University of Rhode Island
Department of Chemistry
CHM 226: Organic Chemistry Laboratory - Syllabus
Updated: 9/14/2020
Course Instructor: Oleg Kazakov, 117G Beaupre, oleg_kazakov@uri.edu

Office Hours: By appointment.

Textbook/Materials

A carbon copy laboratory notebook must be used to record all data.

Experimental procedures and supplemental information will be provided to you via Brightspace, but the textbook for the accompanying lecture course (CHM 227/228) may be useful for preparing laboratory reports.

Safety goggles/glasses, **lab coat**, nitrile gloves. RAM account and card to purchase items in the chemistry stockroom. A calculator that is not capable of accessing the internet. The calculator app on smartphones/tablets/etc may NOT be used. MNova and Chemdraw software (free downloads though URI Chemistry).

Access to the internet. **You are responsible for checking the Brightspace site, coming to the lab prepared to conduct the right experiment and checking your URI e-mail regularly.**

Course Goals

CHM 226 is an introduction to conducting organic research. The ultimate goal of the course is to provide students a basis by which they will be able to conduct a chemical reaction that they have never performed before. The 'real world' of organic chemistry involves performing reactions and making compounds that are unknown. The virtually unlimited diversity of chemical structure originates from a handful of lab and analytical techniques. By conducting specific named reactions and targeted technique instruction, this course will introduce students to a variety of skills that they may implement in their professional development and careers. You are about to embark on one of the most empowering courses in the undergraduate curriculum after which you will have the tools required to synthesize almost any chemical compound, including those that are unknown to humanity. Also, this material is encountered in the MCAT.

Course Grade

Evaluations are directly related to work performed in the lab, and attendance is required. There are no makeup labs. All graded work should be performed individually.

Student grades will be based on evaluations on each experiment (100 points each). The lowest grade in each subset of experiments (face-to-face and online) will automatically be dropped, which will also remedy the pandemic-related issues. Course letter grades will be determined by this scale (%): >95 A; >90 A-; >87 B+; >84 B; >80 B-; >77 C+; >74 C; >70 C-; >60 D. **There is no curve in this course, and no extra credit will be offered.**

Grading

Students will receive a grade for each experiment, activity, and exam (100 points per items) and criteria that will be evaluated for each experiment is given below. For most items, the grade will be determined as described here:

F2F Experiment Evaluations (100 pts each)

1. *Lab notebook*, *data analysis, post-lab questions* (90 pts): *Lab notebook* copy pages and data are submitted in the pdf format, and entries are made according to the guidelines. *Data analysis* should be performed for relevant data (including spectra) with entries provided in table or list form, assigned and analyzed. Note, that not all experiments have data analysis.
2. *Lab technique/citizenship* (10 pts). While points given to other sections of the evaluations will vary depending on the experiment, lab technique/citizenship will always be 10% of the points.

Online Experiment Evaluations (100 pts each)

Lab notebook and data analysis based on the online materials posted on Brightspace site (100 pts): the same guidelines apply as in (1) for F2F Experiment Evaluations.

Online Lab Final Exam (100 pts)

The overarching examination testing your knowledge by answering questions pertaining to the course content.

<u>*Lab technique and citizenship*</u> are important parts of safely conducting chemistry experiments in a shared space, and each experiment includes 10 points for technique/citizenship. Individuals and groups of students will receive a demerit for exhibiting poor technique and/or citizenship. Each infraction will be documented and will result in the loss of 5 points minimum from that experiment. Serious infractions (e.g. removing safety glasses or lab coat) will result in the loss of all 10 points of technique for an experiment, and repeated infractions will result in loss of additional points (beyond the allotted 10 points) and possible dismissal from the course. Non-attributable violations will result in point deduction from the entire section (e.g. untidy waste/dispensing area, minus 5-10 points from everyone).

Other examples:

1. Students engage in unsafe practices including horseplay, no safety glasses, no lab coat, etc. (minus 10 points).
2. Students maintain an untidy work space (including the chemical weighing and dispensing area) and do not return the lab to its starting condition. (minus 5-10 points)
3. Students place outside-lab devices (e.g. cell phones) on the lab bench. (minus 5 points)
4. Students fail to follow the lab safety policies. (minus 5-10 points)
5. Students placing lab notebooks inside the fume hood while experiments are performed (minus 5 points)
6. Students using mobile phones during lab sessions with gloves (minus 5 points)
7. Being late to lab; important safety information is discussed at the beginning of the lab period. (<2 min late, minus 5 points; 2-10 min late, minus 10 points)

No makeup labs are planned to be given.

Regrading

Students may request a regrade on any evaluation for up to 1 week from when the evaluations are made available for review. Requests for regrades must 1) be made in writing and 2) clearly state the issue/point being disputed. The whole assignment is subject to regrading. Any assignment performed in pencil will not be regraded.

