**CHEM 3401 – A**

**PHYSICAL ASPECTS OF BIOCHEMISTRY**

**Instructor:** David McMullin, PhD

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**Class time:**  Monday and Wednesday, 4:05-5:25

**Location:** 280 University Centre

**Contact:**  Email questions at any time and I will respond as soon as possible

Email to make a virtual appointment or phone call

**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 **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.



**TEXTBOOK**

Biochemistry: A short course, 4rd Edition, 2015, JL Tymoczko, JM Berg, Gatto, L Stryer. The digital version is available and it's been added to the course as an option.

**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
2. Reflect on your learning and articulate your knowledge, skills, abilities and competencies

**TENTATIVE SCHEDULE**

Lectures are on Mondays and Wednesdays, 4:05 pm – 5:25 pm

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



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| --- | --- | --- | --- | --- | --- |
| DATE | **DAY** | **THEME** | **CCHAPTERS** | **LEARNING OUTCOMES** | **ASSIGNMENT DUE DATE** |
| Sep 07 | W | Syllabus |  |  |  |
| Sep 12 | M | Intro to biochemistry | 1 | 1 |  |
| Sep 14 | W | Amino acids and proteins | 3-4 | 1, 7 |  |
| Sep 19 | M | Enzymes and regulation | 6-7-8 | 1, 3 | Assignment 1 |
| Sep 21 | W | Carbohydrates | 10 | 1 |  |
| Sep 26 | M | Lipids and cell membranes | 11-12 | 1 |  |
| Sep 28 | W | Signal transduction | 13 | 1, 3, 4 |  |
| Oct 03 | **M** | **MIDTERM 1** |  |  |  |
| Oct 05 | W | Intro to metabolism | 14-15 | 2, 4 |  |
| Oct 10 | M | **STATUTORY HOLIDAY** |  |  |  |
| Oct 12 | W | Glycolysis | 16 | 2, 4, 5 | Assignment 2 |
| Oct 17 | M | Gluconeogenesis | 17 | 2, 4, 5, 7 |  |
| Oct 19 | W | Krebs cycle | 18-19 | 2, 4, 5 |  |
| Oct 24 | M | **FALL BREAK** |  |  |  |
| Oct 26 | W | **FALL BREAK** |  |  |  |
| Oct 31 | M | Oxidative phosphorylation | 20-21 | 2, 4, 5 |  |
| Nov 2 | W | Glycogen metabolism | 24-25 | 2, 4, 5 |  |
| Nov 07 | M | **MIDTERM 2** |  |  |  |
| Nov 9 | M | Fatty acid metabolism | 27-28 | 2, 4, 5 |  |
| Nov 14 | W | Lipid metabolism | 29 | 2, 4, 5, 7 |  |
| Nov 16 | M | Amino acid metabolism | 30-31 | 2, 4, 5 | Assignment 3 |
| Nov 21 | W | Integration of metabolism |  | 2, 4, 5 |  |
| Nov 23 | M | Nucleic acids | 33 | 1, 6 |  |
| Nov 28 | W | DNA replication and repair | 34-35 | 6 |  |
| Nov 30 | M | Transcription, processing | 36-37-38 | 6 |  |
| Dec 5 | W | Translation | 39-40 | 6, 7 | Assignment 4 |
| Dec 7 | F | Catch-up AND/OR review class/Final Exam |  |  |  |

**COURSE ASSIGNMENTS AND GRADING**

Assignments 15%

Cu Portfolio 10%

Midterm 1 25%

Midterm 2 25%

Final exam 25%

**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**. Each assignment is marked for the quality of its content and has a value 3.75%. Late submissions will not be accepted.



**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.

**MISSING EXAMS/ASSIGNMENTS**



If you miss an exam or assignment, you must notify the Professor within 24 hours after the date of the exam or assignment due date. A make-up exam or late assignment submission will be permitted under two conditions only: illness or bereavement. Documentation is required to schedule an alternative time for the midterm and assignment due date. Since the beginning of the COVID-19 pandemic, Carleton has temporarily suspended the need for doctor’s notes or medical certificates for academic accommodation requests. In place of a doctor’ note or medical certificate, students will be advised to complete the [self-declaration form](https://carleton.ca/registrar/wp-content/uploads/self-declaration.pdf) available on the Registrar’s Office website to request academic accommodation for missed course work including exams and assignments. If no documentation is provided, you will receive a grade of zero. If you miss the final exam, you must contact the Registrar’s Office within the time period specified in the 2022-2023 Undergraduate Calendar. You will need to fully document your application.



**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**

Carleton is committed to providing academic accessibility for all individuals. Please review the [processes for academic accommodation requests](https://students.carleton.ca/course-outline/) and ensure the link to this information is included in all course outlines/syllabi for courses you are teaching this academic year.

## Special Information for Pandemic Measures

Carleton will continue to follow all public health guidelines as the COVID-19 pandemic continues. Instructors may find it helpful to review the [guidelines for in-class teaching](https://carleton.ca/provost/wp-content/uploads/Classroom-teaching-COVID19-guideline-210607.pdf) and [labs](https://carleton.ca/provost/wp-content/uploads/Teaching-Lab-COVID-19-Guideline-210607.pdf). Both guideline documents are available on the [COVID-19 website](https://carleton.ca/covid19/safe-return-to-campus/classroom-guidelines/). Please note that updated versions of both documents will be distributed and posted online soon.

It is important to remember that COVID is still present in Ottawa. The situation can change at any time and the risks of new variants and outbreaks are very real. There are [a number of actions you can take](https://carleton.ca/covid19/health-and-safety/reducing-your-risks/) to lower your risk and the risk you pose to those around you including being vaccinated, wearing a mask, staying home when you’re sick, washing your hands and maintaining proper respiratory and cough etiquette.

**Feeling sick?** Remaining vigilant and not attending work or school when sick or with symptoms is critically important. If you feel ill or exhibit COVID-19 symptoms do not come to class or campus. If you feel ill or exhibit symptoms while on campus or in class, please leave campus immediately. In all situations, you must follow Carleton’s [symptom reporting protocols](https://carleton.ca/covid19/covid-19-symptom-reporting/).

**Masks:** Carleton has paused the [COVID-19 Mask Policy](https://carleton.ca/covid19/policies-and-protocols/mask-policy/), but continues to strongly recommend masking when indoors, particularly if physical distancing cannot be maintained. It may become necessary to quickly reinstate the mask requirement if pandemic circumstances were to change.

**Vaccines:** Further, while proof of vaccination is no longer required as of May 1 to attend campus or in-person activity, it may become necessary for the University to bring back proof of vaccination requirements on short notice if the situation and public health advice changes. Students are strongly encouraged to get a full course of vaccination, including booster doses as soon as they are eligible, and submit their booster dose information in [cuScreen](http://carleton.ca/covid19/cuscreen) as soon as possible. Please note that Carleton cannot guarantee that it will be able to offer virtual or hybrid learning options for those who are unable to attend the campus.

All members of the Carleton community are required to follow requirements and guidelines regarding health and safety which may change from time to time. For the most recent information about Carleton’s COVID-19 response and health and safety requirements please see the [University’s COVID-19 website](https://carleton.ca/covid19/) and review the [Frequently Asked Questions (FAQs)](https://carleton.ca/covid19/faq/). Should you have additional questions after reviewing, please contact [covidinfo@carleton.ca](mailto:covidinfo@carleton.ca).