Chem 2223B Course Outline (2020–21)
Organic Chemistry of Biological Molecules

Mandatory Notice from the Registrar

Unless you have either the prerequisites for this course or written special permission from your Dean to enroll in it, you may be removed from this course and it will be deleted from your record. This decision may not be appealed. You will receive no adjustment to your fees in the event that you are dropped from a course for failing to have the necessary prerequisites. The prerequisite for this course is Chem 2213A or 2283G. The website of the Office of the Registrar is http://www.registrar.uwo.ca.

- Although the prerequisite is only a grade of 50 in Chem 2213A or 2283G, a grade of 60 or higher in either 2213A or 2283G is strongly recommended prior to taking 2223B.

Course Website

Students should check OWL (http://owl.uwo.ca) on a regular basis for news and updates. This is the primary method by which information will be disseminated to all students in the course. The missing of critical information due to failure to check OWL cannot be used as a basis for appeal.

Lecture Sections and Instructors

Lecture sections share the same online resources and have common exams.

<table>
<thead>
<tr>
<th>Lecture Section</th>
<th>Instructor</th>
<th>Office</th>
<th>Email</th>
</tr>
</thead>
<tbody>
<tr>
<td>001</td>
<td>Dr. Brian Pagenkopf</td>
<td>BGS 2020</td>
<td><a href="mailto:bpagenko@uwo.ca">bpagenko@uwo.ca</a></td>
</tr>
<tr>
<td></td>
<td>(course coordinator)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>002</td>
<td>Dr. Carlie Charron</td>
<td>ChB 226</td>
<td><a href="mailto:ccharro7@uwo.ca">ccharro7@uwo.ca</a></td>
</tr>
</tbody>
</table>
Interactive Resources

Formats to ask questions and request help:

1) Forums: Forums are accessible through the OWL site 24/7 and checked by TAs once a day to address questions.

2) Zoom Resource Room Hours: Resource room will be held virtually via Zoom with resource room TAs. Hours will be posted in the Announcements on OWL once confirmed. These sessions will be interactive sessions allowing you to ask the TA questions and draw out answers, if necessary.

We are required by law to comply with privacy regulations, so you must use your Western email account (http://mail.uwo.ca) whenever you contact us. Email from a non-uwo.ca address will not be responded to. Any email communication to the instructors must begin with 2223 in the subject line, and the message must contain your student ID number.

Email should only be used for administrative purposes. In order to maximize efficiency and to allow your instructors to respond to legitimate concerns as quickly as possible, emails of the following nature will not be responded to:

- Questions about course material or on how to do a particular problem. Such questions should be taken up in the Forums or Zoom Resource Room on OWL.
- Questions that can be answered based on the information found in this course outline. Being able to find information yourself is an important soft-skill and employability outcome.
- Requests for grade increases, extra assignments, make-up labs, etc.

Please do not hesitate to contact bpagenko@uwo.ca and ccharro7@uwo.ca if you have any constructive comments or feedback on any aspect of Chem 2223B. We are always trying to improve the course!

Course Materials

- The materials below are required
  - Chemistry 2223B Laboratory Manual, Practice Problems and Sample Tests and Exams (2021 edition): available on Vital Source, more details on OWL
  - Old editions may not be used. Students repeating the course and choosing to repeat the lab component will require a new online lab manual

- The course does not have an official textbook, but many students will find the current or former Chem 2213A textbooks (Organic Chemistry, Klein, 3rd or 4th edition; or Introduction to Organic Chemistry, Brown and Poon, 5th or 6th edition) to be a useful reference. Students will have access to additional chapters and problems of relevance to Chem 2223B through the Student Companion Site (details will be posted on OWL). The course will be supplemented with material and practice problems that are not found in the textbook.

- A computer with webcam and highspeed internet, a smartphone or tablet is insufficient
## Outline of Lecture Topics

