

## Biochemistry II (CHE 308)

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Dr. Marianne Staretz

Dept. of Chemical & Physical Sciences

Cedar Crest College

Office: Oberkotter 7

Phone: Ext. 3608; E-mail: [Mestaret@cedarcrest.edu](mailto:Mestaret@cedarcrest.edu)

This is a 3 credit course. It meets MWF at 10 AM in Miller 33.

**Required textbook:** David L. Nelson and Michael M. Cox, Lehninger Principles of Biochemistry, 5th edition, W.H Freeman and Company, 2008.

**Course Description:** Chemistry 308, Biochemistry II, will focus on central metabolic pathways. Before diving into these pathways, we will review some of the principles of bioenergetics. Following this, the reactions of these metabolic pathways will be presented in detail along with the enzymes that catalyze the reactions and their mechanism of action. The regulation of these pathways will also be discussed. The focus will be on mammalian metabolism allowing material to be related to human health and disease.

In addition, we will start the course by examining the structure and properties of lipids, a biological macromolecule not covered in Biochemistry I. In conjunction with lipids, we will also talk about membrane structure and transport through membranes. We will also cover DNA based technologies at the start of the semester and return to more details on DNA replication, transcription, and translation near the end of the semester.

**Course Objectives:** Students will be introduced to the chemistry occurring in biological systems. Students will see the integration and regulation associated with this chemistry. This basic knowledge of Biochemistry will prove useful in future scientific endeavors. Through problem sets and exams, students will practice applying their biochemical knowledge to novel problems/situations. This will contribute to the development of scientific and quantitative reasoning skills.

**Course Outcomes:** The overall goal of this course is for the student to gain a basic understanding of modern biochemical concepts and principles necessary for future scientific endeavors.

Upon completion of the course, the student should achieve an understanding of the following:

- structures of different classes of lipids and their roles in biological systems
- membrane architecture, mechanisms of membrane transport and energetics of membrane transport
- basic principles of bioenergetics and metabolism
- building blocks, reactions, mechanisms of major metabolic pathways including: glycolysis, TCA cycle, glycogen metabolism, electron transport/oxidative phosphorylation, gluconeogenesis, pentose phosphate pathway, fatty acid metabolism, amino acid metabolism, the urea cycle and nucleotide metabolism
- how metabolic pathways are controlled and the integration between these major metabolic pathways
- how lesions in metabolism can result in disease
- DNA based technologies and biological information flow

**Office hours:** Regularly scheduled office hours will be posted on my office door. These are times when I will definitely be in my office, but I am happy to help at other times if my schedule permits. Anytime I am in my office, please feel free to stop by. If you want to be sure of my availability outside regular office hours, you can schedule an appointment.

**Grading Policy:** The grade for this course will be determined as follows:

- a) Four one hour in class examinations will be given and each will be worth 100 points. Exams 2,3, and 4 are not designed to be comprehensive. However, there may be information learned previously that is necessary for satisfactory performance on exams.
- b) Four quizzes will be given throughout the semester. Each will be worth 25 points. The quizzes may or may not be announced. They are designed to encourage the student to keep abreast of the material.
- c) A final comprehensive exam will be given worth 200 points.

At the end of the semester, there is a possible total of 700 points. To compute the lecture grade, add points from all exams/quizzes, divide by 700 and multiply by 100. The grade will be some percentage between 0 and 100%. Letter grades will be assigned based on the following scale:

|          |    |          |    |           |    |
|----------|----|----------|----|-----------|----|
| 93-100%  | A  | 80-82.9% | B- | 67-69.9%  | D+ |
| 90-92.9% | A- | 77-79.9% | C+ | 60-66.9%  | D  |
| 87-89.9% | B+ | 73-76.9% | C  | Below 60% | F  |
| 83-86.9% | B  | 70-72.9% | C- |           |    |

**Lecture Policy:** Students are expected to attend all lectures. Lectures are a necessary supplement to the textbook. In the event of a missed lecture, the student is responsible for the lecture material, any assignments which were given, announcements or any other information that was provided in class.

**Attendance at Exams:** Students are required to attend class on exam days. Make-up exams will not be given without a valid excuse. Validity of the excuse will be up to the discretion of the instructor. Be forewarned; you will need to have a very good reason for missing an exam! I am not trying to be harsh. I am only trying to treat all students in a fair and equitable manner. If the student is aware of some responsibility which will interfere with an exam date, it must be discussed with the instructor in advance. If an exam is missed without advance notice due to illness or emergency, a valid written excuse will be required from the doctor/school nurse in the case of illness or from the Dean of Students' Office in the case of a family emergency. If a student does not have a valid excuse for missing an exam, the student will receive a zero for the missed exam. Your obligations for this course include attendance at the final exam, on the day and time scheduled by the Registrar's Office. You should not make travel arrangements until the final exam schedule is published; if you must make plans early, you should schedule your travel after the last final exam day.

**Assignments:** Students are expected to do assigned problems at the end of each chapter. It is essential for learning the material and performing well in the course. Additional problem sets will be handed out by the instructor periodically. Though these problem sets/homework will not be graded, the students understanding of the material and ability to do well in the course is dependent on completion of these assignments. I am relying on the student to be responsible enough to do homework without being forced to do so. It is imperative for a clear understanding of the material and for learning to apply what was learned.

