

CHEM 4000A: Medicinal Chemistry (Spring 2024)

		email	office	phone	office hours
Instructor	Susan Findlay	susan.lait@uleth.ca	SA 8458	317-5044	open door

To avoid missing important announcements, please check your uleth.ca email daily.

Logistics

- Classes are on Mondays, Tuesdays and Thursdays at 12:00-12:50pm in M1060 (Markin Hall).
- The midterm will be in-person on a Thursday evening. I arrange alternative times for students with conflicts.

Prerequisite

- CHEM 2600 or equivalent

Course Overview

Medicinal chemists use organic chemistry to make drug targets. In this course, students will develop some of the skills necessary to this endeavor, particularly retrosynthetic analysis. By studying previous syntheses of drugs and drug targets, students will improve their understanding of reaction mechanisms, add to their vocabulary of reactions, evaluate the strengths and weaknesses of existing syntheses, and propose new synthetic routes to simple targets.

Course Structure

Students will be assigned readings from the text which will provide a starting point for discussion on Tuesday and Thursday classes. New reactions relevant to the day's discussion may also be introduced (and the standard organic text should support those topics). Monday classes will be structured in "problem set" format in which students take turns working through steps of a synthesis with the help of peers and instructor, when necessary.

To encourage active involvement in both class discussions and the problem set classes, participation marks will form a significant portion of each student's overall grade. Each student can earn a maximum of 40 points which will then be divided by two to obtain a score out of 20. Taking a turn at the board during problem set earns a student 5 points. Active participation in class discussions (or helping the person at the board during problem set) earns a student 1 point (maximum 1 point per class; however, this point can be earned in addition to the 5 points for taking a turn at problem set). To earn participation points, a genuine effort must be made to contribute; credit will not be given for random guesses or other half-hearted attempts. Participation marks do not, however, depend on answers being correct.

Textbook

- **Elements of Synthesis Planning** by R.W. Hoffmann (published by Springer)
- You will also need access to a standard organic chemistry text such as Ogilvie's Organic Chemistry (the required text for CHEM 2500/2600 at the University of Lethbridge). Equivalent texts will be available on reserve at the library for students who are no longer in possession of their copy of Ogilvie.
- You may also find your molecular model kit from CHEM 2500/2600 to be useful.

Online Resources

- <https://scholar.ulethbridge.ca/susanfindlay/book/chem-4000-medicinal-chemistry> has lecture notes, practice questions, practice tests, etc.
- <http://moodle.uleth.ca> will be used to track participation points
- <https://www.ulethbridge.ca/accessible-learning-centre/content/exam-accommodations> is the website for the University of Lethbridge's Accommodated Learning Centre.

Practice Problems

A reading list will be posted on the class website, and it will indicate which of the end-of-chapter questions are of appropriate difficulty that you should work through them. Additionally, it is recommended that you work through problems in the standard organic textbook pertaining to any new reactions discussed in class. As you likely know by now, it is virtually impossible to succeed in an organic chemistry course without working on problems consistently throughout the term (as we will be doing in class!). Cramming does not work in this discipline!

Topics to Be Covered[§]

Chapter (Hoffmann text)	Topic
1	Retrosynthetic Strategies and General Considerations when Designing Syntheses
2	Retrosynthetic Approaches Based on Functional Group Arrangement
3	Retrosynthetic Approaches Based on Molecular Skeleton
4	Retrosynthetic Approaches Based on Available Materials
5	Planning a Synthesis Based on a Proposed Retrosynthesis
6	Formation of Cyclic Structures
7	Protecting Groups
8	Evaluating Syntheses
10	Addressing Stereochemistry and Chirality Centers

[§] I reserve the right to alter this plan as required. You will be informed of any major deviations.

Grade Composition

	Dates	
Participation	<i>see page 1</i>	20%
Assignments	SciFinder Assignment (due Thursday, February 1 st by 5pm) Mechanistic Assignment (due Thursday, February 29 th by 5pm) Synthesis Assignment (due Thursday, March 28 th by 5pm)	3 × 10% = 30%
Midterm Test ¹	Thursday, March 7 th from 6:30 - 8:30 pm in M1060 ²	20%
Final Exam ³	<i>scheduled by Registrar's Office after Add/Drop deadline</i>	30%
	Total	100%

¹ Tests will cover all course material including demonstrations, practice problems and assigned readings up to the end of the preceding lecture unless otherwise stated. Failure to attend a test without a valid reason (illness, family emergency, etc.) will result in a score of 0 for that test. If you miss a test for a valid reason, the value of that test will be added to the value of the final exam.

² The midterm test is scheduled for a Thursday evening. If you have a direct conflict with this date/time, you must email your class schedule to Susan Findlay at susan.lait@uleth.ca at least one week before the test so that she can arrange for you to write at an alternative time. **Please do NOT skip another class to write a test!**

³ The final exam for this course is cumulative covering all material presented in lecture, assignments, etc. throughout the semester. The exam will test your comprehension and your ability to problem solve. Only under extraordinary circumstances may students request to write an equivalent invigilated Final Examination at a time and place other than that scheduled. Students must make a written request to the Dean should the need arise.

