

CHEM 2325 – Organic Chemistry Laboratory II

Syllabus

Instructor: Dr. Shawn M. Miller

Spring Term, 2022

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Office Hours: T/R 12:30 PM – 1:30 PM and by appointment

Location: Widtsoe 339

Prerequisites: CHEM 2315
CHEM 2320 (may be taken concurrently)

Required Materials:

Lab Notebook: Whitelines notebook (ISBN: 9781411801769).

Lab Splash Goggles: Provided by the course. Also available at Campus Bookstore.
Safety glasses (even with side-shields) are unacceptable.

Lab Coat: Must cover arms to wrists and legs to knees. Available at Campus Bookstore.
Lab aprons are unacceptable.

Lab Fees: The lab fee of \$75 is used to maintain and purchase equipment, purchase reagents and supplies, support Undergraduate Teaching Assistants, and partially fund graduate Teaching Assistant stipends.

Recommended Materials:

Calculator: A calculator is useful for performing calculations in the lab. Other electronic devices, including cell phones, tablets, and laptops, are not permitted in lab.

Course Overview

CHEM 2325 is a laboratory course that is designed to accompany CHEM 2320. Students will learn practical organic chemistry laboratory techniques including how to perform the techniques safely and will practice using critical thinking skills by using collected data to support arguments.

Course Objectives

CHEM 2325 is a technical course designed to train students in new laboratory skills and apply laboratory skills from CHEM 2315 in regard to molecular modeling and the properties, syntheses, separation, purification, and identification of organic compounds. In the laboratory space, students will conduct experiments designed to provide training in the use these experimental techniques and in the application those techniques, in conjunction with critical thinking, to solve problems. This course will reinforce the skills students learned in CHEM 2315 regarding recording data in an organized fashion and using that data to create and justify conclusions. Students are expected to not just carefully and efficiently perform experiments in the laboratory, but also be able to explain the principles behind experiments.

By the end of this course, students will be able to...

- ...explain the theory behind standard organic chemistry laboratory techniques and instruments.
- ...predict the outcome of an experiment using knowledge of the theory behind the experiment.
- ...execute basic organic chemistry laboratory procedures safely and efficiently.
- ...record relevant scientific data and observations in a laboratory notebook.
- ...perform arithmetic calculations using recorded scientific data.
- ...create conclusions and justify those conclusions using spectroscopic data or recorded laboratory data.

Students will prepare for and practice achieving these objectives by...

- ...reading the laboratory experiment handouts and watching the recorded lectures.
- ...preparing for lab by completing your Pre-lab Notebook and Pre-lab Quizzes.
- ...attending every lab on time.
- ...being safe in the lab.
- ...asking questions to the Teaching Assistant and course instructor via email, Canvas message, and/or Office Hours.

Students will be assessed on how you have achieved these objectives using...

- ...a Getting Started Quiz.
- ...completion of laboratory Check-in.
- ...Pre-lab Quizzes.
- ...submitted Laboratory Notebook pages.
- ...Laboratory Performance grades.
- ...Laboratory Cleanliness grades.
- ...completion of Laboratory Check-out.

Course Communication

Information that needs to be communicated to the entire course is sent via Canvas Announcements. Students are expected to check Canvas Announcements at least once a day and are responsible for any information in the announcements. "But I did not know" is not an acceptable excuse for being unaware of information in Canvas Announcements.

Students are always welcome to message their Teaching Assistant and/or the instructor with questions. Canvas messages are preferred, but email is fine as well. When messaging via email, students should include their full name, their A-Number, and the course name in their message. We will respond to messages in a timely manner, but we may not be able to respond immediately as we have responsibilities outside of the course.

The instructor will hold regular Office Hours as listed at the beginning of this syllabus and is willing to meet with students individually via appointment. Students wishing to make an appointment should contact the instructor directly via Canvas message with their schedule availability.

Getting started in the course

Read the course syllabus and watch the "Introduction to CHEM 2315/2325" recorded lecture on Canvas. Read the "Laboratory Notebook Instructions" document on Canvas and watch the "Laboratory Notebook Instructions" recorded lecture on Canvas. Read the "Laboratory Safety Rules and Policy" document on Canvas and watch the "Laboratory Safety Rules and Policy" recorded lecture on Canvas. Complete the "Laboratory Safety Policies Agreement Documentation" assignment on Canvas, worth 10 points, by 11:59 PM the Friday of Week 1. Not submitting a complete "Laboratory Safety Policies Agreement Documentation" will prevent students from performing all experiments and from receiving credit for all experiments.

