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**CHEM 351-01 – Biochemistry I – Fall 2022**

**M/W/F: 11:00-11:50 AM**  
**Room: SSMB 138**  
**CRN: 14784**

**Instructor:** Dr. Meredith N. Frazier  
**Email:** fraziermn@cofc.edu  
**Office:** SSMB 306

**Office Hours:** T 11:00-11:50 am; W 1:00-2:00 pm; R 1:45-2:45 pm, or by appointment

**Credit Hours and Prerequisites:** CHEM 351 is 3 credit hours, and the pre-requisites are CHEM 232 and 232L. The Biochemistry Laboratory, CHEM 354L, is not a co-requisite for this class.

**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.

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

**Important Dates:**
- Add/drop deadline: August 29
- Deadline to withdraw: October 28
- No classes: November 7, November 23
- Last day of class: December 5
- Final exam: December 7, 10:30 am – 12:30 pm
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### Course Topics:

<table>
<thead>
<tr>
<th>Topic</th>
<th>Chapters</th>
<th>Group #</th>
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</thead>
<tbody>
<tr>
<td>Intro to biochemistry</td>
<td>1</td>
<td></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>Exam 1</td>
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<tr>
<td>Proteins: 3D structure and function</td>
<td>4</td>
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<tr>
<td>Protein–ligand interactions</td>
<td>4</td>
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<tr>
<td>Enzyme properties and kinetics</td>
<td>5, 6</td>
<td>Exam 2</td>
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<tr>
<td>Enzyme mechanisms</td>
<td>5, 6</td>
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<tr>
<td>Coenzymes and vitamins</td>
<td>7</td>
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<tr>
<td>Carbohydrates</td>
<td>8</td>
<td>Exam 3</td>
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<tr>
<td>Nucleotides and nucleic acids</td>
<td>19</td>
<td>Material on cumulative Final</td>
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<tr>
<td>Lipids and membranes</td>
<td>9</td>
<td>Final</td>
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### 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.

### Learning Assessment:

1. **Quizzes:** There will be quizzes throughout the course. Quizzes will likely be posted on the OAKS page for our class. Typically, quizzes will appear on Thursday afternoon and will be due on Monday night, but exact deadlines will be communicated as the quizzes get posted. Quizzes may require short answers or more elaborated ones. Other quizzes may be administered in the class. There will be no make-up quizzes.

2. **Exams:** There will be 3 exams (excluding the final) during the course focused on the learning objectives for the group of topics being assessed (see color-coded chart above). Exams will be timed, in-class exams. A calculator and scrap paper are allowed, but notes/book/other external material are not permitted. If you foresee you will miss an exam for a school-sponsored, family, or religious event, please notify me as soon as possible to arrange to take the exam early. If you miss an exam due to an unforeseeable event (illness, family emergency), email me as soon as possible to excuse yourself from the exam. That portion of your grade will then be the average of your two other midterm exams. Tentative exam dates are as follows (subject to change):

   Exam 1 = September 19  
   Exam 2 = October 14  
   Exam 3 = November 14

3. **Tutorials:** There will be four tutorials that will help you to focus on the use of Excel and other simple tools (usually software freely available online or websites) to explore parts of the biochemistry curriculum. Due dates for the tutorials will be communicated in class.

4. **Homework project:** The homework project is your chance to work in small groups and explore an enzyme of your choosing to gain an appreciation for how enzymes work and to learn how to use software
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to view the 3D structure of a protein. Detailed information about the homework project will be posted
after our discussion of enzymes in class. 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 = November 28 at Noon

5. 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 = December 7, 10:30 am – 12:30 pm

6. Participation: This part of your grade rewards you for participating, both during our class meetings and
outside of class through the OAKS discussion boards. Discussion boards on each of the tutorials and
possible practice homework problem sets will allow you to both give and receive help from classmates as
you think through the homework problems. These discussion boards are not a place to post a complete
answer key; instead, help each other with specific steps in a problem or a general strategy for approaching
a problem. If you don’t understand a problem, post a specific question on the thread or ask for help getting
started. If you understand a problem, deepen your understanding by explaining your thought process to
someone else who might need help getting started. I may post answers after you have had time to think
about the problems and work through them. Waiting to look at the answers 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. To earn full credit on your participation grade, you will have to
contribute to the discussion board in a meaningful way.

