

# ORGANIC CHEMISTRY LAB I

## Fall 2016 Syllabus

### Course & Instructor Information:

#### Lab Instructor/Section:

Office:

Email:

Office Hours:

**Lab Coordinator:** Dr. Gail Horowitz

**Office:** 5315 Ingersoll

**Email:** ghorowitz@brooklyn.cuny.edu

**Office Hours:** Mon 10:45am-12:45pm & by Appt

### Statement of Course Goals:

The goal of the laboratory component of Organic Chemistry I is to introduce students to fundamental concepts used by organic chemists in the lab. By the end of the semester, a successful student will have acquired a basic fundamental understanding of important laboratory techniques critical to organic chemists, and will be able to carry out reactions from set-up to purification, to data analysis.

### Required Purchases:

1. Organic Chemistry I Lab Manual, 2016 edition (available at Brooklyn College bookstore)
2. Composition Notebook
3. Lock for Lab Drawer
4. Paper Towels
5. Soap

### Recommended Purchases:

1. Laboratory Coat (<http://www.justlabcoats.com/ProductShopping.aspx?scode=DI-83403>)
2. Box of Disposable Gloves

### Grade Breakdown:

Laboratory Reports (Prelab+Postlab) - 60%

Safety Assignment - 3%

Laboratory Notebook - 3%

Instructor Evaluation - 4% \*

Final Exam - 30% \*\*

*\* Instructor evaluation includes the following: coming to class on time, coming to class prepared, maintaining a tidy work space (including the front bench and hoods)*

*\*\*One common final exam will be administered to all laboratory sections on **Tuesday December 13** at 9:30AM. The final exam will be cumulative. It will test students' knowledge of the techniques covered (both theoretical and practical aspects) as well as their ability to analyze and interpret data. A copy of previous semesters' lab finals can be found on Horowitz's website.*

## COURSE RULES & REGULATIONS

### **Academic Integrity:**

Academic dishonesty of any type, including cheating and plagiarism, is unacceptable at Brooklyn College. Cheating is any misrepresentation in academic work. Plagiarism is the representation of another person's work, words, or ideas as your own. Students should consult the Brooklyn College Student Handbook for a fuller, more specific discussion of related academic integrity standards. Academic dishonesty is punishable by failure of the "test, examination, term paper, or other assignment on which cheating occurred" (Faculty Council, May 18, 1954). In addition, disciplinary proceedings in cases of academic dishonesty may result in penalties of admonition, warning, censure, disciplinary probation, restitution, suspension, expulsion, complaint to civil authorities, or ejection. (Adopted by Policy Council, May 8, 1991.)

### **Students with Disabilities:**

If you have a disability, it is the responsibility of the university to provide you with reasonable accommodations. You should first register with Ms. Stewart-Lovell, the Director of the Student Disability Services Center (718-951-5538). Afterward, please provide the laboratory coordinator, Dr. Horowitz, with a copy of your course accommodation form and if necessary schedule an appointment with her to discuss your specific accommodation needs.

### **Laboratory Drawers:**

Please follow the check-in and check-out instructions given by the senior college laboratory technician, Ms. Anna Belyayeva. Make sure that you clean your glassware and bench space everyday (with solvent if necessary) and that you return all your glassware and equipment to your laboratory drawer before you leave. **Make sure you lock your drawer at the end of every lab period.** At the end of the semester, you will be charged for the replacement cost of any missing or broken items.

Note that once you check in to the course, you **must check out** even if you only attend class for one day. Students who fail to check out will be charged a fee of **\$50** plus the cost missing or broken equipment. Students who drop should arrange a checkout day with the stockroom. Students who withdraw will checkout on the day designated for checkout for their lab section.

**Makeups:**

If a student misses a lab, the lab must be made up promptly (ideally with another section that is conducting the same experiment). Lab makeups will only be permitted for legitimate reasons (e.g. family emergency, illness, religious holiday, etc.) and students may be required to submit documentation to verify their reasons for absence from laboratory.

If you miss a lab, you must get permission from your lab instructor to makeup the experiment. In order to do this, please pick up a makeup form from the stockroom and ask your instructor to sign it. Then, schedule and arrange your makeup date by contacting the instructor teaching the makeup section (see contact information below). After you complete the makeup experiment, please have the makeup instructor sign your makeup form so that credit can be given to you for having completed the experiment.

