

Colorado State University Department of Biochemistry
BC 351-002 Principles of Biochemistry
Spring Semester 2023

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Drop-in hours: Monday 2:00 – 3:00PM or by appointment

LA':
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Study Sessions: TBD
Location: TBA

Schedule: Yates 104 MTWR 12:00PM-12:50 PM

Prerequisites: CHEM 245 or CHEM 341 or CHEM 345; LIFE 102 or BZ 110 or BZ 120

Textbook: The course materials are available through the CSU Inclusive Access Program. These materials include online homework, quizzes and/or access to the eBook. The access is **REQUIRED** for this class, so you can utilize the bookstore program, or you must find it on your own. Please watch for emails from the "CSU Bookstore" about charges to your student account and instructions for accessing the book. These emails will be sent to your official "@colostate.edu" address. Also please look at the course "Start Here" page for more information about accessing the book. Finally, you can also find information about the text book login in the "**Manage eResource**" tab on Canvas.

Learning goals: Principles of Biochemistry is designed to introduce you to major topics in the field of biochemistry. The class is broken into four major units: 1. Parts, Driving Forces, and Processes 2. Structural Biology 3. Macromolecular Function 4. Metabolism. In the first unit we will focus exclusively on chemical concepts followed by protein structure. In the 3rd unit we will focus on enzymology, ligand binding, and membrane transport. The final unit will focus on carbohydrate metabolism and cellular respiration. A complete list of Learning objectives will be placed on Canvas. Students will be strongly encouraged throughout the semester to read and understand these objectives. Below are the learning goals for the semester:

Upon completion of BC351 students will...

1. *Understand the chemical properties of the molecular components of living organisms and the physical basis for interactions within and between these molecules.*
2. *Understand the physical driving forces operating in biochemical processes of living organisms.*
3. *Understand the dynamic and regulatory nature of biochemical pathways needed to maintain biological steady states.*

Canvas:

I will be using Canvas this semester in order to make available to you lecture notes, exam study materials, and lecture recordings. On Canvas, you will find the following:

- a. Course home page:
 - i. When you login to this course this will be the default page.
- b. Announcements:
 - i. I will make periodic announcements within Canvas to keep you abreast with the “happening” of the course.
- c. Modules:
 - i. There are several modules in this class. The 1st module is the syllabus module that contains the “Start here” page. If you haven’t already, please go to this page and work your way through the first steps for this class.
 - ii. There are several modules that correspond directly to a chapter within the book. In each of these modules you will find:
 1. A PowerPoint file for the module’s set of lectures.
 - iii. There are 4 exam study materials modules:
 1. These modules contain: study guides, practice exams, learning objectives. They are found immediately following the last chapter for that exam.
- d. Grades:
 - i. I will report the grades on all your assignments in this tool as well as your final grade.
- e. Echo360
 - i. This page will take you to recordings of each day’s lecture.

Attendance:

Attendance to every class is strongly encouraged and will be a determining factor for your success in this class. If you miss a class, you will be held responsible for all material covered.

Exam Attendance: Attendance to exams is absolutely mandatory. Obvious exceptions, such as a death in the family, hospitalization and extreme illnesses will be accepted and dealt with appropriately on a case-by-case basis.

SDC arrangements: If you are a student who will need accommodations in this class due to a disability or chronic health condition, the SDC will need to provide me the SDC accommodation letter. If you do not already have these accommodation letters, please contact the SDC as soon as possible to initiate the process of setting up accommodations. The SDC is located in room 121 of the TILT building. You can reach them by phone at 970-491-6385 or visit www.disabilitycenter.colostate.edu

Assignments: This class consists of 14-chapter quizzes (5 points each), 4 exams (100 points each), 2 drag-n-drop assignment (30 points), 1 group work assignment (10 points), 4 structural tutorials and accompanying quiz, a pre-course and post-course evaluation, as detailed below:

