**CHEM 3401 – A**

**PHYSICAL ASPECTS OF BIOCHEMISTRY**

**INSTRUCTOR:** Dr. Amy Rand

320 Steacie Building

613-520-2600 x 3635

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**OFFICE HOURS:** Tuesdays and Thursdays, 1-2 pm

I will respond to student emails and messages about **lecture material** during office hours ONLY. Any **academic accomodations and missed course work** will receive a response from me within one business day.



Please post any questions about lecture material to the Brightspace forum so that all students can access and benefit from the answer

**COURSE DESCRIPTION**

Chemistry, structure and function of nucleic acids, proteins, carbohydrates, and lipids. Thermodynamics of biological systems, chemical mechanisms and organic transformations. Intended for Chemistry Majors. Prerequisite: CHEM 2103 and CHEM 2204. Precludes additional credit for BIOC 2200, BIOL 2200, and BIOC 3101.



It is the **students’ responsibility** to ensure they come to class prepared. Partial notes will be available on *Brightspace* and will consist largely of figures and reactions. If you print and read the slides ahead of time, and take note of what is said in class, you will be in a strong position for success. In-class time will also be dedicated to formative assessment. This type of assessment does not count for marks. Rather, it is an opportunity for you to work with the material when it is fresh in your mind and obtain feedback on areas of improvement.



This course will be supported by *Brightspace* and is the primary method of electronic communication with students outside of class. It will be used to post announcements, lecture material, assignments, and marks.



**LAND ACKNOWLEDGMENT**

Here at Carleton University, it is important that we acknowledge that the land on which we gather is the traditional and unceded territory of the Algonquin nation.

**TEXTBOOK**

Biochemistry: A short course, 3rd Edition, 2015, JL Tymoczko, JM Berg, L Stryer; Freeman ISBN-13: 978-1-4641-2613-0

**COURSE LEARNING OUTCOMES**

After successful completion of this course, students will be able to:

1. Describe the structures of important biomolecules, and relate their structures to function
2. Explain the role and importance of ATP in cell functioning
3. Explain the role of enzymes in catalyzing biochemical reactions
4. Integrate biochemical reactions into metabolic pathways
5. Describe the regulation of lipid, carbohydrate, and amino acid metabolic pathways
6. Explain the transfer and regulation of genetic information from DNA, to RNA, to protein



1. Interpret and analyze readings relating to biochemistry, health, and disease

**ANTICIPATED SCHEDULE**

Lectures are on Tuesday and Thursdays, 10:05 – 11:25 am

Southam Hall Room 409

One day will be devoted to the Cu Portfolio assignment. Date TBD

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| DATE | **DAY** | **THEME** | **IN PERSON?** | **CHAPTERS** | **LEARNING OUTCOMES** | **DUE DATES** |
| Sep 07 | R | Syllabus | Y |  |  |  |
| Sep 12 | T | Intro to biochemistry | Y | 1 | 1 |  |
| Sep 14 | R | Amino acids and proteins | Y | 3-4 | 1, 7 |  |
| Sep 19 | T | Enzymes and regulation | Y | 6-7-8 | 1, 3 | Assign. 1 |
| Sep 21 | R | Carbohydrates | Y | 10 | 1 |  |
| Sep 26 | T | Lipids and cell membranes | Y | 11-12 | 1 |  |
| Sep 28 | R | Signal transduction | N (Recorded) | 13 | 1, 3, 4 |  |
| Oct 03 | **T** | **MIDTERM 1** | Y |  |  |  |
| Oct 05 | R | Intro to metabolism | Y | 14-15 | 2, 4 |  |
| Oct 10 | T | Glycolysis | Y | 16 | 2, 4, 5 | Assign. 2 |
| Oct 12 | R | Gluconeogenesis | Y | 17 | 2, 4, 5, 7 |  |
| Oct 17 | **T** | Krebs cycle | Y | 18-19 | 2, 4, 5 |  |
| Oct 19 | R | Oxidative phosphorylation | Y |  |  |  |
| Oct 24 | T | **FALL BREAK** |  |  |  |  |
| Oct 26 | R | **FALL BREAK** |  | 20-21 | 2, 4, 5 |  |
| Oct 31 | T | Glycogen metabolism | Y | 24-25 | 2, 4, 5 |  |
| Nov 02 | R | Catchup AND/OR review class | Y |  |  |  |
| Nov 07 | T | **MIDTERM 2** |  |  |  |  |
| Nov 09 | R | Fatty acid metabolism | Y | 27-28 | 2, 4, 5 |  |
| Nov 14 | T | Lipid metabolism | N (Recorded) | 29 | 2, 4, 5, 7 |  |
| Nov 16 | R | Amino acid metabolism | N (Recorded) | 30-31 | 2, 4, 5 | Assign. 3 |
| Nov 21 | T | Integration of metabolism | Y |  | 2, 4, 5 |  |
| Nov 23 | R | Nucleic acids | Y | 33 | 1, 6 |  |
| Nov 28 | T | DNA replication and repair | Y | 34-35 | 6 |  |
| Nov 30 | R | Transcription, processing | Y | 36-37-38 | 6 |  |
|  |  |  |  |  |  |  |
| Dec 05 | T | Translation | Y | 39-40 | 6, 7 |  |
| Dec 07 | R | Catchup AND/OR review class | Y |  |  | Assign. 4 |

