

## ORGANIC CHEMISTRY LABORATORY

### Chemistry 311 Fall 2020

Coordinator and Lecturer: Dr. G. Govindarajoo (ggovinda@chem.rutgers.edu)

Lecture: Tues 8:55am-9:50 am (for Sections 1-9, 17-19, 21-26)

Wed 9:30am-10:25am (for Sections 10, 12, 13, 15)

NOTE: Students should attend the lecture that they are registered for.

### **PREREQUISITES**

Chemistry 307 (or equivalent first semester Organic Chemistry lecture course) and Chemistry 171 (or equivalent General Chemistry Laboratory course). Students who have not satisfied these prerequisites will not receive credit for this course even if they are enrolled.

### **COURSE OBJECTIVES**

This course is designed to introduce the theory and practice of analytical and purification techniques commonly used in Organic Chemistry. These techniques will be used in the synthesis experiments carried out in the latter part of the course. Applications of some of these techniques in biological settings will also be briefly discussed. Students will be expected to write accurate, cohesive and comprehensible laboratory reports of their experiments. The goal of the course is for students to be able to analyze data obtained from their observations in the experiments they perform (or view in the case of remote instruction), form reasonable conclusions and relate the reactions and reaction mechanisms from the Organic Chemistry lecture course to support their analysis and conclusions.

### **REQUIRED COURSE MATERIALS**

**1. Textbook package:** Macroscale & Microscale Organic Experiments by Williamson (6th ed. Custom Version for Rutgers University with OWLv2 Access. (ISBN: 9781337496742).

**Instructions on how to register for OWLv2 for the online prelab questions will be sent by e-mail before the beginning of the semester, including what to do if you run into a problem.**

**2.** High-speed internet, printer and scanner (or scanning app so that documents can be converted into pdf format for uploading), webcam.

**3.** ChemDraw software – available for free for Rutgers students. Go to software.rutgers.edu, login with NetID and password, click on “Chemistry” under Software Category and click on ChemDrawPro 19.1 and follow instructions to download. Needed for structures and mechanisms for later lab reports.

### **WHAT YOU NEED FOR FIRST WEEK OF LAB**

Items 1-3 as shown above with **your prelab completed for first week’s experiment and submitted on Canvas by the deadline, OWLv2 Assignment 1 completed, having watched the lecture and experiment videos as well as studying procedures BEFORE the beginning of the lab period.** (see instructions under Guidelines for Writing Lab Reports)

### **WHAT YOU NEED FOR SECOND WEEK OF LAB**

Items 1-3 with **your completed postlab of first week’s experiment submitted on Canvas, your completed prelab for second week’s experiment submitted on Canvas AND OWLv2 Assignment 2 completed at least 1 hour BEFORE the beginning of lab period. You will**

**need to watch the lecture and experiment videos as well as study the procedures BEFORE the beginning of the lab period.**

### **WHAT YOU NEED FOR SUBSEQUENT WEEKS OF LAB**

**Items 1-3 with your completed postlab of the previous week's experiment submitted on Canvas , your completed prelab for second week's experiment submitted on Canvas AND OWLv2 assignment (if assigned for that week) completed at least 1 hour BEFORE the beginning of lab period. You will need to watch the lecture and experiment videos as well as study the procedures BEFORE the beginning of the lab period.**