1. Chapter Quizzes – 70 points
 - a. These will be presented through the book. There will be a total of 14 quizzes equaling 70 points. You will have two opportunities to take the quizzes. Your highest score of the two attempts will be recorded. Due dates for the final attempt on each quiz are listed on the schedule.
2. Glycolysis and Citric Acid Cycle Drag-n-drop assignment – 15 points
 - a. These assignments will be presented in the book in Chapter 11 and 12. In class discussion will follow. As the time approaches I will address how and when to complete this assignment.
3. Group work assignment – 10 points
 - a. This assignment will be done in Chapter 8 and will consist of two parts: 1. A pre-quiz (taken by each individual student) and 2. An in-class group worksheet. As the time approaches I will be giving more information about this.
4. Structural tutorials – 40 points
 - a. These assignments will be presented in the book with accompanying quizzes for chapters 4, 5, and 8 material. In class discussion will follow. As the time approaches I will be giving you more information about this.
5. Pre-course Evaluation – 10 points
 - a. This evaluation will be given to find out what each student knows about biochemistry prior to taking the class. Ten points will be given to all students taking the evaluation.
6. Post-course Evaluation – 10 points

- a. This evaluation will be at the end of the semester to track learning gains. Ten points will be given to all students taking the evaluation.
- 7. Course surveys – 5 points
 - a. These will be administered during the semester and our for educational research purposes.
- 8. Exams - 400 points
 - a. Four unit exams will be given each worth 100 points.

Late Work: I won't accept late work, nor provide quiz extensions, unless a student can provide documented evidence of an event outside of their control that caused them to miss the assignments original due date.

Grades:

<u>Grade</u>	<u>Percentage</u>
A+	97-100%
A	90 - < 97%
B+	87 - < 90%
B	80 - < 87%
C+	77 - < 80%
C	70 - < 77%
D	60 - < 70%
F	below 60%

<u>Grade Breakdown:</u>	<u>Assignment</u>	<u>Points Counted</u>
	4 Unit Exams (100 points each)	400
	2 Course Evaluations	20
	2 Course Surveys	5
	Drag-n-drop assignments	30
	Chapter 8 group work	10
	Structural tutorials	40
	<u>14 Quizzes (5 points each)</u>	<u>70</u>
	Total	575

Extra Credit: I will use “iClicker Reef” this semester. This program is an alternative to iclickers with significantly more flexibility in the type of questions I can ask. The **program costs you nothing** but you will need to make a user account if you haven't already done so.

Here is a link to the [student iClicker information](#) page where you can learn how to make a student account and also how to prepare your device to answer questions in the classroom. Questions can be responded to from any mobile device (smart phone, ipads or other tablets) or laptop. For mobile devices you will want to download the [mobile app](#). For laptops you will be able to log into the [iClicker Reef website](#). I do NOT recommend using the iClicker remote as not all questions I will ask can be responded to from this device.

I am going to give only **extra credit points** for the use of iClickers. If you participate in **80%** of the polls I will give you **10 points of extra credit**. The iClickers will be used essentially every day in class, and you are responsible for bringing a device that allows you to respond each day.

In addition to iClickers over the course of the semester you will find “practice materials” in the book for each chapter. These materials consist of quizzes comprised of multiple choice and short answer questions. They are optional however, I feel that they will be very helpful in preparing you for the exams. As an incentive to do this I will give **5 points extra credit** to any student that completes **12 or more chapters** of these questions. Keep in mind that you do not have to get all the questions correct to get the extra credit, you simply need to do them and record a **numerical score greater than zero on them**. Finally, keep in mind that the practice quizzes for each chapter will close as follows:

Chapters 1-4: Close 2/20 at 11:59PM (same day as exam 1)

Chapters 5-8: Close 3/9 at 11:59PM (same day as exam 2)

Chapters 9-11: Close 4/17 at 11:59PM (same day as exam 3)

Chapters 12-14: Close 5/8 at 11:59PM (same day as exam 4)

In other words, you will need to work on these throughout the semester!

