

# CHEMISTRY 241

Fundamentals of Organic  
Chemistry Laboratory

Laboratory Manual  
Summer 2017

Dr. Lawrence Goldman  
Department of Chemistry  
University of Washington

## CHEM 241 SUMMER 2017 EXPERIMENT SCHEDULE

WEEK	#	Monday (Lecture)	Tuesday/Wednesday	Thursday/Friday
June 19	1	Intro, Safety, Lab 1 – extractions	Check-in, Lab Safety, Check-in Worksheet (Worksheet due same day)	Lab 1 – Day 1: Extractions and Crystallizations
June 26	2	Lab 1 - crystallizations	Lab 1 – Day 2: Extractions and Crystallizations	Lab 1 – Day 3: Extractions and Crystallizations
July 3	3	Lab 2 – distillations and GC	<b>HOLIDAY – no lab</b>	Lab 2 - Day 1: Distillation Report due: Lab 1
July 10	4	Lab 2 – NMR Lab 3 - reaction	Lab 2 - Day 2: Gas Chromatography, NMR & TLC Exercise	Lab 3 – Day 1: Friedel Crafts Acylation (save products to use in Day 2)
July 17	5	Lab 3 – column chromatography Lab 4	Lab 3 – Day 2: TLC & Column Chromatography	Lab 4: Relative Reactivities of Aromatics Lab 3 NMR, Report due: Lab 2
July 24	6	Lab 5 Lab 3 TLC/yield results due on Canvas by 6pm	Lab 5: Stereochemistry of Bromine Addition Lab 4 NMR Lab 4 Results due on Canvas (Wed. 6pm for sections AA/AB, Thur. 6pm for sections AC/AD)	Discussion Day 1 – Aromatics + Friedel-Crafts
July 31	7	Lab 6	Lab 6 - Day 1: Grignard reaction – synthesis Reports due: Lab 3, 4	Lab 6 - Day 2: Grignard reaction – purification Lab 6 NMR Report due: Lab 5
August 7	8	Labs 7-8	Lab 7 – Elimination of alkyl bromides Lab 6 NMR	Lab 8: Reduction of Camphor and Spectroscopy Worksheet Lab 8 NMR Spectroscopy Worksheet due same day  Report due: Lab 6
August 14	9	<b>Final Exam: Monday, August 14<sup>th</sup> in class</b> Lab 7 Results due on Canvas 6pm	Discussion Day 2 – E2 reaction, borneol/camphor	Check-Out Reports due: Labs 7, 8

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**LAB SESSIONS SCHEDULE & TA CONTACT INFO**

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Section	Days	Period	Lab room	Instructor/TA (Last Name, First Name)		Email
<b>A (Lecture)</b>	M	1:10-2:10	BAG 131	Goldman	Lawrence	<a href="mailto:goldmanl@uw.edu">goldmanl@uw.edu</a>
<b>AA</b>	TTh	8:50-11:50	CHB 127	Anderson	Jordan	<a href="mailto:jmander8@uw.edu">jmander8@uw.edu</a>
<b>AB</b>	TTh	12:00-3:00	CHB 127	Graham	Katherine	<a href="mailto:kagraham@uw.edu">kagraham@uw.edu</a>
<b>AC</b>	WF	10:50-1:50	CHB 127	Spillane	Jesse	<a href="mailto:jessejs@uw.edu">jessejs@uw.edu</a>
<b>AD</b>	WF	2:00-5:00	CHB 127	Obenschain	Derek	<a href="mailto:derek01@uw.edu">derek01@uw.edu</a>

## CHEM 241 COURSE SYLLABUS

**Instructor:** Dr. Lawrence Goldman  
**E-mail:** goldmanl@uw.edu (please include “Chem 241” in the subject line)  
**Lecture:** Mondays, 1:10-2:10, BAG 131  
**Office Hours:** Monday 12-1, Wednesday 2-3, CHB 304K (or by arrangement)  
**Course Website:** <https://canvas.uw.edu/courses/1145740> All course materials and grades will be on Canvas, except for safety quizzes which will be handled through Catalyst  
**Add/Drop/Change:** To add/drop the course visit Undergraduate Services at BAG 303 in person. This is the ONLY way to alter your enrollment status once the quarter starts, including withdrawing from the class mid-quarter. All lab section swaps must occur before 4:00 PM on Wednesday, June 21<sup>st</sup>

