

Colorado State University Department of Biochemistry
BC 351-002 Principles of Biochemistry
Fall Semester 2019

Instructor: Aaron Sholders Ph.D.
Office: AZ E206D
Phone: 491-7916
E-mail: aaron.sholders@colostate.edu
Office Hours: Monday 2:00 – 4:00PM or by appointment

TA: Ben Young
Julie Rizzuti
Zach Shephard
Grace Marrow
Joe Heckman
Mason Hageman

Email: benyoungdisc@gmail.com (Ben)
julierizzuti@gmail.com (Julie)
zshepard1216@gmail.com (Zach)
gvmorrow@rams.colostate.edu (Grace)
Joe.Heckman@rams.colostate.edu (Joe)
mhagaman@rams.colostate.edu (Mason)

Study Sessions: TBD
Location: TBA

Schedule: Yates 104 MTRF 1:00PM-1:50 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. **Please watch for emails from the “CSU Bookstore”** about accessing the materials, ‘opting out’ as well as charges to your student account. These emails will be sent to your official Colorado State University address. Attached to the email are directions to access the materials, as well as your access code will be listed at the bottom. Access the online materials, for free, until the Add/Drop date. **After that date, your student account will be charged for the full semester access.** These materials include online homework, quizzes and 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.

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 a number of modules in this class. The 1st module is the syllabus module that contains:
 1. Syllabus and Course schedule
 2. Student Guide to Polleverywhere
 3. Course Learning goals/objectives
 - ii. eBook Information includes
 1. Link to the text
 2. Document on how to use the texts gradebook
 3. Recording on how to use the text
 - iii. TA recitation information
 1. Topics and attendance sheet.
 - iv. There are 14 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.
 - v. 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 particular 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. In the case of illness, a note from a physician (or other health professional) will be required to reschedule the exam and a **maximum of two days** delay will be given in most cases. Additional time beyond the two day maximum will require an additional note from the physician (or other health professional). Once approved, students will be given a time and place that is convenient for myself or a TA to proctor the exam. If this time does not work with the rescheduling student, they will be required to reschedule their exam with the University testing center. All fees incurred will be covered by the student and the student is responsible for sending the reservation to my email address. If this is NOT done the exam will not be sent to the University testing center.

SDC arrangements: If you are a student who will need accommodations in this class due to a disability or chronic health condition, please 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), 14 summary/reflection questions (15 points total), 2 drag-n-drop assignment (30 points), 1 group work assignment (10 points), 3 structural tutorials and accompanying quiz 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. Summary/Reflection Questions- 15 points
 - a. These will be presented in the book in the “Summary/Reflection” tab. Each chapter will have a single question worth 1 point each. There are no “right” or “wrong” answers for these questions, BUT you will need to do them and take them seriously to receive credit for them. Due dates for each question are listed on the schedule.
 3. 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.
 4. 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.
 5. Structural tutorials – 30 points
 - a. These assignments will be presented in the book with accompanying quizzes for chapter 4 and 5 material. In class discussion will follow. As the time approaches I will be giving you more information about this.
 6. Exams - 400 points
 - a. I am going to give four exams. Each one will be worth 100 points.

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%

Grade Breakdown:

<u>Assignment</u>	<u>Points Counted</u>
4 Exams (100 points each)	400
Summary/Reflection questions	15
Drag-n-drop assignments	30
Chapter 8 group work	10
Structural tutorials	30
<u>14 Quizzes (5 points each)</u>	<u>70</u>
Total	555

Extra Credit: I will use “Poll Everywhere” this semester. Poll everywhere 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 at the following URL:

https://PollEv.com/thegeek/register?group_key=u171n2zL6don8TvBeHZdghipz

Here is a link to a “[Student Guide to Polleverywhere](#)” (which I also posted on Canvas in the “Syllabus” module) that you will want to look over. Once you make your user account you will be able to participate in a wide variety of questions I plan to present using this system. Questions can be responded to from any mobile device (smart phone, ipads or other tablets), laptop or computer. From these devices you can either text answers or login from a browser and respond to polls from that format as well. You can also respond via SMS text messaging on a standard flip-phone. If text messaging is your mode of choice understand that your plans standard text messaging rates will apply.

I am going to give only **extra credit points** for the use of Poll Everywhere. If you participate in **80%** of the polls I will give you **5 points of extra credit**. Poll everywhere 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 Poll Everywhere 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 **85% or more** of these questions. Keep in mind that you *do not have to get the questions correct to get the extra credit, you simply need to do them.*

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. Two recitation sections (at least) will be given a week by the TA’s. You are welcome to attend both 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)	REFLECT? (DUE DATE)	OTHER ASSIGNMENTS (DUE DATE)
8/26	M	Introduction & Physical Considerations for Living Systems – Lecture 1	Chapter 1			
8/27	T	Physical Considerations for Living Systems – Lecture 1	Chapter 1			
8/29	R	Physical Considerations for Living Systems – Lecture 1	Chapter 1			
8/30	F	Physical Considerations for Living Systems – Lecture 1	Chapter 1	1 (9/3)	1 (8/30)	
9/3	T	Chemical Considerations for Living Systems – Lecture 2	Chapter 2			
9/5	R	Chemical Considerations for Living Systems – Lecture 2	Chapter 2			
9/6	F	Chemical Considerations for Living Systems – Lecture 2	Chapter 2			
9/9	M	Chemical Considerations for Living Systems – Lecture 2	Chapter 2	2 (9/10)	2 (9/9)	
9/10	T	Biological Considerations for Living Systems (Gene Expression) – Lecture 3	Chapter 3	3 (9/10)	3 (9/10)	
9/12	R	Amino Acids: The Building Blocks of Proteins – Lecture 4	Chapter 4	4 (9/17)	4 (9/13)	<i>Amino Acid Structural tutorial (DUE 9/17)</i>

