



Master Course Syllabus

Term, Year, and Section

Course Information

CHM-330 Biochemistry

4 credit hours

Course Dates/Times - Online

Instructor Information

Name:

Email Address:

Office Hours:

Response Time

If you need to contact me directly, my preference is that you email me. Please allow 24 hours for me to respond to emails Monday through Friday and 48 hours on the weekend.

Communicating With the Instructor

When questions arise throughout the course, please remember to check the following resources for an answer before reaching out to me:

1. Course Syllabus
2. Announcements
3. The Question Center discussion board

Question Center Discussion

The Question Center Discussion is a great place for you to ask questions and get answers from your peers and from me. You are encouraged to post your questions here before reaching out directly to me unless it is a time-sensitive matter. If you have questions of a personal nature such as relating to a personal emergency, questioning a grade on an assignment, or something else that needs to be communicated privately, you are welcome to contact me directly via email or phone.

Technology Help

If you have a question about the technology being used in the course, please contact the Doane University Service Center for assistance, their contact information is listed later in the syllabus. If there are third-party tools utilized in the course, please reach out to them directly.

Catalog Description

Biochemistry is the study of chemical processes at work in the context of living organisms. Students successfully completing this course will demonstrate an understanding of the molecular structure and function of biomolecules, as well as chemical transformation, energetics and basic regulation of central metabolic pathways. In the lab students will gain experience with common methodologies for investigating proteins.

Course Overview

This course is based around asking the question "How do living organisms transform nutrients into the building blocks needed to thrive?" and probing the different areas in which biochemistry is able to answer this question.

Course Prerequisites

For successful completion of this course it is recommended that students are familiar with General Chemistry I, II, and Organic Chemistry I, or their equivalents.

Course Textbook and Materials Will Be Integrated into Your Canvas Portal

Tymoczko's Biochemistry: A Short Course (Six Month Access) John L. Tymoczko (*Carleton College*) , Jeremy M. Berg , Lubert Stryer (*Stanford University School of Medicine*)

ISBN-10: 1-319-01560-3; ISBN-13: 978-1-319-01560-2;

Optional (hard copy of book)

Biochemistry: A Short Course
John L. Tymoczko (*Carleton College*) , Jeremy M. Berg , Lubert Stryer (*Stanford University School of Medicine*)

Third edition

ISBN-10: 1-4641-2613-5; ISBN-13: 978-1-4641-2613-0

Course Objectives

At the completion of this course students will be able to:

1. Characterize and differentiate between the molecular building blocks and how

those assemble to create macromolecules or structures (Nucleic acids, proteins, polysaccharides, lipid assembly).

2. Dissect the processes for the breakdown of sugar (glycolysis and the citric acid cycle) and be able to link together how that leads to energy (ATP) production
3. Diagram metabolic pathways, metabolite flow and simple regulation of pathways.
4. Describe how macromolecules function, such as ligand binding to proteins and how enzymes work. Perform calculations to find binding and kinetic parameters.
5. Analyze inhibition and regulation of protein function.
6. Make data observation from standard biochemical techniques including, but not limited to: gel electrophoresis, purification of macromolecules such as proteins or nucleic acids, assays, enzyme kinetics, UV-Vis spectroscopy.

Module	Topic	Assessments & Activities	Aligned Objectives
1	<p>Amino Acids and Protein Structure</p> <p>Chapters 1, 3, 4, 5.2</p>	<p>a) Analyze the base structure and side chains of all amino acids and assess why certain ones are termed "essential"</p> <p>b) Compare primary, secondary, tertiary and quaternary structural elements of proteins</p> <p>c) Set-up (online lab) separation techniques for proteins, specifically electrophoresis, column chromatography, and the iso-electric point.</p>	1, 6, 7
2	<p>Enzyme structure and function and Control of Enzyme Activity</p> <p>Chapters 6, 7, & 8</p>	<p>a) Evaluate the function of enzymes in biological reactions and the necessity of catalysts</p> <p>b) Contrast K_m, V_{max}, and k_{cat} and determine how</p>	1, 4, 5, 6

