

Chemistry 432 / 533 – Advanced Organic Synthesis

Spring 2018 • 20508 • A01

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Lectures: Tuesdays, Wednesdays and Fridays 8:30am–9:20pm, Elliott 226

Office Hours / Drop-In Times: Mondays 1:00–2:00pm and Fridays 1:30–2:30pm, Ell 230

(note: drop-in will be shared with Chem335 this year)

Course Website: web.uvic.ca/~chem432/

Textbook: Strategic Applications of Named Reactions in Organic Synthesis, Kurti and Czako

Building upon the methodology learned in Chemistry 335, this course will focus on the art and science of total synthesis. Special attention will be paid to modern asymmetric transformations, organometallic coupling strategies (particularly Pd- and Ru-mediated reactions), and considerations of synthetic efficiency. A significant portion of the evaluation for this course will be based upon a proposal for the synthesis of a complex natural product.

Course Content:

1. **Named reactions** and reagents of use to the modern synthetic chemist.
2. **Vocabulary** commonly used to discuss and evaluate total syntheses.
3. **Concepts** frequently invoked in the planning and execution of a synthesis.
4. Considerations of **how one actually does total synthesis**.

Anyone who has taken Chem 335 (or similar courses at other institutions) will have learned a lot about topics 1–3. Arguably, however, topic 4 is most important to those wanting to advance in careers involving synthetic organic chemistry. In this course, named reactions, vocabulary, and concepts of reactivity or stereochemistry will be presented (as much as possible) within the context of notable total syntheses from the last 50 years. Hopefully, by the end of this course you will have increased your catalogue of named reactions while simultaneously developing an appreciation of the complexities involved in designing and executing your own complex syntheses of natural products or designed molecules.

Evaluation:

| | | | |
|--------------|------|--------------------|------|
| pKa quiz | 5 % | synthesis proposal | 25 % |
| assignment 1 | 10 % | final exam | 25 % |
| assignment 2 | 10 % | participation | 5 % |
| midterm exam | 20 % | | |

Your final grade will be reported as a numerical percentage, in keeping with UVic's policies on grade reporting. Letter grades are derived from numerical percentages as follows:

| | | | | | | | |
|----|---------|----|--------|----|--------|---|------------------------|
| A+ | 90-100% | B+ | 77-79% | C+ | 65-69% | F | < 50% |
| A | 85-89% | B | 73-76% | C | 60-64% | N | incomplete performance |
| A- | 80-84% | B- | 70-72% | D | 50-59% | | |

Course Website:

web.uvic.ca/~chem432/ has old examinations, supplementary material, and other useful information. Lecture notes are also posted but are intended for review only. **Do not bring them to class.**

Textbook:

Strategic Applications of Named Reactions in Organic Synthesis by Laszlo Kurti and Barbara Czako is the assigned textbook, and will be required to complete assignment 1. The bookstore charges too much for this text, so I encourage you to order a copy online instead (CDN \$117 at Amazon; eligible for free shipping). In addition to being useful for this course, you'll find that Kurti and Czako's book will be a really useful resource for you later on. In an era where most reference books have been supplanted by web resources, I still find myself drawing ideas and references from this book on a regular basis. If you really can't afford it, I've also placed a copy on reserve in the library.

Additional Texts:

The following books will be useful to you throughout the course (especially for your final assignment), and have also been placed on reserve:

1. Classics in Total Synthesis. K.C. Nicolaou and E.J. Sorensen.
2. Classics in Total Synthesis II. K.C. Nicolaou and S.A. Snyder.
3. Advanced Organic Chemistry. Jerry March.
4. Protective Groups in Organic Synthesis. T. Greene and P.G.M. Wuts.
5. Frontier Orbitals : a Practical Manual. N. T. Anh.

Other Resources:

Your second- and third-year organic chemistry textbooks will be very useful for looking up all those reactions that you once knew. For more exotic named reactions, you may wish to consult one of the many lists available online. I've posted some links to these on my group website: web.uvic.ca/~wulff/Links.htm. Wikipedia also has some surprisingly advanced treatments of important named reactions... caveat lector!

Important Dates:

- Wednesday, Jan. 3rd – first lecture
- Wednesday, Jan. 10th – pKa quiz
- February 12th to 16th – reading break
- Wednesday, Feb. 21st – assignment #1 due
- TBA – SciFinder information session *in the library, room 130*
- Wednesday, Mar. 7th – midterm exam
- Wednesday, Mar. 21st – assignment #2 due
- Friday, April 6th – last class; synthesis proposal due

assignments are due at the beginning of class

Testable Material:

Because this course does not take the form of a long list of material suitable for memorization, a few of you will be concerned with “what will be on the exam”. To assist you in studying for the midterm and final (which, incidentally, collectively total only 45% of your course mark), I’ve prepared a list of reactions (see attached) that I will be drawing from over the duration of the course. For maximal success on the exams, you should know the following:

- a) reactions covered in 335, and indicated in the attached list (note the red checkmarks).
- b) reactions discussed in the lecture (note: a few of the reactions on the list may not be covered in any given year; reactions that aren’t covered will not be tested).
- c) reactions covered in assignment 1 (note: this assignment intentionally presents material that is not explicitly discussed in the course).
- d) reactions covered in the handouts.

Much of the exam will also be devoted to proposing mechanistic hypotheses for reactions you haven’t necessarily seen before, and for designing workable syntheses. Be sure you get some practice on these skills – simply memorizing named reactions will not get you far.

Academic Integrity:

Instances of plagiarism, copying during exams, or other abuses of academic integrity will be dealt with as harshly as possible, within the confines of the University’s academic integrity policy. (see: <https://web.uvic.ca/calendar2018-01/undergrad/info/regulations/academic-integrity.html>) Having said this, I strongly encourage you to work together with your colleagues on assignments 1 and 2, and study together for tests. Arguing with one another about the course material is extremely helpful in mastering the content from Chemistry 432 / 533.

Equity and Good Behaviour:

The University promotes a safe, respectful and supportive learning, working, and living environment. University policies prohibit discrimination, harassment, and sexualized violence. The Equity and Human Rights office (EQHR) is a resource for all UVic community members, including students. EQHR provides education, information, assistance and advice in aid of building and supporting an inclusive and respectful campus. When issues and concerns arise, EQHR assists those involved through the range of support and resolution options available under the Sexualized Violence Prevention and Response policy and Discrimination and Harassment policy. EQHR staff are available by appointment—contact information and resources can be found at <https://www.uvic.ca/equity/>.

The Department of Chemistry expects everyone participating in university activities in the department to model respectful behaviour and abide by applicable University policies. For more information please contact: Sandra Carlson, Department Secretary: dsecchem@uvic.ca or in person at Elliot 301.