

Course Goals: BCH 480 lays the foundation for understanding the chemistry of life. The main goal of this course is to learn how small molecules (amino acids, nucleic acids, lipids, sugars) are assembled into intricately structured macromolecules (proteins, RNA and DNA) or macroscopic structures (membranes). The course aims to build an appreciation of the physical and chemical basis for the assembly of these complex structures, which are responsible for life. The course ends with a study of the process by which stored information (DNA) is first transcribed into RNA and then translated into proteins via the genetic code. BCH 480 provides the basis for understanding catabolic and anabolic metabolism and the means by which living organisms communicate with their environment. These topics will be the heart of BCH 482, Advanced Biochemistry II.

Meeting time: 10:00 – 10:50 am, MWF in UH 210

Instructor: Bruce Bowler, Chem 310, 406-243-6114, bruce.bowler@umontana.edu

Office Hours: M 3 – 4 pm; W 11:30 am – 12:30 pm; Th 1:30 – 2:30 pm; Chem 310, or by appointment.

Text: Garrett and Grisham *Biochemistry*, 4th, 5th or 6th edition may be used.

Course website: [Moodle](#)

Evaluation:

a) Three in-class midterm exams – 200 points each – lowest dropped	50%
b) 10 in-class quizzes – 25 points each – lowest two dropped	25%
c) 2-hour final exam – 200 points	25%

Course Content and Exam Date Overview:

Topic	Text Chapter
Overview	1
Properties of Water	2
Thermodynamics of Life	3
Amino Acids	4
Proteins: Primary Structure, Purification, Analysis	5
Exam 1: Wednesday, Sept. 27, in class. Chapters 1 – 4, 5.1 – 5.4	
Proteins: Secondary, Tertiary and Quaternary Structure	6
Carbohydrates	7
Lipids	8
Exam 2: Wednesday, Oct. 25, in class. Chapters 5.5 – 5.8, 6 – 8	
Membranes and Membrane Transport	9
Nucleotides and Nucleic Acids	10
Nucleic Acid Structure	11
Recombinant DNA	12
DNA Replication, Recombination and Repair	28
Exam 3: Wednesday, Nov. 29, in class; Chapters 9 – 12, 28.1 – 28.5	
Transcription and Regulation of Gene Expression	29
Protein Synthesis	30
Final Exam: Comprehensive, Tuesday, Dec. 12, 8:00 – 10:00 am, UH 210	

Course Information:

Prerequisites: Biochemistry is a subdiscipline of chemistry. Therefore, students need strong preparation in the basic physical and chemical principles presented in **College Chemistry** and the structure and reactivity of carbon compounds covered in **Organic Chemistry**. Students who are less well prepared in these prerequisites will be expected to review material from general and organic chemistry as needed, so that they can master the material in BCH 480.

Requirements: A detailed schedule of topics and readings is provided below. Students should study all assigned reading in the text carefully prior to the corresponding lectures. Homework problems will be assigned each week to aid in learning the material covered in the lecture. Answers will be provided on Moodle. Similar questions could appear on quizzes and exams.

Quizzes and Exams: There are 10 in-class quizzes. They will be administered every Friday during the last 15 minutes of class on weeks when there is no midterm exam, except during the week of the Veterans Day Holiday and last week of classes when there will be a quiz on Wednesday. Your two lowest quiz scores will be dropped. There are three midterm exams. All three are during class on Wednesdays. Your lowest midterm score will be dropped. Even though your two lowest quiz scores and your lowest midterm exam score will be dropped, it is to your advantage to take all quizzes and midterm exams. ***Because your two lowest quiz scores and your lowest exam score will be dropped, there will be no makeup quizzes or exams.*** The final exam is **comprehensive**. If you have a legitimate conflict with an exam/quiz date (travelling with a varsity team, religious holiday, etc.), you must inform the instructor **at least 1 week before** the exam/quiz to make alternate arrangements.

Graduate Increment: For graduate students taking BCH 480 for graduate credit, there will be a two-part graduate increment. The first part will involve a literature search to find a journal article related to course content. The second part will involve writing a critical summary of the article. These assignments will replace the two lowest of 8 quiz grades. Details of the assignment will be provided in a separate document.

Student participation: You are encouraged to ask questions during class, to clarify details of the lecture or the material in the text. Questions relevant to your own interests with respect to research, human health, etc. are also welcome.

Moodle Supplement: There will be a Moodle Supplement for BCH 480, which will provide:

- Lecture notes, posted in advance of class
- Practice Exams posted in advance of midterm and final exams
- Answers to homework problems
- Answer keys for quizzes and exams, after the graded exam/quiz is returned
- Weekly announcements: quiz/exam reminders, assigned homework problems, etc.

COVID safety in the classroom:

- Masks are not required. However, if you prefer to wear a mask, please feel free to do so.
- If you feel sick and/or are exhibiting COVID-19 symptoms, please don't come to class and contact the Curry Health Center at (406) 243-4330.
- If you are required to isolate or quarantine, you will receive support to ensure continued academic progress. The Moodle supplement should allow you to keep abreast of the course material. If you have to quarantine, please contact me as soon as possible (email or phone) regarding other accommodations you may need as a result of quarantine.
- COVID-19 vaccinations and boosters are available at the Curry Health Center.

