CHEMISTRY 223: ORGANIC REACTIONS
Winter Term 2021

Course instructor: Prof. Zach Ariki
Email: zta@queensu.ca

Lab instructor: Dr. Jason Vlahakis
Email: jason.vlahakis@chem.queensu.ca

CHEM223 is a remote course taught using onQ

Lectures: Asynchronous recordings posted weekly in onQ
Tutorials: Synchronous (live) and offered via Zoom at several times during the week
Office Hours: Will be held during several of the scheduled "lecture" times but are subject to change at the discretion of the instructor.

Wednesday 1:30 – 2:30 pm
Friday 12:30 – 1:30 pm

*Note: older editions are accepted. Please be sure that there is no ambiguity on the assigned readings with your fellow classmates or the instructor.

Labs: The laboratory portion of this course is supervised by Dr. Vlahakis and will consist of 5 virtual laboratory experiments (5% each); students watch a training video and individually write a lab report for each experiment. These can be completed at any time convenient for the student before each report submission deadline, but it is recommended to follow the suggested time frames posted. The prelab/lab report is submitted together as one Word document (as an assignment called Lab 1, Lab 2, Lab 3, Lab 4, and Lab 5) within onQ, and is electronically marked. Watching each video will take about 1 hour, and writing the lab report will probably take about 3-5 hr each time. More info about specific labs will be posted on onQ, please follow the information/marking schemes posted.

Learning Outcomes:

1) Identify functional groups and associated reactivity, in particular that of carbonyl, carboxyl, alkene, alkyne and conjugated systems.
2) Write complete mechanisms for common reactions involving these functional groups.
3) Integrate knowledge from different chemical functions, allowing to complete a reaction sequence, towards a total synthesis.
4) Propose reagents and products for chemical conversions involving carbonyl, carboxyl, alkene, alkyne and conjugated systems.
5) Connect chemical reactivity with real-life examples.
6) Use data obtained in experiments in extraction, reaction, purification and characterization of organic compounds to critically analyze and communicate scientific results.
Marking:

<table>
<thead>
<tr>
<th>Participation in discussion forums &amp; in-course surveys/quizzes</th>
<th>5%</th>
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</thead>
<tbody>
<tr>
<td>onQ Quizzes (Week 5 &amp; 10)</td>
<td>10%</td>
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<tr>
<td>Tutorial Quizzes</td>
<td>10%</td>
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<tr>
<td>Midterm Exam</td>
<td>20%</td>
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<tr>
<td>Final Exam</td>
<td>30%</td>
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<tr>
<td>Labs</td>
<td>25%</td>
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<tr>
<td><strong>Total</strong></td>
<td>100%</td>
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Grading Method:

The Department of Chemistry uses a “Number In, Letter Out” grading scheme; per cent grades are used for evaluations during the course then converted to a letter grade at the end of the course.

<table>
<thead>
<tr>
<th>Letter Grade</th>
<th>Numerical Course Mark</th>
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<tbody>
<tr>
<td>A+</td>
<td>90-100</td>
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<tr>
<td>A</td>
<td>85-89</td>
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<tr>
<td>A-</td>
<td>80-84</td>
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<tr>
<td>B+</td>
<td>77-79</td>
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<tr>
<td>B</td>
<td>73-76</td>
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<tr>
<td>B-</td>
<td>70-72</td>
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<tr>
<td>C+</td>
<td>67-69</td>
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<tr>
<td>C</td>
<td>63-66</td>
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<tr>
<td>C-</td>
<td>60-62</td>
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<td>D+</td>
<td>57-59</td>
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<td>D</td>
<td>53-56</td>
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<td>D-</td>
<td>50-52</td>
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<td>F</td>
<td>49 and below</td>
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*(Tentative) Course Outline*

CHEM 212 is a prerequisite for this class, and as such, *you are expected to be completely comfortable with all the material from that class.*

Helpful review material:

Claydon **Chapter 5** (reaction mechanisms), if this is not enough for you, please try "Pushing electrons" by Meeks

**Week 1**  
Introduction to carbonyl compounds – structure, properties, and reactivity
Addition of weak nucleophiles to carbonyl compounds – O, N, and C nucleophiles

