SYLLABUS[1]

CHEM 2125 – ORGANIC CHEMISTRY LABORATORY II

Fall 2013

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PREREQUISITES: CHEM 2323 & 2123 (Organic Chemistry I lecture and laboratory)

COREQUISITES: CHEM 2325 (Organic Chemistry II lecture)

DESCRIPTION: This course is designed to provide the skills necessary to conceptualize, design, and execute organic experiments with an emphasis on syntheses. Students gain exposure to representative types of organic transformations and mechanisms, spectroscopy and structure determination, and the use of the chemical literature.

LEARNING OBJECTIVES AND OUTCOMES

- Learn to use the organic chemistry literature & scientific databases for research.
- Perform representative reaction types, either in isolation or as part of a synthesis. These include, but are not limited to, oxidations, reductions, aromatic substitutions, and select name reactions.
- Use spectroscopic techniques such as IR and NMR to characterize organic substances.

TEXTBOOK: Pavia, Lampman, Kriz, and Engel. *A Microscale Approach to Organic Laboratory Techniques.* **5th ed**. Thomson Brooks/Cole, 2013. Please refer to the publisher's website for ISBN and price information: http://www.cengagebrain.com/shop/search/9781133106524

***NOTE**: The 5th edition is substantially different from older editions, which will not do for this course. Remember: you will use this book for two semesters and you are not required to bring it to class. You can share a copy with other students if necessary.*

SUPPLIES: The combination padlock is required for check-in during the first lab meeting (see calendar on next page). The rest of the items are required for the second lab meeting and thereafter.

- **COMBINATION PADLOCK** for your drawer. Only one per group is required.
- **APPROVED SAFETY GLASSES**:
  - ✓ Must have the *Z87* code engraved on them.
  - ✓ The spectacle type is recommended over the goggle type. Spectacles look like regular glasses, are comfortable, and can be worn over prescription glasses. Certain retail outlets offer safety glasses made to prescription. For more details about these types of glasses go to the CNA services website.
  - ✓ The Chemistry Student Association (CSA) sells safety glasses year round for about $5 in BE 3.518.
- **HARDBOUND NOTEBOOK** with duplicate sheets (carbon copies) for prelabs.
- **DISHWASHING GLOVES**: Can be obtained at any store. Although disposable gloves are available in the lab, they are not chemical resistant and can tear easily. Having your own gloves is recommended.
- **PROTECTIVE CLOTHING**: A lab coat is strongly recommended. It can be obtained at retail outlets and at most uniform and medical supplies stores (scrubs are OK too).
- **ITEMS OF PERSONAL USE** (one set for a group of two is adequate): Towel, sponge pack for cleaning, tweezers, marker or pen, and masking tape for labeling.

[1] The descriptions and timelines presented in this syllabus are subject to change.

CLASS SCHEDULE – Org. Lab II – Fall 2013

All new experiments start on Tuesday and continue through the following Monday.
Tuesday sections are first to perform new experiments, and Monday sections are last.

DATE	TOPIC / EXPERIMENT
Sept. 3 – 9	• Introduction & Chemical Literature Assignment • Check-in and Library Instruction (**See schedule below**)
Sept. 10 – 16	Exp. 33 A: Grignard Reaction (two period lab) **First library assignment due in your lab section**
Sept. 17 – 23	Exp. 33 A (continued)
Sept. 24 – 30	Exp. 42: Preparation of Benzocaine **Second library assignment due in your lab section**
Oct. 1 – 7	Exp. 65: Esterification of Vanillin
Oct. 8 – 14	Exp. 32 C: Prep. of Benzilic Acid
Oct. 15 – 21	Exp. 60: Aldehyde Disproportionation **Dry lab, no prelab required. Read the class notes**.
Oct. 22 – Nov. 4	Exp. 45 A,B: Synthesis of Sulfanilamide (two period lab)
Nov. 5 – 11	Exp. 39 B: Prep. of a diene using the Wittig Reaction.
Nov. 12 – 18	Exp. 37: Aldol Condensation Reaction **This experiment is mandatory – It cannot be dropped.** **Glassware Cleanup & Check-out**

PROPER ATTIRE: Due to safety reasons and the nature of chemicals used in this course, students are required to wear proper attire to work in the lab. That means **covered torso, covered legs, and closed shoes**. Students wearing tank tops, sleeveless garments, shorts, sandals, open shoes, etc. cannot work in the lab.

