

**CONCORDIA UNIVERSITY
DEPARTMENT OF CHEMISTRY AND BIOCHEMISTRY**

**CHEM 293
SPECTROSCOPY AND STRUCTURE OF ORGANIC COMPOUNDS**

SYLLABUS – Summer 2024

GENERAL INFORMATION

Spectroscopy and Structure of Organic Compounds (CHEM 293) is a one-term course required for all degree programs in chemistry and biochemistry. CHEM 293 requires CHEM 222 (Introductory Organic Chemistry II). It will introduce you to basic concepts used in the identification of organic compounds with methods based on electronic, vibrational, and nuclear magnetic resonance spectroscopies as well as mass spectrometry.

INSTRUCTOR	Professor H.M. Muchall Office SP 275.15 Tel. 848-2424 x3342 (I will not return calls.) heidi.muchall@concordia.ca
COURSE FORMAT	Lectures and Laboratory
LECTURE HOURS	Mo/We 10:15 – 11:30
LOCATION	CJ 1.121
TEXTBOOK	<i>Pavia, Lampman, Kriz, Vyvyan</i> , Introduction to Spectroscopy, 5th Edition
CALCULATOR	scientific
COURSE WEBSITE	Moodle: CHEM 293 2241 and CHEM 293 LAB 2241
OFFICE HOURS	Mo 15:00 – 16:00; or by email; or drop-in “anytime”: stick your head in and ask if I am available.

COURSE WITHDRAWAL

Students who withdraw from the course must also check-out from their laboratory section. You may only attend the lab and receive a grade for lab work, if you are registered in the course. **Wednesday, May 15, 2024 is the last day for academic withdrawal from Summer-term courses.**

LECTURES, VIDEOS, READING AND NOTES

We will be operating “flipped classroom”: classroom time will be in-person, but voice-over PowerPoint slides are made available as **videos** on Moodle, for you to listen to **before** class. The following classroom time will then be dedicated to your questions, additional explanations, examples, practice sessions...

Take good lecture notes while listening to the videos, add to these during the live classtime, and work through the notes **after** the official lecture. Read the textbook material to add further key ideas to your notes.

Remember that reading a chemistry text is not like reading a novel. In particular, even though the textbook is excellent, it may contain mistakes you must correct. Exams 1 and 2 and the Final Exam are **open book!** Have pencil and paper and the lecture slides ready to take notes as you read the chapters. This course requires that you work through problems and spectra time and again. You most likely cannot succeed in this course without this practice.

COURSE OBJECTIVES

- To provide you with an introduction to the spectroscopic methods used in (organic) chemistry, their theory and instrumentation.
- To provide you with the necessary tools for the interpretation of spectra of organic compounds.
- To enable you to identify organic compounds from their spectra.

COURSE OUTLINE

- 1 Molecular Formula and Molar Mass
- 2 Ultraviolet Spectroscopy
- 3 Infrared Spectroscopy
- 4 Nuclear Magnetic Resonance Spectroscopy
- 5 Mass Spectrometry

A detailed list with keywords for every topic can be found on Moodle. Videos (mp4) and their slides (pdf) are also posted; I suggest you print the slides to annotate as you listen to the videos. It is not useful to print the slides too small! I suggest one slide per printed page. Taking notes on the slides electronically is not recommended.

EXAMINATIONS

There will be four (4) formal, mandatory, examinations:

1. Exam 1 (in-class, textbook allowed) on **June 17, 2024**,
2. Exam 2 (in-class, textbook allowed) on **July 24, 2024**,
3. cumulative Final Exam (in-class, textbook allowed) on **August 12, 2024**, and
4. "Lab Exam" (in three parts; practical, in-lab, pre-labs allowed) during the term (see below).

Exams 1, 2 and the Final Exam are "**open book**". You are allowed to bring the **textbook**, only (!). You are allowed and even required to annotate the textbook, but you must not add any pages to it. You are not allowed to bring a collection of loose pages. Photocopies of textbook pages must be in a binder or otherwise bound. You will not be allowed to use the electronic textbook during exams.

If you are absent from an in-class exam, you must produce a written excuse appropriately signed (i.e., by a doctor or an employer) on the appropriate letterhead paper or use the short-term absence form. In case of the former, the letter must be delivered to the Professor as soon as possible but **no later than one (1) week after the exam**. If you lack an excuse or if your excuse is not valid, you will receive a mark of zero for the exam. A make-up exam will not be offered: in case of a valid absence for in-class Exams 1 and/or 2, the percentage will be transferred onto the Final Exam.