### **COURSE POLICIES**

1. **Promptness:** Laboratory session (remote instruction) will begin promptly as scheduled – your lab instructors will be taking attendance and you will be . If a student signs in late to lab, he or she may miss valuable information or the assignment scheduled at that time.
2. **Lectures:** Due to remote learning, most of the material for lecture will be posted as a video. It is imperative that the lecture videos are watched ahead of attending the lab it discusses. An outline will be provided for each lecture for you to take notes on from the videos you watch – this is going to be of utmost importance because the lecture videos **will only be available for a limited time and you will have a written record you can use to study from.** These lecture videos will also be a part of the Playposit quizzes that you will have to complete by a deadline. Much of the quiz and exam material as well as what is required in the lab report will be provided during the lecture for the course in conjunction with the textbook. Lab instructors will assume that students have watched the lecture videos and will not provide information that has already been provided in the lecture. **Starting Tuesday 9/15/20 and Wednesday 9/16/20, the lecture period will be used for the weekly quizzes (see Quiz during Lecture Schedule) and some synchronous lecture work.**
3. **Make-up:** A missed lab period may be made up only for valid medical reason (with a doctor's note as documentation), a religious holiday (with valid documentation from the student's religious leader), valid school activities (with valid documentation) and/or with a note from the dean's office – the latter two situations will require advance notification. The student is responsible for contacting Dr. Govindarajoo **immediately with your detailed schedule for the remainder of the lab week** to find an open spot in other lab sections. The lab must be made up before the last date of the experiment listed under "Experiment Schedule". **Under no circumstances will a make-up lab be permitted once the last date for that experiment has passed.**

**NOTE: You are not permitted to just show up in another lab period to make up the lab without prior authorization from Dr. Govindarajoo.**

You should still contact Dr. Govindarajoo immediately if you cannot find a time for a make up lab because last minute absences in some sections may clear a spot for you to make up your lab. If you manage to make up your lab, **the lab report must still be submitted by your original deadline for that assignment (unless approved otherwise by Dr. Govindarajoo).** Any deviation from this process may result in the material not being graded. You may be also presented with alternate options to complete a lab report so make sure you contact Dr. Govindarajoo immediately if you have to miss a lab for a valid reason.

**If you fail to attend the make up lab session that was agreed upon by you and Dr. Govindarajoo,** the absence would be considered unexcused UNLESS Dr. Govindarajoo was

informed of a timely manner that a valid reason (with documentation) caused you to miss your make up lab. Missing a make up lab without a valid documentable reason that Dr. Govindarajoo was not informed about beforehand may also carry additional penalties.

**Absences:** For an absence to be excused, Dr. Govindarajoo **must** be contacted immediately in case there is a chance for the lab to be made up. Valid documentation **MUST** be provided **within a week of the absence** to your lab instructor **and** Dr. Govindarajoo.

ADDITIONALLY, you must use the University absence reporting website <https://sims.rutgers.edu/ssra/> <<https://sims.rutgers.edu/ssra/>> also within a week of the absence to indicate the date and reason for your absence. If any of the above steps are not followed, the absence will not be excused. It is highly advised that you contact Dr. Govindarajoo immediately after an absence even if you are not sure if the absence can be excused to see what your options are. **NOTE: A student with 3 or more absences (valid or otherwise) will not pass the course.**

**Vacation plans are NOT valid reasons for lab make-up or absences. MCAT/DAT/OAT and similar exams are NOT valid reasons for lab make-up or absences.**

**Religious holidays and valid school activities:** Students have to contact Dr. Govindarajoo about potential absences for any part of this course due to religious holidays and valid school activities (professional conferences/sports meet etc) **by 9/8/20** so that make-ups can be arranged. Students are then responsible for e-mailing Dr. Govindarajoo with their detailed schedule for the week of the potential absence **two weeks from the potential absence** to receive instructions on a makeup or alternate arrangements. Valid documentation (letter from religious leader/faculty advisor/coach) **MUST** be provided for these potential absences by 9/8/20.