Note: Some classes might be moved online pending unforeseen illness, etc.

**COURSE ASSIGNMENTS AND GRADING**



Assignments 15%



Midterm 1 25%

Midterm 2 25%

Final exam 25%

Cu Portfolio 10%

**Assignments –**

Four assignments are to be completed during the term. These assignments contribute to the following learning outcome: *Interpret and analyze readings relating to biochemistry, health, and disease*. The assignments will consist of a reading relating to course material and questions to answer. The questions will vary in type and be representative of questions on midterm and final examinations. The completed assignments must be submitted through *Brightspace* by **11:55 pm of the due date**.



**Late Assignment Penalties:**

Late assignments will lose 10% per day (1 grade point value). An assignment can no longer be submitted 9 days following its initial deadline.

**Cu Portfolio Assignment –**

In this assignment, you will be asked to reflect on your learning experiences in chemistry and begin to consider your academic, professional, and intellectual development throughout the chemistry program.

*What is the purpose of this assignment?*

The purpose of this assignment is to challenge you to become more aware of your own learning and development as a chemistry student. As such, the reflection prompts are directly connected to the chemistry program-level learning outcomes. These outcomes describe what every student should be able to do as a result of completing the program and speak to the specific knowledge, skills, and abilities that students will develop.

*Why reflect?*

Reflection requires you to think critically about your learning. It is not enough to simply achieve the learning outcomes for the program – the true value of your education lies in your ability to recognize, articulate, and synthesize what you have learned so that you can apply your learning post-graduation.

*What is an artifact?*

You will also be asked to select pieces of evidence (artifacts) that demonstrate your developing competency in specific program learning outcomes and describe why these pieces best represent your knowledge, skills, abilities, and/or learning.

**Midterm examination -**

Two non-cumulative midterm examinations will be given. They will consist of multiple-choice questions and short answer questions.

**Final examination -**

The final examination is non-cumulative. It will consist of multiple-choice questions, short answer, and long answer questions.

**Final grades -**

Standing in a course is determined by the course instructor subject to the approval of the Faculty Dean. This means that grades submitted by the instructor may be subject to revision. No grades are final until they have been approved by the Dean.

**ACCOMMODATIONS FOR MISSED WORK**

Notify me within 24 hours of the missed work. Carleton recognizes that students may experience unexpected, temporary incapacitation (i.e., illness, injury, or extraordinary circumstances outside of a student’s control). As a result, Carleton has put into place a protocol for students to apply for accommodations using a self-declaration form in the event of missed work. The form can be found at: <https://carleton.ca/registrar/wp-content/uploads/self-declaration.pdf> Note that these forms should be used for short-term concerns related to missed work; if you are experiencing chronic, ongoing challenges which necessitate a broader solution, I recommend reaching out to the Paul Menton Centre and/or the Care Support team.

