

Winter 2020
Course Information and Syllabus

PROFESSOR:

Dr. K.-S. Focsaneanu (Fox)
 D'lorio 119
 613-562-5800 ext. 6894
 Email: kfocsane@uottawa.ca

OFFICE HOURS:

- after TUE lecture, MRN Common Room
- MON at 13h00 – 14h30 in DRO 119
- WED at 10h00 – 14h30 in DRO 119
- or email me to book an appointment

TEACHING ASSISTANTS

To be announced in class...

CLASS SCHEDULE:

Monday	Tuesday	Wednesday	Thursday	Friday
	<i>Lecture</i> 8:30 – 10:00 MRN 150			<i>Lecture</i> 10:00 – 11:30 MRN 150
	<i>DGD</i> (with Dr. Fox) 14:30 – 16:00 MRN 150	<i>DGD</i> (with a TA) 16:00 – 17:30 MRT 218	<i>DGD</i> (with a TA) 16:00 – 17:30 SCR 002	

Prerequisite: CHM1311 or CHM1301 or Grade 12 chemistry or equivalent.

LABS:

Lab Coordinator: Dr. Rashmi Venkateswaran, vrashmi@uottawa.ca

For your lab schedule (including lab tutorials) the lab manual, and other details, consult the Org Chem Lab website on Brightspace. You can download and print what you want/need at your own convenience.

IMPORTANT NOTES ABOUT THE LAB:

- You MUST purchase safety glasses (\$4 - \$9) and a lab coat (\$20 - \$30) BEFORE coming to the lab. These are available in various places, including the Science Students' Association and uOttawa Bookstore.
- Your lab section is the number after the lab code, e.g. CHM 1321 Z0X. Once you know your lab section, go to the CHM LAB website to see the schedule. Please bring a printout of your timetable to the lab, to verify that you are in the correct lab section.

MORE INFORMATION ABOUT THE LAB WILL BE GIVEN IN THE FIRST LECTURE

COURSE EVALUATION:

Your mark is based on two parts: the lecture portion and the laboratory portion. The lab portion is fixed at **15%**. Please note that you must pass BOTH the lecture and laboratory portions independently in order to pass the course.

The lecture portion counts for the remaining **85%** of your final grade, but its calculation is flexible, as you may "opt-out" of the online assignments if you wish (but more on that later). Here are the two possible evaluation schemes:

	With Online Homework	Without Online Homework
Online Homework via <i>Sapling Learning</i>	10%	-
Participation	5%	5%
In-class Quiz (Friday February 14)	5%	5%
Midterm 1 (Saturday March 7 @ 10h00)	15%	17.5%
Midterm 2 (Saturday March 28 @ 10h00)	15%	17.5%
Final Exam	35%	40%

**Midterm 1, Midterm 2, and the Final Exam proportions are flexible by $\pm 5\%$ **

ABSENCE:

If you know in advance that you will be missing a test for any reason, contact me immediately to discuss the situation BEFORE the midterm (I will not accept non-medical excuses AFTER the tests have taken place!). If you are ill on the day of a test, please bring me a medical certificate to receive exemption from the test ASAP.

If you miss the *final exam* due to illness, please bring a medical certificate to the Faculty of Science to have your final exam deferred to July. (For more information on final exam deferral, go to www.science.uottawa.ca) If you miss a lab due to illness, please obtain a medical certificate, inform your demonstrator and see Dr. Rashmi.

LECTURES:

There is an 80% attendance requirement in the Faculty of Science. If you miss a lecture, it is your responsibility to acquire any notes and assignments for that day from another member of the class. Lecture presentations will be posted to the course website in pdf format; however, we will be drawing most molecules and mechanisms by hand in class, so bring some paper and a pencil. I will be using in-class participation to record attendance.

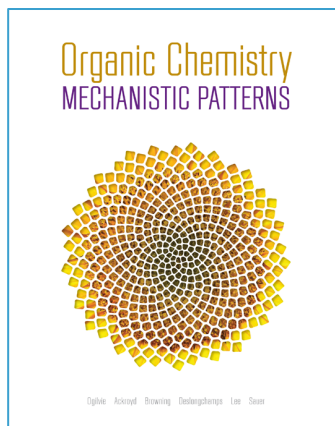
Lectures will be recorded using lecture-capture software so you will be able to go back and re-watch them if you wish. NOTE: occasionally there might be technical issues with the recordings; therefore, be prepared to ask a fellow student about any missed material.

