ORGANIC CHEMISTRY LABORATORY (ONLINE)
Chemistry 313 Summer 2020

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REQUIRED COURSE MATERIALS

1. **Text:** Macroscale & Microscale Organic Experiments by Williamson (6th ed) (soft copy will be fine too). Custom Version for Rutgers University (or online copy).

2. **Technology requirements: Need a laptop or a desktop with camera/microphone** to watch online lab and lecture. Highspeed internet is also required. **Please do not use your phone when you are watching the lecture specifically. Lecture will be synchronous and the online teaching (elearning) platform will not work properly if you use cellphones.**

3. **Online Browser:** To be in the elearning system you must use **"Google Chrome" or "Firefox". Others browsers will not work properly !!!!**

4. **Laboratory Notebook:** You do not need a notebook but if you want to get any notes get a regular notebook or use your laptop or PC to take notes.

5. **Safety goggles:** To protect your eyes in the laboratory (must be face-fitting and form seal around eyes; ordinary glasses or other types of safety glasses including contact lenses worn under goggles are not acceptable). Well, unfortunately you cannot be in the lab this year, so you do not need to buy one.

6. **A simple scientific calculator**: for use on exams and quizzes.

7. **Learning Materials and other resources will be posted on sakai**. All communications regarding course grades, quizzes etc. will be through sakai. Please login to https://sakai.rutgers.edu/ for all the resources for this course.

WHAT YOU NEED FOR THE SECOND DAY OF LAB

Items 1-4 as shown above

WHAT YOU NEED FOR THE FOLLOWING LAB PERIODS

Items 1-4 with the pre lab and post lab assignments as indicated in the syllabus.

COURSE POLICIES

1. **Laboratory Session**: Laboratory session will be online posted on sakai media or on YouTube; students will watch the video of the particular experiment on the scheduled day at any time and submit their lab report before the due date and time mentioned in the syllabus and on sakai.

2. **Lectures**: All the lectures will be online and in the scheduled time for different sections. Attendance in online lectures is essential for a student to do well in this course. Significant amounts of additional material, including modifications to the lab procedure will be discussed in the lecture. Much of the quiz and exam materials as well as what is required in the lab report will be provided during the lecture for the course in conjunction with the textbook.

3. **How to login to lecture session: A detailed announcement will be posted on Sakai website**

4. How to write Prelab and lab reports is described in the "Guidelines for Writing Lab Reports in Laboratory Notebook".

5. **Written Exam** will be given on the specified date and will be online as well. The material for the exams will come from your lab experiments, readings, and lecture material.

6. **Quizzes:** A short online quiz (10 mins) will be adminstered. It will be available for certain amount of time and will be announced on sakai. A safety quiz (online) will also be given.

7. **Preparation:** Adequate preparation before lab will be needed to understand the procedure of the lab. You must watch the video carefully since some questions will be asked to answer on your lab report based on your observation from the video.

8. **Students with Disabilities**: If you have a disability, you are urged to speak to the course supervisor to make the necessary arrangements to support a successful learning experience. Also, you must arrange for the course supervisor to receive a letter from your College's Disability Concerns Coordinator verifying that you have a disability. The student must contact the Office of Disability Services to determine his/her Coordinator (848-445-4477 or https://ods.rutgers.edu/

9. **Academic honesty:** You are being graded on the work you perform. Use of lab reports 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 the observed data.** Do not just copy an answer. Academic honesty also applies to all quizzes and exams in this course.

Unauthorized posting and sharing of course material (including but not limited to: syllabi, lecture notes, past, present and future quizzes and exams, prelab and post lab questions) in paper form or online during the current semester and/or in the future is STRICTLY PROHIBITED. The unauthorized posting and sharing of course material is a violation of copyright law AND a violation of academic integrity and appropriate action will be taken against person(s) who violate this law. Report any violations promptly.

"Students are expected to maintain the highest level of academic integrity. You should be familiar with the university policy on academic integrity:
http://academicintegrity.rutgers.edu/academic-integrity-policy/
Violations will be reported and enforced according to this policy.

