

**CONCORDIA UNIVERSITY**  
**DEPARTMENT OF CHEMISTRY & BIOCHEMISTRY**  
**CHEMISTRY 222 - INTRODUCTORY ORGANIC CHEMISTRY II**

This course aims to provide an introduction to the structures and reactions of different functional groups. The focus is on conjugated dienes, aromatic compounds, and functional groups containing oxygen atoms like alcohols, ethers, epoxides, aldehydes, ketones, and carboxylic acid derivatives. In addition, a quick survey of techniques for structure determination will be done. It is the second course after **Introductory Organic Chemistry I**, which, at Concordia, covers the structure and reactivity of hydrocarbons: alkanes, alkenes, and alkynes and a survey of elimination and substitution reactions.

**COURSE FORMAT:** Lecture (Videos, slides, and group work) and Laboratory.

**INSTRUCTORS:** Sébastien Robidoux    Lec. 01 :    M-W    HB-130    8:45-10:00  
Office: SP-201.15    Lec. 02:    T-J    HC-155    10:15-11:30  
Tel.: 848-2424 ext. 3377    e-mail: sebastien.robidoux@.concordia.ca

**OFFICE HOURS:**    Monday    10H30-12H00    Wednesday    10H30-12H00  
Friday    10H30-12H00

**AUDIENCE:** This course is part of the core component for students enrolled in the Cell and Molecular biology program, the Psychology (Behavioral Neuroscience Option) program, and the Chemistry and Biochemistry programs at Concordia.

**CONTENT:** This course is divided into 8 topics covered over 24 lectures.

1. Structure determination (6 lectures)
2. Conjugated dienes (2 lectures)
3. Alcohols, ethers and epoxides (3 lectures)
4. Aromatic compounds: structure and reactivity (5 lectures)
5. Aldehydes and ketones (3.5 lectures)
6. Carboxylic acid derivatives (2.5 lectures)
7. Enols and enolates (1 lecture)
8. Amines (1 lecture)

The first section on structure determination will present to the students a brief introduction to mass spectrometry, infra-red spectroscopy and nuclear magnetic resonance spectroscopy. This will permit student to characterize and identify simple organic molecules. The following sections 2 to 6 will introduce fundamental concepts about structure and reactivity of the listed functional groups. The last two sections on enols, enolates and amines will give a very brief survey of structures and reactions concerning these functional groups.

**STATEMENT OF OBJECTIVES:** By the end of this course, successful students should be able to:

- identify and visually represent the covered functional groups and discuss their properties and reactivities. (Basic to intermediate level)
- draw mechanisms for the reactions involving covered functional groups. (Basic level)
- predict the chemo-, regio-, and stereoselectivities for the reactions involving covered functional groups using steric and electronic effects. (Basic level)
- explain the chemo-, regio-, and stereo-selectivities for the reactions involving covered functional groups using steric and electronic effects. (Basic level)

- design a 5-10 step synthesis using the principles of chemo- and regio-selectivities. (Basic level)
- extract structural information from the MS, IR, and NMR spectra to identify simple organic molecules. (Basic level)
- use correct basic laboratory procedures to synthesize, purify, isolate, and characterize simple organic molecules.
- write a laboratory report to communicate experimental results in a scientific format.

**ACCESSIBILITY:** As the instructor of this class, I will strive to make the learning experience in this classroom as accessible and inclusive as possible. Students who know that this course might offer challenges are invited to contact me to discuss their concerns and the possible means and strategies that can be applied to attain the objectives stated previously. However, if you have accessibility needs that require academic accommodations, please meet with an advisor from the Access Centre for Students with Disabilities (ACSD) as soon as possible. The ACSD advisor will review your documentation and set an accommodation plan with you. As a student registered with the ACSD, you may have access to e-textbooks and course packs. Please enquire with the accessibility advisor. I welcome meeting with you to discuss your accommodations.

ACSD Contact information: [acsinfo@concordia.ca](mailto:acsinfo@concordia.ca); 514-848-2424 ext. 3525; SGW Campus, GM-300.

