Course Information

The chemistry of biological systems. 3 hours of lecture.

Textbook

Fundamentals of Biochemistry
(Jakubowski and Flatt)

Link:
https://bio.libretexts.org/Bookshelves/Biochemistry/Fundamentals_of_Biochemistry_(Jakubowski_and_Flatt)

Lecture

Mon Wed Fri
9:30p - 10:20p
CHEM 108

Professor

Dr. Johnny Rodriguez

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Office

CHEM 465

Office Hours

Mon. 2:30p-3:30p
Wed. 11:30a-12:30p

Dropping the Course, Changing Sections, Incompletes

For courses offered by the Chemistry Department, if you are interested in dropping or adding, or changing a section use PAWS. Feel free to reach out if you have any difficulty with this. Sometimes a professor's signature may be necessary to make changes (Teaching Assistants are not allowed to sign add/drop forms). Students with a C or above may request an incomplete if they are unable to complete the course.

Support is Available

We all need help with something at some point in our lives. If you need special accommodations or find yourself not understanding the assigned readings, lectures, and assignments, please set up an appointment to meet with me; I'm happy to meet outside of the scheduled class time (in-person or virtually).

University students encounter setbacks from time to time. If you encounter difficulties and need assistance, it's important to reach out. Consider discussing the situation with me, another instructor, or an academic advisor. Follow the link below to learn about resources that assist with wellness and academic success at UW Milwaukee:
https://uwm.edu/mentalhealth/
If you are in immediate crisis, please call the National Suicide Prevention Lifeline at 1-800-273-TALK (8255).

Specifications Grading: A Mastery-Based Approach

One of the issues with widely used grading systems is their limited ability to convey a student's understanding of the subject matter. For example, what level of understanding does a student truly have if they receive a "C" grade in a course? Within traditional grading structures, achieving a score of 70% on an exam is deemed a passing score, yet it may not reflect full mastery of the content. Extrapolating this, if a student consistently scores 70% across all exams in a course, they would ultimately be awarded a "C" grade, despite potential gaps in their comprehension of the material.

For this course, the percentage on Canvas does not provide an indication of your grade; instead, grades are assigned with an emphasis on content mastery using a pass/no pass approach for the Unit Exams. That is, students only receive credit for exams where they demonstrate content mastery (80% is the passing score). This is known as "specifications grading", where students must meet specifications (i.e., criteria) to earn a specific grade. The specifications required to earn grade are provided below.

Grade Group	Criteria That Must Be Met
A	Score at least 80% on all **five** Unit Exams
B	Score at least 80% on **four** Unit Exams
C	Score at least 80% on **three** Unit Exams
D	Score at least 80% on **two** Unit Exams
F	Score at least 80% on **less than 2** Unit Exams

Assigning +/–

The plus or minus for a student's final course grades (e.g., B^- vs. B vs. B^+) will be assigned based on a student's performance on the Final Exam. This amounts to the Final Exam being approximately 5% of a student's total grade. The Final Exam will only move students within a grade group. For example, if a student earned 80% on all five Unit Exams and scored low (or opted not to take the final), their final course grade would be an A^-.

Given the emphasis of the course is on mastering the content, students will be provided five additional opportunities to retake a Unit Exam. For more information see "Course Schedule", which provides an overview of when the Unit Exams and Retake Exams are scheduled.

Description of Course Components

Unit Exams

Our course is divided into five Unit Exams that will be administered in person. Unit Exams will involve multiple-choice and free-response questions that are written using the Learning Objectives for each Unit. If students do not earn a passing score on a Unit Exam (set at 80%), they will have multiple opportunities to retake the exams. During the in-class Retake Exams, students can take any of the previous Unit Exams to improve their score and potentially move to a different grade group.

Problem Sets

Each Unit will have corresponding problem-sets that are posted on Canvas. Students interested in additional practice problems are encouraged to look at the resources and exercises provided at the end of each chapter in the textbook. Given the problem-sets are intended to reflect what students will see on the exams, students are encouraged to work through them even though they are ungraded.

Lecture

There is a large body of research that indicates student-centered approaches improve student learning. The structure of the lecture focuses on student-centered learning where students work in groups and actively construct ideas together. Attendance is beneficial for this class because you learn more when working with your peers; however, lecture is not required.

Final Exam

The final exam will be administered in-person and will be a student's last opportunity to demonstrate content mastery. The final exam will involve two parts:

Pt. 1 - cumulative multiple-choice exam (50 minutes), which will be used to determine a student's final course grade (see grading scheme above)

Pt. 2 - students that have passed at least three Unit Exams will have the opportunity to retake a Unit Exam.

Note: If a student has not yet passed three Unit Exams, instead of Pt.2 above, the student will have the opportunity to take an in-person interview-based Unit Exam.