Use of external sources to obtain solutions to homework assignments or exams is cheating and a

violation of the University Academic Integrity policy. Cheating in the course may result in penalties ranging from a zero on an assignment to an F for the course, or expulsion from the University. Posting of homework assignments, exams, recorded lectures, or other lecture materials to external sites without the permission of the instructor is a violation of copyright and constitutes a facilitation of dishonesty, which may result in the same penalties as explicit cheating."

A signed and scanned copy of Academic honesty policy will be collected from all the students .

10. **Chain of Command**: If you have a question about grading, you should first talk about it **with your lab instructor within the following lab period after receiving your grade.** If you are not satisfied with the explanation, you may raise the question with the course coordinator. I will not intervene for questions of a small number of points. If you have a question about content, concepts, or procedures then you may ask any lab instructors or the coordinator for help.

NOTES!

1. The theoretical part of each experiment will be discussed in lecture.
2. The practical part for each experiment will be discussed in the lab.
3. Read the material and be prepared before lecture and lab.
4. The pre-lab part of your report must be submitted in the scheduled time posted on sakai. **If you do not turn in your prelab at the due date and time, points may be deducted (10% for each hour) or you may not receive any points on the prelab part of the experiment.**
All post labs of an experiment must be turned in as per schedule. Any delay in turning in the post labs (except for excused absences) will result in significant deductions of points or no points being awarded for that post lab.
All reports will be written in hands and then you must take pictures or scanned your lab report to submit in online or you can submit as .doc or pdf file.
5. **You will need to memorize the name of your lab instructor and lab section number.** All exams will be sorted according to lab instructor name and lab section number. Incorrect lab section numbers may result in the deduction of points on your exam.

GRADING

1.	Laboratory Reports and extra questions (65 points x 5 experiments)	325 points
2.	Safety Quiz	5 points
3.	Quizzes (12 points x 5)	60 points
4.	Written Exam	110 points
	TOTAL	500 points

LABORATORY SAFETY RULES: YOU need to know these rules to answer the safety quiz and for your future real- lab environment.

1. Face-fitting goggles must always be worn in the laboratory. Contact lenses, even with goggles are not permitted. Students that have a medical need to wear contact lenses while working in the teaching laboratory (proper visual acuity to complete assigned tasks) will need to inform the course coordinator and their lab instructor **and** be evaluated

by Student Health. Upon review by Student Health, the student must continue to wear appropriate splash goggles always while in the teaching lab environment, and must also notify Student Health if they experience irritation or other problems while working in the lab environment so that REHS can do an assessment. **Students not in compliance will be dismissed from the lab.**

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. Playtex-type rubber gloves are to be worn at all times when handling chemicals.

4. 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), neckties, and unconfined long hair present considerable hazard in the laboratory and are **NOT PERMITTED**. Long hair should be tied back.

5. All experimental work is to be done in the hoods. Apparatus may be cleaned at regular benches.

6. 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.

7. Avoid contact of chemical with your skin, eyes, and clothing.

8. Handle strong acids and bases with extreme care. Strong acids and bases must remain in the allotted hoods.

9. Dispose organic waste in labeled waste containers. No waste solvents or reaction mixtures should be poured into the sinks!

10. No smoking, eating or drinking is allowed in the laboratory.

11. Pipetting by mouth is prohibited.

12. No unauthorized experiments or other horseplay is allowed.

13. Students must be familiar with a procedure before attempting it.

14. Clean your work area, and clean dirty glassware at the end of each period. Broken glassware should be disposed of in broken glassware container and Pasteur pipettes, which are classified as Regulated Medical Waste should be discarded in sharps container. (NOT in broken glass)

15. Accidents must be reported at once to lab instructor and coordinator of the course

16. You should clean all your spills. In case in doubt as to how to clean, ask your instructor.

17. All students are responsible for knowing the safety rules and observing them. Violation may result in expulsion from laboratory.

18. 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.

GUIDELINES FOR WRITING LAB REPORTS IN LABORATORY NOTEBOOK

The laboratory notebook is the primary record of the work you accomplish in the laboratory. It should be well organized, legible, and an accurate record of your work. **In your case you do not need a proper notebook, you can use doc or regular notebook if needed.**

Guidelines for writing a laboratory report

The laboratory report is divided into 2 parts:
I. Pre-lab assignment (must be submitted in the scheduled date and time)
II. Post-lab assignment (The entire report should be no longer than 4-6 pages using the format shown below) and must be submitted in the scheduled date and time.

