# Course Syllabus

| Organic Chemistry Lab (CHEM 129A) | |
| --- | --- |
| **Semester FALL 2019** | **Department of Chemistry CSU Fresno** |
| **Course Name** Organic Chemistry Lab | **Instructor Name: Hubert Muchalski** |
| **Units:** 2 | **Office Location: S1-352** |
| **Time: MW 09:00–11:50 AM** | **E-Mail: hmuchalski@mail.fresnostate.edu** |
| **Location: S1-372** | **Telephone: 559-278-2711** |
| **Website:** [**http://fresnostate.instructure.com/**](http://fresnostate.instructure.com/) | **Office Hours: TBA** |
| **Coordinator:** Hubert Muchalski, Ph.D. ([hmuchalski@mail.fresnostate.edu](mailto:hmuchalski@mail.fresnostate.edu); 8-2711) | |

**Course description**: Introduction to experimental techniques used in organic chemistry, including the preparation, purification, and identification of organic compounds. (6 lab hours). It is usually expected that students will spend approximately 2 hours of study time outside of class for every one hour in class. Expect to study an average of 8–12 hours outside of class each week.

**Course goals**: The goal of this course is to introduce the techniques and tools used by organic chemists to synthesize and investigate the properties of organic compounds. Some of these techniques are the same or similar to those you learned in general chemistry courses but some will be different because the experiments use very small amounts (microscale techniques) of mostly non-polar material. Students who successfully complete CHEM 129A generally enroll in CHEM 129B, which further develops laboratory and research skills. Some students then continue with CHEM 190, undergraduate research or independent study.

**Prerequisites for the course:** CHEM 8 or CHEM 128A with a grade of C or better. CHEM 128A can be taken concurrently. Course fee $25.

## COURSE Materials and Technology

**Textbook:** "A Microscale Approach to Organic Laboratory Techniques, 6th edition" by Donald Pavia et al. published by Thompson/Brooks Cole. Previous editions will also be sufficient to learn the material but page numbers as well as problems will be different.

**Notebook:** Organic chemistry laboratory notebook from Hayden-McNeil, spiral-bound, (ISBN:9781930882461). General chemistry notebook (ISBN:978-1930882744) is also good but will not have organic chemistry-specific reference materials on covers.

**Personal protective equipment (PPE):** Lab coat and approved safety goggles. Disposable nitrile gloves will be provided.

**Canvas:** The central repository for all course materials and information is our Canvas site. The Canvas site will house your grades, links to handouts, videos, and other materials.

## Student Learning Outcomes

Students who successfully complete CHEM 129A should be able to:

* maintain an accurate laboratory notebook that would allow another properly trained person to reproduce the experimental work with the similar results;
* work safely in the laboratory, including the disposal of chemical wastes;
* find relevant information about reagents, equipment, and techniques;
* build apparatus for a reflux reaction and carry out basic organic techniques such as extraction, crystallization, distillation, and chromatography;
* measure physical properties of organic compounds including melting and boiling points;
* carry out liquid–liquid extraction; and
* analyze purity and chemical identity of organic compounds using TLC, GC, and IR.

## Course requirements and assignments

Since this is a lab course, **attendance is mandatory**. You must complete all experiments in order to obtain a passing grade in the course. Since important information about each experiment (including safety information) is provided at the beginning of the lab period it is important to be on-time. *Being late for lab will contribute to lowering your final point total which is the basis of your final grade.* You will not be allowed to begin an experiment if you are late.

**In-lab requirements:** Two 170-minute meetings per week where we experimentally explore selected organic chemistry concepts (5.67 hours per week). Attendance is mandatory because you must complete all experiments to obtain a passing grade. Typically, the in-lab session will start with a short review of relevant material, concepts, and chemical safety through group discussions and problem-solving activities. You will not be allowed to enter the lab if:

* you are late and missed the pre-lab discussion,
* you are not appropriately dressed to work in the lab, or
* you don't complete the pre-lab assignment.