<http://www.concordia.ca/students/accessibility.html>

**TEXTBOOK:** There is a coursepack required for the theory section of the course: Organic II: Introductory Organic Chemistry II. You can buy a hard copy or a digital copy, both available at the bookstore. You can also use any standard textbook of organic chemistry, such as Organic Chemistry by Jones, Bruice, or any other ones. Reading and problems are assigned in the course pack, but the material that you can find in these textbooks is at the appropriate level.

**EXAMINATIONS:** There will be **four** formal examinations:

1. Test 1 (Two stages exam) in **CLASS**  
designed for 30 minutes but will last 50 minutes first stage for two questions on structure determination  
designed for 15 minutes but will last 20 minutes second stage for one question on structure determination:  
Lecture 01 October 3<sup>rd</sup>, 2018  
Lecture 02 October 2<sup>nd</sup>, 2018
2. Test 2 in **CLASS 75 minutes** for three questions on diene, alcohol, ether, epoxide, benzene and Diels-Alder. The exam is designed for 45 minutes, but students would be allowed 75 minutes.  
Lecture 01 November 7<sup>th</sup>, 2018  
Lecture 02 November 1<sup>st</sup>, 2018

If a student is absent from a test, he/she must produce a written excuse appropriately signed (i.e. by a doctor, or an employer) on the appropriate letterhead paper. This letter must be delivered to the instructor **NO LATER THAN ONE (1) WEEK AFTER THE TEST**. The Department determines the validity of the absence. If there is no valid excuse, the student will receive a mark of zero for the test. There is no makeup test. In case of a valid excuse, the percentage is transferred unto the final exam.

3. A final examination, between December 5<sup>th</sup> and December 19<sup>th</sup>, 2018, arranged by the Examinations Office. Final exam will be the same for both sections 01 and 02.
4. A laboratory exam on **MOODLE** for **30 minutes** for 10 multiple choice questions and 5 short answer questions. It must be done between Friday November 23<sup>rd</sup> 18H30 and Monday November 26<sup>th</sup>, 18H30.

**SURPRISE QUIZZES:** 5 or 6 surprise quizzes will be given during the term. Each of them will include 1 or 2 simple questions related to material covered in the previous two lectures. Students will have between 5 and 10 minutes to complete the quiz. No surprise quiz will be given during the lecture following a test. The worst grade will be dropped in order to count the best 4 or 5 grades. Attendance will be judged on the number of quizzes completed. If you feel that the format of the quiz will not give you a fair opportunity at showing your knowledge, speak with the professor.

**DALITE:** DALITE is a database of multiple choice questions selected to review the content of Introductory Organic Chemistry I. There will be 0.2% allowed per questions fully answered (one choice + one rationale and a second choice). You will have to provide a rationale for your first answer. You will then be confronted with another rationale from the database and will have to submit another answer. You do not have to be correct to get the part mark. You need to answer 25 questions in order to get the maximum of 5%. You can answer more questions if you want! You can access the DALITE's questions on Moodle starting Friday, September 7<sup>th</sup>, 9H00 until Monday, September 24<sup>th</sup> 18H30.

**COURSE GRADE:** The final grade of the course is based on the marks obtained in the examinations, quizzes and the laboratory marks. The composition of the final grade is as follow:

DALITE	5%
Surprise quizzes (best 4-5 out of 5-6)	10%
Attendance	5%
Test 1 (2 stages exam)	10%
Test 2	15%
Final exam	30%
Lab reports	15%
Lab examination	10%
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	100%

*Separate minimum passing marks are required for the theory (weighted average of the two tests, the final exam, the attendance, the surprise quizzes, and DALITE), for the lab (weighted average of the lab reports and the lab exam) and for the lab exam. Minimum passing marks for the lab exam and the theory is 50% (D) and for the lab is 60% (C-).*

Letter grades will be assigned according to the following criteria:

A+: 90.00-100.00	A: 85.00-89.99	A-: 80.00-84.99
B+: 76.67-79.99	B: 73.33-76.66	B-: 70.00-73.32
C+: 66.67-70.00	C: 63.33-66.66	C-: 60.00-63.32
D+: 55.00-60.00	D: 50.00-55.00	F: see previous paragraph

**STRATEGIC LEARNING:** Strategic Learning, collaborative study session, accompany this class. Attendance at these is voluntary but strongly encouraged. More details about this will be given in class.