### Required Material & Supplies:

### Available at

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|--|---------------------------------------|
| 1. Textbook: <i>Microscale Approach: Organic Chemistry Labs and Techniques: University of Washington custom ed.</i> ; Pavia, Lampman, Kriz, & Engel ( <i>PLKE</i> ) (previous hardcover or custom editions of the textbook are acceptable) | University Bookstore                  |
| 2. <i>Chemistry 241 Lab Manual</i>   | Course website                        |
| 3. Approved Safety Goggles   | University Bookstore,<br>UG Stockroom |
| 4. Lab Coat  | University Bookstore,<br>UG Stockroom |
| 5. UW chemistry laboratory notebook (Hayden-McNeil) with numbered pages and carbonless duplicate pages. You may continue to use a notebook from a previous quarter if it meets the stated criteria and has at least 30 pages available.    | University Bookstore                  |

**Lab Reports:** Lab reports are normally due one week after the lab is finished (see schedule). The completed check-in worksheet and spectroscopy worksheet are due by the end of the lab day to which they are assigned. See the Gradescope section on page 8 for more details.

**Safety Quizzes:** There will be a general safety quiz to be completed on *Catalyst* that will cover the basics of safety from this manual and the check-in day lab tour. The general safety quiz will be due the morning of your 2<sup>nd</sup> lab period. In addition, individual lab-specific safety quizzes must be completed online *before* each lab and the confirmation # should be written on the prelab. If you haven't completed your safety quiz, you will be sent to the computer room to take it before you can start the lab.

**Exam: Monday, August 14<sup>th</sup>:** The exam will be during the last class period. The exam will cover material from lectures, exercises and lab reports. NO MAKEUP exams will be given.

**Grading:** At the end of the quarter, final grades will be based on points and (if required) curved to a GPA average set to  $2.9 \pm 0.2$ . Department policy is to not make any grade changes  $< 0.2$  GPA units after grades are submitted.

Assignment	Points	Percentage
Individual Lab Safety Quizzes [to be completed <i>before</i> each lab session on <i>Catalyst</i> (11 labs + general safety quiz; ~2-9 pts each)]	47	7.0%
Check-In worksheet	16	2.4%
Lab Reports (8 labs; ~40-66 pts each)	395	59.0%
In-Lab Spectroscopy exercise	15	2.2%
Discussion Points (16 points for each of 2 days)	32	4.8%
General Performance*	20	3.0%
Lecture Participation (clickers)	20	3.0%
Exam	125	18.7%
<b>Total Points</b>	<b>670</b>	<b>100%</b>

\*General performance is awarded by TAs for generally being prepared for lab and taking part in communal activities such as lab cleanup.

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## GENERAL INFORMATION

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### COURSE POLICIES

**Section Changes:** All add and drop codes are handled through the Undergraduate Office in BAG 303. This includes changing lab sections (before Wednesday, June 21<sup>st</sup>, 4pm) and withdrawing from the course at any time starting the second week of classes.

**Absence Policy:** Completing the experiments is crucial to being successful in Chem 241-242. However there may be cases when absences are unavoidable. There are no makeup labs. You must inform your TA that you will be absent from lab. Here is how all absences are handled in this course:

\*Absent from a 1 day lab or all days of a multiday lab - that lab's grade will be removed from your course grade on Canvas. All other parts of the course will be weighted more heavily to compensate, INCLUDING THE FINAL EXAM. Be aware that the final exam historically has a significantly lower average grade than the lab reports.

\*Absent from 1 day of a multiday lab - attend the other lab day as normal. Acquire data from another lab student and use it to write up the lab report as normal.

Please also note the following about lab absences:

\*Missing a lab does NOT extend the due date for assignments or safety quizzes. Lab reports for previous labs must still be turned in on time and safety quizzes must be completed online before the lab starts.

\*If a student misses 3 lab sessions, they will be required to arrange a meeting with the course instructor to discuss their progress.

\*If a student misses more than 3 lab days, they will automatically fail the course

The final exam is mandatory. If a student misses the final exam, they must provide documentation. With proper documentation, they will be given an incomplete and be permitted to take the exam in the standard timeslot for the next quarter of Chem 241.