Academic Integrity

When you graduate from UW Milwaukee, we want you to feel confident that your diploma represents the knowledge and skills you developed through your coursework. When we all build and practice a culture of academic integrity in our programs, courses, and inside ourselves, we can feel confident in the value of our degrees. Regardless of the field you enter after school, conducting yourselves with integrity is an important part of contributing productively to society. For example, in the context of science, we assume that data collected, the associated conclusions, and the developed products (e.g., vaccines) can be trusted. Academic integrity involves working honestly, transparently, and ethically in every assignment and in every interaction to support our community of academic excellence. If you are not sure what behaviors would be considered dishonest, feel free to reach out and ask.

Exams. Academic integrity related to exams involves actions and behaviors that ensure the exam is fair for all students and represents an accurate measure of your understanding. Giving or receiving information from another source during an exam (e.g., peer, notes, online, devices, etc.) or after an exam (e.g., talking with a student that has not yet taken the exam) is dishonest, providing an unfair advantage and resulting in an inaccurate measure of content mastery.

Lecture and Problem Sets. Academic integrity related to lecture and homework involves actions and behaviors that ensure fair distribution of work, where all students participate, make intellectual contributions, and actively learn the content. Students are encouraged to work in groups during lecture and to complete the problem sets. Working in a group without participating or simply copying from another person/online resource is dishonest, contributing to an unfair learning environment and inhibiting your opportunity to learn the course content. Although answers recorded may have been reached as a group, students should make sure they agree with the answers and are able to solve the problem on their own.

GER Statement: Learning Outcomes for this Course

This course meets UWM General Education Requirements (GER) in the Division of Social Sciences, which is defined as "A branch of science concerned with the physical world and its phenomena and with discovering the laws governing them". The branches of Natural Divisional Learning Outcomes for General Education Sciences—such as astronomy, geosciences, biological sciences, chemistry, physics—that deal primarily with matter, energy, and their interrelations and transformations; with living organisms and vital processes; with the laws and phenomena relating to organisms, plants and animal life; with the physical processes and phenomena of particular systems; and with the physical properties and composition of nature and its products. Students will be able to:

(a) understand and apply the major concepts of a natural science discipline, including its breadth and its relationship to other disciplines; and

(b) explain and illustrate the relationships between experiments, models, theories and laws.

UW Learning Goal

As part of the UW Shared Learning Goals, this course is also expected to **Critical and Creative Thinking Skills** including inquiry, problem solving, and higher-order qualitative and quantitative reasoning.

University Policies

Departmental policies regulating the conduct of this course can be found in the main office of the Chemistry Building (CHEM 240). Additional university policies can be found at: https://uwm.edu/secu/syllabus-links/

Course Absences

Unfortunately, illnesses, death in the family, or other tragic and inconvenient events are part of life. I understand how difficult this can be and there are opportunities to make up missing work.

As stated above, Unit Exams will be administered in-person. If students miss a Unit Exam or did not earn a passing score (at least 80%), they can retake one Unit Exam the next time an Exam Retake opportunity is provided. Since five Exam Retakes are built into the course, no additional retakes will be provided. Students have the flexibility of using as many or as few of the Exam Retakes as they would like, depending on their performance, schedule, and other life events.

Course Schedule

Week	Date	Lecture	CSI
1	09.01	**No Class**	**No CSI**
	09.03	Introduction; Lesson 1.1 - Amino Acids	
	09.05	Lesson 1.1 - Continued	
2	09.08	Lesson 1.2 - Protein Structure	Problem Set 1A
	09.10	Lesson 1.2 - Continued	
	09.12	Lesson 1.3 - Lab Techniques and Applications	
3	09.15	Lesson 1.3 - Continued	Problem Set 1B
	09.17	Finish Unit 1	
	09.19	**Unit 1 Exam**	
4	09.22	Lesson 2.1 - Enzyme Catalysis	Problem Set 2A
	09.24	Lesson 2.2 - Enzyme Kinetics	
	09.26	Lesson 2.2 - Continued	
5	09.29	Lesson 2.3 - Enzyme Inhibition	Problem Set 2B
	10.01	Lesson 2.3 - Continued	
	10.03	Lesson 2.4 - Lab Techniques and Applications; **Unit Exam Retake**	
6	10.06	Lesson 2.4 - Continued	Problem Set 2C
	10.08	Finish Unit 2	
	10.10	**Unit 2 Exam**	
7	10.13	Lesson 3.1 - Nucleic Acids	Problem Set 3A
	10.15	Lesson 3.1 - Continued	
	10.17	Lesson 3.2 - DNA Replication	
8	10.20	Lesson 3.3 - Transcription and Translation	Problem Set 3B
	10.22	Lesson 3.3 - Continued	
	10.24	Lesson 3.4 - Lab Techniques and Applications; **Unit Exam Retake**	
9	10.27	Lesson 3.4 – Continued;	Problem Set 3C
	10.29	Finish Unit 3	
	10.31	**Unit 3 Exam**	
10	11.03	Lesson 4.1 - Carbohydrate Structure	Problem Set 4A
	11.05	Lesson 4.1 - Continued	
	11.07	Lesson 4.2 - Carbohydrate Reactions	
11	11.10	Lesson 4.3 - Overview of Lipids	Problem Set 4B

