

CHEM 2325 – Organic Chemistry Laboratory II

Syllabus

Instructor: Dr. Shawn M. Miller

Summer Term, 2021

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Office Hours: By appointment

Location: Online via Zoom – See Course

Communication section for details

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

Required Materials:

Lab Notebook: Self-Copying Student Laboratory Notebook (ISBN: 9781930882232) or 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, and partially fund 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 and reinforce the concepts presented in CHEM 2320 via practical experimentation.

Course Objectives

CHEM 2325 is a technical course designed to train students in new laboratory skills and apply old skills from CHEM 2315 in regard to molecular modeling and the properties, syntheses, separation, purification, and identification of organic compounds. In the laboratory, students will conduct experiments designed to train students to use these experimental techniques and apply 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 the Pre-lab Notebook and Pre-lab Quizzes.
- ...attending every lab on time.
- ...being safe in the lab.
- ...asking questions via email, Canvas message, and/or Office Hours.

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

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

COVID-19 Laboratory Protocols

In order to continue to provide various forms of face-to-face instruction at USU, and to limit the spread of COVID-19 during the pandemic, students are asked to follow certain classroom protocols during the Summer 2021 term. These protocols are based on CDC, state, and local health department guidelines and requirements are in place not only for your safety but also the safety of the entire campus community.

- Face coverings are required in all classrooms and teaching laboratories. Students will not be permitted to remain in class without a face covering, as per University Policy 20T.3. Students that do not adhere to the face covering policy will be referred to the Office of Vice President for Student Affairs for a possible violation of the Student Code of Conduct. There may be individual medical circumstances that prevent some students from using face coverings. If you require this exemption, contact the Disability Resource Center prior to the start of classes to investigate alternative instruction. These circumstances will be rare, but if they do exist, we ask that everyone be respectful.
- Follow faculty instructions regarding social distancing and entering/exiting classrooms.
- Stay home when you are sick, however mild your symptoms.
- Wash your hands frequently with soap and water.
- Masking, social distancing, staying home when sick, and practicing good hygiene are still required on all USU campuses, regardless if a person has tested positive for COVID-19 in the past or received the COVID-19 vaccine.

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 by 11:59 PM the Wednesday of Week 1. Failure to submit a complete “Laboratory Safety Policies Agreement Documentation” will prevent students from performing any in-laboratory experiments and from receiving credit for any experiments whether performed in the laboratory or not. 10 points are awarded for completing the “Laboratory Safety Policies Agreement Documentation” assignment.

Complete the “Getting Started” quiz administered through Canvas. This quiz covers course policy and laboratory safety as detailed in resources described in the previous paragraph. Some questions in this Quiz will involve using common sense to make safe decisions and are not explicitly discussed in those resources. This Quiz is due at 11:59 PM on the Wednesday 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 the 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. 10 points are awarded for completing Laboratory Check-in. 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.

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 particular 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 have a total value of 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 11 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 sudden scenarios. As this is a course with large enrollment numbers, opportunities for a make-up experiment are few even with advance notice. 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 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 shown in the course schedule at the end of this syllabus, some experiments are listed as "dry" labs. They Dry Labs may not occur in your regular laboratory room. Read the Dry Lab's handout for its location. Dry Labs may have Pre-lab Notebooks. If they do, they will have specific instructions in the experiment handout on Canvas for completing the Pre-lab Notebook. At the beginning of each lab session, your TA will check to see that you have completed the Pre-lab Notebook. Students who have not completed the Pre-lab Notebook will not be permitted to participate in the laboratory session and will receive a score of zero for the experiment.

Wet Labs

All experiments not labeled "dry" 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. **Due to the Covid-19 epidemic, students must enter and exit the laboratory space via the marked doors and face masks are required when in the laboratory.** Students barred from the laboratory as a result of improper attire will receive a score of zero for the experiment.

At the start of the laboratory section, students will disinfect their work area according to the provided instructions using the provided disinfection materials. The Teaching Assistant will check Pre-lab Notebooks and will give a short pre-lab lecture. Due to the short time frame of in-lab experiment, **students who arrive late will not be allowed to complete 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 day's lab are allowed into the laboratory space.

After completing the experiment, students will clean and disinfect all materials according to the instructions in the protocol and reset the station so it can be used by the next student.

Laboratory Performance grades are a measure of student safe and efficient efforts in the laboratory. Each 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. Laboratory Performance grades cannot be 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.

Part of being safe includes ensuring the laboratory is clean and organized. Laboratory Cleanliness points are a measure of the cleanliness and organization of a workstation after use. Each experiment is allocated five Laboratory Cleanliness points. At the end of an experiment, students must clean and organize their work area. Laboratory Cleanliness points cannot be dropped. 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.

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

After the 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.

Typically, completing an experiment would be a collaborative experience working with fellow students and the Teaching Assistant. Unfortunately, that experience cannot be replicated using the current course format. Students are encouraged to speak with their Teaching Assistant and other students to discuss each experiment. However, students must submit their own work. **Copying another student's work in any form is plagiarism and is an academic integrity violation.**

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 the instructor with questions. Canvas messages are preferred, but email is fine as well. Please include a full name, an A-Number, and the course name in the message. I will attempt to respond to messages in a timely manner, but I have responsibilities outside of the course that may prevent me from doing so and I ask for patience after sending a message.

The instructor will hold Office Hours by appointment. Students should contact the instructor directly via Canvas message with their schedule availability to set up a time to meet with the instructor via Zoom.

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
Safety Policies Agreement	10
Getting Started Quiz	20
Pre-lab Quizzes	100
Experiment Submissions	400
Laboratory Performance	55
Lab Cleanliness	40
<hr/> Total points	<hr/> 635

Percentage of Points Earned	Grade
94 – 100	A
90 – 93	A-
87 – 89	B+
84 – 86	B
80 – 83	B-
77 – 79	C+
74 – 76	C
70 – 73	C-
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, optional 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. Each student who responds to the end-of-term evaluations will be granted extra credit points.

Summer 2021 Schedule

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

Week #	Day	Experiment/Activity
1	05/11	Lab Check-in
1	05/13	Introduction to Solving Spectroscopy Problems (dry)
2	05/18	Solving Spectroscopy Problems (dry)
2	05/20	Gas Chromatography
3	05/25	Radical Oxidation of Fluorene Part I
3	05/27	Radical Oxidation of Fluorene Part II
4	06/01	Break Day
4	06/03	Substituent Effects on Electrophilic Aromatic Substitution Reactions
5	06/08	Examination of the Reduction of a Ketone
5	06/10	Synthesis of Aspirin Part I
6	06/15	Synthesis of Aspirin Part II
6	06/17	Determining the Reactants in an Aldol Condensation
7	06/22	Molecular Modeling of Biomolecules (dry)
7	06/24	No Labs