Academic Integrity

- All students enrolled in this course are expected to behave ethically and act with integrity. **It is your responsibility to behave in the ways that you would want your fellow students to behave.** That is the only way to create an environment that is fair to everyone. Because our students are so important to us, we are passionate about defending your right to a fair learning environment. As such, **any student caught cheating will be reported to the Dean's Office; the minimum penalty will be a grade of 0 on the test or lab report in question or for their overall online assignment mark.** Under the University's Student Discipline Policy, repeated academic offenses trigger progressively more severe forms of discipline over and above those imposed by the instructor.
- In this course, the following behaviours are allowed (and encouraged):
 - Asking your instructor for clarification. You're writing a test and you think the question is missing an essential piece of data. It's completely acceptable to ask your instructor if you're right about that.
 - Studying in groups. Asking and answering each other's questions. Any course-related discussion that you would be comfortable having in front of your instructor.
 - Using CampusWire to ask questions about the assignments/lab/etc. Your instructors aren't going to do your assignment/report for you, but we will certainly help you find your way to the answer.
 - Working on practice questions or online assignments with friends – provided that you are all contributing ideas for the majority of questions. Explaining a concept is actually one of the best ways to solidify your understanding of it. Teaching is a fantastic way to learn!
- In this course, the following behaviours are forbidden:
 - Collaborating on tests. In this course, tests are individual. You may NOT work with others on them.
 - Using any resource not explicitly listed as "allowed" on a test. For example, if we specified that you were allowed to use your textbook, that would NOT permit you to use Google; it would permit you to use your textbook. Google is NOT a textbook. Wikipedia is NOT a textbook.
 - Sharing information about any test you have already written with any other student who has not yet written it. This includes lab quizzes and exams, and it includes ALL methods of communication.
 - Finding a way to access questions (or answers to questions) before you would normally be able to see them is cheating. This includes finding ways to see the answers to assignment questions without having to work through the normal process of figuring out the answers yourself. Doing this also robs you of the learning that is supposed to happen when doing the assignments and tends to result in significantly lower test scores compared to students who do them properly.
 - Copying another student's assignment/lab report/etc. This is very different from "working on online assignments with friends" because, here, the learning is lost and all that's "gained" is an inaccurate mark for the student doing the copying. Please note that, since we have no way of knowing who copied from whom, both students are held equally responsible. ("Working together" should never result in identical answers. "Working together" means discussing concepts and approaches. Students who work together on a lab report should still write the actual lab report independently so that they each express their understanding of the material IN THEIR OWN WORDS.)
 - Submitting work done by somebody else. This is called "contract cheating". It doesn't matter whether the other person is your friend, your roommate, your tutor, a family member or somebody on the internet. It's still cheating if they give you an answer and you copy it. It's still cheating if they give you an answer and you rephrase it.
 - Use of any website that allows students to submit questions to "tutors" who provide worked solutions for a fee. These websites tend to market themselves as "study resources"; they are actually "cheating websites". Given that we'll help you for free with any task on which help is permitted, there is no excuse for ever using any cheating website.

Conversion of Overall Percentage Grade to Letter Grade in CHEM 4000 Spring 2024

The normal overall percentage grade to letter grade conversion will take place according to the following table:

A+	90.00% – 100%
A	85.00% – 89.99%
A-	80.00% – 84.99%
B+	76.67% – 79.99%
B	73.34% – 76.66%
B-	70.00% – 73.33%
C+	66.67% – 69.99%
C	63.34% – 66.66%
C-	60.00% – 63.33%
D+	55.00% – 59.99%
D	50.00% – 54.99%
F	0% – 49.99%

However, it should be noted that the instructor reserves the right to adjust the conversion table when there are multiple students who have overall percentage grades close to one another (*i.e.* when overall percentage grades for students are within 0.33% of each other) and those grades span the intended percentage-to-letter grade cut-off.

For example, if the following overall percentage grades were obtained:

80.97%	78.62%
80.25%	78.45%
80.13%	78.11%
79.89%	
79.75%	

the overall percentage-to-letter grade conversion for the bottom end of A- might be lowered from 80.00% to 79.75%.

Similarly, if the following overall percentage grades were obtained:

71.59%	70.32%
71.28%	70.19%
71.00%	70.01%
	69.73%
	69.55%
	69.42%
	69.16%
	68.91%
	68.65%

the overall percentage-to-letter grade conversion for the bottom end of B- might be raised to 71.00%.

The purpose of maintaining such flexibility in overall percentage grade to letter grade conversion is to provide the instructor with an ability to accommodate for “natural breaks” in overall percentage grade distributions that correspond to a meaningful difference in course performance. In the event that the actual overall percentage grade to letter grade conversion deviates from the provided table, that deviation will be limited to a maximum of +/- 3.00%.