

Organic Reaction Mechanisms (CHMC41H3)
Winter 2021
University of Toronto Scarborough
(A Tentative Syllabus)

Welcome to CHMC41! This course is intended for students who have completed the two-semester introductory course in organic chemistry (CHMB41 & CHMB42) and wish to expand their understanding of structure and reaction mechanisms in organic chemistry. The laboratory component is designed to complement the topics covered in lectures. Organic chemistry is a perfect combination of theory and practice, as you will experience them. CHMC41 is going to require some hard work, but you will find your efforts rewarding. Modern organic chemistry is about our daily life and our future, and CHMC41 provides the theory and practice to make you prepared to explore this fascinating field.

Students enrolled in CHMC41H must have previously successfully completed CHMB41 and CHMB42. Please carefully read through this document before we get started. It contains important information which will help ensure you have all the tools you'll need to succeed in this course.

Team:

Instructor:

Prof. Xiao-an Zhang

Email: xiaoan.zhang@utoronto.ca

Office Hours on BB Collaborate: Monday 3:00 – 5:00 pm EST

Lab Coordinator:

Prof. Nirusha Thavarajah

Email: nirusha.thavarajah@utoronto.ca

Office Hours on BB Collaborate: Thursdays 3:00 – 5:00 pm EST

Lecture Schedule:

Monday 9 am -12 pm EST on BB Collaborate (Quercus)

Textbook:

Advanced Organic Chemistry Part A: Structure and Mechanisms, 5th Ed., by Francis A. Carey and Richard J. Sundberg, Springer. The textbook is available online with **free** access on campus: <https://link-springer-com.myaccess.library.utoronto.ca/book/10.1007%2F978-0-387-44899-2>. Information and instruction about off-campus access to UofT library resources can be found here: <https://onereach.library.utoronto.ca/faq-keywords/campus-access>. Students may download the pdf files and read them at home. The hardcopy can be purchased from the UTSC Bookstore or online by yourself.

Suggested References:

- (1) Your CHMB41/42 textbook, e.g. *Organic Chemistry: Mechanistic Patterns*, Nathan Ackroyd, et al, Nelson Education Ltd.
- (2) *March's Advanced Organic Chemistry: Reactions, mechanisms and structure*, 6th Edition, Michael B. Smith and Jerry March, Wiley.
- (3) *Organic Chemistry*, 2nd Edition, Jonathan Clayden, Nick Greeves, and Stuart Warren, Oxford University Press

These recommended (not compulsory) readings are available in the UTSC Bookstore, online or the Course Reserve section of the UTSC Library.

Website:

CHMC41 will be using Quercus to release and archive course-related information, including class announcements, lecture slides, contact information and occasionally some useful outside resources. ***In order for you to receive these emails, you must have a valid "utoronto.ca" email account registered with ROSI.***

Email Policy:

Please use a valid "utoronto.ca" account for all CHMC41 correspondence. Emails received from other accounts will not necessarily be answered. When composing your email, please use professional language. Be sure to include the course code in the subject line and sign the email with your first and last name, as well as your student ID. Your email will be answered as soon as possible (likely within 48 hours, unless it is a weekend or holiday). Please state which course you are talking about. We are running multiple courses so we need some context. Questions on the lab material should be directed to Prof. Nirusha Thavarajah, or your TA.

Term Test:

There will be one midterm test written inside of class time, which will count as 20% of your final grade. The exact date, time, location, format and material to be tested will be announced as soon as they are available.

Policy on Missed Tests:

Please note that there will be no make-up exams for a missed test. Should you miss a term test due to a legitimate reason, you must submit appropriate documentation within one week of your absence. If the reason is medical, an official UTSC medical form should be downloaded from <http://www.utsc.utoronto.ca/registrar/verification-illness-or-injury>

If no acceptable documentation is received, you will receive a grade of zero for that test.

With a validated absence, the value of the missed test will be added to your final exam. Please note that in UTSC Calendar it states: "Students cannot petition to withdraw from a course on the grounds that no work was returned before the last day to withdraw without academic penalty if this is the result of their having been given an extension to complete the work for reasons relating to the individual student and not the rest of the class."