DGDs

The discussion groups (DGDs) are *optional, but highly recommended*. While you may have been assigned a particular DGD in your schedule, feel free to attend any DGD you wish, or even more than one if you feel the need to do so. In the DGDs, I (or a TA) will sometimes cover supplementary information and answer questions related to course material posed in person or posted on the forum on the course website. We will NOT answer questions relating to your lab reports – if you have questions or need help with lab reports, talk to your lab demonstrator or go to the lab tutorials (that's what they are for!). The Tuesday afternoon DGD (at 14h30, with me) will be recorded and the resulting lecture-capture video will be posted to the course website.

DGDs will begin January 7th, with a special review on NOMENCLATURE.

TEXTBOOK:



The following is our official recommended textbook:

Organic Chemistry: Mechanistic Patterns

by Ogilvie, Ackroyd, Browning, Deslongchamps, Lee, and Sauer

Available at the uOttawa Bookstore and the Agora Bookstore in the following package:

- textbook + student solution manual + Chemware access (\$112)

If you are taking both CHM1321 and CHM2120 (Organic Chemistry I and II), then it is *definitely* a good idea to buy yourself a copy of this textbook. On the course website you will find a pdf with a list of suggested readings and problems from this text.

Please note that since it is a first edition, we will have to beware of typos/errors. However, I am **thrilled** we are using this book, as it presents a pedagogical advantage over all other textbooks. To explain:

Traditionally, the subject of organic chemistry is presented in a step-wise fashion, where reactions are organized by functional group (for example, a chapter on the chemistry of aldehydes/ketones, another on alcohols, another on alkenes, etc.). Unfortunately, we have found that this method largely encourages students to simply memorize the material, rather than understanding the mechanisms themselves (and to master organic chemistry, you **MUST** understand mechanisms!). A few years ago, the instructors of the organic chemistry courses at uOttawa decided to completely revamp the curriculum, adopting a “mechanisms first” approach. The textbook above is the end result of many years of hard work, trial-and-error, and fine-tuning this new, modern perspective of organic chemistry. So, naturally, it is real pleasure for all of us to be finally reaping the reward of so much effort!

That being said, in the past, we used *Organic Chemistry* (7th edition) by Brown, Iverson, Anslyn, and Foote for this course. It's also a good book, but it follows the traditional organization of material and thus may seem confusing. So, my advice is to only buy this book if you get a really, REALLY good deal on it.

If however, you do not wish to purchase a textbook, I have placed a copy of the textbook and solution manual, along with the following books, on reserve at Morisset Library (simply search the Course Reserves for the course code, CHM1321):

- *Get Ready for Organic Chemistry* by J. Karty
- *The organic chem lab survival manual*, by J. Zubrick

MOLECULAR MODELS:

These are **required**. Darling Molecular Models are best. New kits can be purchased from the Science Students' Association and the uOttawa bookstore. Please buy your models soon and bring them to class starting in Week 3. We will be using them in class, and you will need them for a take-home assignment.

EVALUATION EXERCISES:

Assignments: (Graded, optional)

Ten homework assignments, which can be worth up to **10%** of your final mark, will be administered online through a program called SAPLING LEARNING. These will be weekly assignments (45 – 60 min), designed to help you practice organic chemistry, after having covered the material in class. You can login to the website at any time to work on it (you do not have to complete the whole assignment in one sitting; you can save your work at any point). You will generally have one week to complete each assignment.

More information about registering for Sapling Learning and completing the assignments will be given in the first lecture. Please wait until our first lecture before joining. Do NOT register and/or pay for any online homework system until you are certain you are staying in a specific section of this course.

I *strongly recommend* that you get a Sapling account and use it for the assignments. It is a very valuable learning tool, and if you devote the time to using it properly, it will certainly help you learn, understand and master the course material. Also, marks on the online homework portion are generally quite high (many people earn the full 10%), due to the many hints/help available, the tutorial nature of the program, various extra credit exercises, and because there is no time limit.

However, if you wish to opt out of Sapling: you may do so with no penalty to your course mark. If you let me know at the beginning of the semester that you do not wish to participate in this aspect of the course, I will redistribute your marks as shown in the evaluation scheme on page 2. To be on the "OPT-OUT LIST", you must contact me by email no later than **January 31st 2020**.

Put the following in the subject line: SAPLING OPT OUT. In the email, include:

1. Your name
2. Your student number
3. Copy and paste this: "I opt out of the Sapling Learning Online Assignments".

Any requests to opt out of made after this date will be denied. Any request to opt back in after asking for an opt-out will also be denied after the deadline.

Suggested Exercises: (Not graded, optional)

I also will post extra practice problem sets on the course website as each topic is covered in the course. You do not have to hand them in, but I encourage you to do them as soon as they are posted. I will also post the answers, but you should try to do the problems WITHOUT the answers beside you.

