

## SYLLABUS<sup>1</sup>

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### HCHEM 1215 – HONORS ORGANIC CHEMISTRY LABORATORY II

Spring 2016

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Office Hours: Wed. 1-2pm

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

**COURSE COREQUISITES:** HCHEM 2325 (Honors Organic Chemistry II lecture)

**COURSE DESCRIPTION:** This course provides the skills necessary to conceptualize, design, and execute organic experiments with an emphasis on syntheses. Students gain exposure to representative types of reactions and mechanisms, spectroscopy and structure determination, and the use of the chemical literature. Correlation with the lecture course is adequate, but practical factors prevent full overlap.

#### 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. Access to the OWL Lab Skills is NOT required.

***NOTE:** Previous editions of the textbook 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. We will also be performing two experiments from hand outs that will be provided in class.*

**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.** Only one per group is required. Combination padlocks can be obtained from the UTD bookstore, off-campus bookstore, Tom Thumb, Target, Staples, and Home Depot.
- **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. The goggle type relies on a rubber band to stay in place and is therefore less comfortable.
- **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.

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<sup>1</sup> The descriptions and timelines presented in this syllabus are subject to change at the discretion of the Professor.

- **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 2015

*NOTE: There are no labs the first week of class. All organic lab operations begin on the second week.*

| DATES   | EXPERIMENTS   |
|---------|---|
| Jan. 20 | • Check-in.   |
| Jan. 27 | Exp. 33 A: Grignard Reaction (two period lab)   |
| Feb. 10 | Exp. 32 C: Prep. of Benzilic Acid   |
| Feb. 17 | Knovenangle Special Experiment  |
| Feb. 24 | Exp. 65: Esterification of Vanillin   |
| Mar. 2  | Invisible Ink Special Experiment  |
| Mar. 9  | Exp. 45 A,B: Synthesis of Sulfanilamide (two period lab)  |
| Mar. 30 | Exp. 39 B: Prep. of a diene using the Wittig Reaction   |
| Apr. 6  | Exp. 37: Aldol Condensation Reaction<br><b><i>Glassware &amp; drawer cleanup in preparation for check-out</i></b> |
| Apr. 13 | Final exam & Check-out  |

### DETAILED DESCRIPTIONS, READINGS, & ASSIGNMENTS

**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**; otherwise the stockroom manager cannot assign you a drawer.

*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 cannot work in the lab.*

**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).

*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. 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.

**KNOVENANGLE SPECIAL EXPERIMENT.** Knoevenangle condensation to form tetraphenylcyclopentadienone.

- Handouts will be provided the week before the experiment.

**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.

**INVISIBLE INK LAB.** Synthesis a fluorescent aluminum complex.

- Hand outs will be provided the week before the experiment.
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**EXP 45 A,B – PREPARATION OF SULFANILAMIDE.** Multistep synthesis, protecting groups, electrophilic aromatic substitution.

- **Please inform your instructor if you are allergic to sulfa drugs.**
- 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. 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% |
| • Quizzes                              | 20% |
| • Final exam                           | 20% |

**INDIVIDUAL PRELABS** are required to perform every experiment and are due prior to the beginning of the lab session. Please refer to the guidelines for writing prelabs posted in *eLearning*. **Students who do not produce a prelab are assumed to not be ready to work; therefore they cannot 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. However, individual members can lose points for poor technique (see below).

**LABORATORY TECHNIQUE & SAFETY AWARENESS.** Students will be individually evaluated on technique and safety awareness for each experiment. Points will be deducted from the post-lab for students who:

- show a lack of preparation or lack of knowledge of basic procedures and calculations
- disregard safety rules (for instance not wearing eye protection or proper attire in lab)
- do not carry their fair share of the group's work
- leave experiments unattended or leave the lab for long periods of time
- leave the lab for good before the group concludes the experiment (this earns a grade of zero for the experiment).
- any other types of unprofessional or unsafe behavior

**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.

**QUIZZES.** Quizzes are given during the prelab lecture period and are intended to ensure that 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 it ends, may take the quiz but will receive 5 point off the quiz grade.
- Students arriving after the quiz has ended may not take the quiz. They can still perform the experiment provided they produce the corresponding prelab.

**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 = <b>A+</b> | 80 - 84 = <b>B+</b> | 65 - 69 = <b>C+</b> | 50 - 54 = <b>D+</b> |
| 90 - 94 = <b>A</b>   | 75 - 79 = <b>B</b>  | 60 - 64 = <b>C</b>  | 45 - 49 = <b>D</b>  |
| 85 - 89 = <b>A-</b>  | 70 - 74 = <b>B-</b> | 55 - 59 = <b>C-</b> | 40 - 44 = <b>D-</b> |

#### **POLICY REGARDING MISSED EXPERIMENTS OR ASSIGNMENTS**

- ONE EXPERIMENT (or assignment), ONE PRELAB, and ONE QUIZ will be automatically dropped at the end of the semester. **This is your allowance for emergencies, unexpected problems, or personal engagements that interfere with the class schedule. Do not ask for makeups until you have used this allowance** (see special requests policy below).
- Students who do not miss any experiments or assignments will drop the lowest grade in each of the three categories mentioned above (experiments, prelabs, and quizzes).
- 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 discuss the issue with their instructors.

#### EXEMPTIONS GRANTED BY UNIVERSITY POLICY & STATE LAW

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

Examples of reasons covered under this policy are: **military duty, jury duty, major illness, medical procedures, and participation in 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. When granted, they create confusion regarding grades at the end of the semester, and impose unnecessary disruptions on organic lab operations. Therefore, **students are encouraged to use their emergency allowance before considering making any special requests.** Otherwise the following penalties apply when granting special requests:

| SPECIAL REQUEST/ ACTION                                       | PENALTY   |
|---|---|
| Making up experiments in another section                      | 10 points off the lab report (post-lab)           |
| Arriving to class after the 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 |