**Out-of-lab requirements:** I expect that you will come to lab with a basic understanding of the concepts that will allow you to fully participate in pre-lab discussions. Preparing for the lab means making honest effort to learn on your own by:

* reading the textbook material related to the scheduled experiment;
* preparing the pre-lab write-up;
* reviewing the relevant techniques for each experiment (listed in the introduction section for each experiment);
* watching videos demonstrating laboratory techniques; and
* reviewing safety data sheets (SDS) for chemicals you will be working with.

Out-of-class work also includes analysis of data collected in the lab. For the first half of the semester this will take form of post-lab summary written in your notebook. Later in the semester the post-lab analysis will include a typewritten lab report. (8–12 hours per week)

**Lab make-ups:** If you cannot attend a lab you must notify your instructor and lab coordinator as soon as possible explaining why you have to miss the lab. *Arranging make-ups is very* difficult because every semester all lab sections are at full capacity. If your request is approved you are still required to document the reason for missing the lab, and will be expected to make the lab up and complete the assigned work. *If the above conditions are not met, then a grade of 0 will be given for the missed lab.*

## Types of graded work

There are four kinds of graded work you will encounter in this course:1) Laboratory notes, both pre-lab and in-lab notes; 2) Experimental results, post-lab summaries and lab reports; 3) Quizzes; and 4) Practicals.

**Lab notebook:** Your lab notebook is subject to evaluation at any time and must be kept current. Pre-lab notes contain answers to questions as well as documentation related to the planned experiment which you will prepare before carrying out scheduled experiments. In-lab notes document what you did in the lab (including notes taken during discussions) as well as results of your experimental work.

Assume that you're in note-taking mode at all time when you're in the lab. Well prepared pre-lab and in-lab notes are very important because they are the basis for the post-lab summary or report that you will write for each set of experiments. To know what to write and not to write in the notebook is a balancing act of relevance and brevity. You need only details that are relevant and necessary to reproduce the experiment. You can assume that your notes are going to be read by a trained organic chemist. For example, you don't have to explain what is a round-bottomed flask.

Instructions for maintaining your laboratory notebook are in the textbook and will be discussed in the lab. Include all printouts (IR and NMR spectra, gas chromatograms, etc.) and sketches of TLC plates as part of you notes portfolio.

One of the main objectives of this course is for students to learn to interpret and communicate the meaning of experimental results. The post-lab summary or lab report is an assignment that shows the depth of your understanding of the concepts, techniques, and instrumentation used in the lab.

**Results:** For experiments involving synthesis or unknowns, products/results should be ready for submission to your instructor one week after the experiment is completed (based on the lab schedule). Lab write-ups should also be completed by this time. Ask your instructor about the details of sample/results submission.

**Lab Practicals:** These are the last two experiments for the semester (see Lab Schedule). You will be given a procedure (handout) at the beginning of the Practical session. Your grade for these Practicals will be based on the time required for completion of each procedure, the yield and purity of your product, your actual performance in the lab, and your experimental write-up.

**Quizzes:** These short exams test your understanding of the lab techniques and experiments you conducted and will be based on material covered in the pre-lab lectures, reading assignments, and experiments.

**Instructor’s Evaluation**: The instructor’s evaluation can make a difference in your final course grade. This evaluation will be based on the following factors: arriving in lab on time, participation in class discussions, observance of lab safety rules, laboratory technique, efficient use of lab time (completing labs on time), working independently, initiative and work-ethic, and your ability to work well with others.