Module	Topic	Assessments & Activities	Aligned Objectives
		<p>they relate to enzyme activity</p> <p>c) Derive the Michaelis-Menten equation</p> <p>d) Classify how different types of inhibitors can affect enzymes</p> <p>e) Interpret the mechanism of how a catalytic triad/serine proteases work</p>	
3	<p>Heme, Plasma Membranes and Bio signaling</p> <p>Chapters 9, 10, 11, 12, 13, 14, 15</p>	<p>a) Evaluate the basic concept of metabolism and how blood oxygen is controlled</p> <p>b) Compare the structure and function of carbohydrates and lipids</p> <p>c) Analyze the structure and function of plasma membranes</p> <p>d) Examine the process of signal transduction, the role of proteins in the process, and how hormones regulate the process.</p>	1, 4, 6
4	<p>Glycolysis, Gluconeogenesis, Citric Acid Cycle, Oxidative phosphorylation</p> <p>Chapters 16, 17, 18, 19, 20, 21</p>	<p>a) Contrast the processes of glycolysis and gluconeogenesis</p> <p>b) Dissect the Citric Acid Cycle</p> <p>c) Determine how molecules from the electron transport</p>	1,2,3,4,5

Module	Topic	Assessments & Activities	Aligned Objectives
		chain can be turned into energy for the cell. d) Examine the components needed for cellular respiration	
5	Glycogen and Lipid Metabolism Chapters 24, 25, 26, 27, 28	a) Assess the processes of glycogen degradation and synthesis b) Examine the Pentose Phosphate Pathway c) Compare the processes of fatty acid degradation and synthesis	1,2,3,4
6	Lipid and Nitrogen Metabolism Chapters 29, 30, 31, 32	a) Dissect the processes of lipid, cholesterol and amino acid synthesis b) Contrast the structure and function of various triglycerides c) Analyze the urea cycle and nucleotide metabolism	1,2,3,4
7	Nucleic Acid Structure, DNA Replication and RNA synthesis Chapters 33, 34, 35, 36	a) Evaluate the basic structures DNA and how RNA is differentiated b) Differentiate DNA Replication and Repair c) Label the machinery required to undergo DNA Replication d) Determine the process of RNA synthesis	1,2,3,6
8	Gene expression and Protein synthesis	a) Classify gene expression and RNA	1,2,3 6

Module	Topic	Assessments & Activities	Aligned Objectives
	Chapters 37, 39, 40	processing in Eukaryotes b) Interpret the mechanism of protein translation and how DNA, mRNA and tRNA are used to make protein c) Analyze the parts of the ribosome and how it can be used to make proteins	

Course Requirements

This is an online course and there will **not be any face-to-face class sessions**. All communications, submissions of assignments, course interactions, and posting of grades will utilize Canvas LMS (<https://doane.instructure.com>). You must have a **reliable internet connection** throughout the duration of the course.

Attendance/Participation

Attendance in an online course means logging onto Canvas regularly and participating in all the activities that are posted in the course. In addition, check your Doane University email account and the Canvas Announcements regularly, as I may send important information about the course.

Class Preparation

Preparation for class means reading the assigned readings and reviewing all information required for that module. You should plan to work on this course every day. Regular engagement is expected for online courses.

Netiquette Guidelines

At heart, Netiquette (etiquette for the Internet) is simple, good manners and business courtesy. Some of it may seem basic, but some infringements can result in major problems for others or can create an unintended insult to another user. The guidelines are adapted from The Core Rules of Netiquette by Virginia Shea (1994). For more information, please review the [Netiquette Guidelines](#) in the Student Resource Center.

Computer Requirements

For the successful use of Canvas please refer to Doane University's [minimum computer requirements](#). This also includes:

- Reliable computer and internet connection
- A web browser (Chrome or Mozilla Firefox)
- Adobe Acrobat Reader (free)
- Word processing software—Microsoft Word or Google Docs
- Webcam and mic*

*For privacy purposes, use of a webcam is **optional** during video conferencing and recording.

Campus Network or Canvas Outage

When access to Canvas is not available for an extended period of time (greater than one entire evening - 6 pm until 11 pm) you can reasonably expect that the due date for assignments will be changed to the next day.

Drop and Add Dates

If you feel it is necessary to withdraw from the course, please contact your advisor for full details on the types of withdrawals that are available and their procedures.