**Late Report Policy:** Late reports will be penalized 10% per day. You can hand in late reports in the TA mailboxes on the 3<sup>rd</sup> floor of Bagley outside the gen chem study center. In order for a late report to be graded you must: A) staple a late report cover sheet to it (available to print from Canvas) and B) email your TA to inform them that you have submitted a late report.

**Exam Policy:** There will be 1 exam in this class which will have assigned seating. Your seating location will be based on your lab section. Seating assignments will be posted on the course website prior to the exam date. Please make certain you know the location of your assigned seat in advance so that you can find it quickly and be seated in time to receive the exam before the bell rings. A calculator may be needed for the exam. Headphones, cell phones, hats with bills, and sunglasses are all prohibited during exams. There will be no make-up or rescheduled exam. If you are absent for the exam and excused for the absence you will receive an "I" (incomplete) grade for this course. You will need to take the exam when the course is offered next time to complete and receive a course grade. If you are absent for the exam unexcused, you will receive '0' for the exam and likely fail the course. Be aware that the exam will take place during the standard final exam slot, and there will be no make-up exams or early exams.

**Access and Accommodations:** Your experience in this class is important to us, and it is the policy and practice of the University of Washington to create inclusive and accessible learning environments consistent with federal and state law. If you experience barriers based on a

disability or temporary health condition, please seek a meeting with DRS to discuss and address them. If you have already established accommodations with DRS, please communicate your approved accommodations to your instructor at your earliest convenience so we can discuss your needs in this course. Disability Resources for Students (DRS) offers resources and coordinates reasonable accommodations for students with disabilities and/or temporary health conditions. Reasonable accommodations are established through an interactive process between you, your instructor(s) and DRS. If you have not yet established services through DRS, but have a temporary health condition or permanent disability that requires accommodations (this can include but not limited to; mental health, attention-related, learning, vision, hearing, physical or health impacts), you are welcome to contact DRS at 206-543-8924 or [uwdrs@uw.edu](mailto:uwdrs@uw.edu) or [disability.uw.edu](http://disability.uw.edu)

**E-mail:** Class announcements sent out via the university automatic class email system or Canvas go to 'your\_netID@u.washington.edu' or 'your\_netID@uw.edu' account. Be sure to check it frequently.

**Poll Everywhere:**

Based on the results of surveys of UW students, UW is now supporting a new type of "clickers", Poll Everywhere. The primary change is that rather than purchasing standalone "clickers", you will now use your personal devices such as cell phones, tablets, and laptops. See the UW-IT website for further information.

There will be several multiple choice questions in each lecture. You will be able to respond by texting your answer, or by going to the Poll Everywhere website. Be aware, however, that Bagley Hall historically has lousy cell phone reception. As a UW student, you **MUST** access Poll Everywhere using your UW email address. When you enter your UW email on the website or app, you will be prompted to log in via "single-sign on", the same way you log in to your email or Canvas. If you don't use your UW email address, you may still be able to respond to polls, but these responses will not receive credit on Canvas. You will be graded only on your participation, not on whether you get the questions correct. Though will gain valuable information about how you are doing in class by seeing which questions you are getting correct or incorrect.

Please note that you will only be able to answer the questions during lecture, not while watching the lectures on Panopto later on. If you have concerns about owning a suitable device, or about the costs of sending text messages or data, you can contact UW-IT to ask questions. Additionally, you should contact UW-IT with any technical support questions.

Finally, please be conscientious of your fellow classmates. Being allowed to use your personal devices to participate in class does not mean you should use them to access Facebook, watch movies, or otherwise goof off. To account for potential technical issues, students can miss up to 5 poll questions without losing any participation points.

**Gradescope:**

All pre-lab and post-lab reports and notebook pages will be submitted online at Gradescope.com. Some of you may have used Gradescope to view graded exams. The primary difference is that **you** will be responsible for uploading your reports. Detailed instructions for uploading submissions to Gradescope are available on Canvas. Here is a brief summary.