In-Class Participation

We will be using online software to record in-class participation. This system uses feedback collected from your cellphone or any web-enabled device when answering questions in class. By bringing your devices to class and participating in the in-class questions, you will earn up to **5%** of your final grade, according to the following table:

Lectures Attended	0 – 7	8 – 9	10 – 12	13 – 15	16 – 18	19 – 24
Score	0/5%	1/5%	2/5%	3/5%	4/5%	5/5%

Quiz:

The 30 min quiz is worth **5%** of your final grade and will take place in class on Friday February 14. More information about the quiz will be given in class.

Midterms:

There will be two Saturday midterms (**March 7 and 28, both 10h00 – 11h30**), each worth **15 – 17.5%** of your final mark. The content of each test will be mentioned in class. Tests are semi-cumulative. A periodic table and pKa table will be provided for all tests and for the final exam. To assist you in studying, tests from previous years will be posted on the course website.

Final Exam:

The final exam date and location will be determined later in the semester. Your final exam will be cumulative and will be worth **35 – 40%** of your final mark. A periodic table and pKa table will be provided for the final exam.

Course Outline

Nomenclature: *Review it yourself.* You are responsible for naming chains up to 12 carbons long for all classes of compound covered (alkanes, alkenes, alkynes, alcohols, halides, amines, aldehydes, ketones, carboxylic acids, amides, ethers, cyclic and acyclic molecules). You are NOT required to name bicyclic compounds. **Our first DGD (January 7th) will be a rapid review of IUPAC nomenclature rules.**

Suggested readings/problems corresponding to the topics listed below are available as separate pdf's on the course website. Finally, please note that this list is *approximate* – the exact material covered and order of material is subject to change.

Organic molecular structures
<ul style="list-style-type: none">• The “organic” periodic table, electronegativity and periodic trends, covalent bonds• Drawing organic structures: Lewis & compressed structures, formal charges, resonance• Atomic and molecular orbitals, molecular orbital theory, bonding and anti-bonding orbitals• Orbital shapes and hybridization, bond angles and structure, σ and π bonds, geometries, relative energies• Polarity and dipoles, van der Waals forces, H-bonding; molecular structure and bulk properties
Alkanes and stereochemistry
<ul style="list-style-type: none">• Properties, line structures, σ bond rotation, conformations, energy potential diagrams, Newman projections• Cycloalkanes, ring strain, conformations, configurations, syn/anti and cis/trans nomenclature• Chair conformation, axial and equatorial bonds, chair interconversions• Stereochemistry, configuration and R/S nomenclature, enantiomers, diastereomers and meso compounds• Zig-zag structures, syn/anti nomenclature, resolution, optical activity, enantiomeric excess
Acids and bases
<ul style="list-style-type: none">• Acid/base reactions, acidity of organic compounds, inductive effects, resonance, periodic trends• Predicting equilibria using pK_a values• Functional groups, arrow notation, reaction co-ordinate diagrams
π -Bonds as electrophiles
<ul style="list-style-type: none">• Polarity of π-bonds; carbonyl compounds; effects of resonance• Introduction to mechanisms, nucleophiles and electrophiles, retrosynthetic analysis• Reduction of carbonyl groups via addition “across” π-bonds: sodium borohydride and lithium aluminum hydride• Grignard reagents: preparation, polarity, acid/base reactions, carbonyl displacements• Organo-lithiums: preparation, polarity, acid/base reactions, carbonyl displacements• Formation of hydrates, hemiacetals, and acetals: equilibria with carbonyl forms; intramolecular reactions• Acid and base catalysis in carbonyl additions; oxonium ions and additions to oxoniums• Imines: formation by acid catalysis; reduction by sodium cyanoborohydride• Cyanohydrins: formation and oxidation to alpha-hydroxy carboxylic acids
π -Bonds as nucleophiles
<ul style="list-style-type: none">• Alkenes: cis/trans and E/Z isomerism, relative stability, and cycloalkenes• Electrophilic addition reactions: regioselectivity versus stereoselectivity• Markovnikov additions: hydration, hydrohalogenation, halogenations, halohydrins, and oxy-mercuration• Anti-Markovnikov additions: hydroboration and radical hydrohalogenation• Epoxide formation and ring opening (acidic versus nucleophilic conditions)
Aromatic compounds as nucleophiles
<ul style="list-style-type: none">• Aromaticity: Huckel's rule, aromatic versus anti-aromatic compounds• Electrophilic aromatic substitution: directing groups and electrophiles• The Hammond Postulate: manipulating multiple directing groups• Assorted organic transformations