

# SYLLABUS

## CH109 General and Quantitative Analytical Chemistry Lab Fall 2016

Welcome to CH109 General and Quantitative Analytical Chemistry Lab. This is the first semester of a year-long laboratory course intended for physical/biological science majors, pre-medical students, and engineering students who require a one-year course in chemistry.

By the end of this course students will (i) be able to properly use analytical glassware and associated lab equipment, (ii) understand the basic principles and operation of absorption spectrophotometers, (iii) be able to use basic statistics and graphing software to analyze experimental data, (iv) start developing an understanding of the chemical principles behind various analytical methods (such as gravimetric analysis and titrations), and (v) be introduced to concepts that are part of the process of scientific communication – preparing tables and figures, outlining an argument, and preparing a scientific report.

This syllabus is designed to answer many questions you may have. Please read it over and then keep it handy to use throughout the semester. Additionally, the first sections of the course lab manual contain detailed information about course policies.

### Course Information and Policies

#### Course Staff

This course is given by Dr. Binyomin Abrams:

Office Hours: Wed 4-5pm and Thurs 9-10am (in SCI 270B)

Communication: [abramsb@bu.edu](mailto:abramsb@bu.edu) (e-mail, preferred) and 617.353.2480 (office phone, emergencies)

Course Website: <http://learn.bu.edu/>

The lab teaching fellows and learning assistants (along with their office hours):

Cynthia Ibarra	Wed 1-2pm in SCI 161	Ethan Gelting	Sun 1-2pm in SCI 200B
Hikari Kitadai	Wed 2-3pm in SCI 161	Billie Goolsby	Wed 11am-12pm in SCI 161
Greg Ng Pack	Fri 1-2pm in SCI 161	Sabrina Reilly	Thurs 11am-12pm in SCI 161
Sandy Zhang	Fri 12-1pm in SCI 161	Andrea Rustad	Mon 8-9am in SCI 200B
Rahul Bhale	Fri 2-3pm in SCI 161	Bryan Seguinot	Mon 12-1pm in SCI 161
Paul Gabriel	Thurs 3-4pm in SCI 161	Jada White	Sun 2-3pm in SCI 200B

All members of the course staff are available for consultation during their office hours (listed above) and by appointment. All students are welcome and encouraged to attend any of the office hours. Any questions that you may have about the course can be sent to [ch109-questions@bu.edu](mailto:ch109-questions@bu.edu). E-mails sent to this address will reach all of the course staff simultaneously. Personal and sensitive matters should be emailed directly to the course instructor.

#### Texts and Equipment

The required materials for the course are available at the Boston University Bookstore:

1. Abrams, B. *Quantitative General Chemistry Lab Manual (2016-2017 ed.)*; Kendall-Hunt: Dubuque, IA 2016.
2. Laboratory notebook, Hayden McNeil Publishing, ISBN 1-930882-23-8.
3. Lab coat
4. Approved face-forming safety goggles (UVEX Futura)
5. Scientific (non-graphing, non-programmable) calculator (recommended: <http://goo.gl/uRZQ8K>)

All of the above items are required by all students. You must have procured these items *before* the first lab session.

## Classroom response system and other electronic devices in lecture/discussion

We will be using Top Hat ([www.tophat.com](http://www.tophat.com)) in CH201 for in-class quizzes, pre-lecture work, and other assessment. You will be able to submit answers to in-class questions using Apple or Android smartphones and tablets. You can visit the Top Hat Overview (<https://goo.gl/2VmNnI>) within the Top Hat Success Center which outlines how you will register for a Top Hat account, as well as provides a brief overview to get you up and running on the system. The course join code for the lab portion of CH109 in Fall 2016 is **903749**, and your account for Top Hat must use your BU email address (ending in @bu.edu) in order for you to get credit for your work on Top Hat.<sup>1</sup>

We will use Top Hat for classroom engagement, periodic attendance, and some quizzes; that said, recent studies (see: <http://goo.gl/FOYKJj>) have shown that taking notes with electronic devices (computers, tablets, etc.) leads to **lower performance** by students on exams. For this reason, we **require** that you take notes using the traditional pen and paper mode. Similarly, while you will use your cellphones or tablets for answering Top Hat questions, make sure to keep them down when they are not in use so that you might best benefit from the lectures.

## E-mail Correspondence

Periodic e-mails will be sent to the entire class using the BU-link (registrar's online information system). Make sure that you check your BU e-mail address regularly so that you do not miss any important messages.

