

# Advanced Organic Chemistry

## CHM 411

Spring Term 2017

Lecture: Dow L2      Lab: Dow 257

Meeting Times: See Calendar

**Dr. Jeff Turk**

KSC 246

Office Hours: during lab periods or by appointment

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### Supplies (required)

Textbook: None

Bound laboratory notebook

Z87 approved eye protection

Three ring binder for handouts

### 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](http://chemdoodle.com)) is only \$19.

**Website:** <http://DrTChemistry.com>

**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<sub>2</sub> reduction and multi-step synthesis. Special emphasis will be placed on developing laboratory procedures from the primary literature.

**Examinations and Grading:** There three 'mid-term' examinations followed by a comprehensive final exam. The examinations will reflect material covered in lecture and that 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 as weighted more heavily than was CHM 223/224. Details about laboratory grades can be found on the next page. Please note 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%)
Laboratory reports (3 experiments):	300 pts. (37.5%)
Laboratory spectra:	50 pts. (6%)
Unknown	50 pts. (6%)
Laboratory technique:	50 pts. (6%)
Total =	800 pts.

FINAL EXAM – Thursday, May 21, 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:

April 30, May 1	Review of the laboratories
May 3, 5	One and two dimensional NMR spectroscopy
May 8	Stereochemical considerations in planning syntheses
May 9	Exam 1
May 10	Functional group transformations - oxidations and reductions
May 12	Formation and reactions of carbon-carbon $\pi$ -bonds
May 15	Formation of carbon-carbon single bonds via enolate anions
May 16	Exam 2
May 17	Formation of carbon-carbon single bonds via organometallic reactions
May 19	Synthesis of carbocyclic systems
May 22	Synthetic design and retrosynthesis
May 25	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 need it.

Some of the experiments will instruct you to turn your final product in - others you will not be saving. Three of these experiments must be submitted as laboratory reports - please refer to the separate handout for directions on preparing your lab reports based on the Organic Letters template. The three you choose is up to you. For the others, instructions on what needs to be turned in is on the next page (and written into each laboratory procedure).

**Due dates for lab reports: One laboratory report is due on or by Friday the 8th, Friday the 15th and Thursday the 21st. The identity of your unknown and accompanying spectra is due on the 21st. Whether or not you choose to write up a laboratory report for the experiment, refer to the specific written procedure so you know how each is being graded.**

Some words of advice: 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.

## Summary of labs for CHM411

### Laboratories:

- Synthesis and NMR evaluation of aryl-substituted pyrrolinones, an introduction to NOE spectroscopy
  - Turn in structural and configurational proof as detailed in the handout - product can be discarded
- Multi-step synthesis of a heterocycle: Preparation of a substituted aminothiazoles
  - Turn in aminothiazole and  $^1\text{H}$  and  $^{13}\text{C}$  NMR (including assignments)
- Manual solid phase synthesis of a peptide bioconjugate: pseudoNeurotensin
  - Turn in HPLC of product
- Multi-step synthesis of an Anesthetic: Prilocaine HCl
  - Turn in  $^1\text{H}$  and  $^{13}\text{C}$  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  $^1\text{H}$  and  $^{13}\text{C}$  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 AN ACCOUNT WITH SCIFINDER

#### Procedure:

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>