Complete the "Getting Started" quiz administered through Canvas. This quiz covers course policy and laboratory safety as detailed in the resources described in the previous paragraph. Some questions in this Quiz will involve using common sense to make safe decisions in situations that are not explicitly discussed in those resources. This Quiz is due at 11:59 PM on the Friday of Week 1 of the semester. The Getting Started quiz is graded immediately upon completion and may be attempted an unlimited number of times. Correct answers will not be shown upon completion, but responses will be viewable. If multiple attempts are made, the **best** score will be accepted. **If a numerical score is not present in Canvas Grades, then no attempt was submitted.** The Getting Started Quiz score cannot be dropped, and extensions will not be granted.

USU welcomes students with disabilities. If you have, or suspect you may have, a physical, mental health, or learning disability that may require accommodations in this course, please contact the Disability Resource Center (DRC) as early in the semester as possible (University Inn #101, 435-797-2444, drc@usu.edu). All disability related accommodations must be approved by the DRC. Once approved, the DRC will coordinate with faculty to provide accommodations.

Utah State University is committed to providing access for service dog handlers. Due to the unique nature of the laboratory environment service animal handlers must meet with the Disability Resource Center prior to bringing a service dog into the lab. The purpose of this meeting is not to prevent you from having your service animal with you but rather to understand how to best accommodate your needs and the needs of your animal. Please contact the Disability Resource Center at 435-797-2444 or drc@usu.edu to set up an appointment.

Laboratory Check-in

Laboratory Check-in is held during the first laboratory meeting of the term and will introduce students to their Teaching Assistant (TA) and the laboratory space including a discussion on safety information directly relevant to the laboratory space. Any student failing to attend Laboratory Check-in will not be permitted to perform any in-laboratory experiments and will not receive any credit for any experiments whether performed in the laboratory or not. If you know that you will be unable to attend Laboratory Check-in, you must give prior notice and documentation to the instructor to schedule a make-up Check-in.

Students must come properly attired according to the policies here in the course syllabus and in the "Safety Rules and Training Documentation" located on Canvas, bring their personal protective equipment, and their laboratory notebook. Students will be given a packet containing an equipment list that will be used to check against what is in their assigned drawer as well as a Safety Quiz, a Safety Scavenger Hunt, and some Pre-lab Notebook preparation practice. All Check-in components must be completed prior to leaving the laboratory at the end of Check-in.

Check-out follows a similar structure to Check-in. Students will receive their packet containing the equipment list and will be again check against what is in their assigned drawer. 10 points each will be awarded for completing Check-in and Check-out.

Preparing for Lab

Watch the recorded lecture(s) on Canvas and read the experiment handout(s) on Canvas for each experiment before each laboratory session. For success in this course, students should be an active participant when thinking about the course material and always ask themselves "how and why?" Every step in an experimental procedure is necessary. At each step, a student should be able to explain why that step is being performed.

After completing the background preparation described in the previous paragraph, complete a Pre-lab Notebook unless stated otherwise in the experiment handout. **Failing to complete the Pre-lab Notebook will prevent you from performing the experiment resulting in a score of zero for that experiment.** Detailed instructions on preparing and keeping a laboratory notebook is found in the "Laboratory Notebook Instructions" document on Canvas.

Each experiment has a Pre-lab Quiz located on Canvas. Pre-lab Quizzes are due **30 minutes** before the laboratory section meets for an experiment. These Quizzes contain 10 questions, and each Pre-lab Quiz is worth 10 points.

Recorded lectures and experimental handouts may be referenced when completing the Pre-lab Quiz and the Pre-lab Notebook, but all work must be completed alone. The lowest scoring Pre-lab Quiz is dropped at the end of the course.

Performing an Experiment

There are 10 experimental laboratory sessions. Each laboratory session is assigned one experiment whose submission is worth 40 points and as this is a technical, performance-based course each experiment is mandatory. Make-up experiments for religious obligations and similar scenarios may be possible if the instructor is notified **well in advance**. Due to their sudden nature, make-up

experiments are generally not granted for experiments missed due to illnesses or other unexpected situations. As this is a course with large enrollment numbers, opportunities for a make-up experiment are few even with advance notice. To account for this, the lowest Experiment Submission score is dropped at the end of the course.

