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

People: Dr. Cathleen Crudden
CHE 503, Chernoff Hall
cruddenc@chem.queensu.ca
Assistant: Megan Bruce, Megan.bruce@chem.queensu.ca
*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/le/content/1128388/Home

Schedule: **Classes will be given in person in** [redacted]

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, however, it is strongly suggested that you come to class in person.

Office hours: 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 that if you are sick, I ask that you attend remotely or wear a mask, I will bring masks.** I will email you with the zoom links in the first week of class.

Reference material: Reviews and scientific papers will be used for reference material in the specific notes. Textbook suggestions will be made for any student wanting more information.

Marking (out of 50%):

Assignments	Three worth 30% total
Presentations	20% (week of Feb 12–time slots to be determined)

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%.

Specific dates: Week 5, February 2-6, will be either remote asynchronous or time off to prepare for presentations or a mixture of the two. Time may be given off this week for you to complete your presentation depending on how we are going through the course material. Presentations will be held the week of February 9th (details to be decided). If possible, we will book a longer time slot so all presentations can be held at the same time. For now, please hold [redacted].

Assignments
Assignment 1: Powerpoint presentation based on a topic given in class, due [redacted] (worth 10%).
Assignment 2: Individual assignment based on course material, due [redacted] (worth 10%)
Assignment 3: Individual assignment. Nominate a catalysis team for the Nobel Prize. Due [redacted] (worth 10%)

Presentations
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). Topics must be submitted to Dr. Crudden by Jan 29th.

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 (sections roughly correspond to one week but may deviate)
Section One: Introduction, Catalysis/Catalytic terms, Assessing catalytic activity and heterogeneity, Intro to acid catalysis, Zeolites
Section Two: Lewis acid catalysis, Lewis base catalysis, Frustrated Lewis Pair catalysis
Section Three: Principles of transition metals (TMs) and basic reactions of TMs, Hydrogenation etc.
Section Four: Industrial Catalysis: Haber-Bosch process, Carbonylation (Oxo process, Cativa process), metal catalyzed polymerization.
Section Five: Cross–coupling reactions, Metathesis chemistry, C-H activation, polymer/plastic upcycling, biocatalysis (time permitting)
Section Six: Latest developments and group presentations

Copyright of Course Materials

Learning outcomes
Students in this class will learn the following (and more):

- the basics of catalysis and catalytic cycles
- the details of several industrially significant catalytic processes
- how to prepare and give a presentation on the topic of catalysis

- how to research the literature on a specific topic related to catalysis
- how to critique presentations

Generative Artificial Intelligence (AI) Tools

Using generative AI writing tools such as ChatGPT in any submitted work **is not permitted in this class**. Using these tools constitute a departure from academic integrity. Original work, completed wholly by you, is expected to be submitted in this course.

Queen's Student Academic Success Services (SASS) offers a self-directed, online academic integrity module which we encourage all students to take which will help with:

- Understanding the nature of the academic integrity departure
- Understanding the expectations of and role of sources in scholarly writing
- Integrating sources into your writing (paraphrasing, quoting, summarizing)
- Understanding when and how to cite your sources
- Managing your time effectively to avoid the need for shortcuts
- Taking effective notes to ensure accuracy of source material and correct attribution

Accommodations and Academic Consideration

Queen's University is committed to working with students with disabilities to remove barriers to their academic goals. Queen's Student Accessibility Services (QSAS), students with disabilities, instructors, and faculty staff work together to provide and implement academic accommodations designed to allow students with disabilities equitable access to all course material (including in-class as well as exams). If you are a student currently experiencing barriers to your academics due to disability related reasons, and you would like to understand whether academic accommodations could support the removal of those barriers, please visit the QSAS website to learn more about academic accommodations or start the registration process with QSAS by clicking *Access Ventus* button at Ventus | Accessibility Services | Queen's (queensu.ca)

