SYLLABUS

CHEM 2125 – ORGANIC CHEMISTRY LABORATORY II

Spring 2014

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Office hours: MF 1:00PM – 2:00PM

COURSE PREREQUISITES: CHEM 2323 & 2123 (Organic Chemistry I lecture and laboratory)
COURSE COREQUISITES: CHEM 2325 **(**Organic Chemistry II lecture)

COURSE 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: Previous editions will not do for this course. You are not required to bring the textbook to class, so 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 <u>spectacle type</u> 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. The goggle type relies on a rubber band to stay in place and is therefore less comfortable.
  - ✓ 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**. Coats can be obtained at retail outlets such as Sears, and at most uniform and medical supplies stores (scrubs are OK too). Otherwise proper attire consists of covered torso (garments must have sleeves), covered legs, and closed shoes. Additional guidelines are provided in the *Lab & Safety Policy* document.
- 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.

CLASS SCHEDULE – Org. Lab II – Spring 2014

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.

DATES	TOPIC/ EXPERIMENT
Jan. 27	• Introduction & Chemical Literature Assignment • Check-in and Library Instruction (**See schedule below**)
Feb. 3	Exp. 33A: Grignard Reaction (two period lab) **First library assignment due in your lab section**
Feb. 10	Exp. 33A (continued)
Feb. 17	Exp. 42: Preparation of Benzocaine **Second library assignment due in your lab section**
Feb. 24	Exp. 65: Esterification of Vanillin
Mar. 3	Exp. 32C: Prep. of Benzilic Acid
Mar. 17	Exp. 60: Aldehyde Disproportionation **Dry lab, no prelab required. Read the class notes.**
Mar. 24 Mar. 31	Exp. 45 A,B: Synthesis of Sulfanilamide (two period lab)
Apr. 7	Exp. 39B: Prep. of a diene using the Wittig Reaction
Apr. 14	Exp. 37: Aldol Condensation Reaction **Glassware & drawer cleanup in preparation for check-out**
Apr. 21	Final exam & Check-out

CHECK-IN AND LIBRARY INSTRUCTION SCHEDULE

First day of class: Jan 27, 2014

- **Check-in:**
  - Time: 8:00 AM
  - Location: Organic labs (SLC 3.215)
- **Library instruction:** Report to the library lobby by 9:00AM and a librarian will guide you to a classroom.

After this week we will meet in the regular classroom (**SLC 2.202**)
for the remainder of the semester.

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 bookstore, off-campus bookstore, 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. 33A – PREP. OF TRIPHENYLMETHANOL. Grignard reactions & carbon nucleophiles in organic 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 will get you thinking about the experiment, but you may or may not be able to answer them before doing the experiment. They might appear in the post-lab as well, so giving these questions some thought will make it easier to understand the experiment and 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. 32C – 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, 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 39B – PREPARATION OF CONJUGATED DIENE. Use of the Wittig reaction in alkene synthesis, organic mechanisms involving phosphorus.

- 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.

- 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 until they check out. No check-out is allowed prior to this date unless you drop the course.

GRADING POLICY

The final grade for this course is based on the items listed below. One prelab, one post-lab/assignment, and one quiz will be dropped at semester end. These don't have to be for the same experiment. **THIS IS YOUR ALLOWANCE FOR EMERGENCIES**. All prelabs, reports, and assignments are graded on a 100 point scale.

• Individual prelabs	30%
• Post-labs and individual assignments	30%
• Laboratory technique & safety awareness	10%
• Quizzes	15%
• Final exam	15%

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. Please refer to the guidelines for writing prelabs that will post in *eLearning*.

PLEASE NOTE: *Performing experiments is contingent upon producing a prelab for the corresponding experiment.* ***Students who fail to produce the prelab may not perform the experiment.***

POST-LABS are a group effort and consist of a form to be filled out and turned in following 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.

LABORATORY TECHNIQUE & SAFETY AWARENESS. Students will be individually evaluated on their technique for each experiment, and on safety awareness. Points can be deducted for students that show lack of preparation, lack of knowledge of basic procedures and calculations, not carrying a fair share of the group's work, leaving experiments unattended, leaving the lab for long periods, disregarding safety rules, unprofessional behavior, etc.

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 to class after the quiz has started, but before the experiment begins, may take the quiz but will receive 5 point off the quiz grade.
- Students arriving after the experiment has started may not take the quiz.

FINAL EXAM. The questions in the final exam are based on the theory and technique of the experiments. Students arriving late to the final exam will receive 5 points off the exam grade.

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 OR ASSIGNMENTS

- ONE EXPERIMENT (or assignment) and ONE PRELAB grade will be dropped. **This is your allowance for emergencies, unexpected problems, or personal problems. Do not ask for makeups until you have used this allowance** (see special requests policy 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 will receive a grade of zero for that 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.**

SPECIAL REQUESTS POLICY

Special requests based on reasons not covered by university policy or state law represent an added burden to instructors and impose unnecessary disruptions on organic lab operations. For these reasons **students are encouraged to use their emergency allowance before considering making special requests**. Otherwise the following penalties apply:

SPECIAL REQUEST/ ACTION	PENALTY
Making up experiments	5 points off the lab report
Arriving to class after quiz has begun but before it ends	5 points off the quiz grade
Arriving to lab after quiz has ended	Grade of zero for the quiz
Arriving late to, or making up the final exam	5 points off the final exam grade
Late assignments	5 points off per day late
Additional requests or actions not included in this list	5 points off the relevant experiment or procedure