Each TA will give a pre-lab lecture immediately at the start of the laboratory session; therefore, you must arrive to your lab sessions on time. The TA's pre-lab lectures are critical to your safe and successful performance of each experiment. Arriving late to lab means that you will miss important information pertaining to safe and efficient performance of that day's experiment. TAs will deduct 3 points from the Lab Performance grade, described later in this syllabus, of any student arriving during the TA pre-lab lecture. **Students that miss the TA pre-lab lecture entirely will not be permitted to perform the experiment and will receive a score of zero for the experiment.**

Dry Labs

As seen in the course schedule at the end of this syllabus, some experiments are listed as "dry" labs. Follow the instructions in the experiment handout for each dry lab to complete each dry lab. Dry Labs always have a Pre-lab Quiz. Dry Labs may have Pre-lab Notebooks. If they do, they will have specific instructions in the experiment handout for completing the Pre-lab Notebook.

Wet Labs

All experiments not labeled "dry" experiments are "wet" experiments that will be performed in your regular laboratory room. Information and procedures for each experiment are found in handouts on Canvas.

Safety is the top priority in this course. Details on what is and is not acceptable lab attire are found in the "Laboratory Safety Rules and Policy" document on Canvas and the "Laboratory Safety Rules and Policy" recorded lecture on Canvas. Students must wear appropriate attire under the laboratory coat and appropriate footwear. Students must wear a laboratory coat and splash goggles in the laboratory. Students barred from the laboratory for an experiment because of improper attire will receive a score of zero for the experiment.

At the start of the laboratory section, the Teaching Assistant will check Pre-lab Notebooks and will give a short pre-lab lecture. Students who did not complete the Pre-lab Notebook will not be permitted to complete the experiment and will receive a score of zero for the experiment. No food or drink is allowed in the laboratory. Do not bring in water bottles. Do not use cell phones, tablets, laptops, or other unauthorized electronic devices in the laboratory. Only items required to complete the session's experiment are allowed into the laboratory space.

Laboratory Performance grades are a measure of student safe and efficient efforts in the laboratory. Each wet experiment is allocated five Laboratory Performance points. At the discretion of the Teaching Assistant, Laboratory Performance grades may be reduced for unsafe or irresponsible conduct in the lab. The Teaching Assistant may also choose to fully dismiss students from the lab for unsafe, disruptive, or irresponsible behavior. In such an event, the students will receive a score of zero for the experiment. No Laboratory Performance grades are dropped. In the event of an excused absence, the Laboratory Performance grade for that Experiment will be the average of Laboratory Performance grades for all other Experiments. No more than one Laboratory Performance score can be made up.

Students have only the allotted time of 2 hours and 50 minutes in lab to finish each experiment. **This includes cleaning.** Most experiments will require the majority of the scheduled laboratory period, so it is important that students come to lab prepared to efficiently perform the experiment. Students should use low-intensity periods in the laboratory to prepare for later steps in the experiment procedure or to clean equipment. Teaching Assistants have the authority to instruct students to begin cleaning even if the students have not yet completed the experiment to ensure the students leave the laboratory room on schedule.

Students with health or physical conditions that warrant additional precautions (respiratory ailments, pregnancy, etc.) should contact the instructor *immediately* to discuss their circumstances. Student safety in the laboratory is our top priority.

Post-Lab

Part of being safe includes ensuring the laboratory is clean and organized. At the end of each wet lab period, the Teaching Assistant will grade the cleanliness and organization of the community areas in the laboratory, such as the weighing balances, waste areas, and sinks, **as a section** out of 5 points. Every student in a lab section will receive the same Laboratory Cleanliness Grade. This means that if, for example, the areas around the weighing balances are messy at the end of lab, you will be penalized even if you did not personally make the mess. Remind each other that it is everyone's responsibility to leave the lab in good condition. Laboratory Cleanliness grades are not dropped. A rubric for how Laboratory Cleanliness points are assigned is located on the course Canvas website. In the event of an excused absence, the Laboratory Cleanliness grade for that Experiment will be the average of Laboratory Cleanliness grades for all other Experiments for the student.