**MANDATORY QUIZ AND SEMINAR:** As part of this course, you are *required* to i) attend a Chemistry and Biochemistry Departmental Seminar on the academic conduct code and the appropriate use of information sources and ii) pass the online quiz associated with this seminar (the passing grade for the quiz is 100%). (**Note:** This is **not** the University's quiz you may have been asked to take when you first registered and logged into the myConcordia portal; the one you must take is similar, but graded by the Department of Chemistry and Biochemistry, and you do not have access to it until after you have attended the seminar.) The aim of this seminar is to clarify the academic conduct code in terms of what practices will be considered unacceptable with regards to work submitted for grading in Chemistry and Biochemistry courses. **You are only exempt from repeating the seminar and the quiz if you have**

**done both in Fall 2013 or more recently,\*** otherwise you are required to repeat both this term. This short seminar (1 hour) will be held at the following times (note that late-comers will **not** be admitted):

Date	Time	Room
Monday, Sept. 24	16:45-17:45	HC 155
Tuesday, Sept. 25	16:45-17:45	CC 116
Tuesday, Sept. 25	20:45-21:45	HB 130
Wednesday, Sept. 26	16:45-17:45	HC 155
Wednesday, Sept. 26	20:45-21:45	SP S110
Thursday, Sept. 27	16:45-17:45	CC 115
Friday, Sept. 28	16:45-17:45	HB 130

As space for each of the seminars is limited by the room size, please **sign up** to your preferred time as soon as possible (slots fill up quickly). Sign-up sheets are available two weeks in advance of the seminars outside SP 201.01 (Departmental office). Only sign up in **available slots**: rooms must not be filled over capacity!

***If you do not complete this course requirement, your final grade for the course may be lowered by one full letter grade with an incomplete (INC) notation until such time as this requirement is completed. Please refer to the undergraduate calendar (section 16.3.6) for details on removal of an incomplete notation.***

\* You are exempt if you can locate your ID in the pdf file located on the Departmental web site (<http://www.concordia.ca/content/dam/artsci/chemistry/docs/Compliance-list.pdf>).

**PLAGIARISM AND OTHER FORMS OF ACADEMIC DISHONESTY:** The Academic Code of Conduct can be found in section 17.10 of the academic calendar (<http://www.concordia.ca/academics/undergraduate/calendar/current/17-10.html>). Any form of unauthorized collaboration, cheating, copying or plagiarism found in this course will be reported and the appropriate sanctions applied. The mandatory seminar is a clear and fair opportunity to learn what our faculty regards as academic misconduct. Failure to take part in this learning opportunity and thus ignorance of these regulations is no excuse and will not result in a reduced sanction in any case where academic misconduct is observed.

**COURSE NUMBER & SECTIONS:** Make it a point to remember the *course number*, your *lecture section number* and your *lab section number* for the duration of the course. This information will be required frequently later when you have to fill in your answer books during examinations and when submitting lab reports, etc., to ensure that your grades are correctly recorded.

**LABORATORY INFORMATION:** Laboratory Coordinator: Ms Zornitsa Stoyanova, SP-201.10, Tel. 848-2424 ext. 5976. Email: [Zornitsa.stoyanova@concordia.ca](mailto:Zornitsa.stoyanova@concordia.ca) Chem. 222 Laboratories are located at SP-116 and SP-112. **Laboratories start the week of Monday, September 10 2018.** All students must attend the section for which they are registered during this week. All questions on matters related to the lab organization should be addressed to Ms. Stoyanova.

*Laboratory performance is graded based on the quality of the experimental work, the laboratory reports and a laboratory exam. In cases of very poor technical abilities or dangerous laboratory behavior, your lab grade may be reduced by a maximum of 5 points out of the total of 25 points.*

Do not expect a particular laboratory experiment to be directly related to the material covered in the lectures of the preceding week. **CONSIDER THE LABORATORY WORK AS AN INDEPENDENT AND ADDITIONAL LEARNING EXPERIENCE.**

**LABORATORY MANUAL & MATERIALS:** The lab manual for the course is: **Operational Organic Chemistry**, a problem-solving approach to the laboratory course” Lehman, John W. 4<sup>th</sup> Edition, Prentice Hall, 2009. This is **NOT** available anymore and a **coursepack** containing the information can be bought from the University Bookstore. Other items such as lab coats and safety glasses, and a lab note book are mandatory and can be purchased from the bookstore.