**Plagiarism Detection:** The campus subscribes to Turnitin, a plagiarism prevention service, through Canvas. Written assignments submitted to Turnitin will be used for plagiarism detection and for no other purpose. The student may indicate in writing to the instructor that he/she refuses to participate in the plagiarism detection process, in which case the instructor can use other electronic means to verify the originality of their work. **Turnitin Originality Reports WILL NOT be available for your viewing.**

**Grading policy:** In the past, the grading scale followed a pattern close to the following: A = 85–100, B 75–84, C 65–74; D 50–64; and F <50. The weight of each assignment group is presented below:

|  |  |  |
| --- | --- | --- |
| Grade component | % (each) | Subtotal |
| Experiments (10) | 5% | 50% |
| Practicals (2) | 7% | 14% |
| Quizzes (4) | 8% | 32% |
| Evaluation | 4% | 4% |
|  | **Total** | **100%** |

## Laboratory safety

1. NO food or drink in the laboratory.
2. Wear clothing appropriate for laboratory work.
3. Select and correctly use appropriate Personal Protective Equipment (PPE).
4. Know what to do and who to contact in an emergency in the laboratory.
5. Avoid distractions and be alert to and aware of your surroundings and potential hazards in your area.
6. Maintain a safe and clean work area.
7. Only conduct experiments or procedures approved by your lab instructor or research advisor.
8. Understand the common chemical hazards and hazards specific to the chemicals and procedures with which you are working.
9. Understand and follow best practices on how to handle, transport, store, and dispose of chemicals safely.
10. If any equipment, glassware, or procedures are not working properly or as expected, notify your instructor before proceeding.
11. Notify your instructor if you have, develop, or may develop any medical conditions (e.g. severe asthma, limited mobility, vision impairment, pregnancy, etc) that may affect your safety in the laboratory or sensitivity to chemicals, so that your instructor can properly advise or accommodate you on minimizing the risks associated with laboratory work.

Full discussion of these principles can be found here: <https://goo.gl/1UFRbo>

For additional information about safety in undergraduate teaching labs please refer to Guidelines for Chemical Laboratory Safety in Academic Institutions published by American Chemical Society. ([Download free PDF copy](https://www.acs.org/content/dam/acsorg/about/governance/committees/chemicalsafety/publications/acs-safety-guidelines-academic.pdf)).

You must pass the Safety Quiz to remain in the class. You can take the quiz up to 3 times. The quiz is based upon the information on safety sheet, your instructor’s lab lecture on safety, and Technique 1 (Safety) in the lab textbook. You are strongly encouraged to read the safety related notes, abide by the guidelines ALL THE TIME to keep the lab, lab occupants, and everyone else in the department safe.

## University Policies

**Students with Disabilities:** Upon identifying themselves to the instructor and the university, students with disabilities will receive reasonable accommodation for learning and evaluation. For more information, contact Services to Students with Disabilities in the Henry Madden Library, Room 1202 (278-2811).

The following University polices can be found at:

* [Adding and Dropping Classes](http://fresnostate.edu/studentaffairs/registrar/registration/add-drop-deadlines.html)
* [Cheating and Plagiarism](http://fresnostate.edu/academics/facultyaffairs/documents/apm/236_000.pdf)
* [Computers](https://www.fresnostate.edu/catalog/academic-regulations/index.html#computerreq)
* [Copyright Policy](http://www.fresnostate.edu/home/about/copyright.html)
* [Disruptive Classroom Behavior](http://www.fresnostate.edu/academics/facultyaffairs/documents/apm/419.pdf)
* [Honor Code](http://fresnostate.edu/academics/facultyaffairs/documents/apm/236_000.pdf)
* [Students with Disabilities](http://fresnostate.edu/studentaffairs/ssd/)
* [Title IX](http://www.fresnostate.edu/adminserv/hr/title-ix/index.html)

## UNIVERSITY SERVICES

The following University services can be found at:

* [Associated Students, Inc.](http://fresnostateasi.org/)
* [Dream Success Center](http://fresnostate.edu/studentaffairs/dsc/index.html)
* [Learning Center Information](http://fresnostate.edu/studentaffairs/lrc)
* [Student Health and Counseling Center](https://www.fresnostate.edu/studentaffairs/health/)
* [Writing Center](http://www.fresnostate.edu/artshum/writingcenter/)