Prepare **one** packet for your pre-lab, and **one** packet for your post-lab. In order to ensure that your submission can be graded, please arrange your packets in the following order:

Pre-lab packet:

- 1) Pre-lab report sheet
- 2) Pre-lab notebook page copies

Post-lab packet:

- 1) Post-lab report sheet
- 2) Post-lab notebook page copies
- 3) All NMR spectra
- 4) Any GC-MS spectra
- 5) Any other documents that are part of your lab report

**Important:** For the pre-lab and post-lab reports sheets, answers **MUST** be written in the space provided in order for those questions to be graded. You are also responsible for making sure that your uploaded assignments are clear and legible.

Assignments that are uploaded after the due date, but before the “late” due date will be assessed a 20% penalty. Assignments will **not** be accepted after the “late” due date.

Once the assignments are graded, they will be published and you will be able to see your grades and feedback.

### Starting an experiment

Each experiment has 1 safety quiz associated with it (exceptions – experiment 1 has 2 safety quizzes and experiment 2 has an associated NMR safety quiz). There is also a general safety quiz that is due at the start of experiment 1. All safety quizzes are on Catalyst and must be completed before the start of lab. When you complete the quiz, a confirmation code will be displayed. You must write this code down in your lab notebook. If you close the window, you can not get the confirmation code back, and should instead show your TA a screenshot of the Catalyst website that confirms you already took the safety quiz.

In addition to showing your TA the safety quiz code, you must also show your TA your completed pre-lab report sheet and pre-lab notebook pages (see below for more details). Since you are uploading these pages to Gradescope, it is not necessary to turn in a physical copy to your TA.

### ACADEMIC ETHICS

Original work performed in good faith is assumed on all assignments and course components. The Student Conduct Code (see <http://www.washington.edu/students/handbook/conduct.html>) outlines the following forms of academic misconduct:

- Intentional misrepresentation of credentials
- Falsification of data
- Plagiarism

Failure to adhere to this code of ethics will result in referral for possible disciplinary action as described in the Student Conduct Code. In short, if you have not done something yourself, do not attempt to pass it off as original work. If you have questions about what might cross the line, please do not hesitate to ask your instructor.

It is presumed that the data you record and report in laboratory is your work. In addition, all data analysis and writing you submit should be yours alone in your own words, even if you collected data with a laboratory partner or study with them. We often find examples of plagiarism in which lab reports are copied from someone else, or from an earlier quarter

**Lab Safety:** You may work in the laboratory only during your scheduled section and under the supervision of your assigned TA. You are not allowed in the lab before your lab section begins. You are required by state law to wear approved safety goggles in the lab at all times. Goggles are to be put on before entering the lab and must be worn until you are out the door. Goggles that have the air vents removed are not acceptable. Departmental policy states “students not wearing goggles will be dismissed from the laboratory immediately. A second infraction may result in dismissal for the remainder of the quarter. No makes-up labs will be permitted. Students who have contact lenses are strongly urged to wear regular glasses instead during the lab. Fumes from many organic solvents can dissolve in tear film and cause major eye damage if they get under contacts.

**Appropriate Clothing:** A lab coat is required to be worn over your street clothes. Long pants, socks and closed-toed shoes are required. All students need to have clothing coverage from neck to toe with no exposure of skin anywhere. Headphones and/or texting are not permitted in lab. Please check the course manual and the departmental website for proper lab attire:

<http://depts.washington.edu/chem/courses/LabAttire.html>.

**Arriving Late to Laboratory:** Lab periods start with a safety and procedure overview from the TA. If you are late, you miss that information and also make your lab partner wait for you unnecessarily. If you are more than 10 minutes late for lab, 10% of the possible points for that lab will be deducted from your score. If you are late more than 30 min for any reason you will not be admitted.

**Lab Clean-up:** At the end of lab, clean up your work area and any areas assigned by your TA. The procedure for hood clean-up and shutdown is posted in each hood. Turn off all equipment and water/gas/steam lines. All equipment checked out at the stockroom must be returned by the end of lab. Used glass pipettes and broken glass should be deposited in the glass waste boxes. Pipettes contaminated with noxious chemicals should be placed in special glass waste containers in fume hoods. Non-compliance with the rules above will result in deduction of points from your lab score.

### **Prelabs and Lab Reports:**

Each lab has both a pre-lab report and a post-lab report. The pre-lab report is due at the beginning of the lab period. The post-lab report is due at the beginning of the lab period 1 week after the lab is completed (see schedule). In addition, you will be turning in copies of your notebook pages with both your prelabs and postlabs (see the notebook section later).