I. PRE-LABORATORY NOTES & IN-LABORATORY DATA

A. <u>Pre-laboratory notes</u> – <u>(check lists for pre lab)</u>
The pre-laboratory notes should include:

1) **Title of Experiment**: You will have to write the title of the experiment and **follow** it with a reference.
References:
If you used the procedure from the textbook, then the Reference would be the pages of the book from which you wrote the procedures, followed by the author's name and the title of your textbook.
Example: Recrystallization (Reference: pg. 64-65) Williamson, K. Macroscale and Microscale Organic Experiments
If you used a handout, then the Reference would be "Chemistry 313 Handout". (posted online)

2. **A <u>very brief</u> statement about the purpose of the experiment** - (1-2 lines)

3. **An Introduction** section that discusses briefly the technique being used (purpose and use) and/or the reaction being carried out (in a synthesis reaction). The information needed for this section is typically found in the text and the lecture.

4. Pertinent balanced equation(s) for the reaction(s) using structures and names of reactants and products. Equations for important side-reactions should also be included.

5. **A sketch** of the apparatus set-up when a new technique is being used. You must draw by hand and then take a picture and attach it in the .doc file or submit it separately.

6. **Chemical Hazards of the chemicals** you are using and Precautions to be taken with the chemicals being used: Information can be obtained using the MSDS data found on the Rutgers Chemistry website or the Chemical Hazards posting under Resources on the Sakai website for this course or the Merck Index on the cambridgesoft.com website (free access to Rutgers users with rutgers.edu e-mail accounts. Another site is msds.chem.ox.ac.uk. You can also go to Wikipedia or do a Google search.

7. **Table of reagents and/or reactants and/or products -** this table will vary somewhat with the nature of the experiment. It must include literature values (if you cannot find these in your textbook, you can find it in *The CRC Handbook of Chemistry and Physics* or *The Merck Index* or other online sources)

When the experiment involves a synthesis, you must have Table for the Reactants (or you can incorporate the reactants into the table of reagents) which should include:

(a) Physical properties (as mentioned above)
(b) Molecular weight
(c) Amount used in grams or mL
(d) Moles used

When appropriate, you should identify the Limiting Reagent.

When conducting a synthesis, you should also have a Table for the Product(s), which should include:

(a) Physical properties (mol. wt., mp, bp, density, solubility) of product and side product(s)
(b) Molecular weight of each product
(c) Theoretical weight in grams of only expected product (**show calculations**)

8. **Brief outline of expected experimental procedure**. Make sure that the procedure is brief!!

In Laboratory Data

In-laboratory data should include:

1. A precise record of all experimental data including weights, volumes, boiling point ranges, melting point ranges and other measurements pertinent to the experiment.

2. Your observations and comments for each procedural step. These should include changes in color, texture, clarity of solution, temperature, smell etc.

NOTE: Many points for each lab report will be attributed to the observations you make. Experimental work depends VERY heavily on accurate observations.

An example of observations is shown in procedure table below.

Procedure	Observations
1. Place 42 mg benzil, 42 mg 1,3 diphenyl acetone and 0.4 mL triethylene glycol in a test tube. 2. Clamp tube over hot sand bath, insert thermometer and heat until benzil is dissolved.	Benzil: yellow crystalline solid, Weight: 40.5 mg 1,3-diphenylacetone: white powdery solid, Weight: 41 mg Triethylene glycol: clear, colorless, viscous liquid Volume: 0.4 mL Appearance of mixed solution: benzil forms a yellow suspension in clear solution Benzil dissolves in solution when heated to form yellow clear solution at 120°C

II. POST LAB

Post Laboratory Reports should include the following:

1. Post Lab Questions. The list of post lab questions is listed in the syllabus in the Post lab Assignment section.

2. Analysis of experimental data - this will vary with the type of experiment. Include when appropriate:

(a) Specified calculations using experimental data. For experiments involving a synthesis, the percent yield of the product(s) should be calculated.