**Week 2**  
Addition of strong nucleophiles to carbonyl compound – hydrides, organometallics, and ylides

**Week 3**  
Oxidation of carbonyl compounds
Introduction to carboxylic acid derivatives – preparation and hydrolysis
Week 4  Interconversion and reduction of carboxylic acid derivatives
Week 5  Introduction to the reactivity of enols and enolates – halogenation reactions
Week 6  Alkylation of enol(ates) and their addition to carbonyl compounds – Aldol and Claisen reactions
Week 7  Introduction to alkene addition reactions – addition of H–X and H–OH, radical additions, X₂ addition, and hydration
Week 8  Alkene reactions contd – epoxidation, dihydroxylation, (semi)pinacol rearrangements, ozonolysis, and reduction
Week 9  Introduction to conjugated systems – addition of H–X and X₂
Week 10 Addition to α,β-unsaturated carbonyl compounds – Michael additions
Week 11 Pericyclic reactions – cycloadditions (Diels-Alder)
Week 12 Electrocyclizations and rearrangements

Problem Sets:

Practice problems from the text will be outlined for each week and answers will be posted on the onQ site. These questions are not marked but are recommended as they will help in practicing and studying for quizzes, the mid-term, and final exam.

Tutorials:

There will be 8 one-hour tutorials held throughout the semester on the dates listed below. Please attend the date and time based on the section you selected upon enrollment. The tutorials will include a discussion of a pre-posted assignment followed by a short quiz.

<table>
<thead>
<tr>
<th>Tutorial</th>
<th>Content</th>
<th>Dates</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>Section 005</td>
<td>Dates</td>
<td>Section 006</td>
<td>Dates</td>
<td>Section 007</td>
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<tr>
<td>Tutorial 1</td>
<td>Week 1</td>
<td>Weds, Jan 20</td>
<td>2:30 – 3:30 pm</td>
<td>Thurs, Jan 21</td>
<td>5:30 – 6:30 pm</td>
<td>Weds, Jan 20</td>
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<tr>
<td>Tutorial 2</td>
<td>Week 2</td>
<td>Weds, Jan 27</td>
<td>2:30 – 3:30 pm</td>
<td>Thurs, Jan 28</td>
<td>5:30 – 6:30 pm</td>
<td>Weds, Jan 27</td>
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<td>Tutorial 3</td>
<td>Weeks 3</td>
<td>Weds, Feb 3</td>
<td>2:30 – 3:30 pm</td>
<td>Thurs, Feb 4</td>
<td>5:30 – 6:30 pm</td>
<td>Weds, Feb 5</td>
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<tr>
<td>Tutorial 4</td>
<td>Week 4-5</td>
<td>Weds, Feb 24</td>
<td>2:30 – 3:30 pm</td>
<td>Thurs, Feb 25</td>
<td>5:30 – 6:30 pm</td>
<td>Weds, Feb 24</td>
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<tr>
<td>Tutorial 5</td>
<td>Week 6-7</td>
<td>Weds, Mar 10</td>
<td>2:30 – 3:30 pm</td>
<td>Thurs, Mar 11</td>
<td>5:30 – 6:30 pm</td>
<td>Weds, Mar 10</td>
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<tr>
<td>Tutorial 6</td>
<td>Week 8</td>
<td>Weds, Mar 17</td>
<td>2:30 – 3:30 pm</td>
<td>Thurs, Mar 18</td>
<td>5:30 – 6:30 pm</td>
<td>Weds, Mar 17</td>
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<tr>
<td>Tutorial 7</td>
<td>Weeks 9-10</td>
<td>Weds, Mar 31</td>
<td>2:30 – 3:30 pm</td>
<td>Thurs, Apr 1</td>
<td>5:30 – 6:30 pm</td>
<td>Weds, Mar 31</td>
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<tr>
<td>Tutorial 8</td>
<td>Week 11</td>
<td>Weds, Apr 7</td>
<td>2:30 – 3:30 pm</td>
<td>Thurs, Apr 8</td>
<td>5:30 – 6:30 pm</td>
<td>Weds, Apr 7</td>
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IMPORTANT:

1) The lecture material is composed of the video lectures; they take priority over the textbook/external online material. In the exams, you will be judged on your understanding of the lecture material.

2) Students must pass BOTH the lecture and the laboratory components to pass the course. If a student does not pass both the laboratory and lecture components of a course, they will fail the entire course and be allocated a mark of 47% or their actual mark, whichever is lower. Students who do not attend all lab sessions may be assigned a grade of incomplete (IN) and be required to attend and pass the missed lab(s) the following year before the IN is cleared from their transcript.

