

SYLLABUS¹

CHEM 2123 – ORGANIC CHEMISTRY LABORATORY I Summer 2016

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PREREQUISITES: General Chemistry I and II or equivalent.

COREQUISITES: Organic Chemistry I

DESCRIPTION: Introduction to basic experimental technique and information sources. Major topics include safety, record keeping, written communication, information sources, physical separations, determination of physical constants, purification and characterization techniques, and basic organic reactions. An important goal of this course is to master technique before shifting the focus to outcome in Organic Chem. Lab II. Correlation with the organic lecture is adequate, but practical factors prevent full overlap.

LEARNING OBJECTIVES AND OUTCOMES

- Describe and utilize safety protocols associated with basic organic chemistry laboratory operations.
- Know how to keep experiment records, produce reports, interpret data, and draw conclusions.
- Prepare, purify, and characterize simple organic compounds.
- Know how to work and communicate effectively in small groups and teams.

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.*

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. They are comfortable and can be worn over prescription glasses. They can even be made to prescription at certain outlets. The goggle type has a rubber band and is more constraining. It is therefore less comfortable and less conducive to wear consistently.
- **HARDBOUND NOTEBOOK** with duplicate sheets (carbon copies) for prelabs.
- **GLOVES:** Although disposable gloves are available in the lab, they are not chemical resistant and can tear easily. Having your own gloves is recommended. Dishwashing gloves are adequate for this lab.
- **PROTECTIVE CLOTHING:** A lab coat or similar garments such as scrubs are highly recommended. 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.

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

CLASS SCHEDULE – Org. Lab I – Summer 2016

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

Week of	TOPIC / EXPERIMENT
May 30	<ul style="list-style-type: none">• Introduction to Organic Lab Procedures & Safety Protocols• Weekly Quiz Preparation• MSDS assignment• Check-in Exp. 10: Extraction of active ingredient from analgesic drug
June 06	Exp. 3 A: Crystallization of Acetanilide NOTE: Acetanilide is substituted for sulfanilamide in this exp. Refer to the class notes for details. MSDS assignment due
June 13	Exp. 4 A,B: Extraction & distribution coefficient
June 20	Exp. 6 A,B: Thin layer chromatography (TLC)
June 27	Exp. 17 A - C: Isolation of pigments from spinach Please bring a small package of fresh spinach for your group
July 04	Exp. 14 A: Synthesis of isopentyl acetate (banana oil) Introduction to IR Spectroscopy
July 11	Exp. 23 A,C: Sn1 and Sn2 reactions IR interpretation exercise due
July 18	Bromination of stilbene (Not in textbook - Posted in eLearning) Glassware & drawer cleanup in preparation for check-out
July 25	Final Exam & Check-out

DETAILED DESCRIPTIONS, READINGS, & ASSIGNMENTS

INTRODUCTORY MEETING

1. Organic Lab Operations & Safety

ASSIGNED READINGS:

- *Syllabus & Introductory Items* folder in eLearning – **Please read the items in this folder carefully.**
- Technique 1 in the textbook (Laboratory safety): p. 576-591
- *Safety Manual*, available at the [UTD Chemistry Safety Page](#).

ASSIGNMENT (due next period): Download an MSDS for a chemical of your choice, print it, highlight any information that seems important, and turn it in (max.: 5 pages). This is your first report (100 pts).

2. Overview of Prelabs and Lab Reports

ASSIGNED READINGS: Guide to Prelabs and Post-labs (posted in *eLearning*)

3. Check-in Procedure – Students will form groups of two. **Each group must provide a combination padlock.**

For all experiments you are strongly encouraged not only to do the assigned readings, but also to bring the class notes to the lab. They contain useful tips and possible modifications to the experimental procedure.

EXP # 10: ISOLATION OF ACTIVE INGREDIENT FROM ANALGESIC. Solid-liquid extraction, vacuum filtration, melting point determination.

