

CHEM524H: Biochemistry II, Honors (Spring 2016)

Instructor:

Dr. Jason C. Hurlbert

Office: Sims 301B

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Course Meeting Times: MW: 5:00 – 6:15PM

Location: Sims 113C

Textbook: Fundamentals of Biochemistry, 4th edition, Voet, Voet and Pratt (required)

Course Goals and Objectives

Biochemistry is the branch of science focused on studying the structure, function and interactions of the molecules found in living systems. Its very name tells you that it is a hybrid discipline incorporating biology, organic chemistry, physical chemistry and even physics into the study of the chemical reactions and interactions that allow life to exist. This course builds upon the vocabulary and concepts that were learned in the first course of the biochemistry series (CHEM523). During the semester, we will cover: 1) The chemistries of the various enzyme-catalyzed reactions involved in cellular metabolism, 2) The chemistries of the Central Dogma of Molecular Biology, 3) Cellular pathways and reactions involved in the metabolism of glucose, 4) Oxidative phosphorylation, 5) Lipid metabolism and 6) Fatty acid biosynthesis.

A large portion of your grade in the course will be based upon your synthesis of information learned in this and in previous courses as you write a review article on a protein of your choosing. For this review article, you will be expected to perform a complete literature search, perform a thorough phylogenetic analysis of your protein, completely describe the binding site(s) and reaction mechanism and elucidate the role of the protein in the physiology of the host organism. Details for the protein assignment are found on the course website, as are the grading rubrics for the written and oral components of the assignment.

This is a 500 level course, which means that the concepts we will discuss are advanced and will require you to spend a lot of time and work outside of the classroom to fully understand and apply them. This class is meant to prepare students for admission to graduate, dental, medical or other professional schools and, as such, everyone taking it will be held to the highest possible standards. Since this class is not required for participating students to earn a degree from the university, it is assumed that you are enrolled in the course because you want to take it and, more importantly, you want to use the information discussed in the next stage of your academic careers. This means several things, but first and foremost: you will be accountable for your actions in all aspects of the course.

Student Learning Outcomes

Upon the completion of this course, students will:

- 1) Have an in-depth chemical understanding of cellular energy metabolism and selected anabolic processes.
- 2) Understand the related nature of chemistry and biology.
- 3) Better understand how general chemistry, organic chemistry and physical chemistry are related to biological processes.
- 4) Understand modern methodologies and experimental approaches to studying biochemistry.
- 5) Utilize modern bioinformatics software in the study of biological molecules.
- 6) Be better able to read and interpret scientific research articles.
- 7) Be able to communicate scientific concepts by verbal and written means.

These learning outcomes mesh well with the four University Level Competencies (ULCs) that describe the skills Winthrop faculty have outlined for students to develop during their tenure here. These include:

Competency 1: Winthrop graduates think critically and solve problems.

You will be regularly tested on your abilities to read, interpret and apply information that ties together biology, general, organic and physical chemistries as they apply to life's processes.

Competency 2: Winthrop graduates are personally and socially responsible.

You will be expected to work with others in the class, while striving to complete assignments individually and with your own personal interpretations.

Competency 3: Winthrop graduates understand the interconnected nature of the world and the time in which they live.

Biochemistry is an interdisciplinary science and during this course you will realize the interdependence of biology, physics and chemistry. You will gain an appreciation of how each field can be interpreted in terms from the others.

Competency 4: Winthrop graduates communicate effectively.

A major portion of your grade in this course will come from applying the concepts we discuss in lecture to two proteins that are unfamiliar to you. You will present your findings on the structure, function and biological importance of these proteins in a 15 minute presentation that will be graded by your peers. You will also prepare a 15-page review article describing your proteins that will be turned in on the last day of class.

Grading for the Course

In-class quizzes

Several times throughout the semester we will have a 10 minute quiz covering the highlights of the material from the previous week. The quiz will be picked up at precisely 5:10PM on days it is administered, so showing up late will give you less time to complete the quiz.

Homework

Six problem sets will be due during the course of the semester. The problem sets will be due at the start of class on the dates indicated on the course webpage.

Tests

Four tests will be administered during the semester. Each exam will be worth 100 points.

Protein Project

In the first month of the semester, each student will choose a protein. Students will be responsible for working with this protein during the semester. As we learn different bioinformatic, computational and visualization techniques, students will apply them to their assigned proteins. The grade for the protein project is derived from two unique components:

- 1) At the end of the semester, students will write a 13-page review article about their protein. This article will be due on the last day of the semester. Grading rubrics for the paper will be available on the course website.
- 2) Students completing the course for Honors credit will design several inhibitors of their chosen protein and will perform *in silico* docking experiments to determine the efficacy of the compounds they have developed. Their studies will be summarized in 3 pages as part of the review article (see above).