Once their notebook pages for an experiment are complete, students submit their notebook pages to a Canvas assignment. Students may submit their notebook pages as images or PDFs, but it is strongly recommended that students download and use one of the many free apps available that automatically convert images to PDFs as they are easier to handle for both students and Teaching Assistants. Students may submit their notebook pages as a single file or individual pages, although a single file is preferred. To submit individual pages, make successive submissions to the same assignment. **It is the students' responsibility to ensure their submissions are legible.** Teaching Assistants cannot grade what they cannot read, and illegible submissions will receive a score of zero.

Specific due dates for each experiment's submission are shown via each experiment's Canvas Assignment. **Always check Canvas for specific due dates.** In general, the due date for experiment submissions is one week after the experiment is performed. **All deadlines are hard deadlines and there are no exceptions.**

Notebook pages will be graded for completeness and correctness, including an appropriate account of the procedure as actually performed, all relevant data and observations, calculations, and conclusions.

As students work in pairs and collaborative work is strongly encouraged, there will be significant similarities, particular with regards to recorded data, between the notebook pages each student in a pair submits. However, students must create and submit their own work. **Copying another student's Conclusions, or any other section, is plagiarism and an example of an academic integrity violation.**

Academic Integrity

All Utah State University academic integrity policies are strictly enforced. All students at Utah State University agree to be bound by the following Honor Pledge "I pledge, on my honor, to conduct myself with the foremost level of academic integrity." See the following for further information: <https://studentconduct.usu.edu/studentcode/article5>. Students found guilty of academic misconduct on any assignment will, **at minimum, be given a zero for the assignment and have the full value of that assignment deducted from their final course grade.** Actions up to and including a failing grade for the course are options available to the instructor. Examples of violations of the academic integrity policies include, but are not limited to, copying the objectives, conclusions, post-lab question answers, and other sections of laboratory notebook submissions of another student including from your laboratory partner.

Grading

The total score for each type of assignment represents totals after appropriate lowest scores have been dropped.

Check-in	10	Percentage of Points Earned	Grade
Safety Policies Agreement	10	94 – 100	A
Getting Started Quiz	20	90 – 93	A-
Pre-lab Quizzes	90	87 – 89	B+
Experiment Submissions	360	84 – 86	B
Laboratory Performance	50	80 – 83	B-
Laboratory Cleanliness	35	77 – 79	C+
Check-out	10	74 – 76	C
End-of-term evaluations	10	70 – 73	C-
<hr/> Total points	<hr/> 595	67 – 69	D+
		60 – 66	D
		0 – 59	F

Course scores will be rounded to the nearest whole number. Your TA is the instructor of record for all grading related to the laboratory experiments. Questions about lab report point deductions must be addressed directly to your TA. The administration of CHEM 2325, including the issuing of grades of Incomplete, will adhere to the outlines in the USU General Catalog. In the event of significant differences in TA grading are observed, standardization will be performed to account for the differences.

Course Assessment

Partway through the semester, the instructor will solicit feedback through optional midterm evaluations on Canvas. The purpose of these surveys will be to determine student opinions of the course and TAs up to that point and ask for suggestions on what could be done to improve the course for the rest of the semester. The instructor will know who completed the survey but will be unable to match survey responses to students. Each student who responds to the midterm evaluation will be granted extra credit points. At the end of the course, end-of-term evaluations of the course and the TAs will be administered through Canvas. The instructor will know who completed the surveys but will be unable to match survey responses to students. 5 points are awarded for completion of each survey for a total of 10 points.

Spring 2022 Schedule

Please look carefully at the following schedule for the correct order of laboratory experiments.

Week #	Week of	Experiment/Activity
1	01/10	Lab Check-in
2	01/17	Martin Luther King Jr. Day - Introduction to Solving Spectroscopy Problems Part I (dry) at home
3	01/24	Introduction to Solving Spectroscopy Problems Part II (dry)
4	01/31	Solving Spectroscopy Problems (dry)
5	02/07	Gas Chromatography
6	02/14	Radical Oxidation of Fluorene - Part I
7	02/21	President's Day - No Labs All Week
8	02/28	Radical Oxidation of Fluorene - Part II
9	03/07	Examination of the Reduction of a Ketone
10	03/14	Spring Break - No Labs All Week
11	03/21	Synthesis of Aspirin - Part I
12	03/28	Synthesis of Aspirin - Part II
13	04/04	Determining the Reactants in an Aldol Condensation
14	04/11	Molecular Modeling of Biomolecules (dry) and Check-out
15	04/18	No Labs All Week