CHEM 351-02 – Biochemistry I – Fall 2021

T/R 1:45–3:00 PM, "in person over Zoom" online

Instructor Contact Information:
Dr. Jennifer Fox
If you have a question that can be answered over email, please email me at FOXJL@cofc.edu, and I will reply within 48 h. If your question is about course content, post it on the discussion board instead of using email. If you want to meet in individual or group office hours, email me with your availability, and we will schedule an appointment over Zoom.

Course Description:
Biochemistry I is an introduction to the chemistry of biological compounds, including study of the macromolecules necessary for life. A key principle you will see throughout the course is how the structure of biomolecules determines their function. We will also study how biological macromolecules are made from monomers, how ligands bind to proteins, how enzymes catalyze chemical reactions, and how DNA-based technologies have advanced our ability to understand living systems in health and disease. My goal in this course is to guide you through these topics to help you gain an appreciation for and understanding of these foundations of biochemistry. Many of you may choose to build on them in Biochemistry II, upper-level Biology courses, and/or graduate or professional school coursework to learn about metabolism and disease. (CHEM 351 is 3 credit hours, and the pre-requisites are CHEM 232 and 232L.)

Student Learning Outcomes:
- Discuss how the structure of biological molecules determines their function
- Understand and apply principles of biological catalysis
- Appraise kinetic and thermodynamic data
- Employ chemical and thermodynamic principles to explain biological interactions

Course Topics:

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<tr>
<th>Topic</th>
<th>Chapters</th>
<th>Exam #</th>
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<tbody>
<tr>
<td>Intro to biochemistry</td>
<td>1</td>
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<tr>
<td>Water and buffers</td>
<td>2</td>
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<tr>
<td>Amino acids and the primary structure of proteins</td>
<td>3</td>
<td>1</td>
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<tr>
<td>Proteins: 3D structure and function</td>
<td>4</td>
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<td>Protein–ligand interactions</td>
<td>4</td>
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<td>Enzyme properties and kinetics</td>
<td>5, 6</td>
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<td>Enzyme mechanisms</td>
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<td>Coenzymes and vitamins</td>
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<tr>
<td>Carbohydrates</td>
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<td>3</td>
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<tr>
<td>Nucleotides and nucleic acids</td>
<td>19</td>
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<tr>
<td>Lipids and membranes</td>
<td>9</td>
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<tr>
<td>DNA-based information technologies</td>
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<td>4</td>
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This syllabus is subject to change by the instructor at any time.
Important Dates:
The add/drop deadline is August 30.
No class over Fall Break, October 19.
The deadline to withdraw is October 29.
No class over Thanksgiving Break, November 25.
The last day of T/R class is December 2.

Required Materials:
2. Scientific calculator (e.g., TI-30Xa scientific calculator, approx. $10) that can handle scientific notation, log, antilog, exponents, and square roots. A graphing calculator is fine, but you may not program anything into it. You may not use your phone as a calculator on quizzes/exams.
3. Computer with internet access. Your computer should meet CofC's requirements. You will need to install the following software (free to you): Microsoft Word, Adobe Acrobat Reader, and Pymol (instructions for Pymol download are included in the homework assignment).
4. Webcam
5. Microphone (You can use headphones/ear buds with a built-in mic)

Class Format, Etiquette, and Attendance:
1. This class will be the same as a Biochemistry class occurring in a classroom, except we will meet online from different locations instead of meeting in one classroom.
   - Treat this class the same as you would an in-person Biochemistry class; by attending all class meetings, you will be able to participate, ask questions, and avoid falling behind.
2. It should go without saying that you should be equally as respectful of me and your classmates as you would be in a physical classroom setting.
3. Sign into your licensed CofC Zoom account when you join the class Zoom meetings.
   - Please use your first and last name as your display name.
   - The Zoom link (or meeting ID and password) for all class meetings is found in the Announcements area of our OAKS page.
   - Class sessions will be recorded (voice and video). By remaining in this class, you consent to being recorded. Recordings are for instructional use only and may not be shared with anyone who is not enrolled in our class. If you miss class due to COVID-19, email me to request access to a recording of the day(s) you missed. If you miss class for any other reason, you will need to get the notes from a classmate like usual.
4. Unmute yourself to participate then mute yourself when you are done speaking.
5. Attendance on the days of all exams is mandatory.
   - If you foresee you will miss a quiz or exam for a school-sponsored, family, or religious event, email me ASAP to arrange to take the quiz or exam early.
   - If you miss a quiz or exam for an unforeseeable reason (e.g., illness or a family emergency), email me ASAP to excuse yourself from that assignment. That portion of your grade will then be an average of your remaining three scores.
Learning Assessment:

1. **Quizzes**: Quizzes focus on the basic concepts you should be learning early in your studying, while exams focus on higher-level synthesis and application. The practice quiz is to familiarize you with the format; it will not be on content, but you will lose points for not completing it.

