

SYLLABUS¹

CHEM 2123 – ORGANIC CHEMISTRY LABORATORY I

Fall 2019

Dr. Sumudu Wijenayake

BE 3.330C

972-883-2906

sumudu.wijenayake@utdallas.edu

Hours: Friday 1-2 pm

PREREQUISITES: General Chemistry 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 simple organic reactions.

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 – Required for both semesters of organic lab (CHEM 2123 & 2125)

A Microscale Approach to Organic Laboratory Techniques, 6th ed. By Pavia/Kriz/Lampman/Engel

ISBN: 9781305968349

Price: \$130 or less at the bookstore. Purchasing options are also available at www.cengagebrain.com (search using the ISBN listed above).

SUPPLIES: The combination padlock and approved safety goggles are 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). Can be obtained from the bookstore, or from area retailers such as the 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 also be made to prescription at certain retail outlets.
- **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. In addition, they can trigger allergic reactions. Having your own gloves is recommended. Dishwashing gloves are adequate for this lab.
- **PROPER ATTIRE:** Students working in chemistry labs must have a covered torso, and wear long pants and closed shoes. The following are unacceptable: sleeveless garments, tank tops, shorts, sandals, open shoes, Capri pants, etc.

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

- **ITEMS OF PERSONAL USE** (for cleaning, labeling, etc.): Towel, Sharpie marker or pen, and masking tape.

CLASS SCHEDULE – Org. Lab I – Fall 2019

NOTE 1: There are no labs the first two weeks of class. Lab operations begin on the third week.

NOTE 2: No makeup labs are allowed. The first missed lab is a dropped grade.

DATE	TOPIC / EXPERIMENT
Sept. 3 – 9	<ul style="list-style-type: none"> • Introduction to Organic Lab Procedures & Safety Protocols • Weekly Quiz Preparation • SDS assignment • Check-in
Sept. 10 – 16	<ul style="list-style-type: none"> • Exp. 3A: Crystallization of Acetanilide • Note: Acetanilide is substituted for sulfanilamide in this experiment (See class notes for details). • Waste Disposal Procedures • SDS assignment due
Sept. 17 – 23	Exp. 4A: Extraction & distribution coefficient
Sept. 24 – 30	Exp. 6 A,B: Thin layer chromatography (TLC)
Oct. 1 – 7	Exp. 17 A,B: Isolation of pigments from spinach Please bring a small package of fresh, green spinach for your group
Oct. 8 – 14	Exp. 14A: Synthesis of isopentyl acetate (banana oil) Part 1: Reflux & Workup
Oct. 15 – 21	Exp. 14A – Part 2: Distillation and IR analysis Introduction to Infrared Spectroscopy
Oct. 22 – 28	An oxidation puzzle (Not in textbook - Posted in eLearning)
Oct. 29 – Nov. 4	Exp. 23C: Synthesis of <i>t</i> -pentyl chloride
Nov. 5 – 11	Bromination of stilbene (Not in textbook - Posted in eLearning) Glassware & drawer cleanup in preparation for check-out
Nov. 12 – 18	Final Exam & Check-out

DETAILED DESCRIPTIONS, READINGS, & ASSIGNMENTS

INTRODUCTORY MEETINGS

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. 590-607.

ASSIGNMENT (due next period): Download a SDS (Safety Data Sheet) for a chemical of your choice (must have at least one hazard pictogram), print it, highlight any information that seems important, and turn it in (max.: 10 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.** No drawers can be assigned without combination padlocks.

For all experiments, you are encouraged to bring the class notes to the lab. They contain useful tips to save time and avoid common mistakes. They also point to possible modifications to the experimental procedure.

EXP # 3A: CRYSTALLIZATION.

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

ASSIGNED READINGS & EXERCISES:

- Exp. 3 (introduction, part A, and posted notes)
- Technique 10 (Solubility): p. 687 - 693
- Technique 11 (Crystallization): p. 696 - 704

NOTE: The "Pre-Lab Calculations" section of some experiments in the textbook (such as exp. 3A, p. 22) is not required for your prelab.

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

ASSIGNED READINGS & EXERCISES:

- Exp. 4A and posted notes
- Technique 12 (Extractions): Sections 12-1 to 12-10

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

ASSIGNED READINGS & EXERCISES:

- Exp. 6 (introduction, parts A and B, and posted notes)
- Technique 20 (Thin-Layer Chromatography):
 - Sections 20.1 & 20.2
 - Sections 20.4 – 20.9
- Suggested study questions from the textbook: problems # 1 – 5 on p. 840-41

NOTE: The suggested study questions might appear in the post-lab. Give them some thought for better understanding of the experiment, and to make it easier to answer the post-lab questions.