PROBLEM SETS, TEXTBOOK QUESTIONS AND END-OF-LECTURE QUESTIONS

There will not be formal problem sets or assignments. However, problem sets and their answers are posted on Moodle; questions from the textbook are suggested in the Schedule (on Moodle). Work through the problems and pay particular attention to how the information is given in the answers where you have them from me.

The Moodle lecture site has one or two end-of-lecture questions for each day, for you to attempt.

LABORATORY EXEMPTION

If your course grade in **Winter 2024 was a DISC, you may not** request a lab exemption and must repeat the lab component. Otherwise, this term, you may request a lab exemption, if you are repeating the course (with a previous grade of F or better) and have passed the lab component **within the past two (2) years**. Application forms for the exemption, available online (<http://www.concordia.ca/artsci/chemistry/programs/undergraduate/procedures-forms.html>), must be completed and returned to the Chemistry Reception (chemistry.reception@concordia.ca) by the end of the first week of term, **no later than noon, Friday, May 10, 2024**; late applications will not be accepted. You will be registered into the appropriate lab exemption section (56); if you remain in any other lab section, you will be **required** to complete the lab portion of the course. If you apply late or are denied exemption, you must repeat the lab portion. Partial exemptions will not be given, in particular, lab (performance and reports) and lab exams are linked. If an exemption is granted, your previous lab mark (lab reports and lab exams) will be carried forward.

Please note that you will **not** be granted a lab exemption in a future term, if your course grade is DISC or R, your lecture performance is below 40% and/or you do not write the final exam, even if you pass the lab.

LABORATORY INFORMATION

The laboratory coordinator is **Dr. Constantin Yannopoulos** (constantin.yannopoulos@concordia.ca). All technical questions on matters related to the labs (absences, section switches) must be addressed to him.

The CHEM 293 laboratory is located at SP 220. **Laboratories start the week of Monday, May 13, 2024.** You **must** attend the section for which you are registered during this week. Switches will be considered only in exceptional circumstances (e.g., course conflict). All requests for section switches must be made to Dr. Yannopoulos. Laboratories are mandatory. If you are absent from a lab, you must produce a written excuse (analogous to the above section “**Examinations**”). Only one such absence is allowed and must be made up.

The laboratories are supposed to enhance the lecture material and provide hands-on experience. Laboratory performance is marked on the quality of the experimental/computational work, reports and lab exams.

LABORATORY EXAMS

Your lab knowledge will be tested in three practical lab exams. The exams will be given in regular lab periods, during the weeks of **June 3 (UV)**, **June 17 (IR)** and **July 15, 2024 (¹H NMR)**. The three lab exam marks will be averaged, and the passing mark for the average is 50%. **You will receive an R as course grade should your lab exam average be below 50%.** A passed average counts for 10% of the final course grade. The lab exams are an integral part of the laboratory portion of CHEM 293. As such, each is linked to its lab (UV, IR, ¹H NMR), i.e., you will take each lab exam in the term you take the lab. A missed lab exam will need a valid excuse (analogous to the above section “**Examinations**”) and must be made up.

Details on the lab exams can be found in the lab manual.

LABORATORY MANUAL AND MATERIALS

The lab manual is

Spectroscopy and Structure of Organic Compounds, Department of Chemistry and Biochemistry.

The lab manual (pdf) is available on the CHEM 293 course and lab Moodle sites; a printed copy is not offered this term. Other items such as lab coats and safety glasses (both mandatory) are available from the University Bookstop.

LABORATORY INSTRUCTORS (DEMONSTRATORS)

Each laboratory section will have one or two demonstrators who are graduate students or staff members of the department. You must know their names and the location of their rooms. You will need to contact them later for matters related to your labs: all questions on procedures or general understanding of lab material must be brought to a TA **first**. The TAs are listed, with their preferred email addresses, on Moodle.

ACADEMIC INTEGRITY AND “CHEM 101”

(Source: <http://www.concordia.ca/students/academic-integrity.html>)

Go to the link above and familiarize yourself with what you are supposed to do and what you are supposed to avoid doing. **In short:** always maintain your academic honesty! And if you have specific questions on this, ask.