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<thead>
<tr>
<th>Grading Policy and Scale:</th>
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<tbody>
<tr>
<td>Participation</td>
<td>5%</td>
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<tr>
<td>Quizzes (5% each)</td>
<td>25%</td>
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<tr>
<td>Exams (10% each)</td>
<td>30%</td>
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<tr>
<td>Tutorials (3.75% each)</td>
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<tr>
<td>Homework Project</td>
<td>10%</td>
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<tr>
<td>Final Exam</td>
<td>15%</td>
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<tr>
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<tbody>
<tr>
<td>A</td>
<td>93-100</td>
<td>4.0</td>
<td>C</td>
<td>73-76</td>
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<tr>
<td>A-</td>
<td>90-92</td>
<td>3.7</td>
<td>C-</td>
<td>70-72</td>
<td>1.7</td>
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<tr>
<td>B+</td>
<td>87-89</td>
<td>3.3</td>
<td>D+</td>
<td>67-69</td>
<td>1.3</td>
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<tr>
<td>B</td>
<td>83-86</td>
<td>3.0</td>
<td>D</td>
<td>63-66</td>
<td>1.0</td>
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<tr>
<td>B-</td>
<td>80-82</td>
<td>2.7</td>
<td>D-</td>
<td>61-62</td>
<td>0.7</td>
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<tr>
<td>C+</td>
<td>77-79</td>
<td>2.3</td>
<td>F</td>
<td>Below 60</td>
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**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 class. Look up anything you don’t understand from class notes, discuss with peers, come to office hours, and arrive at the next class ready to learn new material. I encourage you to form study groups outside of class to stick to a plan of consistent studying and help draw connections between material. However, unless otherwise specified, graded work should be done individually.

One thing that is important to understand is that there is no “one size fits all” solution in Biochemistry. Sometimes the best way to tackle a problem is to think about the nature of the atoms or the functional group involved in the interactions; sometimes you will have to think of macromolecules as blobs with some shape; and sometimes you will have to find a middle ground. At times, you will have to use precise math, but other times you will simply need a ballpark calculation. Thus, you will have to use your knowledge and your intuition to solve problems in the right, and more productive, way.

Unlike Organic Chemistry 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 may post practice problems before each exam, and we may work some problems during class. Memorizing the answers to those and other practice problems, like the ones present in your book, 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 class, so I would strongly advise against doing that.

**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 exams are to be completed individually, without the use of notes, unauthorized use of the internet, or the work of other people.
3. You may not copy from someone else’s work or from internet resources. You may not turn in work that you originally began/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/).
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**SNAP (Students Needing Access Parity) and Disability Access:**
The College will make reasonable accommodations for persons with documented disabilities. Students should apply for services at the Center for Disability Services/SNAP located on the first floor of the Lightsey Center, Suite 104 ([http://disabilityservices.cofc.edu/](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.

**Inclement Weather or Substantial Instructional Interruption:**
If in-person classes are suspended, faculty will announce to students a detailed plan for a change in modality to ensure the continuity of learning. All students must have access to a computer equipped with a web camera, microphone, and Internet access. Resources are available to provide students with these essential tools.

**Support Resources:**
For help with a wide variety of tech issues, including how to use OAKS ([http://blogs.cofc.edu/sits/tutorials/oaks_tutorials/](http://blogs.cofc.edu/sits/tutorials/oaks_tutorials/)), visit Student Instructional Technology Services ([https://blogs.cofc.edu/sits/](https://blogs.cofc.edu/sits/)) and the library’s guide to online learning ([http://tutorials.library.cofc.edu/tutorial/onlinestudent](http://tutorials.library.cofc.edu/tutorial/onlinestudent)). For issues with your CofC accounts, contact ITservicedesk@cofc.edu (843-953-3375). Student health services (843-953-5520), the Counseling Center ([http://counseling.cofc.edu](http://counseling.cofc.edu)), and food and housing assistance ([http://studentaffairs.cofc.edu/student-food-housing-insecurity/index.php](http://studentaffairs.cofc.edu/student-food-housing-insecurity/index.php)) are also available. For important CofC information during the pandemic and other emergencies, visit [https://continuity.cofc.edu/](https://continuity.cofc.edu/).