Finally, I am going to give an additional **5 points of extra credit** to any student that attends **70% or more** of the TA’s recitation sections. Four recitation sections will be given a week by the TA’s. You are welcome to attend all of them if you like but you cannot receive double credit. Tracking attendance to these sessions will be discussed in individual TA recitations.

Academic Integrity: This course will adhere to the Academic Integrity Policy found in the Colorado State University [General Catalog](#).

End of the Semester: I know that there will be a handful of people at the end of the semester that need “just a few points” to get the grade they desire. The extra credit assignments listed above will be designated as THE mechanism to get these points. **I WILL NOT NEGOTIATE GRADES AT THE END OF THE SEMESTER.** It is my expectation that you will accept the grade assigned to you and take responsibility for YOUR work throughout the semester. Grade negotiation always leads to someone receiving special treatment and is a policy that I cannot abide as I desire to maintain an atmosphere of academic honesty and integrity. If you are concerned about your grade please come and talk to me **DURING** the semester when something **can be done** about it.

Lecture Schedule
SUBJECT TO CHANGE

DATE	DAY	TOPIC	TEXT	QUIZ (DUE DATE)	OTHER ASSIGNMENTS (DUE DATE)
1/17	T	Introduction & Physical Considerations for Living Systems – Lecture 1	Chapter 1		
1/18	W	Course Pre-test			
1/19	R	Physical Considerations for Living Systems – Lecture 1	Chapter 1		
1/23	M	Physical Considerations for Living Systems – Lecture 1	Chapter 1		
1/24	T	Physical Considerations for Living Systems – Lecture 1	Chapter 1	1 (1/24)	
1/25	W	Chemical Considerations for Living Systems – Lecture 2	Chapter 2		
1/26	R	Chemical Considerations for Living Systems – Lecture 2	Chapter 2		
1/30	M	Chemical Considerations for Living Systems – Lecture 2	Chapter 2		
1/31	T	Chemical Considerations for Living Systems – Lecture 2	Chapter 2	2 (1/31)	
2/1	W	Biological Considerations for Living Systems (Gene Expression) – Lecture 3	Chapter 3	3 (2/2)	
2/2	R	Amino Acids: The Building Blocks of Proteins – Lecture 4	Chapter 4		<i>Amino Acid Structural tutorial (DUE 2/2)</i>
2/6	M	Amino Acids: The Building Blocks of Proteins – Lecture 4	Chapter 4	4 (2/7)	<i>Peptide Backbone/Torsion Angles Tutorial (DUE 2/6)</i>
2/7	T	The Three-Dimensional Structure of Proteins –	Chapter 5		

		Lecture 5			
2/8	W	The Three-Dimensional Structure of Proteins – Lecture 5	Chapter 5		<i>Secondary Structure Tutorial (DUE 2/8)</i>
2/9	R	The Three-Dimensional Structure of Proteins – Lecture 5	Chapter 5		
2/13	M	The Three-Dimensional Structure of Proteins – Lecture 5	Chapter 5		
2/14	T	The Three-Dimensional Structure of Proteins – Lecture 5	Chapter 5		
2/15	W	The Three-Dimensional Structure of Proteins – Lecture 5	Chapter 5		
2/16	R	The Three-Dimensional Structure of Proteins – Lecture 5	Chapter 5	5 (2/16)	
2/20	M	Exam I (Chapters 1 - Chapter 5)			
2/21	T	Enzymes: The Catalyst of Biological Life – Lecture 6	Chapter 6		
2/22	W	Enzymes: The Catalyst of Biological Life – Lecture 6	Chapter 6		
2/23	R	Enzymes: The Catalyst of Biological Life – Lecture 6	Chapter 6	6 (2/28)	
2/27	M	Enzyme Kinetics: Measuring and Comparing Enzyme's Abilities – Lecture 7	Chapter 7		
2/28	T	Enzyme Kinetics: Measuring and Comparing Enzyme's Abilities – Lecture 7	Chapter 7	7 (3/1)	
3/1	W	Ligand Binding, Allostery, and Cooperativity – Lecture 8	Chapter 8		<i>Mb/Hb Structural Tutorial (DUE 3/1)</i>
3/2	R	Ligand Binding, Allostery, and Cooperativity – Lecture 8	Chapter 8		
3/6	M	Ligand Binding, Allostery, and Cooperativity – Lecture 8	Chapter 8		<i>Hb Structure Tutorial Quiz (DUE 3/5)</i>
3/7	T	Ligand Binding, Allostery, and Cooperativity – Lecture 8	Chapter 8		
3/8	W	Ligand Binding, Allostery, and Cooperativity – Lecture 8	Chapter 8	8 (3/8)	
3/9	R	Exam II (From Protein Folding Lecture 5 - 8)			
3/13-3/17		Spring Break			
3/20	M	The Lipid Bilayer, Membrane Proteins, and			