CHECK-IN AND LIBRARY INSTRUCTION SCHEDULE – Week of Sept. 3 – 9.

- ***For check-in:*** *Report to the organic labs (SLC 3.203 and 3.215).*
- ***For library instruction:*** *Report to the library lobby and a librarian will guide you to a classroom.*

DATE	SECTION	FIRST ACTIVITY	SECOND ACTIVITY
Wed. Sept. 4	103	Check-in: 8:00 am	Library Instruction: 9:00 am
Wed. Sept. 4	104	Library Instruction: 12:00 pm	Check-in: 1:00 pm
Mon. Sept. 9	101	Library Instruction: 8:00 am	Check-in: 9:00 am
Mon. Sept. 9	102	Check-in: 12:00 pm	Library Instruction: 1:00 pm

DETAILED DESCRIPTIONS, READINGS, & ASSIGNMENTS

CHECK-IN, LIBRARY INSTRUCTION & FIRST ASSIGNMENT

Check-in – The check-in procedure takes place in the lab and goes as follows:

- Students will form groups of two. Each group must provide a combination padlock, or the stockroom manager cannot assign a drawer. The Chemistry Student Association sells them in the SLC lobby (first level). Other outlets include the UTD and off-campus bookstores, Tom Thumb, Target, Staples, and Home Depot.

- Organic lab rules require proper attire, which means covered torso, covered legs, and covered feet. Students wearing tank tops, sleeveless garments, shorts, sandals, open shoes, and the like can be barred from entering the lab.

Library Instruction – Library instruction consists of an introduction to the chemical literature and use of scientific databases for research. An assignment related to this lecture is described below.

Library Assignment: This assignment is posted in eLearning under the title *Chemical Literature Exercises*. It consists of two parts, each worth 100 points, to be completed after the library lecture. Due dates are indicated in the class schedule.

EXP. 33 A – PREP. OF TRIPHENYLMETHANOL. Grignard reactions and carbon nucleophiles in synthesis.

- Readings: Posted notes and p. 305 – 312.
- Suggested study questions from the textbook (see note below): # 1, 3, 5(a,b,d) on p. 315).
- First library assignment due the first week of this experiment.

NOTE: The suggested study questions might appear in the post-lab that you're required to submit at the end of the lab session. Giving these questions some thought beforehand will enable better understanding of the experiment and will make it easier to answer the post-lab questions.

EXP. 42 – PREPARATION OF BENZOCAINE. Local anesthetics, controlled conditions esterification, use of high field NMR for product characterization.

- Readings: Posted notes and p. 364 – 371. Note: the quiz for this experiment may include questions about the introductory essay (*Local Anesthetics*).
- Suggested study questions from the textbook: # 1 – 4, p. 371.
- Second library assignment due.

EXP. 65 – ACID AND BASE CATALYZED ESTERIFICATION OF VANILLIN. Use of the chemical literature and NMR to solve a structure proof problem.

- Readings: Posted notes and p. 568 – 570.
- Obtain the following article and read it: Kochlar, S.K. *et. al. J. Org. Chem.,* **48**, 1765 – 1767 (1983). Please consult your instructor or a reference librarian if help is needed.

EXP. 32 C – SYNTHESIS OF BENZILIC ACID. Organic oxidations and reductions, skeletal rearrangements.

- Readings: Posted notes and p. 301 – 304.
- Suggested study questions from the textbook: # 1, 2(a,c) on p. 304.

EXP. 60 – ALDEHYDE DISPROPORTIONATION REACTIONS. Use of critical thinking and spectral data to identify reaction products.

- Readings: Posted notes and p. 548 – 550.
- Suggested study questions from the textbook: None.

EXP 45 A, B – PREPARATION OF SULFANILAMIDE. Multistep synthesis, use of protecting groups, electrophilic aromatic substitution.

- Readings: Posted notes and p. 389 – 396. Note: the quiz for this experiment may include questions about the introductory essay (*Sulfa Drugs*).
- Suggested study questions from the textbook: # 3, p. 396.

EXP 39 B – PREPARATION OF CONJUGATED DIENE. Use of the Wittig reaction in alkene synthesis.