Course and University Policies:

- The \pm grading system will be employed.
 - See the [Catalog for Academic Policies and Procedures](#) which includes grading policies
- Unless otherwise specified, you will only be allowed a pen or pencil and calculators for quizzes and exams.
- Students are encouraged to work together to master the material in this course including solving homework problems, sharing information or resources, and testing each other's understanding of the material. Those are all acceptable forms of collaboration. However, all written work on exams and quizzes is expected to be each student's own work.
- See the [Student Conduct Code](#) for the definition and potential consequences of academic misconduct and plagiarism.
- Information on disability accommodations is available on the [University of Montana Accessibility Website](#).
- Last day to add a class on CyberBear without instructor consent is Wednesday, Sept. 6, 2023, by 5:00 pm.
- Last date to add/drop on CyberBear without a fee and with a refund, change grade mode without instructor consent or withdraw from UM with a partial refund is Monday, September 18, 2023, by 5:00 pm. An instructor override is needed to add a class.
- Last date to drop without approval from the dean is Monday, Oct. 30, 2023, at 5:00 pm using the add/drop link in CyberBear. A "W" will be assigned. After this date a grade of WP or WF will be assigned by the instructor. A fee of \$20 is assessed for each add/drop after September 18, 2023.
- Courses may not be dropped after Friday, December 8, 2023, at 5:00 pm. More details on add/drop policies are available in the [Autumn 2023 Calendar page](#) on the Registrar's website.

Detailed Schedule and Readings:

Month	Date	Day	Topic	Reading
August	28	M	Course Overview	1.1 – 1.2
	30	W	Introduction	1.3 – 1.6
September	1	F	Properties of Water;	2.1
	4	M	Labor Day Holiday, no class	
	6	W	pH and Acid/Base Chemistry	2.2 – 2.4
	8	F	Introduction to Thermodynamics; Quiz 1	3.1 – 3.2
	11	M	High energy molecules and energy coupling	3.3 – 3.8
	13	W	Intro to amino acids	4.1
	15	F	Acid-base properties of amino acids; Quiz 2	4.2 – 4.4
	18	M	Spectroscopy of amino acids; peptide bonds	4.5 – 4.7
	20	W	Introduction to protein structure and purification	5.1 – 5.2
	22	F	Amino acid analysis and protein sequencing; Quiz 3	5.3 – 5.4
	25	M	Protein sequence alignment	5.5
27	W	Exam 1 (Chapters 1 – 4 and 5.1 – 5.4)		
29	F	Peptide synthesis and protein function	5.6 – 5.8	
October	2	M	Protein secondary structure	6.1 – 6.3
	4	W	Protein tertiary structure	6.4
	6	F	Protein quaternary structure; Quiz 4	6.5
	9	M	Carbohydrates: monosaccharides and their chemistry	7.1 – 7.2
	11	W	Carbohydrates: oligosaccharides	7.3 – 7.7
	13	F	Lipids: fatty acids and glycerophospholipids; Quiz 5	8.1 – 8.3

	16	M	Lipids: sphingolipids, steroids, lipid signaling	8.4 – 8.9
	18	W	Membranes: physical properties, fluid mosaic model	9.1
	20	F	Membranes: membrane proteins; Quiz 6	9.2
	23	M	Membranes: membrane organization and dynamics	9.3 – 9.4
	25	W	Exam 2 (Chapters 5.5 – 5.8, 6 – 8)	
	27	F	Membranes: membrane transport and transport proteins	9.5 – 9.10
	30	M	Nucleic Acids: Bases, nucleosides, and nucleotides	10.1 – 10.3
November	1	W	Nucleic Acids: DNA, RNA, restriction enzymes	10.4 – 10.6
	3	F	DNA: Sequencing, structure, and properties; Quiz 7	11.1 – 11.3
	6	M	DNA: supercoiling and chromosome structure	11.4 – 11.5
	8	W	DNA: chemical synthesis; RNA: structure; Quiz 8	11.6 – 11.7
	10	F	Veterans Day Holiday – no class	
	13	M	Recombinant DNA: cloning	12.1
	15	W	Recombinant DNA: libraries, expression, PCR, mutagenesis	12.2 – 12.6
	17	F	DNA Metabolism: DNA replication, polymerases; Quiz 9	28.1 – 28.2
	20	M	DNA Metabolism: Eukaryotic replication	28.3 – 28.5
	22	W	Thanksgiving Holiday, no class	
	24	F	Thanksgiving Holiday, no class	
	27	M	DNA Metabolism: recombination	28.6 – 28.7
	29	W	Exam 3 (Chapters 9 – 12, 28.1 – 28.5)	
December	1	F	DNA Metabolism: repair DNA Transcription: prokaryotes	28.8 – 28.10 29.1 – 29.2
	4	M	DNA Transcription: eukaryotes	29.3 – 29.6
	6	W	Protein Synthesis: Genetic code, tRNAs; Quiz 10	30.1 – 30.3
	8	F	Protein Synthesis: Ribosomes and translation	30.4 – 30.6
	12	T	Final Exam (Comprehensive), 8:00 – 10:00 am, UH 210	