Calculator Policy:

As noted in Academic Regulation 9.2, “Calculators acceptable for use during quizzes, tests and examinations are intended to support the basic calculating functions required by most Arts and Science courses. For this purpose, the use of the Casio 991 series calculator is permitted and is the only approved calculator for Arts and Science students.”

Technology:

This course will have synchronous sessions hosted through Zoom (or Microsoft Teams) for the labs and tutorials, you will get the best experience if you have access to a webcam and headset. Students are encouraged when possible to work with the most recent versions of software including web browsers, Java, Flash and Adobe Reader.

Web Browsers:

onQ performs best when using the most recent version of the web browsers, Chrome or Firefox. Safari and Edge are strongly discouraged as these web browsers are known to cause issues with onQ.

Internet Speed:

While wired internet connection is encouraged, we recognize that students may be relying on a wireless connection. A minimum download speed of 10 Mbps and up to 20 Mbps for multimedia is recommended. To test your internet speed, https://www.speedtest.net/For technology support ranging from setting up your device, issues with onQ to installing software, contact ITS Support Centre https://www.queensu.ca/its/itsc

Notice of Recording:

Synchronous (live) tutorials and labs will be delivered in this course through video conferencing platforms supported by the University (MS Teams and Zoom). Steps have been taken by the University to configure these platforms in a secure manner. Classes will be recorded with video and audio (and in some cases transcription) and will be made available to students in the course for the duration of the term. The recordings may capture your name, image or voice through the video and audio recordings. By attending these live classes, you are consenting to
the collection of this information for the purposes of administering the class and associated coursework. If you are concerned about the collection of your name and other personal information in the class, please contact the course instructor to identify possible alternatives. To learn more about how your personal information is collected, used and disclosed by Queen’s University, please see the general Notice of Collection, Use and Disclosure of Personal Information.

**Academic Integrity:**

Queen's students, faculty, administrators and staff all have responsibilities for upholding the fundamental values of academic integrity; honesty, trust, fairness, respect, responsibility and courage (see www.academicintegrity.org). These values are central to the building, nurturing and sustaining of an academic community in which all members of the community will thrive. Adherence to the values expressed through academic integrity forms a foundation for the "freedom of inquiry and exchange of ideas" essential to the intellectual life of the University (see the Senate Report on Principles and Priorities http://www.queensu.ca/secretariat/policies/senate/report-principles-and-priorities).

Students are responsible for familiarizing themselves with the regulations concerning academic integrity and for ensuring that their assignments and their behaviour conform to the principles of academic integrity. Information on academic integrity is available in the Arts and Science Calendar (see Academic Regulation 1 http://www.queensu.ca/artsci/academic-calendars/regulations/academic-regulations/regulation-1), on the Arts and Science website (see https://www.queensu.ca/artsci/students-at-queens/academic-integrity), and from the instructor of this course. Departures from academic integrity include plagiarism, use of unauthorized materials, facilitation, forgery and falsification, and are antithetical to the development of an academic community at Queen's. Given the seriousness of these matters, actions which contravene the regulation on academic integrity carry sanctions that can range from a warning or the loss of grades on an assignment to the failure of a course to a requirement to withdraw from the university.

_In this course you are permitted to work with a partner or in groups of up to 4 to encourage collaboration, cooperation, and collective learning on lab/tutorial assignments that are designated as "group work". You are not permitted to share answers among large groups or as a tutorial group. You must work independently on all assignments, exams, quizzes and 'pop questions' designated as "individual work"._

**Copyright of Course Materials:**

Course materials created by the course instructor, including all slides, presentations, handouts, tests, exams, and other similar course materials, are the intellectual property of the instructor. It is a departure from academic integrity to distribute, publicly post, sell or otherwise disseminate an instructor's course materials or to provide an instructor's course materials to anyone else for distribution, posting, sale or other means of dissemination, without the instructor's express consent. A student who engages in such conduct may be subject to penalty for a departure from academic integrity and may also face adverse legal consequences for infringement of intellectual property rights. This course makes use of Turnitin for submitting lab reports. Be aware that by logging into the site, you will be leaving onQ, and accessing Turnitin's website. Your independent use of that site, beyond what is required for the course (for example,
purchasing the company’s products), is subject to Turnitin’s terms of use and privacy policy. You are encouraged to review these documents, using the link below, before using the site.