Federal requirements state that students must complete 75% of the coursework to be eligible to receive an incomplete for the course. If students fall more than two weeks behind, they cannot meet this requirement.

Academic Integrity

Fundamental to our mission, our core values, and our reputation, Doane University adheres to high academic standards. Students of Doane University are expected to conduct themselves in a manner reflecting personal and professional integrity. Disciplinary actions may be taken against students whose academic behavior is not congruent with the expectations of the University. Students are responsible for adhering to the standards detailed in this policy. Not being familiar with these standards does not mean that the students will not be accountable for adherence to them. Additional details on the Academic Integrity policy for violating academic integrity are published in the undergraduate and graduate catalogs. Please review [Doane University's Academic Integrity Policy](#).

Course Grading

Submitting Assignments

All assignments, unless otherwise communicated to me, must be submitted via Canvas. Each assignment will have a designated place to submit your work. All materials, assignments, and deadlines are subject to change without prior notice. It is your responsibility to stay in touch with me and review the course site (Canvas), including Announcements, regularly to learn about changes to assignments or due dates.

Grading Scale

Assignment of letter grades is based on a percentage of points earned. The letter grade will correspond with the following percentages achieved. All course requirements must be completed before a grade is assigned.

Grade	Percentage
A+	97-100%
A	93-96%
A-	90-92%
B+	87-89%
B	83-86%
B-	80-82%
C+	77-79%
C	73-76%
C-	70-72%
D+	67-69%
D	63-66%
D-	60-62%
F	<60%

Module Schedule/Grading Scheme

- **Basic Concept Worksheet** - (10% of total grade)

The basic concept worksheet will guide the student through the introductory level information for each module. Worksheets will consist of drawing structures, graphs or metabolic pathways (in pencil) to give students both hands-on experience in drawing biochemical structures as well as serve personal notes which the student can refer directly back to. Students will be expected to print out each worksheet and either scan or take a photo of their finished product and email it to the instructor.

- **Chapter Quizzes**- (5% of total grade)

Chapter quizzes is a series of questions (either multiple-choice or fill-in-the-blank) based on the information covered in the assigned chapters and homework. This is meant to serve as a practice opportunity to test your knowledge of the individual chapters. Each student will have 2 chances to answer each question. By the end of this assignment, all chapters for the week should be read.

- **Exams:** Proctored by Third Part Provider - (**40%** of total grade)

Exams will cover concepts from the assigned readings, homework and labs, usually stressing ideas from the basic knowledge worksheet. They will consist of 30-40 questions. There will be a mix of basic concepts and deeper thinking questions. You will need to go through the Third-Party Provider tutorial (Module 0) in the course to learn how to have your exam proctored by the online software.

- **Online-Lab - (15%** of total grade)

Online labs are designed to be a fun and "hands-on" way to observe the concepts taught within the chapters. Each week there will be a different lab assigned as well as a series of questions following the lab. **IPAD/ELECTRONIC PEN ASSIGNMENTS WILL NOT BE ACCEPTED FOR CREDIT PLEASE USE NORMAL PEN OR PENCIL ON A PRINTED WORKSHEET OR IN A NOTEBOOK.**

GROUP Discussions/Presentations -

- **Discussion Board (10%** of total grade)

These discussion boards are designed to ask more deep-thinking questions which may or may not have a correct answer. You will work in groups to generate an initial response to a prompt and after all responses are submitted, your group will be asked to give feedback to another group's response.

- **Advanced Concepts Presentation (15%** of total grade))

These presentations are designed to allow students the opportunity to take on the role of the instructor. Each presentation will be around 5-10 minutes and use information from the chapter and in some cases, real-world applications. If needed, supplementary materials (i.e. journal articles) that show examples of the concepts will be included. Students will be expected to record videos of themselves talking through the material covered in the assignment. Feel free to use PowerPoint or any other means to convey your point.

- **Final Exam - (5%** of total grade) o Students will complete a final exam based on all the information covered in the class

Proctored Assessments:

This course may contain proctored quizzes & exams, which are **not optional**. For these proctored events, Doane uses a third-party provider, which is a secure, online proctoring service that allows you to complete your exam from any chosen location at any time. Proctoring provides your instructor with the assurance that any suspicious activity by test takers will be monitored and reported. The cost of the proctoring is included in the tuition and fees for this course.