**Honor Philosophy:** The Cedar Crest College Honor Philosophy states that students should uphold community standards for academic and social behavior in order to preserve a learning environment dedicated to personal and academic excellence. Upholding community standards is a matter of personal integrity and honor. Individuals who accept the honor of membership in the Cedar Crest College community of scholars pledge to accept responsibility for their actions in all academic and social situations and for the effect their actions may have on other members of the College community. Incumbent from the Honor Code, academic integrity and ethical behavior provide the foundations of the Cedar Crest scholarly community and the basis for our learning environment.

Cedar Crest College expects students to set a high standard for themselves to be personally and intellectually honest and to ensure that other students do the same. This standard applies to all academic work (oral, written, or visual) completed as part of a Cedar Crest education.

Students should consult the appropriate sections of the Student Handbook defining and listing examples of academic misconduct and the potential consequences associated with such action.

**Classroom Protocol:** Appropriate classroom behavior is defined and guided by complete protection for the rights of all students and faculty to a courteous, respectful classroom environment. That environment is free from distractions such as late arrivals, early departures, inappropriate conversations and any other behaviors that might disrupt instruction and/or compromise students' access to the Cedar Crest College education. Inappropriate classroom protocol may lead to removal from the classroom and a lowering of the lecture grade. If continuous, it can lead to forced withdrawal from the class.

Students should consult the Student Handbook for more examples of disruptive classroom behavior. Because some may consider certain behaviors disruptive and some not, the instructor will have the final word on what constitutes disruptive behavior in the classroom.

**Disabilities:** Students with documented disabilities who may need academic accommodations should discuss these needs with their professor during the first two weeks of class. Students with disabilities who wish to request accommodations should contact the Advising Center.

**Note to students:** Biochemistry is a very intensive course and as such requires a serious commitment on the part of the student. There is a wealth of information in the field of biochemistry and the study of biochemistry encompasses many areas of chemistry and biology. This makes Biochemistry challenging but also very satisfying. It is a course that contains many different types of material and requires many different skills. Principles learned in general and organic chemistry will be applied in this course. If these principles are lacking, please take it upon yourself to review and brush up on the necessary material as we proceed through the course. Because of the wealth of info, some memorization will be needed to acquire a solid background in biochemistry, but we will also need to learn to apply that assimilated knowledge. The chapter problems and problem handouts are designed to aid in that aspect. Try to complete these problems on your own before resorting to the posted solutions or solutions manual. Biochemistry is a challenging subject, but definitely worth the challenge. The more effort put into learning the material, the more rewarding the effort will be.

Exams are intended to assess mastery of the subject not just familiarity with it. Answers to exam questions need to be reasonable and use terminology appropriately. Some students will complain about the length of the exams. Exams will seem long to those who are not adequately prepared for them. Always work through assigned problems. Do not do them in your head and expect to complete them on paper when taking the exam. Remember I need to grade what is on the paper; I cannot gauge what is in your head. If you are not comfortable with the material, you are not ready for the exam. Please be honest with yourself – seek help if you are not comfortable with the material. I will do all I can to help you, but I can't do it for you. It requires a serious effort on your part. I do not gain any satisfaction from giving a student a low grade. However, I do need to assess what you have learned and assign an appropriate grade based on that.

## TENTATIVE SYLLABUS

| <b>DATE</b>    | <b>TOPIC</b>   | <b>CHAPTER</b>        |
|----------------|--|-----------------------|
| Jan 19-21      | Introduction to the course<br>DNA based technologies | Syllabus<br>Chapter 9 |
| Jan 23-26      | Lipids   | Chapter 10            |
| Jan 28-30      | Biological Membranes and Transport                   | Chapter 11            |
| Feb 2-4        | Bioenergetics  | Chapter 13            |
| Feb. 6         | Glycolysis   | Chapter 14            |
| <b>Feb. 9</b>  | <b>EXAM #1- Chapters 10, 11, 13</b>                  |                       |
| Feb. 11-13     | Glycolysis   | Chapter 15            |
| Feb. 16-20     | Glycogen metabolism and gluconeogenesis              | Chapter 15            |
| Feb 23-27      | Citric Acid Cycle                                    | Chapter 16            |
| Mar 2-4        | Electron transport and oxidative phosphorylation     | Chapter 19            |
| <b>Mar 6</b>   | <b>EXAM #2- Chapters 15, 16</b>                      |                       |
| Mar 16         | Electron Transport and oxidative phosphorylation     | Chapter 19            |
| March 18-23    | Lipid Metabolism                                     | Chapters 17 and 21    |
| Mar 25-30      | Amino acid metabolism                                | Chapters 18 and 22    |
| April 1        | Genes and Chromosomes                                | Chapter 24            |
| <b>April 3</b> | <b>EXAM #3- Chapters 17-19, 21, 22</b>               |                       |
| April 5-15     | Genes and Chromosomes                                | Chapter 24            |
| April 17-22    | DNA metabolism                                       | Chapter 25            |
| April 27-29    | RNA metabolism                                       | Chapter 26            |
| <b>May 1</b>   | <b>EXAM #4- Chapters 24-25</b>                       |                       |
| May 4-5        | RNA metabolism                                       | Chapter 26            |

**FINAL EXAM AS SCHEDULED BY  
REGISTRAR (May 11-15)**