## All course sections

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| --- | --- | --- | --- | --- | --- |
| Class | Section | Days | Times | Room | Instructor |
| 74827 | 05-LAB | MW | 09:00–11:50 AM | S1-370 | Tamras, S. |
| 74699 | 06-LAB | MW | 09:00–11:50 AM | S1-372 | Muchalski, H. |
| 74828 | 16-LAB | MW | 01:00–03:50 PM | S1-370 | Tamras, S. |
| 75292 | 17-LAB | MW | 01:00–03:50 PM | S1-372 | Munshi, K. |
| 74698 | 07-LAB | TR | 09:00–11:50 AM | S1-370 | Tamras, S. |
| 75030 | 10-LAB | TR | 09:00–11:50 AM | S1-372 | Chen, M. |
| 75308 | 19-LAB | TR | 01:00–03:50 PM | S1-370 | Vazquez, S. |
| 75608 | 20-LAB | TR | 01:00–03:50 PM | S1-372 | Munshi, K. |

# Course Schedule

*The syllabus and course schedule are subject to change in the event of extenuating circumstances.*

| **Wk of** | **Day** | **Topic** | **Experiment** | |
| --- | --- | --- | --- | --- |
| 20-Aug | We/Th | Orientation & laboratory safety |  | |
| 27-Aug | Mo/Tu | Locker check-in. Laboratory glassware | Experiment 1 | |
| 29-Aug | We/Th | Solubility and miscibility | Experiment 2 (A–E) | |
| 3-Sep | Mo/Tu | NO CLASS |  | |
| 5-Sep | We/Th | Solubility and miscibility | Experiment 2 (A–E) | |
| 10-Sep | Mo/Tu | Crystallization | Experiment 3 (A, C, D, E) | |
| 12-Sep | We/Th | Crystallization | Experiment 3 (A, C, D, E) | |
| 17-Sep | Mo/Tu | Extraction | Experiment 4 (A, C, D) | |
| 19-Sep | We/Th | Extraction | Experiment 4 (A, C, D) | |
| 24-Sep | Mo/Tu | **Quiz 1**. Chromatography | Experiment 6 (A, B, D) | |
| 26-Sep | We/Th | Chromatography | Experiment 6 (A, B, D) | |
| 1-Oct | Mo/Tu | ChemDraw Software | Experiment 6 (follow-up if needed) | |
| 3-Oct | We/Th | Distillation | Experiment 8 | |
| 8-Oct | Mo/Tu | Distillation | Experiment 8 | |
| 10-Oct | We/Th | Steam distillation | Experiment 15A | |
| 15-Oct | Mo/Tu | Steam distillation | Experiment 15A | |
| 17-Oct | We/Th | Synthesis of acetaminophen | Experiment 11B | |
| 22-Oct | Mo/Tu | **Quiz 2**. Synthesis of acetaminophen. | Experiment 11B | |
| 24-Oct | We/Th | Synthesis of banana oil | Experiment 14B | |
| 29-Oct | Mo/Tu | Synthesis of banana oil | Experiment 14B | |
| 31-Oct | We/Th | Substitution reactions | Experiment 23 (B, D) | |
| 5-Nov | Mo/Tu | Substitution reactions | Experiment 23 (B, D) | |
| 7-Nov | We/Th | Substitution reactions | Experiment 23 (B, D) | |
| 12-Nov | Mo/Tu | NO CLASS |  | |
| 14-Nov | We/Th | Synthesis of benzoic acid | Experiment 35 | |
| 19-Nov | Mo/Tu | **Quiz 3**. Synthesis of benzoic acid | Experiment 35 | |
| 21-Nov | We/Th | Synthesis of benzoic acid | Experiment 35 | |
| 26-Nov | Mo/Tu | Lab make-up period |  | |
| 28-Nov | We/Th | Thanksgiving Break |  | |
| 3-Dec | Mo/Tu | Synthesis of a solid | Practical #1 | |
| 5-Dec | We/Th | Synthesis of a liquid | Practical #2 | |
| 10-Dec | Mo/Tu | **Quiz 4**. Locker check-out |  | |
| 11-Dec | We/Th | Last Day of Instruction |  | |
| **Finals week** | | | **Days** | **Dates** |
| Final Exam Preparation & Faculty Consultation Days: | | | Thursday and Friday | Dec 12–13 |
| Final Semester Examinations | | | Monday–Thursday | Dec 16–19 |
| Final Exam in this course | | |  |  |

