

SYLLABUS¹

CHEM 2123 – ORGANIC CHEMISTRY LABORATORY I

Fall 2013

Dr. Sergio Cortes

SLC 3.509

972-883-6801

scortes@utdallas.edu

Hours: TBA

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: <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 I – 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	<ul style="list-style-type: none"> • Introduction to Organic Lab Procedures & Safety Protocols • Weekly Quiz Preparation • MSDS assignment • Check-in
Sept. 10 – 16	Exp. 10: Extraction of active ingredient from analgesic drug MSDS assignment due
Sept. 17 – 23	Exp. 3 A: Crystallization
Sept. 24 – 30	Exp. 4 A,B: Extraction & distribution coefficient
Oct. 1 – 7	Exp. 6 A,B: Thin layer chromatography (TLC)
Oct. 8 – 14	Exp. 17 A - C: Isolation of pigments from spinach Please bring a small package of fresh spinach for your group
Oct. 15 – 21	Exp. 14 A: Synthesis of isopentyl acetate (banana oil)
Oct. 22 – 28	Exp. 66: An oxidation puzzle/ Intro to infrared spectroscopy IR interpretation exercise introduced
Oct. 29 – Nov. 4	Exp. 66: Continued IR interpretation exercise due
Nov. 5 – 11	Exp. 23 A,C: Sn1 and Sn2 reactions
Nov. 12 – 18	Exp. 46 B: Polymerization reaction: Preparation of Nylon 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.

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, and each group must provide a combination padlock. 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.

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 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 # 3A: CRYSTALLIZATION. Basic crystallization technique and its uses, vacuum filtration.

ASSIGNED READINGS & EXERCISES:

- Experiment: Posted notes and p. 22 - 26
- Technique 10 (Solubility): p. 669 - 677
- Technique 11 (Crystallization): p. 678 - 686
- **Include the "Pre-Lab calculations" exercises # 1 & 2 (p. 24) in your prelab.**
- Suggested study questions from the textbook: # 1 on p. 33

NOTE: The "Pre-Lab Calculations" section of some experiments is usually not required for your prelab, unless otherwise indicated in the assigned readings & exercises, as in the above example.

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
- **Include the "Pre-Lab calculations" exercise # 1 (p. 35) in your prelab.**

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

EXP # 66: AN OXIDATION PUZZLE. Oxidation of alcohols. Use of infrared spectroscopy for product characterization.

ASSIGNED READINGS & EXERCISES:

- Experiment & IR spectroscopy: Posted notes and p. 571 - 573
- Technique 25 (Infrared Spectroscopy): p. 875 – 895
- Suggested study questions: # 2 on p. 895

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 SN1 AND SN2 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

EXP # 46 B: PREPARATION OF NYLON. Polymerization reactions and types of polymers.

- **This experiment is mandatory and cannot be dropped .**
- Assigned readings: p. 397-405, and 409-410 (Part B)

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 at semester end. **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 | 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.**