   - **Practice Quiz** = open from 3 pm Thurs. 9/2 till 11 pm Fri. 9/3
   - **Quiz 1** = open from 3 pm Thurs. 9/16 till 11 pm Fri. 9/17
   - **Quiz 2** = open from 3 pm Thurs. 10/14 till 11 pm Fri. 10/15
   - **Quiz 3** = open from 3 pm Thurs. 11/4 till 11 pm Fri. 11/5
   - **Quiz 4** = open from 3 pm Mon. 11/22 till 11 pm Tues. 11/23

2. **Exams**: An exam may include concepts from any topics covered up to that date.

   - **Exam 1** = Thurs. 9/23 during class
   - **Exam 2** = Tues. 10/26 during class
   - **Exam 3** = Thurs. 11/11 during class
   - **Exam 4** = Thurs. 12/2 during class

3. **Final Exam**: The final exam is a cumulative exam. You must take it during our scheduled exam period (unless you follow the College's protocol for re-scheduling a final exam and have all required paperwork processed and approved prior to 5 PM on the last day of class).

   - **Final exam** = Thurs. 12/9 at 1-3 pm

*All quizzes and exams, including the final exam, will be taken according to these rules:*

1. Find a quiet location conducive to test-taking; minimally, you may not take the exam while in the same room as another chemistry student in any class.
2. Clear your workspace of all notes.
3. You will need 2 blank sheets of paper, your calculator, and your phone.
4. Log into the appropriate OAKS Quiz and launch LockDown Browser on time, using a computer (not a tablet), and complete the guided check of your webcam and mic, which will both remain on during the assignment. During the survey of your workspace, show the absence of notes then show yourself placing your phone out of reach.
5. All exams are to be completed the same way as though you were in a classroom. **Consulting notes, books, the internet, or other people is not allowed.**
6. There will be three types of questions on quizzes/exams this semester. Each page of the exam will only have a single type of question to eliminate confusion.

   1) **Handwritten Questions**: If these are present, they will be on the first page of the OAKS Quiz. Handwritten questions will ask you to hand-write your answer on paper instead of answering within the OAKS Quiz (example: Draw the structure of histidine). Answer all these questions in order on one sheet of paper (referred to as your answer sheet). If the question involves math, show all your work. Make sure your final answer is clear by circling it. If you write down more than one conflicting answer, none of them will be marked correct. After you finish each question requiring a hand-written answer, hold up your answer to the camera for a count of 5 seconds then move on to the next question in the OAKS Quiz. After finishing the assignment and submitting the OAKS Quiz, immediately use the AdobeScan app on your phone to compile pictures of all your work (in order) into a single PDF document, and submit it to the appropriate dropbox.
OAKS within 5 minutes of finishing the OAKS Quiz. This file should start with your answer sheet and after that have all mathematical work you did for other questions that you answered within the OAKS Quiz. Before submitting, review the file to make sure all pages are present in the right order, oriented correctly, and legible.
*You are responsible for doing a trial run beforehand with multiple pages of handwriting to make sure AdobeScan is working for you. Note: Do not take a picture of a stack of written pages or the page underneath might show through and make it hard to read the top page. If your ink is visible through the page, do not write on the reverse side of pages. If the room lighting results in an illegible picture, retake it in better lighting. If you turn in pages that are hard to read because you ignored these commonsense guidelines, your work might not be graded.

2) **Multiple-Choice Questions:** These questions will be completed by clicking on the single best answer in the OAKS Quiz. If any of these questions requires math, write down the question number then write your work on your blank sheet of paper.

3) **Multi-Select Questions:** These questions will be completed by clicking on all correct answers in the OAKS Quiz. Each question could have one or more correct answers. Your score is calculated as the correct minus wrong choices.

4. **Homework project:** The homework project is your chance to explore an enzyme of your choosing to gain an appreciation for how enzymes work and to learn how to use software to view the 3D structure of a protein. Detailed information about the homework project will be posted after our discussion of enzymes. Late assignments will be accepted with a 10% reduction in grade for each day late; no assignments will be accepted after the last day of classes. You will have a large window of time to work on the assignment; to avoid any last-minute issues or unnecessary stress, complete the project ahead of the deadline.