Late or Missed Assignments (at the discretion of the faculty member)

All assignments must be completed and turned in to finish the course. Furthermore, all assessment types (assignments, discussions, labs, quizzes, final exam) must be submitted by the due date to receive credit. Unless you discuss an extension with me before the due date, late submissions will receive zero points.

Assignment & Assessment Feedback (at the discretion of the faculty member)

Please allow up to one week from date of submission for grades and any feedback the instructor wishes to provide back on written assignments. Be sure to review my feedback, as this will help you reflect on what you have learned while receiving suggestions for improvement.

Grade Appeals

Students who believe that their grade was miscalculated due to a mathematical error should contact the instructor within **ten (10) days of the grade posting**. A student is encouraged to talk with their advisor to offer an assessment of the concern and to clarify the steps of the appeal process. More information is published in the [Undergraduate and Graduate Catalogs](#).

Studying and Preparation Time

The course requires you to spend time preparing and completing assignments. A three-credit course requires 144 hours of student work. Therefore, expect to spend approximately 9 hours a week preparing for and actively participating in this 16-week course.

Tutor Me

Students will have access to a free tutor me service within their Canvas account. You can connect with a live free tutor or submit a paper to get feedback before submitting.

Technical Support

If you are in need of technical assistance, please access the [Self-Service Portal](#). You may reach the help desk at 402-826-8411 or by email at helpdesk@doane.edu.

Accessibility Statement

In compliance with the Rehabilitation Act of 1973, Section 504, and the Americans with Disabilities Act of 1990, professional disability specialists and support staff at Doane University facilitate a comprehensive range of academic support services and accommodations for qualified students with disabilities. Doane University staff coordinate student transitions from high schools and community colleges, conduct in-service training for faculty and staff, enable the resolution of accessibility issues, conduct community outreach, and facilitate collaboration among Doane University staff on disability policies, procedures, and accommodations.

Accommodations & Disability Services

[Doane University's Disability Services Office](#) will provide guidance on accommodations and universal access. To request accommodations please complete the [Self-Identification Form](#) and visit the website for additional information as soon as possible.

Academic Support

Doane University offers all of its students access to [Academic Support](#) services.

Title IX Requirements: Mandatory Reporting

At Doane, all university employees, including faculty, are considered Mandatory Reporters. As a Mandatory Reporter, I am required to report incidents of sexual misconduct and relationship violence to the Title IX Coordinator and, thus, cannot guarantee confidentiality. This means that if you tell me about an incident of sexual harassment, sexual assault, domestic violence, dating violence, stalking and/or other forms of prohibited discrimination, I have to share the information with the University's Title IX Coordinator. My report does not mean that you are officially reporting the incident. This process is in place to ensure you have access to and are able to receive the support and resources you need. For additional information, including confidential resources, please visit the [Campus Advocacy, Prevention, and Education \(CAPE\) Project](#).

Anti-Harassment Policy

Doane University, referred to as the "University", is committed to providing a safe and non-discriminatory learning, living, and working environment for all members of the University community. This policy addresses the University's responsibilities under Title IX, the Violence Against Women Reauthorization Act of 2013, and the

Jeanne Clery Disclosure of Campus Security Policy and Campus Crime Statistics Act ("Clery Act"). More information is published in the [Student Handbooks](#).

Instructional Technology Accessibility and Privacy Policies

[Technology accessibility and privacy policies](#) are available on the Student Resource Center within the Canvas LMS.

Syllabus Addendum & Disclaimer

I (the instructor) view the course syllabus as an educational contract between myself and each student. Every effort will be made to avoid changing the course schedule but the possibility exists that unforeseen events will make syllabus changes necessary. I reserve the right to make changes to the syllabus as deemed necessary. Students will be notified in a timely manner of any syllabus changes via email or in the course site Announcements. Please remember to check your Doane University email and the course site Announcements often.

Syllabus Changes

The instructor and Doane University reserve the right to make changes as necessary to this course syllabus. All students will be notified of any changes.

Syllabus Addendum

Each student is responsible for being aware of the policies, resources, and expectations as specified in the [Doane Syllabus Addendum](#).