**LAB CONTENT:** The laboratory component of the course is divided into 8 experiments spread over 10 weeks.

1. Exp. 4 Synthesis of Salicylic Acid from Wintergreen Oil (1 week)
2. Exp. 11 Identification of Unknown Ketones (2 weeks)
3. Exp. 7 A Green Synthesis of Camphor (1 week)
4. Exp. 42 Haloform Oxidation of 4'-Methoxyacetophenone (1 week)
5. Exp. 20 Reaction of Iodoethane with Sodium Saccharin, an Ambident Nucleophile (1 week)
6. Exp. 30 Synthesis of Triphenylmethanol and the Trityl Carbocation (2 weeks)
7. Exp. 29 Borohydride Reduction of Vanillin to Vanillyl Alcohol (1 week)
8. Exp. 9 Isolation and Isomerization of Lycopene from Tomato Paste (1 week)

The objective of the experiments is to learn the basic laboratory procedures, and the proper way to write a laboratory report; all of this within an organic chemistry framework. You will be exposed to simple and advanced instrumentation. For some experiments, you will be judged on the quality of the results: yield and purity. There will be a lab report to write for every experiment; only some components for most of the experiment and all parts for exp. 29. You are invited to consult the laboratory Moodle website associated with this course for more information.

**LAB EXEMPTIONS:** Students who are repeating the course, having passed the lab component within the past two (2) years, may be eligible for a lab exemption. Applications for the exemption (forms available in SP201.01) must be completed by the end of the first week of term (*i.e.* prior to the start of the laboratory); late applications will not be accepted. Signed and completed forms are to be returned to Hilary Scuffell, (SP 275.01). Students **MUST** register for the appropriate lab exemption lab/tutorial section; students registered in any other lab/tutorial sections will be required to complete the lab portion of the course (**NO EXCEPTIONS**).

**LABORATORY INSTRUCTORS (TEACHING ASSISTANTS):** Each laboratory section will have one or two demonstrators who are senior undergraduates, graduate students or staff members of the department. You must know their names, emails and the location of their rooms. You will need to contact them later for matters related to your labs.

**COURSE WITHDRAWALS:** Students who withdraw from the course must also check-out from their laboratory section. Only those students registered in the course may attend the laboratory and receive a grade for lab work.

**TYPES OF QUESTIONS**

	<b>Quiz</b>	<b>Test 1</b>	<b>Test 2</b>	<b>Final</b>	<b>Example 1</b>	<b>Example 2</b>
Identify and visually represent the covered functional groups and discuss their properties and reactivities. (Basic to intermediate level)	Yes	No	Yes (1)	Yes (3-4)	Sample Test 2 Question 3	Sample Final 1 Questions 3, 4, 8, and 12
Draw mechanisms for the reactions involving covered functional groups. (Basic level)	Yes	No	Yes (1)	Yes (4-5)	Sample Test 2 Question 1	Sample Final 1 Questions 2, 5, 8, and 11
Predict the chemo-, regio-, and stereoselectivities for the reactions involving covered functional groups using steric and electronic effects.	Yes	No	Yes (1)	Yes (4-5)	Sample Test 2 Question 2	Sample Final 1 Questions 2, 3, 5, 10, and 11
Explain the chemo-, regio-, and stereo-selectivities for the reactions involving covered functional groups using steric and electronic effects. (Basic level)	Yes	No	Yes (1)	Yes (3-5)	Sample Test 2 Question 1	Sample Final 1 Questions 2, 3, 5, 8, 11, and 12
Design a 5-10 step synthesis using the principles of chemo- and regio-selectivities. (Basic level)	Yes	No	No	Yes (2)	Sample Final 1 Questions 7 and 9	Sample Final 2 Questions 2 and 9
Extract structural information from the MS, IR, and NMR spectra to identify simple organic molecules. (Basic level)	Yes	Yes (2)	No	Yes (1)	Sample Test 1 Questions 1 and 2	Sample final 1 and 2 questions 1 and 6