The most common offense under the Academic Code of Conduct is plagiarism, which the Code defines as “the presentation of the work of another person as one's own or without proper acknowledgement.”

Clarifications: “Work” here could be material copied word for word from books, journals, internet sites, professor's course notes, etc. It could be material for which the words have been changed but where the phrasing still closely resembles that of the original source. It could be the work of a fellow student, e.g., a lab report completed by another student, or unauthorized data for a lab report. It could be a paper/report purchased through one of the many available sources or obtained through an AI algorithm. “Plagiarism” does not refer to words alone: it also refers to images, graphs, tables and ideas. “Presentation” is not limited to written work: it also includes computer and artistic works. Finally, if you translate the work of another person into English and do not cite the source, this is also plagiarism. Since “AI” is not yet a “person”, cheating with it is just that, cheating, and therefore an offense. Unauthorized recordings and distribution of lecture and related materials (electronically or otherwise) are also offenses.

The Academic Code of Conduct can be found in section 17.10 of the undergraduate calendar (<http://www.concordia.ca/academics/undergraduate/calendar/current/17-10.html>). Any form of cheating, unauthorized collaboration, copying or plagiarism found in this course will be reported to the Dean's office.

“CHEM 101”: As part of CHEM 293, you are **required** to attend a seminar and pass a quiz on avoiding plagiarism and other forms of academic dishonesty, offered by the Department of Chemistry and Biochemistry. If you have already attended the seminar and achieved 100% (110 points) on the quiz **within the past five (5) years (i.e., Summer 2019 or more recently)**, you have fulfilled the requirement. You are exempt, if you can locate your ID, with no associated entry, in the pdf file located on the Departmental web site (<http://www.concordia.ca/content/dam/artsci/chemistry/docs/compliance-list.pdf>).

The aim of the seminar and quiz is to clarify which academic practices are considered unacceptable by the Department of Chemistry and Biochemistry. The seminars will be offered during the third week of classes (see the appendix for the dates and times); the quiz is online, can be accessed through the Student Hub (on Moodle, choose CHEM 101 in Specialized Chemistry Sites) and can be taken from after the seminar up to the deadline announced on the CHEM 101 site, but preferably as soon as possible. **If you do not attend the seminar and/or do not pass the quiz (passing mark is 100%), your course grade will be lowered by one full letter grade with an incomplete (INC) notation.** Please refer to the academic calendar section 16.3.5 on how to remove the INC and restore the proper course grade, and read the CHEM 101 FAQ section located on the Departmental web site (<http://www.concordia.ca/artsci/chemistry/programs/undergraduate/procedures-forms.html>).

COURSE GRADE

The final grade in the course is based on the marks obtained in the examinations and the laboratories, which include the three averaged lab exams. The composition of the final course grade is as follows:

In-class Exams	50% (25% each)
In-class Final Exam	25%
Laboratories	25% (10% lab exams, 10% lab reports, 5% unknown)

Separate minimum passing marks are required for the lecture (weighted average) and the laboratory (weighted average) material. The minimum passing mark for the lecture part is 50% (D–), for the lab part 60% (C–). The minimum passing mark for the averaged lab exams is 50% (see above). The grading scheme (percentage to letter grade, normal rounding) follows:

Passing Grades:

A+	A	A-	B+	B	B-	C+	C	C-	D+	D	D-
100-90	89-86	85-80	79-77	76-73	72-70	69-67	66-63	62-60	59-57	56-53	52-50

Failing Grades:

F	R
<50 (theory)	<40 (theory) or <50 (lab exam) or <60 (lab)

In the event of extraordinary circumstances beyond the University's control, the content and/or evaluation scheme in this course is subject to change.

H.M. Muchall
April 2024

Appendix**Seminar on academic conduct (first part of CHEM 101)**

Date (S2024)	Time	Mode	Registration link
May 23 (Thursday)	19:30-20:30	Zoom	https://concordia-ca.zoom.us/meeting/register/tZEpdOutrj0oGteYFc4CTvwfkCQjgeWHbspY

Please **register** early (copy the corresponding link above into your browser) for your preferred slot. You will **receive** a notice from Zoom with the link to the actual seminar. Then do not forget to **attend** the seminar. We will take attendance at the Zoom seminar: do not join late or leave early. You must join the seminar **yourself**: do not “watch with a friend” who logged in: this will not register you as having attended.