Accommodations for Disabilities:

Queen's University is committed to achieving full accessibility for people with disabilities. Part of this commitment includes arranging academic accommodations for students with disabilities to ensure they have an equitable opportunity to participate in all of their academic activities. The Senate Policy for Accommodations for Students with Disabilities was approved at Senate in November 2016 (see https://www.queensu.ca/secretariat/sites/webpublish.queensu.ca.uslcwww/files/files/policies/senateandtrustees/ACADACCOMMPOLICY2016.pdf).

If you are a student with a disability and think you may need academic accommodations, you are strongly encouraged to contact the Queen’s Student Accessibility Services (QSAS) and register as early as possible. For more information, including important deadlines, please visit the QSAS website at: http://www.queensu.ca/studentwellness/accessibility-services/

Academic Considerations for Students in Extenuating Circumstances:

Queen's University is committed to providing academic consideration to students experiencing extenuating circumstances that are beyond their control and are interfering with their ability to complete academic requirements related to a course for a short period of time. The Senate Policy on Academic Consideration for Students in Extenuating Circumstances is available at http://www.queensu.ca/secretariat/sites/webpublish.queensu.ca.uslcwww/files/files/policies/senateandtrustees/Academic%20Considerations%20for%20Extenuating%20Circumstances%20Policy%202016.pdf.

Each Faculty has developed a protocol to provide a consistent and equitable approach in dealing with requests for academic consideration for students facing extenuating circumstances. Arts and Science undergraduate students can find the Faculty of Arts and Science protocol and the portal where a request can be submitted at: http://www.queensu.ca/artsci/accommodations. Students in other Faculties and Schools who are enrolled in this course should refer to the protocol for their home Faculty.

If you need to request academic consideration for this course, you will be required to provide the name and email address of the instructor/coordinator. Please use the following:

Instructor/Coordinator Name:
Instructor/Coordinator email address:

Statement of the Location and Timing of Final Examinations:

The exam dates for each Term are listed on the Faculty of Arts and Science webpage under “Important Dates.” Student exam schedules for the Fall Term are posted via SOLUS immediately prior to the Thanksgiving holiday; for the Winter Term they are posted on the Friday before Reading Week, and for the Summer Term they are individually noted on the Arts and Science
Online syllabi. Students should delay finalizing any travel plans until after the examination schedule has been posted. Exams will not be moved or deferred to accommodate employment, travel/holiday plans or flight reservations.

**Remote Exams:**

For exams being offered remotely, Regulation 7.2.3. Restrictions on Assessment is waived. Remote exams will be allowed in the last two weeks of classes and in the study period designated by Senate prior to the examination period in order to accommodate the limited number of online proctoring seats available.

**Remote Proctoring:**

The final exam in this course will use remote proctoring provided by a third-party, cloud-based service that enables the completion of a proctored exam or test from an off-campus location, through onQ. This online proctoring solution was chosen as part of the approach to maintaining academic integrity in online assessment. Precise details about how remote proctoring will be used in this course can be found in the “Getting Started with Remote Proctoring” content module in onQ.

When writing tests/exams using remote proctoring, you are connecting to the third-party service. Queen’s has conducted a privacy and security review of the service and has entered into a binding agreement with terms that address the appropriate collection, use and disclosure of personal information in accordance with Ontario’s privacy legislation.

You should also take measures yourself to protect your information by keeping your NetID password and challenge questions private, closing all applications prior to starting an exam/test, and ensuring your device is updated and safeguarded against malware.

*For more information about remote proctoring, see the Student FAQs on the OUR Exams resource page for remote proctoring:*

[http://www.queensu.ca/registrar/students/examinations/exams-office-services/remote-proctoring](http://www.queensu.ca/registrar/students/examinations/exams-office-services/remote-proctoring)

**Discussion Guidelines:**

University is a place to share, question and challenge ideas. Each student brings a different lived experience from which to draw upon. To help one another learn the most we can from this experience please consider the following guidelines.

1) Make a personal commitment to learn about, understand, and support your peers.
2) Assume the best of others and expect the best of them.
3) Acknowledge the impact of oppression on the lives of other people and make sure your writing is respectful and inclusive.
4) Recognize and value the experiences, abilities, and knowledge each person brings.
5) Pay close attention to what your peers write before you respond. Think through and re-read your writings before you post or send them to others.
6) It's ok to disagree with ideas, but do not make personal attacks.
7) Be open to being challenged or confronted on your ideas and to challenging others with the intent of facilitating growth. Do not demean or embarrass others.
8) Encourage others to develop and share their ideas