Final Examination:

There will be a *cumulative* exam written during the end of semester exam period, which will count as 35% of your final grade. The exact date, time and location will be announced as soon as they are available. ***Please note that if you miss the Final Exam, you must petition the Registrar's Office to write a make-up exam in the next formal exam period.*** Check the UTSC Calendar for instructions and deadlines.

Virtual Synchronous Laboratory:

*****You must receive a passing grade in the laboratory section in order to pass the course.***

All Lab Practical Sections Begin on the Week of January 18th 2021.

Introduction

The goal of this virtual laboratory is to help you understand the fundamentals of organic synthesis and reaction mechanisms. The virtual labs are organized as Lab Modules on CHMC41H3 Course Quercus. The laboratory modules are designed to navigate you through safety training and experiments. Please watch the Lab Content Organization video under the introductory module to have a clear understanding on the organization and delivery of the CHMC41H3 labs online.

The **Lab Module 1** contains information on virtual laboratory structure, lab schedule, lab assignment due dates, details on pre-lab quizzes, lab grading, lab policies and practices. **Lab Module 2** contains information on general lab safety practices, safety contract and WHMIS quiz. Even though, the labs are online it is a good practice to read and understand all the lab safety practices under this module. **Lab Module 3** has details on the literature assignment and oral presentation. **Lab Module 4** contains a tutorial assignment that needs to be submitted on the first day of the lab. **Lab Module 5** is composed of mini lab assignments to be completed using Labster virtual simulations. Each **Experiment Module (Module 6-Module 15)** has information on experimental procedure, lab skills video, pre-lab quiz, lab report instructions, and notebook report submission link.

The Synchronous Lab Sessions will be held online via BB Collaborate **on a weekly** basis. Search for your Practical session number and TA name on BB collaborate to find your synchronous lab session at the scheduled time. Synchronous sessions are 4.0 Hrs in length. Please arrive on time and you must come prepared to actively participate in the discussion sessions during the synchronous sessions. All questions pertaining the labs must be discussed during the official synchronous lab sessions.

You are expected to review your prior knowledge on the following Organic chemistry lab techniques: simple and fractional distillation at atmospheric pressure; recrystallization; reflux; the use of drying agents and decolorizing charcoal; the theory and practice of liquid-liquid extraction; obtaining of melting points, boiling points, and refractive indexes. Review and practice interpretation of IR and NMR as part of your preparation.

Lab Absence Policy

If you are unable to attend the synchronous lab session online (only the instructions will be recorded not the discussion) due to time zone difference or for any other reason you must give ahead notice to the Lab Coordinator, Prof. Nirusha Thavarajah (nirusha.thavarajah@utoronto.ca) and you are responsible for watching the recorded lab sessions and completing the experimental modules on time to meet the due dates in **EST. Late submission of any pre or post-lab assessments will not be accepted.**

There are **no make-up** synchronous lab sessions. If you are unable to complete the pre- or post-lab assignments due to a valid reason (e.g. medical), you must e-mail the appropriate documentation (e.g. A UTSC medical certificate signed by a physician) to Prof. N. Thavarajah **within 5 days of the due date of the assignment** for consideration to be excused or to have an extension. After the 5 days, the documentation will not be accepted and you will receive a grade of zero for all components of the lab.

If you are required to attend an important appointment, e.g. court, you will arrange ahead of time for alternate arrangements. Missing a lab assignment deadline due to a midterm or final exam will not be considered as an acceptable reason.

If a student misses a lab assignment and provides no reasonable explanation or supporting documentation, a mark of zero will be assigned.