**Students are responsible for all the material from a missed lab and will be tested on it in quizzes and exam.**

4. **Laboratory Reports** and format for submitting them on Canvas will be discussed in the posting “Guidelines for Writing Lab Reports”. Submitting late or incomplete laboratory reports and/or failure to submit lab reports will result in deduction of lab report points which may very possibly lead to the earning of an unsatisfactory/ failing grade in the course. **Please note that the Academic Honesty clause applies to the lab reports and all other assignments/quizzes/exam for the course.**

5. **Online OWLv2 assignments** for Experiments 1-5 and 7 must be completed by the deadline determined by your section time (deadline is an hour prior to your scheduled lab time) on the OWLv2 website. It is advised that you actually study the entire assignment instead of just answering the questions since some quiz/exam questions will be taken from these assignments. **Instructions on how to register for the online prelab questions will be sent by e-mail to you at the beginning of the semester.**

6. **Exam** will be given on the specified dates during lecture period. The material for the exams will come from your lab experiments, readings and lecture material. Since the exam is during the lecture period, students **CANNOT** have a conflict with the exam. Students **MUST** take the exam in the lab lecture session associated with their lab section. You will **NOT** be able to postpone/take the exam on a different date just because you have other exams that same week – you have plenty of notice and the review sheet is posted weeks ahead of time. Please plan accordingly. Earning a score of less than 30% on the written exam may very possibly lead to the earning of an

unsatisfactory/ failing grade in the course. **NOTE:** If you end up falling ill on the day of the exam, you have to make the decision if you take the exam or not. If you decide not to take it, please get a doctor's or dean's note to excuse you for that absence. If you do decide to take the exam even though you are ill, then you would need to be prepared to accept the consequences of the score you earn if you end up with a low score. We cannot disregard the score after the fact just because you took the exam while you were ill. **Please note that the Academic Honesty clause applies to the exam and all other assignments/quizzes for the course.**

7. **Quizzes** A short quiz will be administered during the start of your lecture period starting on Tuesday 9/15/20 (for sections 1-9, 17-19, 21-26) and Wednesday 9/16/20 (for sections 10,12,13, and 15) and follow suit in subsequent weeks. The material for the quizzes has been listed in the "**Quiz During Lecture Schedule**". Two comprehensive super quizzes will be administered during the course – more detail will be given in lecture and the website. A safety quiz will be assigned on Canvas on the first week of lab and will be due ONE HOUR prior to your **2<sup>nd</sup> lab period** . **Please note that the Academic Honesty clause applies to the quizzes and all other assignments/lab reports/exam for the course.**

8. **Preparation** Adequate preparation before lab period will reduce frustration and increase understanding and facilitate learning for the course.

9. **Extra Credit Digital Badging Assignment:** More information will be provided closer to the time of this assignment. There will be a determined deadline for this assignment and any work submitted after the deadline will not be accepted.

10. **Library Research Project:** A short assignment involving the use of library resources, citing references in proper form and researching techniques discussed in the course. More detailed instructions and information will be provided closer to the time of this assignment.

11. **Laboratory Safety** Although you are not physically in the laboratory, you will still be responsible for knowing all the safety rules that would need to be observed in lab.

12. **Exams that Conflict With Lab:** Your laboratory period is a scheduled class. If you have a group exam that conflicts with your lab, **your lab takes priority**. You will have to make arrangements with the professor of the class with the group exam to take a conflict exam. Make-ups for lab will not be approved for this situation.

13. **Students with Disabilities:** If you have a disability, you are urged to speak to Dr. Govindarajoo **by 9/8/20** to make the necessary arrangements to support a successful learning experience. Also, you must arrange for Dr. Govindarajoo to receive a letter from your College's Disability Concerns Coordinator verifying that you have a disability by 9/8/20 as well. The student must contact the Office of Disability Services to determine his/her Coordinator (848-445-6800 or [dsoffice@echo.rutgers.edu](mailto:dsoffice@echo.rutgers.edu)).

14. **Academic honesty** You are being graded on the work you perform. Use of lab reports/quizzes/library assignment/any other graded course material from other students (past or present) is expressly forbidden. **Both the lender and the borrower are subject to severe penalties.** Some discussion about the labs is acceptable at the discretion of the lab instructor, but you must perform all the work (including the data analysis and answering of questions) yourself. **A lab report is NOT a collaborative effort** –it must be written in your own words using your own data (in this case, data provided to you specifically). If you are confused, please ask for

help. Don't just copy an answer. **Do not make up data.** Academic honesty also applies to all quizzes, exams, library assignments and other submitted materials in this course.