	11.12	Lesson 4.3 - Continued	
	11.14	Lesson 4.4 - Lab Techniques and Applications; **Unit Exam Retake**	
12	11.17	Lesson 4.4 - Continued	Problem Set 4C
	11.19	Finish Unit 4	
	11.21	**Unit 4 Exam**	
13	11.24	**No Class**	**No CSI**
	11.26	**No Class**	
	11.28	**No Class**	
14	12.01	Lesson 5.1 - Cofactors	Problem Set 5A
	12.03	Lesson 5.2 – Biochemical Processes	
	12.05	Lesson 5.2 – Continued; **Unit Exam Retake**	
15	12.08	Finish Unit 5	Problem Set 5B
	12.10	**Unit 5 Exam**	
	12.12	**No Class**	
16	**TBA**	**Final Exam** **Pt.1:** Multiple-Choice Cumulative Exam (Units 1-5, 50 minutes) **Pt.2:** Last Unit Exam Retake	**No CSI**

Learning Objectives

Unit	Lessons	Learning Objectives
Unit 1	**Lesson 1.1** - Amino Acids	• Students can describe and identify the general structure and properties of amino acids • Students can classify amino acids based on the chemistry of their side chains and explain changes in structure based on pH
	Lesson 1.2 - Protein Structure	• Students can differentiate between primary, secondary, and tertiary, and quaternary protein structures, including explaining relevant stabilizing interactions
	Lesson 1.3 - Lab Techniques and Applications	• Students can apply their knowledge of the structure and properties of macromolecules to analyze and interpret data related to common biochemical techniques
Unit 2	**Lesson 2.1** - Enzyme Catalysis	• Students can explain the thermodynamics related to catalyzed reactions, uncatalyzed reactions, and enzyme-substrate interactions, including drawing and interpreting reaction coordinate diagrams
	Lesson 2.2 - Enzyme Kinetics	• Students can interpret different representations related to enzyme kinetics (e.g., enzyme-substrate chemical reactions, Michaelis-Menten equation, kinetics graphs) to draw conclusions • Students can perform calculations involving kinetic parameters
	Lesson 2.3 - Enzyme Inhibition	• Students can differentiate between enzyme inhibitors (competitive, noncompetitive, uncompetitive, mixed inhibition) and explain how they impact kinetic parameters and

		representations related to enzyme kinetics (e.g., enzyme-substrate chemical reactions, Michaelis-Menten equation, kinetics graphs)
	Lesson 2.4 - Lab Techniques and Applications	• Students can apply their knowledge of the structure and properties of macromolecules to analyze and interpret data related to common biochemical techniques
Unit 3	**Lesson 3.1** - Nucleic Acids	• Students can describe and identify the general structure and properties of nucleic acids, including differentiating between DNA and RNA • Students explain relevant stabilizing interactions within nucleic acids
	Lesson 3.2 - DNA Replication	• Students can apply their knowledge of the structure and properties DNA to explain the process of DNA replication
	Lesson 3.3 - Transcription and Translation	• Students can apply their knowledge of the structure and properties of DNA and RNA to explain the process of transcription and translation
	Lesson 3.4 - Lab Techniques and Applications	• Students can apply their knowledge of the structure and properties of macromolecules to analyze and interpret data related to common biochemical techniques
Unit 4	**Lesson 4.1** - Carbohydrate Structure	• Students can describe and identify the general structure and properties of carbohydrates
	Lesson 4.2 – Carbohydrate Reactions	• Students can apply their knowledge of the structure and properties carbohydrates to explain relevant common reactions
	Lesson 4.3 - Overview of Lipids	• Students can describe and identify the general structure and properties of lipids and lipid membranes
	Lesson 4.4 - Lab Techniques and Applications	• Students can apply their knowledge of the structure and properties of macromolecules to analyze and interpret data related to common biochemical techniques
Unit 5	**Lesson 5.1** - Metabolic Energy	• Students can describe and identify the general structure and properties of ATP/ADP and NAD^+/NADH, including their role in metabolism
	Lesson 5.2 - Glycolysis	• Students can identify the key non-reversible enzymes, rate-limiting step, and explain relevant regulatory mechanisms within the context of glycolysis
	Lesson 5.3 - Citric Acid Cycle	• Students can identify the key non-reversible enzymes, rate-limiting step, and explain relevant regulatory mechanisms within the context of the citric acid cycle