Prof. Abeykoon	<a href="mailto:nwalalawela@brooklyn.cuny.edu">nwalalawela@brooklyn.cuny.edu</a>
Prof. Berkowitz	aberkowitz13@gmail.com
Prof. Domzalski	calisonche@gmail.com
Prof. Horowitz	ghorowitz@brooklyn.cuny.edu
Prof. LeRoy	gdewaeleleroi@gradcenter.cuny.edu
Prof. Mollica	rmollica@brooklyn.cuny.edu
Prof. Son	<a href="mailto:json2@gradcenter.cuny.edu">json2@gradcenter.cuny.edu</a>
Prof. Zhang	gan.zhang89@brooklyn.cuny.edu
Prof. Zilberman	dbzilb@yahoo.com

**Laboratory Safety:**

Safety is the number 1 priority in lab. You will be provided with an approved pair of safety goggles. **Wearing goggles at all times in the laboratory is mandatory.** If you are caught not wearing goggles in the lab, you will be asked to leave and you won't be allowed back for that session.

During the first laboratory period, you will receive 2 copies of a hand-out of safety rules. One is for you to keep and the other one is for you to sign and return to your lab instructor. You must read, understand and agree to abide by these rules if you want to take the course.

You must not run heating devices (e.g. hotplates, heating mantles and melting point devices) more than the halfway up their temperature setting unless instructed otherwise by your instructor. Doing otherwise can cause thermometers and other glassware to crack and break and put you at risk of injury.

**Exposure to Chemicals:**

There is scientific evidence that exposure to laboratory chemicals (especially volatile solvents) during pregnancy increases the risk of birth defects. Any student who has a sensitivity toward chemicals or who may be pregnant is strongly advised to check with his or her doctor to determine if taking this course may pose a hazard to his or her health. A list of chemicals to be used in the laboratory experiments will be made available upon request.

## LABORATORY SCHEDULE

Lab	Berkowitz MQ9A (Mon AM)	Zilberman MQ9B (Mon AM)	LeRoy MQ2 (Mon PM)	Son TQ2A (Tues PM)	Horowitz TQ2B (Tues PM)	Mollica WQ9A (Wed AM)	Zhang WQ9B (Wed AM)	Domzalski WQ2 (Wed PM)	Abeykoon FQ9 (Fri AM)
I	8/29	8/29	8/29	8/30	8/30	8/31	8/31	8/31	8/26
2	9/12	9/12	9/12	9/6	9/6	9/7	9/7	9/7	9/2
3	9/19	9/19	9/19	9/13	9/13	9/14	9/14	9/14	9/9
4	9/26	9/26	9/26	9/20	9/20	9/21	9/21	9/21	9/16
5	<b>Thurs 10/6</b>	<b>Thurs 10/6</b>	<b>Thurs 10/6</b>	9/27	9/27	9/28	9/28	9/28	9/23
6*	10/17	<b>10/24</b>	10/17	<b>Fri 10/14</b>	<b>10/18 2:30 PM</b>	<b>10/5 10:30 AM</b>	<b>10/19 10:30 AM</b>	10/5	9/30
7	10/24	10/17	10/24	10/18	<b>Fri 10/14</b>	10/19	10/5	10/19	10/7
8	10/31	10/31	10/31	10/25	10/25	10/26	10/26	10/26	10/21
9	11/7	11/7	11/7	11/1	11/1	11/2	11/2	11/2	10/28
10	11/14	11/14	11/14	11/8	11/8	11/9	11/9	11/9	11/4
11	11/21	11/21	11/21	11/15	11/15	11/16	11/16	11/16	11/11
12	11/28	11/28	11/28	11/22	11/22	11/23	11/23	11/23	11/18
13	12/5	12/5	12/5	11/29	11/29	11/30	11/30	11/30	12/2
14	12/12	12/12	12/12	12/6	12/6	12/7	12/7	12/7	12/9

**\*Lab 6 will take place in the learning center, located at 1300 Boylan.**

## EXPERIMENTS AND READINGS

Lab	Experiment	Required Reading
1	Check-in, Safety, Techniques 1, 3	548-565, 573-580
2	Solubility Experiment Experiments 1A, 1B & 1C; Technique 10	2-5, 655-661
3	Extraction of Neutral Unknown Experiment 3D, Technique 9, 12	22-24, 645-654, 683-690, 695-704
4	Recrystallization of Sulfanilamide & Fluorene Experiments 2A & 2B; Techniques 8 & 11	9-13, 632-641, 664-682
5	TLC and Column Chromatography Experiment 5D; Techniques 19 & 20	35-37, 780-797, 804-814
6	Computer Modelling Lab	Handout*
7	Simple & Fractional Distillation: Unknown Mixture Experiment 6; Techniques 7.1, 14 & 15	38-42, 610-613, 722-729, 733-743
8	Isolation of Eugenol Experiment 13	88-90
9	Preparation of Dibromosuccinic Acid Handout	Handout*
10	Nucleophilic Substitution: Iodide versus Chloride Handout; Technique 24	Handout*, 848-852
11	Phenyl Alanine Handout; Technique 23	Handout*, 840-846
12	Elimination of Methylcyclohexanol Experiment 22	171-174
13	Substitution versus Elimination Handout; Technique 7.6	Handout*, 619
14	Check-out: No Experimental Work <b>SUBMIT LABORATORY NOTEBOOK</b>	NA

\* Handouts can be found on Prof. Horowitz's website:  
<http://userhome.brooklyn.cuny.edu/ghorowitz>

## LABORATORY REPORTS AND NOTEBOOKS

*You will be required to submit a prelab and postlab for each experiment. You will also be required to keep a laboratory notebook which you will turn in at the end of the semester. The instructions below describe what should be included in your prelab, postlab and notebook.*

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**Headings** - Each prelab and postlab you turn in should have the following information at the top of the page: your name, your instructor's name, the title of the experiment, the date. Each new experiment in your notebook should have this heading as well.