<table>
<thead>
<tr>
<th>Topic</th>
<th>Available on OWL</th>
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<tbody>
<tr>
<td>1. Colours and Chromophores</td>
<td>Jan 11</td>
</tr>
<tr>
<td>Photophysical processes, UV/visible absorption spectroscopy, fluorescence spectroscopy</td>
<td></td>
</tr>
<tr>
<td>2. Cellular Structure and Function (examinable self-study section)</td>
<td>Jan 11</td>
</tr>
<tr>
<td>Brief overview of components, organelles, and function</td>
<td></td>
</tr>
<tr>
<td>3. Amino Acids and Proteins</td>
<td>Jan 18</td>
</tr>
<tr>
<td>Acid-base properties, protein structure, composition and sequence analyses, Edman degradation, laboratory peptide synthesis, enzymes, biosynthesis of proteins</td>
<td></td>
</tr>
<tr>
<td>4. Carbohydrates</td>
<td>Feb 8</td>
</tr>
<tr>
<td>Stereochemistry, reactions of functional groups, properties of di- and polysaccharides, mechanisms of glycolytic reactions, connection between pyruvate and amino acids</td>
<td></td>
</tr>
<tr>
<td>5. Lipids</td>
<td>Mar 1</td>
</tr>
<tr>
<td>Properties, biosynthesis and beta-oxidation of fatty acids, synthesis of soaps and detergents, biosynthesis of terpenes, phospholipids, fat-soluble vitamins</td>
<td></td>
</tr>
<tr>
<td>6. Nucleic Acids</td>
<td>Mar 15</td>
</tr>
<tr>
<td>Structure and properties, DNA sequencing, laboratory DNA synthesis, carcinogens</td>
<td></td>
</tr>
<tr>
<td>7. Pharmaceutical Drugs</td>
<td>Mar 29</td>
</tr>
<tr>
<td>Sources of pharmaceutical drugs, approval process, sulfanilamide, PDT</td>
<td></td>
</tr>
</tbody>
</table>

## Learning Outcomes

1. Recognize the importance of organic chemistry in everyday life and the interdisciplinary nature of chemistry.

2. Recognize the relationship of organic chemistry to colour, proteins, sugars, nucleic acids, enzymes and drugs.

3. Think critically about mechanisms, electronic transitions, reactivity and methodology.

4. Learn a variety of experimental techniques and the theory behind them.

5. Use a variety of laboratory equipment and instrumentation.

6. Solve a variety of novel problems in new contexts to unfamiliar substrates or reagents.

7. Draw scientific conclusions from experimental results or data.

8. Safely perform experimental procedures.
Laboratory Information and Schedule

All lab-related enquires should be directed to the Chem 2223B Laboratory Coordinator:

- Sandra Zakaria Holtslag  MSA 1235 (next to the year-1 lab)  szakaria@uwo.ca

Any email communication to the laboratory coordinator must begin with **2223 and your lab section** in the subject line and must come from your Western email account.

Due to COVID-19, labs will be taking place online this term on the Chem 2223b lab OWL site that you registered in. Lab related announcements may come from either the lecture or the lab OWL site but the prelab quizzes and lab videos will be found on the lab OWL site.

Lab experiments will consist of the following:

1. There are online prelab quizzes that must be completed before the start of your assigned laboratory. These will be available at least one week prior to your lab section. The prelab quizzes are worth 20% of each laboratory.
2. Each lab will consist of a video of the key components of the experiment. You will watch these, take observations, and independently complete your data sheets. Your lab will be available from your lab section start time for 48 hours. You can complete these in less than 3 hours.

If you miss a lab due to your inability to follow the schedule, you will receive a zero for that lab.

Please note that there is a break in the schedule due to the Spring Reading Week.

<table>
<thead>
<tr>
<th>Experiment</th>
<th>Lab Sections</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. TLC Analysis of Spinach Pigments</td>
<td>021, 022, 023, 024</td>
<td>Jan 26</td>
<td>Jan 27</td>
<td>Jan 28</td>
</tr>
<tr>
<td>2. Amino Acid and Proteins: Properties and Reactions</td>
<td>031, 032, 033, 034</td>
<td>Feb 9</td>
<td>Feb 10</td>
<td>Feb 11</td>
</tr>
<tr>
<td>3. Acetylation, Oxidation, and Hydrolysis of Carbohydrates</td>
<td>041, 042, 043, 044</td>
<td>Mar 2</td>
<td>Mar 3</td>
<td>Mar 4</td>
</tr>
<tr>
<td>4. Fat, Oils, Soaps, and Detergents</td>
<td></td>
<td>Mar 16</td>
<td>Mar 17</td>
<td>Mar 18</td>
</tr>
<tr>
<td>5. One-Pot, Multistep Synthesis of Zyban</td>
<td></td>
<td>Mar 30</td>
<td>Mar 31</td>
<td>Apr 1</td>
</tr>
</tbody>
</table>
Evaluation

Components

The overall course grade, out of 100, will be calculated as listed below. Listed next to the respective components are their maximum contributions toward the course grade.

<table>
<thead>
<tr>
<th>Component</th>
<th>Notes</th>
<th>Max Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Midterm Test 1</td>
<td>Saturday, February 6th, 2021, tentatively 7 pm – 8 pm (final date and time pending registrar approval) Covering: Topics 1 – 3</td>
<td>15</td>
</tr>
<tr>
<td>Midterm Test 2</td>
<td>Saturday, March 13th, 2021, tentatively 7 pm – 8:30 pm (final date and time pending registrar approval) Covering: Topics 1 – 5, weighted to Topics 4 &amp; 5</td>
<td>20</td>
</tr>
<tr>
<td>Final Exam</td>
<td>TBA Covering: Topics 1 – 7</td>
<td>50</td>
</tr>
<tr>
<td>Laboratory</td>
<td>Five online modules</td>
<td>15</td>
</tr>
</tbody>
</table>

If a midterm exam is missed with an approved excuse, the weighting will be applied to the final exam.

