The University *of* Western Ontario

Chemistry 4493

CHEMISTRY OF BIOLOGICAL MACROMOLECULES

Course Information – January 2024

Instructor: Prof. Robert Hudson [redacted]

Teaching Assistant: Sanjog Kaur Brar [redacted]

Lectures: [redacted]
Start: January 8, 2024; End: April 8, 2024.
Exam period: April 11 – 30, 2024.

Office hours: By appointment (administrative matters)

Course web site: https://owl.uwo.ca/portal

Prerequisites: Chemistry 2283G or Chemistry 2223B

Description: A survey of the chemistry of carbohydrates, nucleosides and amino acids particularly in the context of the laboratory synthesis oligosaccharides, polynucleotides and oligopeptides.

Course Topics:

1) Introduction: course overview; biological macromolecules and their constituents
2) Protecting group chemistry, polymer-supported chemistries, and automation in synthesis
3) Amino acids to oligopeptides: structure, properties and selected reactions of amino acids; selected historical and modern chemical synthesis of oligopeptides; synthetic peptides and peptidomimetics
4) Carbohydrates: structures, representations and selected reactions of monosaccharides; approaches to the chemical synthesis of oligosaccharides
5) Nucleic Acids: chemical synthesis of nucleosides, oligonucleotides and analogues.

Expected Course Outcomes:

- Students will be able to describe, define, identify (including stereochemical elements) and name common amino acids, nucleosides and monosaccharides.
- Students will learn the basic principles and applications of protecting group chemistry and solid-phase methods and apply this knowledge to propose reasonable synthetic approaches to oligomeric biomolecules.
- Students will learn to analyse complex biomacromolecules and outline their synthesis.

- Students will communicate solutions to questions related to the synthesis of biomacromolecules in clear, rational terms, explain and defend their answers and learn to evaluate and critique others' solutions.

Course Materials:

There is no required textbook; your previous organic chemistry textbooks will provide a solid background. Various other sources will be used throughout the course and citations given at the time. Journal articles may be assigned for reading and discussion. Notes will be written on the chalk board and you are responsible for taking/making your own notes. Some supplements will be handed out when needed (e.g. overly complex drawings).

Evaluation:

Tutorials/Assignments. Five in-person tutorials are scheduled throughout the term.

Questions for discussion will be distributed; solutions must be submitted thorough OWL prior to start of the tutorial to receive credit for having completed the assignment. In addition to the submitted solutions, both attendance of the tutorial and participation in the discussion counts toward the grade.

Tutorials/assignments, 3% x 5: **15%**

Tentative dates:

Friday, Jan. 19, Protecting group chemistry
Friday, Feb. 9, Peptide chemistry
Friday, Mar. 15, Carbohydrates
Friday, Apr. 5, Nucleic Acids
Monday, Apr. 8, Summary and Review

In-Class, Midterm Test, 2 x 50 min.

Friday, Feb. 16 (protecting groups and peptides): **20%**

Monday, Mar. 18 (carbohydrates): **20%**

Final Exam (3 hour), cumulative, date set by Registrar: **45%**

Contingency plan for an in-person class pivoting to 100% online learning

In the event of a COVID-19 resurgence during the course that necessitates the course delivery moving away from face-to-face interaction, affected course content will be delivered entirely online, synchronously (i.e., at the times indicated in the timetable). The grading scheme will not change. Any remaining assessments will also be conducted online as determined by the course instructor.

Policies

Student absences and missed work. Students who are unable to meet their academic responsibilities due to medical or compassionate reasons may submit a request for academic consideration. For each missed piece of work worth 10% or more of the total course grade, you must apply for such consideration by providing valid medical or supporting documentation to the Academic Counselling Office of your Faculty of Registration. For each missed or late piece of work worth less than 10% of the total course grade (i.e., a lab report or assignment), you do not need to provide medical documentation or contact the Academic Counselling Office, but you must send a written explanation of your absence to the instructor to be excused. Note that all accommodations for missed work, regardless of who grants them, are subject to the Conditions required to pass the course.

Accommodation for students with disabilities. Students with disabilities are encouraged to contact Accessible Education, which provides recommendations for accommodation based on medical documentation or psychological and cognitive testing. In cases where a student misses a piece of work for reasons related to the disability on file with Accessible Education, the student should request accommodation by contacting Accessible Education instead of the Academic Counselling Office.

Religious Accommodation

When a course requirement conflicts with a religious holiday that requires an absence from the University or prohibits certain activities, students should request an accommodation for their absence in writing at least two weeks prior to the holiday to the course instructor and/or the Academic Counselling office of their Faculty of Registration. Please visit the Diversity Calendars posted on our university's EDID website for the recognized religious holidays: https://www.edi.uwo.ca.

Missed assignments. There are no make-up assignments. If you miss an assignment and are granted accommodation, the weight of the missed assignment will be transferred to the Final Exam.

Missed midterm test. If you miss a midterm test and are granted accommodation, the weight of the midterm will be transferred to the Final Exam. If you miss both midterm tests, a cumulative make-up test will be offered.

Missed Final Exam. If you miss the Final Exam, contact the Academic Counselling office of your Faculty of Registration as soon as possible. They will assess your eligibility to write the Special Examination. You may also be eligible to write the Special Exam if you are in a "Multiple Exam Situation" (e.g., more than 2 exams in 23-hour period, more than 3 exams in a 47-hour period).

Late assignments. Late assignments are not accepted. Students with disability accommodations who ask for a longer extension will be excused instead.

Use of electronic devices. No electronic devices (calculators, cell phones, laptops, tablets, cameras, etc.) are permitted during tested components.

Scholastic offences. The University will take all appropriate measures to promote academic integrity and deal appropriately with scholastic offences. For definitions of what constitutes a scholastic offence, see https://www.uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_discipline_undergrad.pdf

Support Services

Please visit the Science Academic Counselling webpage for information on adding/dropping courses, academic considerations for absences, appeals, exam conflicts, and many other academic related matters: https://www.uwo.ca/sci/counselling/.

Students who are in emotional/mental distress should refer to Mental Health@Western (https://uwo.ca/health/) for a complete list of options about how to obtain help.

Western is committed to reducing incidents of gender-based and sexual violence and providing compassionate support to anyone who has gone through these traumatic events. If you have experienced sexual or gender-based violence (either recently or in the past), you will find information about support services for survivors, including emergency contacts at

https://www.uwo.ca/health/student_support/survivor_support/get-help.html.

To connect with a case manager or set up an appointment, please contact support@uwo.ca.

Please contact the course instructor if you require lecture or printed material in an alternate format or if any other arrangements can make this course more accessible to you. You may also wish to contact Accessible Education at

http://academicsupport.uwo.ca/accessible_education/index.html

if you have any questions regarding accommodations.

Additional student-run support services are offered by the USC, https://westernusc.ca/services/.