**FEEKING SICK?**

If you feel very sick (e.g., fever, chills, stomach upset) do not come to class or campus. Missed lectures can be made up by watching the recorded lecture, which I will post on Brightspace within 24 hours after the lecture.

**MENTAL HEALTH**

If you are struggling, please do not hesitate to reach out. I am happy to listen, and/or direct you to resources that might help. In terms of class, if you need extra help or missed a lesson, don’t stress! Email me and we will set a time to meet. Remember that Carleton also offers an array of mental health and well-being resources, which can be found [here](https://carleton.ca/wellness/).

**PLAGIARISM AND CHEATING**

The University Senate defines plagiarism as “presenting, whether intentionally or not, the ideas, expression of ideas or work of others as one’s own.” This can include:

* reproducing or paraphrasing portions of someone else’s published or unpublished material, regardless of the source, and presenting these as one’s own without proper citation or reference to the original source;
* submitting a take-home examination, essay, laboratory report or other assignment written, in whole or in part, by someone else;
* using ideas or direct, verbatim quotations, or paraphrased material, concepts, or ideas without appropriate acknowledgment in any academic assignment;
* using another’s data or research findings;
* failing to acknowledge sources through the use of proper citations when using another’s works and/or failing to use quotation marks;
* handing in "substantially the same piece of work for academic credit more than once without prior written permission of the course instructor in which the submission occurs."

Plagiarism is a serious offence that cannot be resolved directly by the course’s instructor. The Associate Dean of the Faculty conducts a rigorous investigation, including an interview with the student, when an instructor suspects a piece of work has been plagiarized. Penalties are not trivial. They can include a final grade of "F" for the course.”

**COURSE SHARING WEBSITES**

Classroom teaching and learning activities, including lectures, discussions, presentations, etc., by both instructors and students, are copy protected and remain the intellectual property of their respective author(s). All course materials, including PowerPoint presentations, outlines, and other materials, are also protected by copyright and remain the intellectual property of their respective author(s).

My lectures and course materials (including all PowerPoint presentations, outlines, and similar materials) are protected by copyright. I am the exclusive owner of copyright and intellectual property of all course materials. You may take notes and make copies of course materials for your own educational use. You may not allow others to reproduce or distribute lecture notes and course materials publicly for commercial purposes without my express written consent.



**ACADEMIC ACCOMODATIONS**

You may need special arrangements to meet your academic obligations during the term. For an accommodation request the processes are as follows:

**Pregnancy obligation** –

Write to me with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details visit the Equity Services website.

**Religious obligation –**

Write to me with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details visit the Equity Services website.

**Student activities –**

Carleton University recognizes the substantial benefits, both to the individual student and for the university, that result from a student participating in activities beyond the classroom experience. Reasonable accommodation must be provided to students who compete or perform at the national or international level. Please contact me with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details, see the [Senate Policy on Accommodation for Student Activities (PDF, 25KB)](https://carleton.ca/senate/wp-content/uploads/Accommodation-for-Student-Activities-1.pdf).

**Students with disabilities requiring academic accommodations** -

The Paul Menton Centre for Students with Disabilities (PMC) provides services to students with Learning Disabilities (LD), psychiatric/mental health disabilities, Attention Deficit Hyperactivity Disorder (ADHD), Autism Spectrum Disorders (ASD), chronic medical conditions, and impairments in mobility, hearing, and vision. If you have a disability requiring academic accommodations in this course, please contact PMC at 613-520-6608 or pmc@carleton.ca for a formal evaluation. If you are already registered with the PMC, contact your PMC coordinator to send me your Letter of Accommodation at the beginning of the term, and no later than two weeks before the first in-class scheduled test or exam requiring accommodation (if applicable). After requesting accommodation from PMC, meet with me to ensure accommodation arrangements are made. Please consult the [PMC website](https://carleton.ca/pmc/faculty/) for the deadline to request accommodations for the formally-scheduled exam (if applicable).”