- Readings: Posted notes and p. 347 – 349, and 352 – 354. Note: The TLC part of this experiment will not be performed.
- Suggested study questions from the textbook: # 1, 2 (p. 354).

EXP. 37 – ALDOL CONDENSATION. Crossed aldol condensation, preparation of benzalacetophenones.

- **This experiment is mandatory and cannot be dropped**.
- Readings: Posted notes and p. 337 – 340.
- Suggested study questions from the textbook: # 1, 2, 4(a, b, c) on p. 340.

CHECK-OUT. ALL students must be present for check-out. Anyone missing will continue to be responsible for the equipment in their drawer. No check-out is allowed prior to this date unless you drop the course.

GRADING POLICY

The final grade is based on the items listed below. One prelab, one experiment (or assignment), and one quiz will be dropped. **THIS IS YOUR ALLOWANCE FOR EMERGENCIES**.

- Individual prelabs 30%
- Post-labs and individual assignments 40%
- Quizzes 30%

PLEASE NOTE: Performing experiments is contingent upon producing a prelab and taking a quiz for the corresponding experiment. Students who fail to produce the prelab or take the quiz may not perform the experiment. Likewise, students cannot make up experiments in other sections.

INDIVIDUAL PRELABS are required prior to the performance of every experiment and are due on the day of the experiment at the start of the lab session. Refer to the guidelines for writing prelabs posted in *eLearning*.

POST-LABS are a group effort and consist of a form to be filled out and returned after completion of the experiment. The grade obtained applies to all members of the group.

INDIVIDUAL ASSIGNMENTS. These are individual write-ups intended to be completed outside the lab, and handed in during lab time at the beginning of the lab session. See class schedule for due dates. **Late assignments will be accepted, but will receive 5 points off per day late**.

QUIZZES. Quizzes are given during the prelab lecture period and are intended to make sure students are prepared before they attempt to perform the experiment. Therefore, the following applies:

- Students arriving after the quiz has started but before the experiment begins may take the quiz but will receive 10 points off the quiz grade.

- Students arriving after the experiment begins may not take the quiz and therefore may not perform the experiment.

LETTER GRADE ASSIGNMENT TABLE (based on final percent grade after round-off)

95 - 100 = A+	80 – 84 = B+	65 – 69 = C+	50 – 54 = D+
90 – 94 = A	75 – 79 = B	60 – 64 = C	45 – 49 = D
85 – 89 = A-	70 – 74 = B-	55 – 59 = C-	40 – 44 = D-

POLICY REGARDING MISSED EXPERIMENTS AND ASSIGNMENTS

- ONE EXPERIMENT (or assignment), ONE QUIZ, and ONE PRELAB grade will be dropped. This is your allowance for emergencies, unexpected problems, or personal commitments that conflict with labs. Please do not ask for makeups unless your case falls under university policy or state law (see below).

- TWO-PERIOD EXPERIMENTS:
  - If you miss the first period of a two-period experiment, you miss the entire experiment. There is no need to show up for the second period of that experiment.
  - If you miss only the second period, you get 50% off the experiment grade.

- Missing more than two experiments is grounds for failing this class. Students who miss more than two experiments are advised to withdraw from the course.

- All members of the group must be present during the entire experiment. Any member that leaves early or takes long breaks during the experiment will receive a grade of zero for that experiment.

SUMMARY OF FACTORS THAT CAN NEGATIVELY IMPACT YOUR GRADE

1. Late assignments: 5 pts. off per day late.
2. Being late for a quiz: 10 pts. off the quiz grade.
3. Missing a quiz or failing to produce a prelab on time: Grade of zero for the quiz or prelab, AND for the corresponding experiment.
4. Missing the second part of a 2-period experiment: 50% off the experiment grade.
5. Not wearing proper attire: May not work in the lab, therefore grade of zero for the experiment.

EXEMPTIONS GRANTED BY UNIVERSITY POLICY & STATE LAW

Students can request exemptions from certain rules (e.g. waiving an absence or making up an experiment) when the reasons are covered by university policy or state law, and when they can be properly documented.

Examples of reasons covered under this policy are military duty, jury duty, major illness, medical procedures, and participation in certain university-sponsored events.

Examples of reasons NOT COVERED under this policy are personal engagements such as travel and social events, common emergencies such as accidents and minor illness, and any reasons that cannot be properly documented.