Plagiarism

Cheating or plagiarism on a graded assignment will result in a zero for that evaluation and referral to the Dean and possible failure of the course. Students are expected to follow the University policy of ACADEMIC HONESTY and all other University policies.

Cancellations

In the event that classes are cancelled (e.g. snow day), an experiment may be deleted from the schedule. For grading purposes, do not count on being able to complete all laboratory experiments. The laboratory schedule is subject to change in the event of emergencies, cancellations, etc., and it is the responsibility of all students to be present for all scheduled lab sessions.

Absenteeism

This is a laboratory course; there is no substitution for a missed lab. If a student must be absent for any reason, the missed experiment will be counted as their dropped grade. Further absences resulting in a missed experiment will result in a grade of zero for that experiment. Students that miss more than 2 experiments will be advised to drop the course. If a student misses one day of a multiple day

experiment, they should not expect to be able to finish the experiment in the other day(s). Excused absences must be cleared by Oleg 2 weeks in advance, minimum.

Students will not be admitted to the lab if they are 10 minutes late to lab; important safety information is discussed at the beginning of the lab period. That experiment will receive a grade of zero.

Equipment

Students are responsible for the equipment in the drawer assigned to them on the first day of class. Any broken equipment must be replaced at the student's expense, this includes any shared/departmental equipment. Any student who has an unpaid bill with the chemistry stockroom will have a hold placed on their account which will prevent the student from registering in the future. Drawers must be checked out at the end of the semester or if a student chooses to drop the course. Improper or missed checkout may result in a charges from the stockroom and a hold on the student's account.

Experiment Schedule

Schedule may be revised in the event of class cancellations or other unforeseen events.

Dates	Day	Experiment
9/7–9/11	M	*Labor Day Holiday*
	Tu	*Advising Day*
	W	Prepare via Brightspace
	Th	Prepare via Brightspace
	F	Prepare via Brightspace
9/14–9/18	M	No labs
	Tu	Lab 1 (ss-A)/check-in
	W	Lab 1 (ss-A)/check-in
	Th	Lab 1 (ss-B)/check-in
	F	Lab 1 (ss-B)/check-in
9/21–9/25	M	No labs
	Tu	Lab 2 (ss-A)
	W	Lab 2 (ss-A)
	Th	Lab 2 (ss-B)
	F	Lab 2 (ss-B)
9/28–10/2	M	No labs
	Tu	Lab 3 (ss-A)
	W	Lab 3 (ss-A)
	Th	Lab 3 (ss-B)
	F	Lab 3 (ss-B)
10/5–10/9	M	No labs
	Tu	Lab 4 (ss-A)
	W	Lab 4 (ss-A)
	Th	Lab 4 (ss-B)
	F	Lab 4 (ss-B)
10/12–10/16	M	*Columbus Day Holiday*
	Tu	Lab 5 (ss-A), Lab 6 (ss-B)
	W	Lab 5 (ss-A), Lab 6 (ss-B)
	Th	Lab 5 (ss-A), Lab 6 (ss-B)
	F	Lab 5 (ss-A), Lab 6 (ss-B)
10/19–10/23	M	No labs
	Tu	Lab 5 (ss-B), Lab 6 (ss-A)
	W	Lab 5 (ss-B), Lab 6 (ss-A)
	Th	Lab 5 (ss-B), Lab 6 (ss-A)
	F	Lab 5 (ss-B), Lab 6 (ss-A)

Dates	Day	Experiment
10/26–10/30	M	No labs
	Tu	Lab 7 (ss-A), Lab 8 (ss-B)
	W	Lab 7 (ss-A), Lab 8 (ss-B)
	Th	Lab 7 (ss-A), Lab 8 (ss-B)
	F	Lab 7 (ss-A), Lab 8 (ss-B)
11/2–11/6	M	No labs
	Tu	*Election Day Holiday*
	W	Lab 7 (ss-B), Lab 8 (ss-A)
	Th	Lab 7 (ss-B), Lab 8 (ss-A)
	F	Lab 7 (ss-B), Lab 8 (ss-A)
11/9–11/13	M	No labs
	Tu	Lab 7 (ss-B), Lab 8 (ss-A)
	W	*Veterans' Day Holiday*
	Th	Lab 9 (ss-A), Lab 10 (ss-B)
	F	Lab 9 (ss-A), Lab 10 (ss-B)
11/16–11/20	M	No labs
	Tu	Lab 9 (ss-A), Lab 10 (ss-B)
	W	Lab 9 (ss-A), Lab 10 (ss-B)
	Th	Lab 9 (ss-B), Lab 10 (ss-A)
	F	Lab 9 (ss-B), Lab 10 (ss-A)
11/23–11/27	M	No labs
	Tu	Lab 9 (ss-B), Lab 10 (ss-A)
	W	Lab 9 (ss-B), Lab 10 (ss-A)
	Th	*Thanksgiving Holiday*
	F	*Thanksgiving Recess*
11/30–12/4	M	
	Tu	
	W	
	Th	
	F	
12/7–12/11	M	
	Tu	
	W	
	Th	
	F	

