

## CHEMISTRY 414–SECTION 1 (weeks 1-6): Catalysis

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\*Note Dr. Crudden will be teaching the first 6 weeks, after which Dr. Evans will take over and teach the last 6 weeks concurrently with Chem 863.

**Web Site:** <https://onq.queensu.ca/d2l/home/856499>

**Schedule:** **Classes will be given in person with several lectures given remotely. Lectures will be available on zoom and recorded** so that anyone who can't attend in person will be able to either attend virtually or watch lectures after they are provided. Dr. Crudden will be available to meet with students at a time that is convenient for you either in person or by zoom. **Please note all in person meetings require masking.**

**First class zoom link:**

\_\_\_\_\_

**Textbooks:** Rather than have one required textbook, I will suggest several textbooks, reviews and scientific papers for reference material in the specific notes.

**Marking (out of 50%):**

Assignments	30% total
Presentations	20% _____

*Participation marks will be added on top of the marks described above, to encourage students to participate in final presentations. The value will be determined at the end of term but will not exceed 5%.*

**Dates:** Classes 2 and 3 of week 1 are remote only—available for download. Classes will be held i \_\_\_\_\_  
\_\_\_\_\_ Some time may be given off for research into and practice for your presentation depending on how we do going through the course material. Presentations will be held the week of \_\_\_\_\_ (details to be decided). If possible, we will book a longer time slot so all presentations can be held at the same time.

### **Assignments**

**Assignment 1:** Case study—can be done as an individual or group of 2. Power point format. Due Jan 22 (worth 5%).

**Assignment 2:** Individual assignment based on course material, due Jan 29 (worth 10%)

**Assignment 3:** Individual assignment based on course material, due Feb 5 (worth 10%).

**Assignment 4:** Nomination of catalysis topic for Nobel Prize—can be done as an individual or group of 2. Due Feb 19 (worth 5%)

### **Presentation**

Details to be discussed in class. Topic suggestions will be provided by Dr. Crudden or can be chosen independently (needs to be approved by Dr. Crudden and should not be related to current or former research or presentations in other classes). Topic submitted to Dr. Crudden by Jan 29<sup>th</sup>.

Marking (out of 100):

20% for participation – half for a critique of other student's presentations (these critiques will not be used to evaluate your colleagues but rather your ability to assess the presentations) and half for your own participation and asking questions.

40% content

20% knowledge of the subject/questions

20% delivery skills/presentation quality

### **Course Outline**

*Section One:* Introduction, Catalysis/Catalytic terms, Assessing catalytic activity and heterogeneity, Intro to acid catalysis, Zeolites

*Section Two:* Lewis acid catalysis (Zimmerman–Traxler, Evans Aldol), Lewis base catalysis, Frustrated Lewis Pair catalysis, biocatalysis

*Section Three:* Principles of Transition metals and basic reactions of TMs, Hydrogenation, biocatalysis

*Section Four:* Industrial Catalysis: Haber-Bosch process, Carbonylation (Oxo process, Cativa process), Polymerization.

*Section Five:* Cross-coupling reactions and Metathesis chemistry

*Section Six:* Latest developments and group presentations

### **Academic Integrity**

Queen's students, faculty, administrators and staff all have responsibilities for supporting and upholding the fundamental values of academic integrity. Academic integrity is constituted by the five core fundamental values of honesty, trust, fairness, respect and responsibility (see [www.academicintegrity.org](http://www.academicintegrity.org)) and by the quality of courage. These values and qualities 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.

Students are responsible for familiarizing themselves with and adhering to the regulations concerning academic integrity. General information on academic integrity is available at Integrity@Queen's University, along with Faculty or School specific information. Departures from academic integrity include, but are not limited to, plagiarism, use of unauthorized materials, facilitation, forgery and falsification. Actions which contravene the regulation on academic integrity carry sanctions that can range from a warning, to loss of grades on an assignment, to failure of a course, to requirement to withdraw from the university.

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constitute a breach of academic integrity under the University Senate's Academic Integrity Policy Statement.

### **Calculator Policy**

No calculators are needed or allowed.

### **Accommodations Statement**

Queen's University is committed to achieving full accessibility for persons 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. If you are a student with a disability and think you may need accommodations, you are strongly encouraged to contact Student Wellness Services (SWS) and register as early as possible. For more information, including important deadlines, please visit the Student Wellness website at: <http://www.queensu.ca/studentwellness/accessibility-services/>

### **Academic Consideration for Students in Extenuating Circumstances**

The Senate Policy on Academic Consideration for Students in Extenuating Circumstances (<http://www.queensu.ca/secretariat/sites/webpublish.queensu.ca.uslclwww/files/files/policies/senateandtrustees/Academic%20Considerations%20for%20Extenuating%20Circumstances%20Policy%20Final.pdf>) was approved in April, 2017. Queen's University is committed to providing academic consideration to students experiencing extenuating circumstances that are beyond their control and which have a direct and substantial impact on their ability to meet essential academic requirements. 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 they submit a request at: <http://www.queensu.ca/artsci/accommodations>. Students in other Faculties and Schools should refer to the protocol for their home Faculty.