VENTUS is an online portal that connects students, instructors, Queen's Student Accessibility Services, the Exam's Office and other support services in the process to request, assess, and implement academic accommodations. To learn more go to: https://www.queensu.ca/ventus-support/students/visual-guide-ventus-students

Academic Consideration is a process for the University community to provide a compassionate response to assist students experiencing unforeseen, short-term extenuating circumstances that may impact or impede a student's ability to complete their academics. This may include but is not limited to any extenuating circumstance (illness, bereavement, traumatic event, injury, family emergency, etc.) which is short-lived, begins within the term, and will not last longer than 12 weeks - see Academic Consideration webpage for details (https://www.queensu.ca/artsci/undergraduate/student-services/academic-consideration)

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. For more information, undergraduate students in the Faculty of Arts and Sciences should consult the Faculty's webpage on Academic Consideration in Extenuating Circumstances and submit a request via the Academic Consideration Request Portal. Students in other Faculties and Schools who are enrolled in this course should refer to the protocol for their home Faculty.

Students are encouraged to submit requests as soon as the need becomes apparent and to contact their instructor and/or course coordinator as soon as possible once academic consideration has been granted. Any delay in contact may limit the options available for academic consideration. While we encourage instructors to accommodate, each instructor has discretion in deciding whether or how to apply the Academic Consideration. For more information on the Academic Consideration process, what is and is not an extenuating circumstance, and to submit an Academic Consideration request, please see the Faculty of Arts and Science's Academic Consideration website. ASO courses include links to information on **Academic Consideration** on your **Course Homepage** in onQ.

For more information, please see the Senate Policy on Academic Consideration for Students in Extenuating Circumstances.

Queen's Policy Statement on Academic Integrity

Queen's University is dedicated to creating a scholarly community free to explore a range of ideas, to build and advance knowledge and to share the ideas and knowledge that emerge from a range of intellectual pursuits. Each core value of academic integrity, as defined in the Senate Academic Integrity Policy, gives rise to and supports the next.

Honesty appears in presenting one's own academic work, whether in the context of an examination, written assignment, laboratory or seminar presentation. It is in researching one's own work for course assignments, acknowledging dependence on the ideas or words of another and in distinguishing one's own ideas and thoughts from other sources. It is also present in faithfully reporting laboratory results even when they do not conform to an original hypothesis. Further, honesty is present in truthfully communicating in written and/or oral exchanges with instructors, peers and other individuals (e.g. teaching assistants, proctors, university staff and/or university administrators).

Trust exists in an environment in which one's own ideas can be expressed without fear of ridicule or fear that someone else will take credit for them. Fairness appears in the proper and full acknowledgement of the contributions of collaborators in group projects and in the full participation of partners in collaborative projects. Respect, in a general sense, is part of an intellectual community that recognizes the participatory nature of the learning process and honours and respects a wide range of opinions and ideas. However, "respect" appears in a very particular sense when students attend class, pay

attention, contribute to discussion and submit papers on time; instructors “show respect by taking students’ ideas seriously, by recognizing them as individuals, helping them develop their ideas, providing full and honest feedback on their work, and valuing their perspectives and their goals” (“The Fundamental Values of Academic Integrity”, 3rd Edition, p. 8).

Ultimately, responsibility is both personal and collective and engages students, administrators, faculty and staff in creating and maintaining a learning environment supported by and supporting academic integrity.

Courage differs from the preceding values by being more a quality or capacity of character – “the capacity to act in accordance with one’s values despite fear” (“The Fundamental Values of Academic Integrity”, 3rd edition, p. 10). Courage is displayed by students who make choices and integrous decisions that are followed by action, even in the face of peer pressure to cheat, copy another’s material, provide their own work to others to facilitate cheating, or otherwise represent themselves dishonestly. Students also display courage by acknowledging prior wrongdoing and taking proactive measures to rectify any associated negative impact.

All of these values are not merely abstract but are expressed in and reinforced by the University’s policies and practices.