## Course Schedule

The detailed course schedule can be found on the course website and at the end of this document. The course consists of two required components:

- Pre-lab lecture (W 12noon-1pm in SCI 109), and
- Lab (M/T 1pm, or M/T 5:30pm in SCI 153/160). Even numbered sections are in SCI 160.

You are **required to attend** all of the lab meetings of your registered section and all lab lectures (where important details that will not necessarily be disseminated at any other times will be discussed). Some recorded lectures will be posted to the *Echocenter* in the course blackboard website.

## Safety, Pedagogy, and Course Policies

A discussion of lab safety guidelines, the course pedagogy, and course-specific policies can be found in the first part of your lab manual. All students are **required** to read through those sections and complete the "Course Policies Quiz and Safety Agreement" (on Top Hat) before the beginning of the first experiment. Additionally, helpful guidelines for preparing course assignments and laboratory notebooks are presented in Appendix B of the lab manual. All students are responsible for following the course policies and regulations at all times.

## Academic Conduct

All students at Boston University are expected to maintain high standards of academic honesty and integrity. Details about academic integrity, including specific details about laboratory courses, are presented in the first part of the course lab manual. All students are **required** to read through those sections and complete the "Academic Conduct Quiz" (posted on Top Hat) before the beginning of the first experiment.

## Copyright Laws and Protection

The syllabus, course descriptions, lab manual, and all handouts created for this course, and all class lectures, are copyrighted by the course instructor. The materials and lectures may not be reproduced in any form or otherwise copied, displayed or distributed, nor should works derived from them be reproduced, copied, displayed or distributed without the written permission of the instructor. Infringement of the copyright in these materials, including any sale or commercial use of notes, summaries, outlines or other reproductions of lectures, constitutes a violation of the copyright laws and is prohibited. Please note in particular that distributing, receiving, selling, or buying class

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<sup>1</sup>We've arranged a special deal for students entering BU in fall 2016: a lifetime Top Hat license is discounted for you to \$60. If you plan to take Organic Chemistry next year, this is likely the most economical choice.

notes, lecture notes or summaries, or similar materials both violates copyright and interferes with the academic mission of the College, and is therefore prohibited in this class and will be considered a violation of the student code of responsibility that is subject to academic sanctions.

## Lab Components and Assessments

### Pre-lab Assignments

Pre-lab assignments are at the end of the each lab in the lab manual. The completed sheets should be removed from the lab manual and must be submitted to the supervising TF *before* the beginning of the lab section. In general, pre-lab assignments will typically consist of a few calculations, or questions, that are relevant to the lab that is about to be performed. Doing well on these assignments is a good indicator of preparedness for the lab – make sure to work on them in advance (and it is advisable to keep copies of your work for reference when doing the post-lab).

### Lab Notebooks

Use of the lab manual in lab is not permitted. All work in the lab must be done directly from your notebook - the correct academic, and industrial, lab practice. The duplicate notebook pages must be submitted before leaving the lab, and the use of proper lab notebook technique will be part of your assessments. **Detailed instructions** for preparing lab notebooks to be used in lab can be found in the Appendix of the lab manual.

### Quizzes

There will be unannounced quizzes given at the start of some labs and in pre-lab lecture. They will test you on the labs that you've just completed or are about to complete (based on the pre-lab lecture material). Late arrivals will not be allowed extra time for the quiz.

### Post-lab Assignments

Post-labs are submitted on Blackboard and are due 2 hours before the beginning of your scheduled lab period<sup>2</sup> of the following week (unless otherwise announced). These assignments will be either (1) a series of questions related to the lab and your data, or (2) a formal lab report. Detailed instructions and guidelines for preparing post-lab assignments can be found in the Appendix of the lab manual. Students names and section numbers need to be included on all pages of the submission.

### Lab material on lecture exams

Lab questions will be included in all lecture exams (approximately 20% of each exam) and they will cover the material covered in pre-lab lecture, the lab manual, the lab textbook, and in the laboratory (including post-lab assignments).

## Grading

### Overall Lab Grade

In addition to the lab material that will be featured in the exams, the lab is worth 25% of the overall CH109 course grade. The **approximate** breakdown of the points is:

Component	Points
Labs	700
Quizzes and Participation	200
Performance	100
Total	700

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<sup>2</sup>In many cases, the system will take submissions after the due date. Late submissions will either not be graded or will receive a substantial penalty.

