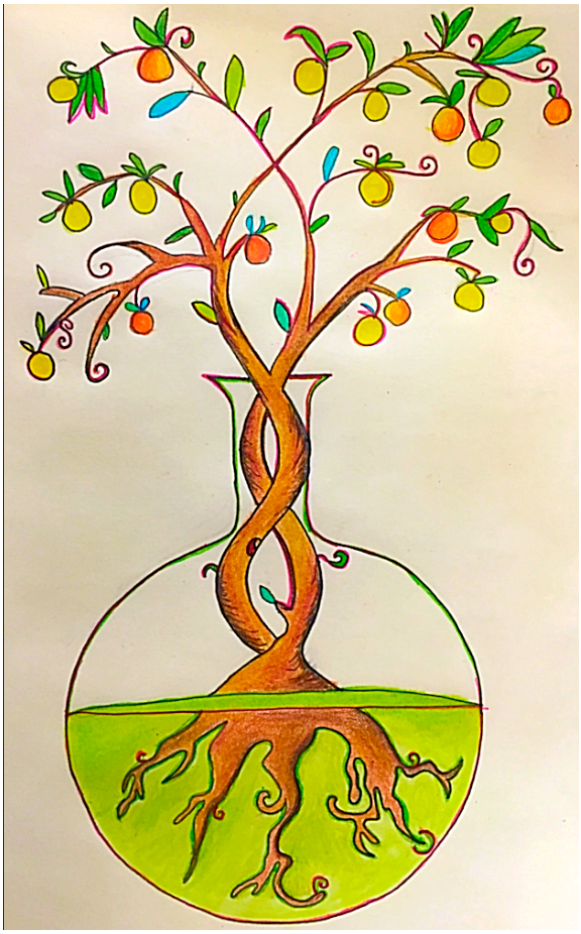
**Promoting Health & Safety:**
The University of Vermont's number one priority is to support a healthy and safe community:

> ***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/). Perhaps you would like to give designing a logo for the class a try? No cash prize this year, sorry.




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

| Date | Lecture | Topic |
|---|---|---|
| 1-14 | 1 | Course introduction/review |
| 1-16 | 2 | review |
| **1-17** | **Last Day to add/drop classes** | |
| **1-20** | **MLK DAY** | **NO CLASS** |
| 1-21 | 3 | Unit 1 |
| 1-23 | 4 | Unit 1 |
| **1-27** | **Add/Drop, Pass/No Pass, Audit Deadline** | |
| 1-28 | 5 | Unit 1 |
| 1-30 | 6 | Unit 1 |
| 2-4 | 7 | Unit 1 |
| 2-6 | 8 | Unit 1/2 |
| **2-6** | **Magnesium Fake News Assignment Due** | |
| 2-11 | 9 | **Unit 1 + review Exam** |
| 2-13 | 10 | Unit 2 |
| **2-17** | **President's Day** | **NO CLASS** |
| 2-18 | 11 | Unit 2 |
| 2-20 | 12 | Unit 2 |
| 2-25 | 13 | Unit 2 |
| 2-27 | 14 | Unit 2 |
| **3-2** | **Copper Fake News Assignment Due** | |
| **3-3** | **Town Meeting Day** | **NO CLASS** |
| 3-5 | 15 | **Unit 2 Exam** |
| **3-10** | **NO CLASS/Spring Break** | |
| **3-12** | **NO CLASS/Spring Break** | |
| 3-17 | 16 | Unit 3 |
| 3-19 | 17 | Unit 3 |
| 3-24 | 18 | Unit 3 |
| 3-26 | 19 | Unit 4 |
| **3-27** | **Last Day to Withdraw (receive a W)** | |
| 3-31 | 20 | Unit 4 |

| | | |
|---|---|---|
| 4-2 | 21 | Unit 4 |
| 4-7 | 22 | Unit 4 |
| **4-7** | **Iron Fake News Assignment Due** | |
| 4-9 | 23 | **Unit 3/4 Exam** |
| 4-14 | 24 | Unit 5 |
| 4-16 | 25 | Unit 5 |
| 4-21 | 26 | Unit 6 |
| 4-23 | 27 | Unit 6 |
| 4-28 | 28 | Unit 7 |
| 4-30 | 29 | Unit 7 |
| **5-1** | **Last Day of Classes** | |
| **5-1** | **Zinc Fake News Assignment Due** | |
| **5-5** | **Unit 5/6/7 Exam** | **1:30 p.m. to 4:15 p.m. in Given C443** |