The Rutgers honor pledge will be included on all (major) assessments for you to sign: *On my honor, I have neither received nor given any unauthorized assistance on this examination/quiz/assignment.*

Rutgers University takes academic dishonesty very seriously. By enrolling in this course, you assume responsibility for familiarizing yourself with the Academic Integrity Policy and the possible penalties (including suspension and expulsion) for violating the policy. As per the policy, all suspected violations will be reported to the Office of Student Conduct. Academic dishonesty includes (but is not limited to):

- Cheating
- Plagiarism
- Aiding others in committing a violation or allowing others to use your work
- Failure to cite sources correctly
- Fabrication
- Using another person's ideas or words without attribution—re-using a previous assignment
- Unauthorized collaboration
- Sabotaging another student's work. When in doubt, please consult the instructor

Use of external website resources such as Chegg.com or others to obtain solutions to assignments, quizzes, or exams is cheating and a violation of the University Academic Integrity policy. Cheating in the course may result in grade penalties, disciplinary sanctions or educational sanctions.

Posting assignments, quizzes or exams, to external sites without the instructor's permission may be a violation of copyright and may constitute the facilitation of dishonesty, which may result in the same penalties as plain cheating.

Almost all original work is the intellectual property of its authors. These works may include syllabi, lecture slides, recorded lectures, homework problems, exams, and other materials, in either printed or electronic form. The authors may hold copyrights in these works, which are protected by U.S. statutes. Copying this work or posting it online without the permission of the author may violate the author's rights. More importantly, these works are the product of the author's efforts; respect for these efforts and for the author's intellectual property rights is an important value that members of the university community take seriously.

**15. Chain of Communication:** Please contact your lab instructor as your first point of contact for questions. Your lab instructor will triage the questions and decide if a matter needs to be addressed by Dr. Govindarajoo.

**16. Chain of Command:** If you have a question about grading, you should first talk about it with your lab instructor - **any questions about a score of a particular quiz or lab report MUST be addressed within a week of receiving back the quiz or lab report.** If you are not satisfied with the explanation, you may raise the question with Dr. Govindarajoo. If you have a

question about content, concepts or procedures then you may ask any lab instructors or the coordinator for help. Use our office hours.

17. **Website:** We will be using Canvas (URL: [canvas.rutgers.edu](https://canvas.rutgers.edu)) as a classroom management system. You should check this site regularly. If you check it now, you will find a number of documents posted. If you are registered in the course and a Rutgers Student, you will automatically be a “member” of the online class. Under each week’s module, which you should go to every week to prepare for your lab, you will find Extra Notes for a particular experiment, prelab and postlab question assignments, as well as Hints on Preparation for a particular lab. The lecture outline for the next lecture would be posted as well.

18. **Netiquette:**

**Be Respectful** - Be very mindful that all your communication with the course instructor, lab instructor and fellow classmates is respectful and does not border on being disrespectful, discourteous, inappropriate or abusive. If you encounter any disrespectful behavior from your fellow course participants, please let Dr. Govindarajoo know. We all understand that remote learning is unusual and can cause undue stress but please understand that all of us are dealing with this situation.

**Allow for time for responses to queries** – Please understand that the course instructor and lab instructors have many other responsibilities and the standard time to wait for a response is a **full business day**. Most times you will receive a response much sooner but please be aware of this standard.

**Be Professional** - Coursework is more than learning facts; it is a professional activity. Your conduct in this course should reflect this. Your communication should follow standard rules for grammar and spelling (unless in an online chat) and be clear, concise, courteous, and to the point.