EXP # 17 A,B: ISOLATION OF PIGMENTS FROM SPINACH. Use of column chromatography and TLC to isolate and identify natural products. **Please bring a small package of fresh spinach for your group.** Spinach works best if it is deep green, rather than pale or yellowish green.

NOTE: For the prelab, do not include the pigments from spinach in your table of physical constants. Only the main chemicals (acetone, hexane, and methanol) need to be included.

ASSIGNED READINGS & EXERCISES:

- Exp. 17 A,B and posted notes

- Technique 19 (Column Chromatography): Sections 19.1 – 19.6 and 19.8 – 19.9

EXP # 14A: CHEMICAL SYNTHESIS: PREPARATION OF ISOPENTYL ACETATE & INTRODUCTION TO INFRARED SPECTROSCOPY. Esterification, reflux, simple distillation, boiling point determination, driving equilibrium reactions, infrared spectroscopy.

ASSIGNED READINGS & EXERCISES FOR PART 1 (first week):

- Exp. 14 (introduction, part A, and posted notes)
- Technique 7 (Reaction Methods): Sections 7.1 - 7.3
- Technique 13 (Physical Constants of Liquids): Sections 13.1 and 13.2 (up to p. 747 only)
- Technique 14 (Simple Distillation): Sections 14.1 – 14.3, but only up to p. 761 (Fig. 14.6)
- Suggested study questions from the textbook: # 3-7 on p. 114 - 115

ASSIGNED READINGS & EXERCISES FOR PART 2 (second week):

- Class notes (PowerPoint presentation) posted in eLearning
- Technique 25 (Infrared Spectroscopy): Part B only (p. 893 – 913)
- Try problem 2 at the end of this section. Some related problems will appear in the post-lab.

OXIDATION PUZZLE. Oxidation of alcohols. Use of infrared spectroscopy for product characterization.

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

EXP # 23C: SYNTHESIS OF *t*-PENTYL CHLORIDE BY S_N1 REACTION.

ASSIGNED READINGS & EXERCISES:

- Exp. 23 (introduction, part C, and posted notes)

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.

CHECKOUT. ALL students must be present for checkout. Those missing will continue to be responsible for the equipment in their drawer. No checkout is allowed prior to this date unless you drop the course.

GRADING POLICY

The final grade for this course is calculated as follows. All work is graded on a 100-point scale.

- | | |
|------------------------|-----|
| • Prelabs (individual) | 30% |
| • Post-labs (group) | 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*.

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),
- or any other types of unprofessional or unsafe behavior.

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 not be granted any time extensions.
- 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, and on the quizzes. A study guide will be posted the week prior to the final exam.

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-

DROPPED GRADE POLICY

1. One experiment, one prelab, and one quiz grade will be dropped (they don't have to be for the same experiment). It is wise to reserve this option for emergencies or personal engagements.
2. For two-period experiments, the first period is usually the most important. Students who miss the first period will get no credit for the experiment. Students who miss only the second period will get a 50 pt. deduction from the report grade.
3. The final exam cannot be dropped.

EXPERIMENT MAKEUP POLICY

1. Due to space and equipment restrictions, makeup experiments are only given when mandated by university policy. **Documentation is required in all cases.** Examples:
 - Military or jury duty
 - Major illness, hospitalization, or medical procedures
 - Participation in university-sponsored events
2. NOT INCLUDED IN THE ABOVE CATEGORY ARE: minor emergencies, minor illness, participation in events not sponsored by the university, and personal engagements like travel, social events, family affairs, and funerals.
3. Granting makeup experiments for reasons not covered by university policy is left to the discretion of the instructor, but in all cases STUDENTS WILL AGREE TO RECEIVE A 6 POINT DEDUCTION FROM THE POST-LAB GRADE. The reasons are as stated above, plus the fact that students already have the option to drop one grade without penalty.
4. Students MUST make up the experiment within the time period allocated to that experiment in the syllabus. If this is not possible, the grade will be dropped.

UTD SYLLABUS POLICIES AND PROCEDURES – Refer to the [Provost Webpage](#) for a complete list of university syllabus policies and procedures, including Incomplete grade policy, academic integrity, student conduct and discipline, grievance procedures, student resources, etc.