In order to obtain credit for the course, all four of the following requirements must be met:

1. Obtain a minimum of 7.5 out of 15.00 (50%) on the laboratory component. This mark is calculated from all five experiments. A missed experiment is assigned a mark of zero unless it has been “excused” (see section on Missed Course Components).
2. Complete a minimum of 4 out of 5 lab experiments, whether excused or not.
3. Obtain a minimum weighted average of 50% on the midterm tests and the final exam. That is, the sum of the midterm test marks out of 15 and 20, and the final exam mark out of 50, must be greater than or equal to 42.5 out of 85.
4. Obtain a minimum of 50 out of 100 on the overall course grade. Students who meet this requirement, but fail to meet one or more of the above requirements, will receive a course grade no greater than 40 out of 100 (even if the calculated course grade is higher) and will not receive credit for the course.

Use of Remote Proctoring Software

Tests and examinations in this course will be conducted using the remote proctoring service, such as Proctortrack. By taking this course, you are consenting to the use of this software and acknowledge that you will be required to provide personal information (including some biometric data) and the session will be recorded. More information about this remote proctoring service is available in the Online Proctoring Guidelines at the following link: https://www.uwo.ca/univsec/pdf/onlineproctorguidelines.pdf
Completion of this course will require you to have a reliable internet connection and a device that meets the technical requirements for this service. Information about the technical requirements are available at the following link:
https://www.proctortrack.com/tech-requirements/

Important Legalities

It is Faculty of Science policy that a student who chooses to write a test or exam is deemed fit enough to do so, and the student must accept the mark obtained. Claims of medical, physical, or emotional distress after the fact will not be honoured. There is no opportunity for a reweight of the other course components after the test or exam has been written. *The reason of “I did not want to write a heavily weighted final” is not a valid reason for writing the midterm test while ill.*

It is university policy that a regularly scheduled class (lecture, lab, or tutorial) takes precedence over tests and exams. Therefore, if another course schedules a test or exam that takes place during your lab or tutorial, the instructor for that course must accommodate you.

All midterms and exams must be carried out independently and in a closed book fashion. Scholastic offences are taken seriously and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, at the following website:
http://www.uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_discipline_undergrad.pdf

Computer-marked, multiple-choice tests and exams may be subject to submission for similarity review by software that will check for unusual coincidences in answer patterns that may indicate cheating.

Accommodation and Accessibility

Accommodation Policies

Students with disabilities work with Accessible Education (formerly SSD) which provides recommendations for accommodation based on medical documentation or psychological and cognitive testing. The Academic Accommodation for Students with Disabilities policy can be found at:
https://www.uwo.ca/univsec/pdf/academic_policies/appeals/Academic_Accommodation_disabilities.pdf

Academic Consideration for Student Absence

Students will have up to two (2) opportunities during the regular academic year to use an on-line portal to self-report an absence during the semester, provided the following conditions are met: the absence is no more than 48 hours in duration, and the assessment for which consideration is being sought is worth 30% or less of the student’s final grade. Students are expected to contact their instructors within 24 hours of the end of the period of the self-reported absence, unless noted on the syllabus. Students are not able to use the self-reporting option in the following circumstances:
- for final exams scheduled by the Office of the Registrar (e.g., December and April exams)
- absence of a duration greater than 48 hours,
- assessments worth more than 30% of the student’s final grade,
- if a student has already used the self-reporting portal twice during the academic year

If the conditions for a Self-Reported Absence are not met, students will need to provide a Student Medical Certificate if the absence is medical, or provide appropriate documentation if there are
compassionate grounds for the absence in question. Students are encouraged to contact their Faculty academic counselling office to obtain more information about the relevant documentation.

Students should also note that individual instructors are not permitted to receive documentation directly from a student, whether in support of an application for consideration on medical grounds, or for other reasons. All documentation required for absences that are not covered by the Self-Reported Absence Policy must be submitted to the Academic Counselling office of a student's Home Faculty.