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|  | **Date** | **Topic** | **Experiment** | |
| --- | --- | --- | --- | --- |
| 1 | Wed., Aug 21 | Orientation & laboratory safety |  | |
| 2 | Mon., Aug 26 | Locker check-in. Laboratory glassware | Experiment 1 | |
| 3 | Wed., Aug 28 | Solubility and miscibility | Experiment 2 (A–E) | |
| 4 | Mon., Sept 2 | NO CLASS |  | |
| 5 | Wed., Sept 4 | Solubility and miscibility | Experiment 2 (A–E) | |
| 6 | Mon., Sept 9 | Crystallization | Experiment 3 (A, C, D, E) | |
| 7 | Wed., Sept 11 | Crystallization | Experiment 3 (A, C, D, E) | |
| 8 | Mon., Sept 16 | Extraction | Experiment 4 (A, C, D) | |
| 9 | Wed., Sept 18 | Extraction | Experiment 4 (A, C, D) | |
| 10 | Mon., Sept 23 | Quiz 1. Chromatography | Experiment 6 (A, B, D) | |
| 11 | Wed., Sept 25 | Chromatography | Experiment 6 (A, B, D) | |
| 12 | Mon., Sept 30 | ChemDraw Software | Experiment 6 (follow-up if needed) | |
| 13 | Wed., Oct 2 | Distillation | Experiment 8 | |
| 14 | Mon., Oct 7 | Distillation | Experiment 8 | |
| 15 | Wed., Oct 9 | Steam distillation | Experiment 15A | |
| 16 | Mon., Oct 14 | Steam distillation | Experiment 15A | |
| 17 | Wed., Oct 16 | Synthesis of acetaminophen | Experiment 11B | |
| 18 | Mon., Oct 21 | Synthesis of acetaminophen. Quiz 2. | Experiment 11B | |
| 19 | Wed., Oct 23 | Synthesis of banana oil | Experiment 14B | |
| 20 | Mon., Oct 28 | Synthesis of banana oil | Experiment 14B | |
| 21 | Wed., Oct 30 | Substitution reactions | Experiment 23 (B, D) | |
| 22 | Mon., Nov 4 | Substitution reactions | Experiment 23 (B, D) | |
| 23 | Wed., Nov 6 | Substitution reactions | Experiment 23 (B, D) | |
| 24 | Mon., Nov 11 | NO CLASS |  | |
| 25 | Wed., Nov 13 | Synthesis of benzoic acid | Experiment 35 | |
| 26 | Mon., Nov 18 | Quiz 3. Synthesis of benzoic acid | Experiment 35 | |
| 27 | Wed., Nov 20 | Synthesis of benzoic acid | Experiment 35 | |
| 28 | Mon., Nov 25 | Lab make-up period |  | |
|  | Wed., Nov 27 | Thanksgiving Break |  | |
| 29 | Mon., Dec 2 | Synthesis of a solid | Practical #1 | |
| 30 | Wed., Dec 4 | Synthesis of a liquid | Practical #2 | |
| 31 | Mon., Dec 9 | Quiz 4. Locker check-out |  | |
|  | Wed., Dec 11 | Last Day of Instruction |  | |
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