9/13	F	The Three-Dimensional Structure of Proteins – Lecture 5	Chapter 5			<i>Peptide Backbone/Torsion Angles Tutorial (DUE 9/13 at 1PM)</i>
9/16	M	The Three-Dimensional Structure of Proteins – Lecture 5	Chapter 5			<i>Secondary Structure Tutorial (DUE 9/16 at 1PM)</i>
9/17	T	The Three-Dimensional Structure of Proteins – Lecture 5	Chapter 5			
9/19	R	The Three-Dimensional Structure of Proteins – Lecture 5	Chapter 5			
9/20	F	The Three-Dimensional Structure of Proteins – Lecture 5	Chapter 5			
9/23	M	Catch-up				
9/24	T	Exam I (Chapters 1-Through Quaternary Structure in Chapter 5)				
9/26	R	The Three-Dimensional Structure of Proteins – Lecture 5	Chapter 5			
9/27	F	The Three-Dimensional Structure of Proteins – Lecture 5	Chapter 5	5 (10/1)	5 (9/27)	
9/30	M	Enzymes: The Catalyst of Biological Life – Lecture 6	Chapter 6			
10/1	T	Enzymes: The Catalyst of Biological Life – Lecture 6	Chapter 6			
10/3	R	Enzymes: The Catalyst of Biological Life – Lecture 6	Chapter 6			
10/4	F	Enzymes: The Catalyst of Biological Life – Lecture 6	Chapter 6	6 (10/8)	6 (10/3)	
10/7	M	Enzyme Kinetics: Measuring and Comparing Enzyme's Abilities – Lecture 7	Chapter 7			
10/8	T	Enzyme Kinetics: Measuring and Comparing Enzyme's Abilities – Lecture 7	Chapter 7	7 (10/8)	7 (10/4)	
10/10	R	Ligand Binding, Allostery, and Cooperativity – Lecture 8	Chapter 8			
10/11	F	Ligand Binding, Allostery, and Cooperativity – Lecture 8	Chapter 8			
10/14	M	Ligand Binding, Allostery, and Cooperativity – Lecture 8	Chapter 8			

10/15	T	Ligand Binding, Allostery, and Cooperativity – Lecture 8	Chapter 8			<i>Hb Structure Tutorial (DUE 10/15 at 1PM)</i>
10/17	R	Ligand Binding, Allostery, and Cooperativity – Lecture 8	Chapter 8	8 (10/18)	8 (10/18)	
10/18	F	Catch-up				
10/21	M	Exam II (From Protein Folding Lecture 5 - 8) LAST DAY TO WITHDRAW				
10/22	T	The Lipid Bilayer, Membrane Proteins, and Transport – Lecture 9	Chapter 9			
10/24	R	The Lipid Bilayer, Membrane Proteins, and Transport – Lecture 9	Chapter 9			
10/25	F	The Lipid Bilayer, Membrane Proteins, and Transport – Lecture 9	Chapter 9			
10/28	M	The Lipid Bilayer, Membrane Proteins, and Transport – Lecture 9	Chapter 9	9 (10/29)	9 (10/28)	
10/29	T	Bioenergetics and Metabolic Regulation – Lecture 10	Chapter 10			
10/31	R	Bioenergetics and Metabolic Regulation – Lecture 10	Chapter 10			
11/1	F	Bioenergetics and Metabolic Regulation – Lecture 10	Chapter 10			
11/4	M	Bioenergetics and Metabolic Regulation – Lecture 10	Chapter 10	10 (11/5)	10 (11/4)	
11/5	T	Carbohydrate Metabolism – Lecture 11	Chapter 11			<i>Glycolysis Drag-n- drop (DUE 11/5 at 1PM)</i>
11/7	R	Carbohydrate Metabolism – Lecture 11	Chapter 11			
11/8	F	Carbohydrate Metabolism – Lecture 11	Chapter 11			
11/11	M	Carbohydrate Metabolism – Lecture 11	Chapter 11			
11/12	T	Carbohydrate Metabolism – Lecture 11	Chapter 11	11 (11/12)	11 (11/11)	
11/14	R	The Citric Acid Cycle- Lecture 12	Chapter 12			
11/15	F	Catch-up				
11/18	M	Exam III (Lectures 9-11)				

11/19	T	The Citric Acid Cycle- Lecture 12	Chapter 12			<i>Citric acid cycle Drag-n-drop (DUE 11/19 at 1PM)</i>
11/21	R	The Citric Acid Cycle- Lecture 12	Chapter 12	12 <i>(11/21)</i>	12 <i>(11/21)</i>	
11/22	F	Oxidative Phosphorylation – Lecture 13	Chapter 13			
11/23-30		Fall Break				
12/2	M	Oxidative Phosphorylation – Lecture 13	Chapter 13			
12/3	T	Oxidative Phosphorylation – Lecture 13	Chapter 13			
12/5	R	Oxidative Phosphorylation – Lecture 13	Chapter 13			
12/6	F	Oxidative Phosphorylation – Lecture 13	Chapter 13			
12/9	M	Oxidative Phosphorylation – Lecture 13	Chapter 13	13 <i>(12/10)</i>	13 <i>(12/9)</i>	
12/10	T	Lipid Catabolism – Lecture 14	Chapter 14			
12/12	R	Lipid Catabolism – Lecture 14	Chapter 14	14 <i>(12/13)</i>	14 <i>(12/13)</i>	
12/13	F	Catch-up				
12/17	T	Final Exam (Lectures 12-14) – 11:50AM-1:50PM Yates 104				