ASSIGNED READINGS & EXERCISES:

- Experiment: Posted notes and p. 79-82
- Technique 8 (Filtration): p. 652 - 655
- Technique 9 (Melting point theory): p. 660 – 663
- Suggested study questions from the textbook: # 1-5 on p. 82

NOTE: The suggested study questions might appear in the post-lab. Giving these questions some thought will enable better understanding of the experiment and will make it easier to answer the post-lab questions.

EXP # 3A: CRYSTALLIZATION.

Note: Acetanilide is substituted for sulfanilamide in this exp. See the class notes for details.

ASSIGNED READINGS & EXERCISES:

- Experiment: Posted notes and p. 22 – 26.
- Technique 10 (Solubility): p. 669 - 677
- Technique 11 (Crystallization): p. 678 - 686
- Suggested study questions from the textbook: # 1 on p. 33

NOTE: The “Pre-Lab Calculations” section of some experiments in the textbook (such as exp. 3A, p. 24) is not required for your prelab.

EXP # 4 A & B: EXTRACTION. Liquid-liquid extraction, miscibility & solubility, distribution coefficient.

ASSIGNED READINGS & EXERCISES:

- Experiment: Posted notes and p. 34 - 38
- Technique 12 (Extraction): p. 700 - 715

EXP # 6 A & B: THIN LAYER CHROMATOGRAPHY (TLC). Theory and practice of chromatography.

- Experiment: Posted notes and p. 47 - 50
- Technique 20 (Thin-Layer Chromatography):
 - p. 810 – 811 (sections 20.1 & 20.2)
 - p. 814 - 820 (sections 20.4 & 20.9)
- Suggested study questions from the textbook: problems # 1 – 5 on p. 822 - 823

EXP # 17 A – C: ISOLATION OF PIGMENTS FROM SPINACH. Combined use of column chromatography and TLC to isolate and identify natural products. **Please bring a small package of fresh spinach for your group.**

- Experiment: Posted notes and p. 144 - 150
- Technique 19 (Column Chromatography):
 - p. 790 – 799 (sections 19.1 – 19.6)
 - p. 802 – 803 (sections 19.8 – 19.9)
 - p. 804 – 806 (sections 19.11 – 19.13)
- Technique 20 (Thin-Layer Chromatography): p. 820 – 822 (section 20.10)
- Suggested study questions from the textbook: # 1, 3, 4 on p. 150; and # 3, 5 on p. 809

EXP # 14A: CHEMICAL SYNTHESIS: PREPARATION OF ISOPENTYL ACETATE. Esterification, reflux, simple distillation, boiling point determination, driving equilibrium reactions.

ASSIGNED READINGS & EXERCISES:

- Experiment: Posted notes and p. 109 - 117
- Technique 7 (Reaction Methods): p. 631 – 634 (sections 7.2 & 7.3)
- Technique 13 (Physical Constants of Liquids): p. 727 – 729
- Technique 14 (Simple Distillation): p. 738 – 743 (no “internal monitoring of temperature.”)
- Suggested study questions from the textbook: # 3-7 on p. 116 - 117

INDIVIDUAL ASSIGNMENT (Due on the second period of this experiment): **IR Interpretation Exercise** (available in eLearning). This assignment counts as a report (100 pts.).

EXP # 23 A & C: SYNTHESIS OF ALKYL HALIDES BY S_N1 AND S_N2 REACTIONS.

ASSIGNED READINGS & EXERCISES:

- Posted notes and p. 200 – 206
- Suggested study questions from the textbook (p. 208):
 - For *n*-Butyl bromide: questions 1, 3-5
 - For *t*-Pentyl chloride: questions 3, 5

BROMINATION OF STILBENE. Electrophilic addition reactions of alkenes. Stereospecific reactions. Identification of diastereomers.

- This experiment is not in the textbook. Refer to the class notes posted in eLearning.

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.

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|----------------------------------------|-----|
| • 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 by the instructors on their technique and on 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 = 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), 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 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
Taking the final exam and/or checking out off schedule	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

UTD SYLLABUS POLICIES WEBSITE – Please use this link to access information regarding matters such as:

- Incomplete grades policy
- Disability services
- Student conduct
- Grievance procedures
- Religious holy days
- Withdrawal from class