## GRADING

1.	Laboratory Reports (Expt 1-5, 7 that have online prelab questions - 6 x 23 points)	138 points
2.	Laboratory Reports with written prelab questions - (3 x 28 points)	84 points
3.	OWLv2 assignments (6 x 13 points)	78 points
4.	Write up for Nucleophilic Substitution experiment	10 points
5.	Library Research Project (due date TBA)	10 points
6.	Safety Quiz	4 points
7.	Quizzes (20 points x 7)	140 points
8.	Super Quizzes (2 x 27 points)(during Week 4 and 8 of lab schedule)	54 points
9.	Playposit Quizzes (9 x 5 points)	45 points
10.	Canvas Quizzes during Lab (9 x 3 points)	27 points
11.	Comprehensive Exam	160 points
12.	Project	25 points
	<b>TOTAL</b>	<b>775 points</b>

### Extra Credit: Digital Badging during Week 6-7 10 points

Your final grade will be based on your overall percentage and number of points earned, with the final scale FOR EACH SECTION (to account for how differently each lab instructor grades) to be decided at the end of the course. An approximate idea of the grading scale would mimic the standard scale.

A	≥ 90%
B	80-89%
C	65-79%
D	55-64%
F	≤ 55%

## LABORATORY SAFETY RULES

There are a few precautions that you must take to avoid accidents in the lab – PLEASE NOTE THAT YOU ARE RESPONSIBLE FOR KNOWING LABORATORY SAFETY RULES EVEN THOUGH YOU ARE NOT CARRYING OUT EXPERIMENTS IN PERSON.

1. Face-fitting goggles must be worn at all times in the laboratory. Contact lenses, even with goggles are not permitted.
2. Know the location of laboratory exits. Know the location and use of fire extinguishers, eye-wash fountains, safety showers, and fire blankets in the laboratory.
3. For safety reason, you must inform your lab instructor if you leave the laboratory while an experiment is being carried out. If you feel unwell or if you see lab mate unwell while carrying out an experiment, it is crucial that you inform your lab instructor.
4. Nitrile gloves are to be worn at all times when handling chemicals. They must be disposed off in the trash receptacle before leaving the laboratory and handling door handles etc.

## **LABORATORY SAFETY RULES (Continued)**

5. Appropriate attire for performing experiments is a must and non-negotiable. Pants or skirts worn **MUST** cover the entire length of your legs (there should not be any rips or tears that expose any part of legs). Shoes **MUST** be close-toed and close backed **AND** enclose your entire foot. Tops must be at least short-sleeved. Open shoes/sandals, shorts, frilly or cumbersome clothing, bare backs or midriffs (or clothing that exposes backs and midriffs when a student reaches up or bends over), sleeveless tops, neckties, and unconfined long hair present considerable hazard in the laboratory and are **NOT PERMITTED**. Long hair should be tied back.
6. All experimental work is to be done in the hoods. Apparatus may be cleaned at regular benches.
7. Avoid breathing the vapors of volatile solvents. Some organic solvents may be toxic or carcinogenic (cancer-producing). Organic solvents should be used in the hood.
8. If the fire alarms go off, stop all experimental work and leave all chemicals and equipment in the lab. Follow instructions of lab instructor and head for an exit and assemble outside the building to the area you were instructed to go to by the lab instructor as quickly as possible.
9. Avoid contact of chemical with your skin, eyes, and clothing.
10. Handle strong acids and bases with extreme care. Strong acids and bases must remain in the allotted hoods.
11. Dispose organic waste in labeled waste containers. No waste solvents or reaction mixtures should be poured into the sinks!
12. No smoking, eating or drinking is allowed in the laboratory. Empty food/drink disposable containers **MUST** be disposed of **OUTSIDE** the laboratory before entering the laboratory.
13. Pipetting by mouth is prohibited.
14. No unauthorized experiments or other horseplay is allowed.
15. Students must be familiar with a procedure before attempting it.
16. Clean your work area, and clean dirty glassware at the end of each period.
17. Accidents must be reported at once to lab instructor and coordinator of the course
18. All spills must be cleaned up immediately by person responsible.
19. All students are responsible for knowing the safety rules and observing them. Violation may result in expulsion from laboratory.