   **Homework project = due Fri. 11/19 at 11 pm**

5. **Practice Problem Sets and Extra credit:** All questions you have about course content and about the practice problem sets should be posted to the discussion boards in OAKS (not asked via email). If you don't understand a problem, post a specific question or ask for help getting started (please begin each thread with the question number). If you understand how to do that problem, deepen your understanding by explaining your thought process to the classmate requesting help. Replies that help someone understand the concept they are asking about (not replies that just provide the correct answer to a problem) will allow you to earn extra credit points on the final exam. I will post answer keys to the problem sets after you have had time to think about the problems and work through them. Looking at the answers without figuring out the problems on your own severely limits your learning; don't miss out on the value of attempting all the problems, first on your own, and then again if needed after receiving tips from your peers.
Grading Policy and Scale:
Quizzes (7% each) 28%
Exams (11% each) 44%
Final Exam 14%
Homework Project 14%

There is no grade replacement or exam dropping policy.
There are no credit-bearing or extra-credit assignments other than those discussed in this syllabus.

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<td>A-</td>
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<td>70-72</td>
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<td>D+</td>
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<td>D-</td>
<td>61-62</td>
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<td>F</td>
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OAKS Course Site:
1. You should check both your CofC email address and the OAKS course site regularly.
2. Course Home: Announcements – Information about exams and quizzes and any changes to dates, etc., will be posted here.
3. Content – Class notes with spaces left for you to annotate them and work practice problems during class will be posted here as PDF files. You will likely want to print those files prior to class (or put them onto a tablet) so you can write on them during class. Practice problems, this syllabus, the homework project, and learning objective checklists will also be here.
4. Grades: Assignments – This is where you will submit the homework project and PDFs of your work on quizzes/exams.
5. Grades: Quizzes – Quizzes and exams will be here.
6. Grades: Grades – All your grades will be here.
7. Communication: Discussions – The discussion boards are available for your collaborative use, to help each other with practice problems, studying, and using Pymol for the homework project. You can also use them to find a study partner or form a study group. All questions about course content should be posted to the discussion board, not asked via email, so that everyone can benefit from hearing the answer.
COVID-19 Reminders:

Respect for Others
For the health and safety of yourself and those around you, you are required to wear a face-covering over both your nose and mouth while inside all campus buildings (you should do the same inside other public buildings). This mask should fit well; there should not be gaps anywhere between your face and the mask. Also remember that students, faculty, and staff should not come to campus when they feel unwell.

Close Contacts and Infection
Anyone with known contact with someone who is infected with COVID is required to follow CDC and CofC guidance, which states that unvaccinated people quarantine themselves away from others for 10-14 days after the last known contact and additionally get tested (negative test results do not eliminate the need to quarantine), while vaccinated people monitor themselves for symptoms and, if they become symptomatic, begin quarantine and testing. Additionally, per the CDC, fully vaccinated people should get tested 3-5 days after their exposure, even if they don’t have symptoms, and wear a mask indoors in public for 14 days following exposure or until receiving a negative test result.

Students living in the same household as someone infected with COVID will need to consult Student Health on the length of their quarantine. If a new member of the household becomes sick, they will need to restart their quarantine.

Anyone who is sick should be tested for COVID and, upon receiving a positive test result, isolate from others for at least 10 days, regardless of vaccination status. Consult Student Health for whether you can come out of isolation after 10 days.

The CDC’s guidance has changed over the course of the pandemic as new data and new variants have emerged; check the latest info for yourself: https://www.cdc.gov/coronavirus/2019-ncov/if-you-are-sick/quarantine.html and find CofC's info here: https://cofc.edu/back-on-the-bricks/ The easiest thing to do is to contact Student Health about your particular situation to get their guidance: https://studenthealth.cofc.edu/ If you cannot attend class due to a COVID-related situation, contact your instructors for help in making up assignments.

Online Classes Only
It is safe for you to attend online classes from home during both quarantine and isolation. If you are very ill or hospitalized and cannot attend online classes, notify your instructors for help in making up assignments.

Resources
CofC Student Health requests that you inform them of positive COVID testing results and any close contact with someone who is COVID-positive, so they can monitor the campus health situation and give you personalized healthcare. CofC holds regular free testing events on campus for anyone in the campus community to get tested for COVID infection. CofC also holds free vaccination events on campus for all students. Vaccination remains the best way to protect yourself, your family, and those around you.
How to Succeed in this Course:
I am often asked what recommendations I have about doing well in Biochemistry. I think the most important thing you can do is devote regular time to the class, even if the next exam feels far away. This includes some easy steps: attending class, participating in and staying actively engaged during class, and then reviewing your notes after each class.