List of Laboratories and Activities

Lab 1 - ChemDraw, ACS Publications, SciFinder – *face-to-face (with laptops) combined with check-in*
Lab 2 - General Techniques – face-to-face
Lab 3 - Distillation - face-to-face
Lab 4 - NMR & MS – online (Zoom)
Lab 5 - Diels-Alder Reaction – online (activity)
Lab 6 - Recrystallization Techniques - face-to-face
Lab 7 - Chromatography - face-to-face
Lab 8 - Suzuki - online (activity)
Lab 9 - Reducing Benzil - online (activity)
Lab 10 - Zyban Synthesis - face-to-face
Lab Final - after the Thanksgiving recess, during the lab time, date TBD

ss-A, ss-B - subsection A, subsection B contain half the students from one section
face-to-face - a regular experiment in the lab
online (Zoom) - instruction is in Zoom at the scheduled section time
online (activity) - a lab is performed using video materials

Important University Dates

- September 9: First day of classes
- September 9-15: Open Add Period in e-Campus
- September 16-22: Late Add Period in e-Campus, permission numbers required for enrollment
- September 22: Last day to Add courses via e-Campus, late add form needed after this point
- October 1: Courses dropped on or after this date will receive a ***W***
- October 12: Classes ***do*** meet, offices are closed. Columbus Day
- October 21: Last day for students to drop courses in E-Campus (late drop form needed after this date)
- November 3: Election day, classes ***do not*** meet, offices are closed
- November 11: Veteran's Day, classes ***do not*** meet, offices are closed
- November 25: Last day of face-to-face classes, switch to remote instruction for all classes for end of semester
- November 26 - 29: Thanksgiving Recess
- December 14: Last day of classes
- December 15: Reading Day for Exams
- December 16-22: Final exam period
- December 23: Final exam make-up day
- December 28: Grades due in e-Campus by 12 Noon

Keeping a Laboratory Notebook

Students must acquire a carbon copy laboratory notebook and maintain it according to the rules below. Students will be required to hand in a copy of their lab book entries for each experiment; hand in all pages. These copies should be

affixed to the lab report. In short, a lab notebook should contain enough information that a person 'skilled in the art' could reproduce your experiments. Students need to arrive at the lab ready to listen to safety/lab discussion and/or perform experimentation. If a student arrives with an empty lab notebook (i.e. is not ready to start the experiment) they may be asked to leave the lab.

An example lab page will be on the Brightspace course site.

Before coming to lab:

1. Name the experiment.
2. Write down a purpose or hypothesis statement. It can be difficult to remember why you did something 6 months after you do it.
3. Place a chemical drawing of the reaction being performed at the beginning of the entry, if applicable.
4. For each reagent used, clearly give 1) the desired amount; 2) the amount used in grams/mL/etc; 3) (m)mol; and 4) (m)M; 5) formula weight and density (if applicable). These data will help as you go to write up experiments and help trace errors later.
5. Write down a **condensed** procedure or flow chart for the lab. There is no point in copying a procedure (nearly) word-to-word, so save time and give yourself a shortened version of the actions you need to perform; you can always refer back to the experimental.

During/after each experiment and in general:

1. Give a short synopsis of the experimental procedure and reference any literature that you are following (this can often be done before the lab as well). Update your notebook with observations.
2. Errors should be crossed out with a single line and the new entry provided above/beside
3. Each experiment should receive its own page (or more than one page).
4. All spectra/data should be numbered (physically on the paper) and saved to the spectrometer/instrument so that they reference a specific notebook page. The sample should be numbered in the same format. Use the format: 'your initials'-'notebook number'-'page number' (ex. FL-1-15). The type of data collected and what was analyzed should be clearly labeled in the notebook.
5. Multiple analyses should be given letters. Example: if FL-1-15 is the crude material, the purified material could be called FL-1-15b. Consider giving complicated purifications their own notebook page/experiment.
6. Cross reference your pages, if applicable. For experiments that use more than one page, clearly label at the bottom of the first page where the second page starts (it may not always be on the next page).
7. Date your entries.
8. Calculate yield and give brief conclusions that also demonstrate your advanced understanding of the experiment. Think about it as giving yourself pointers for 'next time' you do that reaction. For instance, "The yield was low because the […] was […]. Next time […] should be […]."