For policy on Academic Consideration for Student Absences - Undergraduate Students in First Entry Programs, see:
https://www.uwo.ca/univsec/pdf/academic_policies/appeals/Academic_Consideration_for_absences.pdf
and for the Student Medical Certificate (SMC), see:
http://www.uwo.ca/univsec/pdf/academic_policies/appeals/medicalform.pdf

Religious Accommodation

Students should consult the University's list of recognized religious holidays, and should give reasonable notice in writing, prior to the holiday, to the Instructor and an Academic Counsellor if their course requirements will be affected by a religious observance. Additional information is given in the Western Multicultural Calendar: https://multiculturalcalendar.com/ecal/index.php?s=c-univwo
You may also be eligible to write the Special Exam if you are in a “Multiple Exam Situation” (see http://www.registrar.uwo.ca/examinations/exam_schedule.html)

If a student fails to write a scheduled Special Examination, the date of the next Special Examination (if granted) normally will be the scheduled date for the final exam the next time this course is offered. The maximum course load for that term will be reduced by the credit of the course(s) for which the final examination has been deferred. See Academic Calendar for details (under Special Examinations).

Missed Course Components

If you are unable to meet a course requirement due to illness or other serious circumstances, you must seek approval for the absence as soon as possible. Approval can be granted either through a self-reporting of absence or via the Dean’s Office/Academic Counselling unit of your Home Faculty. If you are a Science student, the Academic Counselling Office of the Faculty of Science is located in NCB 280, and can be contacted at scibmsac@uwo.ca. Their website is:
https://www.uwo.ca/sci/counselling/.

If you miss a lab for any reason, you will be assigned a mark of zero for that lab. No grade will be given for the prelab quiz in this case. If the missed lab is due to a reason that is approved by your faculty’s Academic Counselling Office, the zero will be replaced by a mark of EXCU (excused), which shifts the weight of the missed lab onto all of the other labs. You must complete a minimum of 4/5 labs to pass the course, excused or not.

You must, within one week of the absence, report your absence. Do not report your absence directly to the course instructors or the lab coordinator.

Chem 2223B entrusts your faculty's Academic Counselling Office with the task of assessing your circumstances and deciding whether academic accommodation is warranted. Thus, the email from your faculty’s Academic Counselling Office must explicitly state that they recommend the granting of
academic accommodation. If the email states that the granting of academic accommodation will be left at the discretion of the instructor, it will not be granted. Do not talk to the instructors about your situation.

Tests and exams will contain questions related to the theoretical aspects of the experiments. Students are responsible for the material pertaining to the missed labs.

Missed Midterm Test or Final Exam

There are no make-up midterm tests. If your faculty’s Academic Counselling Office has approved your circumstances, then the value of the midterm test will be shifted to the Final Exam.

If you miss the Final Exam, contact your faculty’s Academic Counselling Office as soon as possible. They will assess your eligibility to write the Special Exam (SPC).

In accordance with guidelines set by the university senate, we will approve an SPC exam if you have a multiple exam situation (see the registrar’s definition to determine if you have one here: http://www.registrar.uwo.ca/examinations/exam_schedule.html). However, we will not authorize SPC exams for those with a “heavy exam load” (three exams in four or more periods), nor for those with conflicts. The Registrar will make arrangements for students with conflicting exams.

Equal Opportunity and Evaluation Policy

All individuals involved in the offering of Chem 2223B were, at one time, students themselves. Accordingly, they thoroughly understand the importance of course grades and the hard work that you will invest into this course. They are there to help you achieve your goals in 2223B.

The university is committed to academic integrity and has high ethical and moral standards. All students will be treated equally and evaluated using the criteria presented in this course outline and their respective weights. The evaluation criteria are based strictly on actual achievement, not on effort or how hard the student tried. Claims of an excellent academic history, of attendance in the course components, or of personal issues (family, relationship, financial, etc.) cannot be used to justify a higher grade in course because they are not criteria for evaluation. There is no extra work available for extra credit or to “make up” another grade. We do not offer any extra assignments, essays, experiments, or other work of any kind to any student.

The requirement for a higher grade in order to, for example, maintain a scholarship, enter a program, or obtain a higher GPA for various reasons, is not a justifiable reason for increasing your grade. If we increased or “bumped” your grade (i.e. gave you a grade that you did not legitimately earn), it would be unfair to the other students and also a great disservice to the scholarships and programs who are evaluating all students on the basis of their grades.

This course is supported by the Science Student Donation Fund. If you are a BSc or BMSc student registered in the Faculty of Science or Schulich School of Medicine and Dentistry, you pay the Science Student Donation Fee. This fee contributes to the Science Student Donation Fund, which is administered by the Science Students’ Council (SSC). One or more grants from the Fund have allowed for the purchase of equipment integral to teaching this course. You may opt out of the Fee by the end of September of each academic year by completing paperwork in the Faculty of Science’s Academic Counselling Office. For further information on the process of awarding grants from the Fund or how these grants have benefitted undergraduate education in this course, consult the chair of the department or email the Science Students’ Council at ssc@uwo.ca.