Final Exam

A cumulative final exam will be given on the date and time specified by the University Final Exam schedule.

Late Work

There are very few acceptable excuses for late work and the most common one proffered by students: "I didn't have time", is not one of them. Failure to plan ahead and complete the assignments on time is no one's fault but your own. Should you have difficulties in completing an assignment, you are expected to come to the instructor as early and as often as necessary so that you understand the assignment and can perform your very best work. **No late assignments will be accepted.** The only exceptions to this rule are documented medical and legal absences or excused absences for athletic competitions. **All due dates are given on the Detailed Schedule page on the course website and you are expected to plan accordingly.** Please, budget your time and just come see me if any problems arise. I will work with each of you on a case-by-case basis to be certain that you achieve the goals laid out for you for the course.

Extra Credit Opportunities

Throughout the semester you will be given several opportunities to earn extra credit points. These opportunities will be challenging and are meant to be extremely difficult. Failure to complete the assignment exactly as instructed will result in no points being awarded. **Extra credit assignments are always non-negotiable:** You do the assignment

completely, you do the assignment well and you do the assignment in the manner it was intended to be done or you do not get any bonus points.

Final Grade

Homework Assignments: = $6 \times 50 = 300$ points

In class quizzes: 10 exams \times 10 points = 100 points

Tests: 4×100 points = 400 points

Protein Assignment: 50 points

Final Exam: 150 points

Total Number of Points for Course: 1000 points

Grading Scale:

A: >93% of the total points

A-: 90.0 - 92.9% of the total points

B+: 87 - 89.9% of the total points

B: 83 - 86% of the total points

B-: 80 - 82.9% of the total points

C+: 77 - 79.9% of the total points

C: 70 - 76.9% of the total points

D: 60 - 69.9% of the total points

F: <60% of the total Points

Students taking the course for graduate credit

Any student taking the course for graduate credit will be required to prepare an extended final presentation (15 minutes) and final paper (10 pages) for the protein assignment. They will also be assigned two additional proteins (Total of 4) for the assignment.

Technology in the Classroom

No cellular phones may be used when class is meeting. Once class starts, all cellular telephones must be turned to silent mode for the duration of class. Should your cellular telephone ring while the class is meeting, you will be asked only once to silence it. A second violation of this policy will result in immediate removal from that class session. Anyone caught using these devices during class without prior permission will immediately be asked to leave the class. Anyone caught texting, using Facebook or other forms of social media during class will be immediately ejected from class. This policy is non-negotiable and will be enforced without exception. ANY and ALL violations of these rules will result in forfeiture of all earned bonus points and violators will also be ineligible for future extra credit opportunities.

Drop Policy: As described in the Winthrop University Undergraduate catalog

Student Code of Conduct

As noted in the Student Conduct Code: "Responsibility for good conduct rests with students as adult individuals." The policy on student academic misconduct is outlined in

the “Student Conduct Code Academic Misconduct Policy” in the online *Student Handbook* (<http://www2.winthrop.edu/studentaffairs/handbook/StudentHandbook.pdf>).

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- 1) Late work will never be accepted without a documented medical or legal excuse.
- 2) Any requests for changes to the schedule must be made 48 hours before the date of the change.
- 3) You will be expected to take your own notes during the lecture period (In other words: completed, Powerpoint format notes will not be provided to you). In the graduate, medical school and other professional school courses many students will take after graduation, you will be expected to listen, look and write down what the professor is saying whilst simultaneously thinking about the information being transmitted.
- 4) All assignments, unless otherwise specified, must be completed independently.
- 5) ANY academic dishonesty (e.g.: failure to properly cite the work of others, plagiarism, copying from other students, usage of an answer key for homework problems and all other possible examples of poor behavior) will result in the immediate imposition of the maximum possible penalties.

I understand that some of you may feel that I am being unfair or even prematurely punitive by holding you to such standards, however I assure you that nothing could be further from the truth. These are the standards that the world outside of Winthrop expects you to adhere to and the failure of faculty members to hold you to them only sets you up for unnecessary pain and suffering after graduation.

Many of the techniques and concepts we will discuss during the semester will be completely new to you. I promise that I will make myself available for questions and help as often as necessary and will be available during the evenings for consultations on the videoconferencing server. There is no reason to struggle with the material when help is just an office visit or email away, so please come see me early and frequently.

Students with Disabilities

Winthrop University is dedicated to providing access to education. If you have a disability and require specific accommodations to complete this course, contact the Office of Disability Services (ODS) at 323-3290. Once you have your official notice of accommodations from the Office of Disability Services, please inform me as early as possible in the semester.