(b) Graphs using data from experiments and an analysis of graphs

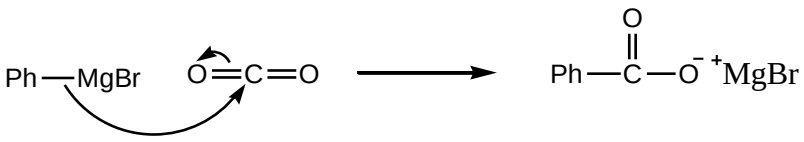
(c) Results from analytical techniques like TLC, melting points, IR, NMR and explanations of results. (This can also be shown in the discussion section).

3. A discussion of these results.

(i) Each observation in the in-lab report should be explained. If an observation was a result of a chemical reaction, the balanced equation and mechanism (if applicable) should be used to explain the observation.

Example: When phenyl magnesium bromide was added to dry ice, there was initial fizzing until the excess dry ice evaporated. The reaction is represented by the following equation and mechanism.

$$PhMgBr + CO2 \rightarrow PhCO_2^{-}\ ^{+}MgBr$$



(ii) In experiments involving synthesis, techniques used must be explained (Example: Simple distillation was used to separate cyclohexanone from cyclohexanol and water. Simple distillation was used because cyclohexanone and cyclohexanol have a large boiling point difference).

(iii) Comparison of products to accepted literature values - conclusion derived from the deviation from or similarity to literature value.

(iv) Possible sources of error to explain why product yield deviated from theoretical yield

4. A statement regarding the conclusions that can be drawn from these results.
5. Extra Questions: Some questions will be asked (posted on sakai in "resource" folder) based on your observation as well as from the concepts of the experiment. To answer these questions, you must watch the video for a experiment as well as read the procedure and theory behind it.

Make sure that you turn in the post lab in the scheduled time and date. You will lose the points of that portion if you fail to do so.

CHEMISTRY 313 **SUMMER 2020**

Coordinator: Dr. Sanhita Pramanik

LECTURE SCHEDULE (ONLINE)

Date	Lecture/Topic	Reading Material
T 5/26	Organization/safety	pp 1-40
TH 5/28	Melting Point	Handout/Syllabus; pp. 41-55
W 6/3	Chromatography	Handout; pp. 164-177; 183-190
T 6/9	Recrystallization	pp. 45-48; 57; 61-85
TH 6/11	Extraction	pp. 131-147
W 6/17	Distillation	pp. 55-60; 86-101; 102-104; 116-119

CHEMISTRY 313 **SUMMER 2020**

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LAB/QUIZ SCHEDULE

Date	Topics	Quiz	Procedure
T 5/26	Organization (Lec)*		
W 5/27	Check-in/Safety	Safety quiz#	
TH 5/28	Melting point (Lec.)		Expts. 2, 3, 4; pp 54
T 6/2	Melting point (Lab)**		
W 6/3	Chromatography (Lec)	M.P.#	Handout, Expt. 1; pp 175-177
TH 6/4	Chromatography (Lab)		
T 6/9	Recrystallization (Lec.)	TLC#	Expt. 5; p 81
W 6/10	Recrystallization (Lab)		
TH 6/11	Extraction (Lec.)	RECRYSTALLIZATION#	Expt. 1; pp 145-147
T 6/16	Extraction (lab)		
W 6/17	Distillation (Lec.)	EXTRACTION#	Expt. 1A, 2A; 92-95
TH 6/18	Distillation (lab)	DISTILLATION#	
T 6/23	Check-out	(last day of submitting any missing lab report with 25% penalty)	
W 6/24	No Lab/Lecture		
TH 6/25	Written Exam		
W 7/3	Grades Posted		

***Online lecture (synchronous) by Dr. Pramanik (at 12:15 pm for section B1 and B2 and at 3:30 pm for section B3 and B4)**
**** Lab (asynchronous) a link will be posted to watch the video for the experiment online (YouTube or prerecorded)**
 # Quizzes will be online too (on sakai) under Test/Quizzes.

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Submission of Post lab Assignments

Date	Experiment	Assignment
TH 6/4	**Post lab Melting Point**	**p. 60 # 2, 3, 10, 11**
SAT 6/6	**Post lab TLC**	**p. 183-184 # 3, 5, 6, 7, 8**
FRI 6/12	**Post lab Recrystallization**	**P. 85 # 2, 3, 5, 7**
TH 6/18	**Post lab Extraction**	**p. 163 # 4, 5, 6**
W 6/20	**Post lab Distillation**	**p. 100-101 # 5, 7, 9, 10**