Advanced Organic Chemistry
CHM 411

Spring Term 2017
Lecture: SAC 209 Lab: KSC 257
Meeting Times: See Calendar

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Office Hours: during lab periods or by appointment

Supplies (required)
Textbook: None
Bound laboratory notebook
Z87 approved eye protection
Three ring binder for handouts

Website: http://DrTChemistry.com

Optional Supplies
Molecular model set
Chemical structure drawing program - Chemdraw
- available on 1st floor computer cluster and the computer in our laboratory (two-week trial software is free).
- ChemDoodle (chemdoodle.com) is only $19.

Course Description: The lecture component of Advanced Organic Chemistry is an in-depth study of spectroscopic and synthetic methods; a topic outline is on the next page. We will build on concepts learned in CHM 223 and CHM 224, so a solid understanding of those topics is assumed. This course has an intensive laboratory component that will help prepare you for direct employment in a chemical industry or for post-graduate studies by enhancing your critical thinking and problem solving skills and by promoting experimental independence and regular use of advanced instrumentation. Techniques will include 2-dimensional NMR, microwave synthesis, HPLC, GC/MS, IR, solid phase peptide synthesis, reactions requiring inert atmospheres, high pressure H_2 reduction and multi-step synthesis. Special emphasis will be placed on developing laboratory procedures from the primary literature.

Examinations and Grading: There two 'mid-term' examinations followed by a comprehensive final exam. The examinations will reflect material covered in lecture and that may be presented in any handouts or other materials you are referred to. Graded homework assignments will also be given during the semester. The laboratory portion of this course is significant, and will comprise about 56% of your grade. Details about the parts that make up the laboratory grade can be found below This syllabus is tentative and may change. Re-grading requests must be made within 48 hours of receipt of an exam. Academic dishonesty will be dealt with vigorously and will result in a zero for the exam/assignment.

Mid-Term Exams (100 points each):	200 pts. (25%)
Comprehensive final exam:	100 pts. (12.5%)
Homework:	50 pts. (6.25%)
Laboratory reports (3 experiments):	300 pts. (37.5%)
Laboratory spectra:	50 pts, (6.25%)
Unknown	50 pts. (6.25%)
Laboratory technique:	50 pts. (6.25%)
Total =	800 pts.

FINAL EXAM – Thursday, May 25, 9:00 - 11:30 AM

Completion of all of the laboratories is required to earn a passing grade in this course. High standards of excellence are expected for all written work. Attendance is mandatory.

Lecture Topics:

One and two dimensional NMR spectroscopy

Stereochemical considerations in planning syntheses

Functional group transformations - oxidations and reductions

Formation and reactions of carbon-carbon π-bonds

Formation of carbon-carbon single bonds via enolate anions

Formation of carbon-carbon single bonds via organometallic reactions

Synthesis of carbocyclic systems

Named reactions in organic chemistry

Synthetic design and retrosynthesis

Exam Dates:

May 9	Exam 1 (covering lectures 1 and 2)
May 16	Exam 2 (covering lectures 3, 4 and 5)
May 25	Comprehensive Final Exam

Laboratories:

Because the laboratory component of this course involves more sophisticated setups and because some specialized glassware is limiting, you will rotate through the laboratory experiments at your discretion. In this manner, not everyone will be doing the same lab on any given day. Some labs may have sign-up sheets for equipment use to reduce the possibility for someone not having equipment for a given experiment when they had planned to use it.

Each one of these procedures require a multi-day commitment. A key to managing your time is to use the laboratory periods to do parts of more than one experiment. A recommended strategy for any given laboratory period would be to get a reaction started, workup a prior reaction, collect spectral data on an isolated product and collect the necessary material in preparation for the next lab period.

You will be expected to keep a detailed laboratory notebook, much like you did in CHM 223/224. Refer to the Laboratory Notebook handout for additional instructions. Although your lab notebook will not be collected and graded, it will be assessed periodically in class and will be bundled into the Laboratory Technique grade. Make sure you leave plenty of space for each lab experiment, since you may not be able to accurately guess how many pages you will need for any given experiment.

Three of these experiments must be submitted as formal laboratory reports - please refer to the separate handout for directions on preparing your lab reports based on the Organic Letters template. Which three you choose is up to you. For these and the remaining experiments, instructions on what needs to be turned in to complete the "Laboratory spectra" portion of your grade are listed after each experiment on the following page (these instructions are also found at the end of each laboratory procedure).

Due dates for lab reports: One laboratory report is due on or by Friday the 12th, Friday the 19th and Thursday the 25th. The identity of your unknown and accompanying spectra is due on the 25th.

Summary of labs for CHM411

Laboratories:

- Synthesis and NMR evaluation of aryl-substituted pyrrolinones, an introduction to NOE spectroscopy
    - Turn in ^{1}H and ^{13}C NMR (including assignments)
    - Turn in your 2D NOE spectra. Draw the structure of the molecule as you have determined it, and highlight how you came to the structural and configurational proof
    - Product can be discarded
- Synthesis of potential neuraminidase inhibitors
    - Turn in final product and ^{1}H and ^{13}C NMR (including assignments)
- Synthesis of a peptide bioconjugate, pseudoNeurotensin using Fmoc-SPPS
    - Turn in product and HPLC. Draw product on HPLC chromatogram.
- Multi-step synthesis of an Anesthetic: Prilocaine HCl
    - Turn in all ^{1}H and ^{13}C NMR (including assignments)
- Multi-step synthesis of a cysteine sulfenic acid probe
    - Read Clark Still's paper prior to doing the flash chromatography
    - Turn in ^{1}H and ^{13}C NMR (including assignments) - the product can be discarded
- An experiment in spectroscopy: Identification of an unknown
    - Turn in all supporting spectral data (assigned), proposed structure and supporting statement.

INSTRUCTIONS TO CREATE A SCIFINDER ACCOUNT:

Because this method of creating a username and password requires a specific IP range, this will have to be done ON CAMPUS. You must also USE YOUR ALMA COLLEGE EMAIL ADDRESS when registering, even if you have your mail forwarded to another account. This is how SciFinder associates the user with an institution.

After the required information is entered (i.e. name, email, username and password, etc), a message will be sent to the email address, with a link to confirm registration. Students must confirm registration within 48hrs or the registration becomes void and the link will no longer work.

The link to register is: https://scifinder.cas.org/registration/index.html?corpKey=AD68ABD1-86F3-5055-2F87-6955759C0CDD