Lab Grade Calculation

Lab Assessments	Lab Marks	Percent of the Lab Grade
Pre-Lab Quizzes	10 x 10 Lab periods =100	5.0
Lab Tutorial Assignment	25	1.25
Labster Virtual Simulation Assignments	10 x 10 Labs = 100	5.0
Labster Reflection paper	100	5.0
Notebooks	5 x 10 Labs = 50	2.5
Online Lab Engagement (taking part in discussions, and submission of all contracts/documents)	5 x 10 Lab periods = 50	2.5
Lab Reports	275 (See individual experiments for breakdown)	13.75
Total	700	35

****You must receive a passing grade in the laboratory section in order to pass the course**

Literature Assignment & Oral Presentations:

Details on literature assignment and oral presentation are posted on Quercus under *Lab Module 3*.

Method of Evaluation:

The following grading system will be used to calculate your final grade:

Graded Work	Value
Laboratory*	35%
Term Test (NO MAKE-UP)**	20%
Literature Assignment	5%
Oral Presentation	5%
Final Exam	35%

*You must pass the lab to pass the course.

**If you miss a test with a valid reason as described in the section “Policy on Missed Tests”, its value will be added to that of the final.

Note: To pass the course, you **MUST pass the laboratory and either the term test or the final exam (and receive a final grade of 50+, of course!).**

Online Grades:

Individual grades will be posted on Quercus as they become available. Please check these periodically to make sure that the posted grades match your own records. Any discrepancy should be reported immediately to the instructor or the lab coordinator, as appropriate.

Study Hints:

Organic chemistry is a cumulative subject. As such, an understanding of new material depends on mastery of topics discussed in previous chapters, including that was taught in Organic Chemistry I and II. **Keep up with the material –do not let yourself get behind!!!**

Academic Integrity:

UTSC anticipates that you will pursue your studies with purpose and integrity. The cornerstone of scholarship in all academic disciplines is honesty. UTSC expects that you will approach everything you do here honestly – whether solving a homework problem, or writing an exam. It is critically important both to maintain our community which honours the values of honesty, trust, respect, fairness and responsibility and to protect you, the students within this community, and the value of the degree towards which you are all working so diligently.

According to Section B of the University of Toronto's Code of Behaviour on Academic Matters (<http://www.governingcouncil.utoronto.ca/Assets/Governing+Council+Digital+Assets/Policies/PDF/ppjun011995.pdf>)

which all students are expected to know and respect, it is an offence for students to:

- To use someone else's ideas or words in their own work without acknowledging that those ideas/words are not their own with a citation and quotation marks, i.e. to commit plagiarism.
- To include false, misleading or concocted citations in their work.
- To obtain unauthorized assistance on any assignment.

- To provide unauthorized assistance to another student. This includes showing another student completed work.
- To submit their own work for credit in more than one course without the permission of the instructor.
- To falsify or alter any documentation required by the University. This includes, but is not limited to, doctor's notes.
- To use or possess an unauthorized aid in any test or exam.

There are other offences covered under the Code, but these are by far the most common. Please respect these rules and the values which they protect. Offences against academic integrity will be dealt with according to the procedures outlined in the Code of Behaviour on Academic Matters.

Accessibility:

Students with diverse learning styles and needs are welcome in this course. In particular, if you have a disability/health consideration that may require accommodations, please feel free to approach me and/or the AccessAbility Services Office (ability.utsc@utoronto.ca) as soon as possible. I will work with you and AccessAbility Services to ensure you can achieve your learning goals in this course. Enquiries are confidential. The UTSC AccessAbility Services staff are available by appointment to assess specific needs, provide referrals and arrange appropriate accommodations. More details are available at: <http://www.utsc.utoronto.ca/~ability/>.

Lecture Topics (tentative):

Below is a list of tentative topics to be covered (in the approximate order that you will see them) along with the corresponding textbook sections:

1. Chemical bonding and molecular structure
2. Stereochemistry, conformation, and stereoselectivity
3. Study and description of organic reaction mechanisms
4. Nucleophilic substitution
5. Polar addition and elimination reactions
6. Carbanions and other nucleophilic carbon species
7. Reactions of carbonyl compounds
8. Aromaticity
9. Aromatic substitution
10. Pericyclic reactions
11. Free-radical reactions (optional)
12. Photochemistry (optional)