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**Prelabs** - Prelabs are due promptly at the start of lab. Write the prelab assignment directly into your laboratory notebook and submit a photocopy to your lab instructor.

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### **Table of Chemicals Used (2 pts)**

*List all chemicals to be used, including solvents. List any hazards associated with each chemical. When a reaction is run, give the quantity of each reagent in grams or mL, along with MW, density and moles.*

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### **Flowchart of Procedure (2 pts)**

*Provide a diagram or scheme of the procedural steps you will be conducting (see page p. 23 of your lab manual for an example of a flowchart). Be sure to include specific information such as chemical names, quantities, temperatures, time frames, etc.*

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**Notebooks** – Any observations you make and any numerical data you collect should be recorded directly into your notebook in pen. (Data should never be written on scrap paper and later transferred to a notebook.) Notebooks should be legible so that another person can follow what you have done; however they need not look perfect. Errors should not be erased or covered over with whiteout, but rather should be crossed out neatly so that the original error is still visible.

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**Postlabs** - Postlabs are due one week after completion of an experiment and are due promptly at the start of lab. If a lab report is submitted 1 day late, a 10% penalty will be applied. If a report is submitted more than one day late (up to 1 week late), a 20% penalty will be applied. Reports submitted more than one week after they are due will receive no credit.

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### **Observations (3 pts)**

*List 3 important physical observations you made. Briefly state why each is significant. Physical observations are things you see or feel. They are not conclusions or interpretations.*

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### **Data (3 pts)**

*List any data that you have obtained (e.g. melting point, boiling point, yield) and report % recovery or % yield when applicable. Show graphs of data where applicable.*

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### **Post-lab Question (5 pts)**

*Answer the designated postlab question (see below) concisely, but completely. Your answer should typically be about one to two paragraphs long.*

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## Postlab Questions:

Lab 2 – Solubility (due week 3) - Compare the solubility results of biphenyl and benzophenone and explain why you would expect these results to differ. Explain the solubility trends you observed for the alcohols in part B.

Lab 3 – Aqueous Extraction (due week 5) - Identify the neutral compound. Was your extraction effective at purifying it? Use your data and observations to support your claims.

Lab 4 – Recrystallization and Melting Point (due week 6) – Which solvent did you determine was best for the recrystallization of fluorene? Discuss, in terms of polarity, why this solvent should be optimal.

Lab 5 – TLC & Column Chromatography (due week 7) – Make sure to include a picture of your TLC plate in your lab report. Why does fluorenone travel more slowly than fluorene? Why does acetone speed up the rate at which fluorenone travels?

Lab 6 – Computational Modeling (due week 7) - **No prelab is required for this lab.** Turn in your completed packet week 7.

Lab 7 – Distillation (due week 8)- Graph your data. Identify the two unknowns. What differences do you notice between the fractional and simple distillation graphs? How do these differences help support the notion that fractional distillation is more efficient at separating liquids?

Lab 8 – Isolation of Eugenol (due week 9) – Why is steam distillation used in this experiment? (Hint: Look up the boiling point of Eugenol and read about steam distillation at [https://en.wikipedia.org/wiki/Steam\\_distillation](https://en.wikipedia.org/wiki/Steam_distillation).)

Lab 9 – Preparation of dibromosuccinic acid (due week 11) – Which stereoisomer of dibromosuccinic acid (racemic melting point = 170°C, meso melting point = 290°C) did you obtain? Draw it and show a mechanism to justify its formation.

Lab 10 – Nucleophilic Substitution (due week 11) – Compare the results of the KI and KCl reactions. How do the results differ? How can you account for the difference? Predict the results you would have obtained if you had used 2-bromo, 2-methylheptane instead of 1-bromooctane. Explain your prediction.

Lab 11 – Phenyl Alanine (due week 14) – Given that the specific rotation of S-2-hydroxy-3-phenylpropanoic acid is -22°, determine the absolute configuration of the product you obtained (Is it R or S?) Draw its three dimensional structure. Show a mechanism to justify the formation of this stereoisomer.

Lab 12 – Elimination of Methylcyclohexanol (due week 13) – Do you think your synthesis was successful? Use the data from your alkene tests to justify your answer.

Lab 13 – Substitution versus Elimination (due week 14) – See handout.