**REPORT EMERGENCIES TO THE RUTGERS UNIVERSITY POLICE AT  
8-911**



**COURSE SCHEDULE**  
**Schedule of Lectures (When lecture material will be posted by)**  
**Please note, pages listed below are from the textbook**

<b>Week</b>	<b>Date</b>	<b>Lecture Topic</b>	<b>Reading Material</b>
1	9/1	Introduction, Safety, Melting Point	Syllabus p. 1-40 p. 41-55
2	9/8	Crystallization	p. 45-48, 57, 61-85
3	9/15	Distillation	p. 55-60, 86-99, 102-104, 116-119
4	9/22	Chromatography	p. 164-177, 185-190
5	9/29	Extraction	p.131-147
6	10/6	Nucleophilic Substitution <b>(Library Project Introduced)</b>	p. 318-325
7	10/13	Esterification, IR	p. 515-521, 220-232, 55-57, 86-93
8	10/20	Aldol Condensation	p. 484-486, 61-77, 83-84
9	10/27	Oxidation	p. 395-399, 61-77, 83-84, 164-175, 186-190
10	11/3	Reduction	p. 668-669, 61-77, 83-84
11	11/10	Project discussion	TBD
12	11/17-11/18	COMPREHENSIVE EXAM	

**NOTE:           Exam for Sections 1-9, 17-19, 21-26 on Tuesday 11/17/20 8:55am**  
**Exam for Sections 10, 12, 13, 15 on Wednesday 11/18/20 9:30am**

## EXPERIMENT SCHEDULE

<b>Week</b>	<b>Dates</b>	<b>Experiment</b>	<b>Procedure</b>
1	9/9-9/15	Melting Point	Expt. 2, 3, 4 p. 54
2	9/16-9/22	Recrystallization	Modified Expt. 5 p. 81
3	9/23-9/29	Distillation	Expt 1A, 2A p. 92-95
4	9/30-10/6	TLC	Handout experiment p. 175-177
5	10/7-10/13	Extraction	Expt 1 p. 145-147
6	10/14-10/20	Nucleophilic Substitution	Expt 1,2 p. 323-325
7	10/21-10/27	Esterification	Expt. 1 p. 520-521
8	10/28-11/3	Aldol Condensation	Expt. 1 p. 485-486
9	11/4-11/10	Epoxidation	Modified Expt. 1 p. 399
10	11/11-11/17	Reduction	Expt. 1 p. 669
11	11/18-11/24	Project Discussion (DUE DATE: Tuesday 12/1/20)	

## QUIZ DURING LECTURE SCHEDULE

**NOTE: Quizzes 1-4, 6,7 and 9 will be 15 minutes long and worth 20 points each.**

**Quizzes 5 and 8 will be 20 minutes long and worth 27 points each.**

**Sections 1-9, 17-19, 21-26 will have quizzes on Tuesdays (starting Tuesday 9/15/20) at 8:55am**

**Section 10, 12, 13, 15 will have quizzes on Wednesdays (starting Wednesday 9/16/20) at 9:30am**

<b>Quiz</b>	<b>Dates</b>	<b>Topics</b>
1	9/15-9/16	Safety and Melting Point
2	9/22-9/23	Melting Point and Recrystallization
3	9/29-9/30	Recrystallization and Distillation
4	10/6-10/7	Distillation and TLC
5	10/13-10/14	Review Quiz 1: Melting Point, Recrystallization, Distillation, TLC
6	10/20-10/21	Extraction and Nucleophilic Substitution
7	10/27-10/28	Esterification (and techniques discussed)
8	11/3-11/4	Review Quiz 2: Aldol Condensation (and techniques discussed) and Extraction, Nucleophilic Substitution and Esterification
9	11/10-11/11	Oxidation and Reduction (and techniques discussed)
COMPREHENSIVE EXAM	11/17-11/18	