This syllabus is subject to change with notification by the instructor. Check OAKS for the latest updates.

**CHEM 351-01 – Biochemistry I – Spring 2023**

M/W/F: 11:00-11:50 AM  Room: SSMB 127  CRN: 20157

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

**Office Hours:** M 1:00-1:50 pm; T 11:00-11:50 am; R 10:00-10:50 am, 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: Jan 18
- Deadline to withdraw: Mar 24
- No classes: Jan 16, Mar 6-10
- Last day of class: Apr 26
- Final exam: Apr 28, 10:30 am – 12:30 pm
This syllabus is subject to change with notification by the instructor. Check OAKS for the latest updates.

**Course Topics:**

<table>
<thead>
<tr>
<th>Topic</th>
<th>Chapters</th>
<th>Group #</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intro to biochemistry</td>
<td>1</td>
<td>Practice sets 1-3 Quiz 1</td>
</tr>
<tr>
<td>Water and buffers</td>
<td>2</td>
<td>Quiz 1</td>
</tr>
<tr>
<td>Amino acids and the primary structure of proteins</td>
<td>3</td>
<td>Tutorial 1 Exam 1</td>
</tr>
<tr>
<td>Proteins: 3D structure and function</td>
<td>4</td>
<td>Practice sets 4-7 Quiz 2</td>
</tr>
<tr>
<td>Protein–ligand interactions</td>
<td>5, 6</td>
<td>Tutorial 2 + 3 Exam 2</td>
</tr>
<tr>
<td>Enzyme properties and kinetics</td>
<td>5, 6</td>
<td>Practice sets 8-9 Quiz 3</td>
</tr>
<tr>
<td>Enzyme mechanisms</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coenzymes and vitamins</td>
<td>7</td>
<td>Tutorial 4 Exam 3</td>
</tr>
<tr>
<td>Carbohydrates</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Nucleotides and nucleic acids</td>
<td>19</td>
<td>Practice sets 10-11 Quiz 4</td>
</tr>
<tr>
<td>Lipids and membranes</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Material on cumulative Final</td>
</tr>
</tbody>
</table>

**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 4 in-class quizzes throughout the course. Quizzes will be a combination of multiple choice and free response. There will be no make-up quizzes.

   **Quiz 1 = Jan 25**  **Quiz 2 = Feb 17**  **Quiz 3 = Mar 27**  **Quiz 4 = Apr 17**

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 = Feb 6**  **Exam 2 = Mar 1**  **Exam 3 = Apr 5**

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. They will be posted at the beginning of the corresponding unit and can be turned in anytime up to the exam date.
This syllabus is subject to change with notification by the instructor. Check OAKS for the latest updates.

4. **Homework project:** The homework project is your chance to work in pairs and 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 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 paper = Apr 21**  
**Homework project presentations = Apr 21, 24, 26**

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 = Apr 28, 10:30 am – 12:30 pm**

6. **Participation:** This section includes class participation and completion grades for practice set assignments. This rewards you for participating during our class meetings or outside of class through the OAKS discussion boards. Discussion boards on each of the tutorials and 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. 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. Practice set assignments will be graded for completion: they are primarily for you to practice your understanding of the material and tackle longer, more difficult problems than the in-class examples.

**Grading Policy and Scale:**

<table>
<thead>
<tr>
<th>Letter</th>
<th>%</th>
<th>GP</th>
<th>Letter</th>
<th>%</th>
<th>GP</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>93-100</td>
<td>4.0</td>
<td>C</td>
<td>73-76</td>
<td>2.0</td>
</tr>
<tr>
<td>A-</td>
<td>90-92</td>
<td>3.7</td>
<td>C-</td>
<td>70-72</td>
<td>1.7</td>
</tr>
<tr>
<td>B+</td>
<td>87-89</td>
<td>3.3</td>
<td>D+</td>
<td>67-69</td>
<td>1.3</td>
</tr>
<tr>
<td>B</td>
<td>83-86</td>
<td>3.0</td>
<td>D</td>
<td>63-66</td>
<td>1.0</td>
</tr>
<tr>
<td>B-</td>
<td>80-82</td>
<td>2.7</td>
<td>D-</td>
<td>61-62</td>
<td>0.7</td>
</tr>
<tr>
<td>C+</td>
<td>77-79</td>
<td>2.3</td>
<td>F</td>
<td>Below 60</td>
<td>0.0</td>
</tr>
</tbody>
</table>

There is no grade replacement policy. One problem set grade will be dropped. Students will have the opportunity to submit reworked exam problems for partial credit. There are no credit-bearing assignments other than those discussed in this syllabus.
This syllabus is subject to change with notification by the instructor. Check OAKS for the latest updates.

**OAKS Course Site:**
You should check both your CofC email address and the OAKS course site regularly, as announcements will be posted and communicated using these tools, in addition to the regular communication in the class (if possible). Oaks’ gradebook will be used to post grades.

**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: reading the textbook, 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. The practice sets and in class problems are good examples of how you should think through problems. Memorizing the answers 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
This syllabus is subject to change with notification by the instructor. Check OAKS for the latest updates.

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 services at the Center for Disability Services/SNAP 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.

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/), 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. 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), and food and housing assistance (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/.