CHEM/ENCH 212 2020

Dr Ross

SYLLABUS 2020 CHEM/ENCH 212:
Principles of Chemical Reactivity

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CHEM/ENCH 212 is a remote course taught using OnQ

Lectures: Will be asynchronous recordings posted in OnQ each week
Tutorials: Will be synchronous (live) and offered using Zoom at several different times
Labs: Will be synchronous (live) and offered using Teams
Office Hours: Will be live and offered through Zoom during several of the official “classtimes”
Wednesday 10:30-11:30 am and Friday 9:30-10:30 am

Each week a new module of the course will be released through OnQ, it will consist of a guided combination of textbook readings, video mini-lectures, knowledge checking questions and discussion questions. Most weeks you will also have a tutorial and there will be 4 remote labs during the course of the semester.

Learning goals: (i) understanding the essence of the reactivity of organic molecules and (ii) being able to relate it to kinetic studies and parameters; (iii) understanding solvent and electronic effects on reactivity. At the end of the course, students should be able to anticipate the reactivity of nearly any reactive partners.

Learning outcomes:
At the end of CHEM/ENCH 212, students should be able to……
(i) Identify and characterize reactive sites on organic molecules
(ii) Predict and illustrate the pathway of a reaction using curly arrows to represent electron flow
(iii) Determine and derive rate law expressions for Substitution and Elimination reactions
(iv) Articulate the meaning of transition state parameters and use them to infer class of chemical reaction
(v) Predict and justify the impact of solvent and electronic effects on reactivity
(vi) Use experimental data obtained in the laboratory to evaluate reaction kinetics, and critically analyze and communicate scientific results.

Assessment of Learning outcomes:
Tutorials will assess outcomes (i), (ii), (iii), (iv) and (v)
Quizzes and Mid Term Exams will assess outcomes (i), (ii), (iii) and (v)
Final Exam will assess outcomes (i), (ii), (iii), (iv) and (v)
Labs will assess outcome (vi)
*Note: older editions are also accepted (just make sure that there is no ambiguity on the assigned reading, either with your fellow students or with the instructor)*  
*Readings from Clayden will be posted in OnQ each week*

### Course Outline

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
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<tbody>
<tr>
<td>Week 1</td>
<td>Organic Chemistry Basics and Intro to Substitution Reactions</td>
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<tr>
<td>Week 2</td>
<td>Orbitals and Reactivity in Substitution Reactions</td>
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<tr>
<td>Week 3</td>
<td>Distinguishing Between Substitution Mechanisms, Focus on SN1</td>
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<tr>
<td>Week 4</td>
<td>Distinguishing Between Substitution Mechanisms, Focus on SN2</td>
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<tr>
<td>Week 5</td>
<td>Leaving Groups in Substitution Reactions, Solvent effects on SN1</td>
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<tr>
<td>Week 6</td>
<td>Solvents Effects on SN2, Effects of Nucleophilicity on Substitution Reactions</td>
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<tr>
<td>Week 7</td>
<td>Reaction Kinetics of Substitution Reactions, Introduction to Elimination Reactions</td>
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<tr>
<td>Week 8</td>
<td>Distinguishing Substitution and Elimination Reactions Part 1</td>
</tr>
<tr>
<td>Week 9</td>
<td>Distinguishing Substitution and Elimination Reactions Part 2</td>
</tr>
<tr>
<td>Week 10</td>
<td>Distinguishing Substitution and Elimination Reactions Part 3</td>
</tr>
<tr>
<td>Week 11</td>
<td>Electrophilic Aromatic Substitution Reactions Part 1</td>
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<tr>
<td>Week 12</td>
<td>Electrophilic Aromatic Substitution Reactions Part 2</td>
</tr>
<tr>
<td>Week 13</td>
<td>Reaction Dynamics: Collision and Transition State Theories</td>
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### Useful software: - free online testing and learning tools are available from the RSC website: [http://www.rsc.org/learn-chemistry/resources/mechanism-inspector/](http://www.rsc.org/learn-chemistry/resources/mechanism-inspector/)
- Several tutorials and exercises are mentioned in class as well as in the individual problem sets. Please take the time to study them: they are very useful.
- Free online reaction animations (as well as orbitals animations) are available at the following website: [http://www.chemtube3d.com/](http://www.chemtube3d.com/)
- Data processing requires Microsoft Excel

### Problem sets: Practice problems and solutions will be posted on the CHEM/ENCH 212 OnQ site.  
These are not marked, but are recommended, as they will help you practice applying concepts from the course and will help you prepare for the mid-term and final exams.

### Tutorials: There are 9 x 1 hour tutorials throughout the semester and the dates are listed below. Please attend the time and section you selected upon enrolling. Note: Each week there will be a pre-tutorial assignment posted in onQ that you will work on in a small group. Although these will not be graded they must be submitted to your TA before the start of the tutorial to receive participation credit. The tutorial itself will include a discussion of the assignment with an opportunity to ask questions and clarify challenging concepts. The TA will then administer a
A short quiz that you must complete and submit individually during the tutorial. Tutorials are worth 10% of your final grade and only your 8 highest grades will count towards this 10%.

**Tutorial 1:** Wednesday September 16th/Thursday September 17th  
**Tutorial 2:** Wednesday September 23rd/Thursday September 24th  
**Tutorial 3:** Wednesday October 7th/Thursday October 8th  
**Tutorial 4:** Wednesday October 21st/Thursday October 22nd  
**Tutorial 5:** Wednesday November 4th/Thursday November 5th  
**Tutorial 6:** Wednesday November 11th/Thursday November 12th  
**Tutorial 7:** Wednesday November 18th/Thursday November 19th  
**Tutorial 8:** Wednesday November 25th/Thursday November 26th  
**Tutorial 9:** Wednesday December 2nd/Thursday December 3rd

**Labs:** All labs must be attended as scheduled  
All students must attend the introductory lab (lab group assignment, lab safety, lab quiz) in week 2 (Sept. 15-17th)  
Regular labs will be held on alternate weeks (See Schedule in onQ), through Microsoft Teams.  
In weeks 3-13 students will work through the following four experiments:

- **Experiment 1:** Kinetics of Nucleophilic Substitution  
- **Experiment 2:** Alkaline hydrolysis of Ethyl Acetate  
- **Experiment 3:** Photo-isomerization Kinetics of 4-Hydroxyazobenzene  
- **Experiment 4:** Enzyme Kinetics – Enzyme Catalyzed Oxidation of DOPA

**Course Marking Scheme:**  
- Participation in discussion forums and in-course surveys/quizzes 5%  
- OnQ Quizzes 10% (Week 4 and Week 10)  
- Tutorials 10%  
- Practise mid term 10% (Week 6)  
- Take home mid term 10% (Week 8)  
- Remote-Proctored Final 30% (TBA, 3 h).  
- Labs 25%

**Grading Method:**  
All components of this course will receive numerical percentage marks. The final grade you receive for the course will be derived by converting your numerical course average to a letter grade according to Queen’s Official Grade Conversion Scale:

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

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 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/](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](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](http://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](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/artssci/academic-calendars/regulations/academic-regulations/regulation-1](http://www.queensu.ca/artssci/academic-calendars/regulations/academic-regulations/regulation-1)), on the Arts and Science website (see [https://www.queensu.ca/artssci/students-at-queens/academic-integrity](https://www.queensu.ca/artssci/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
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

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.