		Transport – Lecture 9			
3/21	T	The Lipid Bilayer, Membrane Proteins, and Transport – Lecture 9	Chapter 9		
3/22	W	The Lipid Bilayer, Membrane Proteins, and Transport – Lecture 9	Chapter 9		
3/23	R	The Lipid Bilayer, Membrane Proteins, and Transport – Lecture 9	Chapter 9		
3/27	M	The Lipid Bilayer, Membrane Proteins, and Transport – Lecture 9	Chapter 9	9 (3/28)	
3/28	T	Bioenergetics and Metabolic Regulation – Lecture 10	Chapter 10		
3/29	W	Bioenergetics and Metabolic Regulation – Lecture 10	Chapter 10		
3/30	R	Bioenergetics and Metabolic Regulation – Lecture 10	Chapter 10		
4/3	M	Bioenergetics and Metabolic Regulation – Lecture 10	Chapter 10		
4/4	T	Bioenergetics and Metabolic Regulation – Lecture 10	Chapter 10	10 (4/4)	
4/5	W	Carbohydrate Metabolism – Lecture 11	Chapter 11		<i>Glycolysis Drag-n-drop (DUE 4/5)</i>
4/6	R	Carbohydrate Metabolism – Lecture 11	Chapter 11		
4/10	M	Carbohydrate Metabolism – Lecture 11	Chapter 11		
4/11	T	Carbohydrate Metabolism – Lecture 11	Chapter 11		
4/12	W	Carbohydrate Metabolism – Lecture 11	Chapter 11	11 (4/13)	
4/13	R	Catch-up			
4/17	M	Exam III (Lectures 9-11)			
4/18	T	The Citric Acid Cycle- Lecture 12	Chapter 12		
4/19	W	The Citric Acid Cycle- Lecture 12	Chapter 12		<i>Citric acid cycle Drag-n-drop (DUE 4/19)</i>
4/20	R	The Citric Acid Cycle- Lecture 12	Chapter 12	12 (4/21)	
4/24	M	Oxidative Phosphorylation – Lecture 13	Chapter 13		

4/25	T	Oxidative Phosphorylation – Lecture 13	Chapter 13		
4/26	W	Oxidative Phosphorylation – Lecture 13	Chapter 13		
4/27	R	Oxidative Phosphorylation – Lecture 13	Chapter 13		
5/1	M	Oxidative Phosphorylation – Lecture 13	Chapter 13	<i>13 (5/2)</i>	
5/2	T	Lipid Catabolism – Lecture 14	Chapter 14		
5/3	W	Lipid Catabolism – Lecture 14	Chapter 14	<i>14 (5/4)</i>	
5/4	R	Catch-up			
5/8	M	Exam IV (Lectures 12-14) and Post Course Eval – 11:50AM-1:50PM Yates 104			