If you choose not to review your notes after class, then class time will become less effective for you. You will lose the opportunity to draw connections between the material we've already covered and the new material, which means you will have a harder time understanding the new material. That effect tends to snowball and become worse the more you delay studying. So, make learning easier on yourself by keeping up with the material. Actively read through your notes after class, look up anything you don't understand, and arrive at the next class ready to learn new material. Doing this will help you stay engaged during class and gain the most out of the class meeting, keep up with the material and feel confident about it, and avoid a massive cramming session before the next exam.

Unlike Organic where a nearly infinite number of practice problems can be generated in which you look for patterns to predict reactions or mechanisms, Biochemistry I has a mixture of concepts and applications to pay attention to. I will post practice problems before each exam, and we will work some problems during class. Memorizing the answers to those practice problems is of very limited use; instead, you should study the material first, then work the problems, and only check the answer key once you have figured them out. Looking at the answer key and rationalizing the answer without figuring out how to solve the problem on your own is likely to give you a false sense of how prepared you are for the exam, so I would strongly advise against doing that.

I have made learning objective checklists for each exam. Students have found it helpful to go through these checklists as they study, to make sure they don't skip important topics.

Honor Code and Academic Integrity:
1. It is your responsibility to conform to the College of Charleston Honor Code and Code of Conduct (http://deanofstudents.cofc.edu/policies-and-procedures/honor-code-and-code-of-conduct.php).
2. In this course, collaborative studying is encouraged, but all quizzes and exams are to be completed individually, without the use of notes, unauthorized use of the internet, or the work of other people. You may only use your cell phone at the end of a quiz/exam to scan in your finished work. You may not type any information into your calculator to be used during an exam. Exams must be turned in on time following the rules described above, or you will receive a zero on the assignment.
3. You may discuss the homework project with other classmates and help each other learn how to use Pymol, but you must perform your own work. You may not copy from someone else's work or from internet resources. You may not turn in work that you originally began or completed for a different class.
4. Lying, cheating, attempted cheating, and plagiarism are violations of our Honor Code that, when suspected, are investigated. Each incident will be examined to determine the degree of
deception involved. Incidents where the instructor determines the student’s actions are related more to misunderstanding and confusion will be handled by the instructor. The instructor designs an intervention or assigns a grade reduction to help prevent the student from repeating the error. The response is recorded on a form and signed both by the instructor and the student. It is forwarded to the Office of the Dean of Students and placed in the student’s file. Cases of suspected academic dishonesty will be reported directly by the instructor and/or others having knowledge of the incident to the Dean of Students. A student found responsible by the Honor Board for academic dishonesty will receive a XXF in the course, indicating failure of the course due to academic dishonesty. This status indicator will appear on the student’s transcript for two years after which the student may petition for the XX to be expunged. The F is permanent. Students can find the complete Honor Code and all related processes in the Student Handbook (refer to the link in the middle of this webpage for a PDF of the handbook http://deanofstudents.cofc.edu/honor-system/studenthandbook/).

SNAP (Students Needing Access Parity) and Disability Access:
The College will make reasonable accommodations for persons with documented disabilities. Students should apply for accommodations at the Center for Disability Services/SNAP office located on the first floor of the Lightsey Center, Suite 104 (http://disabilityservices.cofc.edu/). Students approved for accommodations are responsible for notifying me as soon as possible and for contacting me at least one week before accommodation is needed.

Support Resources:
For help with a wide variety of tech issues, including how to use OAKS (http://blogs.cofc.edu/sits/tutorials/oaks_tutorials/) and Zoom (http://blogs.cofc.edu/sits/zoom-video-resources/), visit Student Instructional Technology Services (https://blogs.cofc.edu/sits/) and the library's guide to online learning http://tutorials.library.cofc.edu/tutorial/onlinestudent. Zoom support is at https://support.zoom.us/hc/en-us/articles/206175806. For issues with your CofC accounts, contact Itservicedesk@cofc.edu (843-953-3375). Student health services (https://studenthealth.cofc.edu/), the Counseling Center (http://counseling.cofc.edu), and food and housing assistance (http://studentaffairs.cofc.edu/student-food-housing-insecurity/index.php) are also available. For important CofC information during hurricanes, visit https://continuity.cofc.edu/ and during the pandemic, visit https://cofc.edu/back-on-the-bricks/.