Letter grades **are not** assigned to individual labs or to the lab component of the course. Course letter grades are assigned based on your total score for the course (lecture and lab). As this is a more advanced freshmen chemistry course, do not expect “High School”-type scores; in other words, an “A” is not a 93, an “A-” is not a 90, etc... Moreover, there can be a relatively steep learning curve when starting analytical chemistry. The most important thing is that you should work as hard as you can and strive to continually improve your **learning** and performance throughout the course. In the lab, an “A” grade would represent excellence and consistently meeting the expectations of the lab portion of the course on assignments; a “B” corresponds to a good mastery of the material and mostly meeting the course expectations; a “C” represents being consistently below expectations; and a “D” corresponds to insufficient mastery of the course material.

## Individual Labs

Typical experiments will be graded based on some, or all, of the following components: pre-lab assignment, notebook pages, data, and post-lab assignment. Exact breakdowns will be lab-dependent.

## Performance

Your performance during the labs will be evaluated by your lab instructor (TF). These assessments will include proper lab etiquette, following course policies, demonstrating proficiency with techniques that are taught, and instrumentation use. It is important to remember that you should work efficiently and safely at all times. Exceptional performance will lead to an increased assessment score. Infractions in lab safety and etiquette will result in a lowered assessment score. Repeated infractions may result in your ejection from the lab.

Note: not following explicit instructions of a TF or LA, or talking back to them, is completely unacceptable. Students not following the instructions of their TF will be ejected from the lab. This is unsafe and irresponsible. If you feel that your TF is wrong/incorrect: have them contact the course instructor immediately.

## Questions Regarding Grades

Any question concerning the grading of a lab must be brought to the attention of the grading TF within a reasonable amount of time (usually 1 week) of when it is returned to you; material will not be accepted for regrading after a long delay. If, after having met with grading TF you are still uncertain about your grade, you should bring the graded work to the lab course instructor. Be sure that you have made no alterations in your work.

## Tips and Hints

While many students enter college already well-versed in chemical theory, they often find themselves lacking in some of the fundamentals of experimental techniques. This course is designed to walk a student through the basics of analytical chemistry. There is no pre-requisite knowledge of lab techniques, but they will build-up quickly.

Make sure to use the course staff (and their office hours) and study groups to get the answers to any questions that you have. The best approach is to always make sure that you know what you are doing, and why you are doing it, and if you don't understand something then ask questions.

In the past, students have best been able to manage their workload with good time management. Students should be reading the textbook and lab manual before their lecture on Wednesday. Pre-lab assignments, and notebook pages, are best completed soon after lecture in order to be prepared for lab. Break-up working on the post-lab assignment: consider doing the data analysis in the day or two after the lab period, and then polishing/completing the assignment (sometimes with help at office hours) later in the week.

## Tutorial sessions (a.k.a. office hours)

You are strongly encouraged to attend office hours frequently. They are a great opportunity to work through problem in groups, get support from course instructors, and ask questions. **Note:** you do not need to have a question or an appointment to attend these open hours. Rather, come frequently and maximize your effort by getting support. These tutorial sessions are helpful for all students.

An important note about getting answers to your questions: e-mail is not a replacement for office hours. While instructors will certainly respond to personal, private, and urgent matters by email, they will not be regularly

answering content-related questions by email. To get answers from instructors, please attend any of the office hours listed above.

## Tentative Course Schedule

Week of	Monday/Tuesday Labs	Notes
9/5	No labs	First Day of Classes (T) Pre-lab lecture (W)*
9/12	Check-in, Safety tour, Lab orientation Lab 1: Excel tutorial	
9/19	Lab 2: Scientific Measurement Safety, Policy, and AC Quizzes due before lab	
9/26	Lab 3: Redox Titration of Hydrogen Peroxide	
10/3	Lab 4: Molecular Spectroscopy Tutorial	
10/10	No classes (M)	Tuesday is Monday's Schedule
10/17	Lab 5: Modeling dyes: Particle in a box	
10/24	Lab 7: Bicarbonate Content - Gas Laws	
10/31	Lab 8: Beer's Law: Colorimetric Determination of Aspirin	
11/7	Workshops on argument and paper organization	
11/14	Lab 9: Investigating the 1st Law of Thermodynamics	
11/21	Lab 10: Determining Iron Content of Food by AAS <sup>†</sup>	No classes (W/R/F)
11/28	Lab 10 part 2	
12/5	Lab 11: Qualitative Analysis	
12/12	No Labs	Last day of classes (M)

\* Pre-lab lectures will be held every Wednesday unless otherwise noted.

<sup>†</sup> Post-lab is due *one* week from the completion of part 2 of the lab.

This is a tentative syllabus and is subject to change at any time. Students are expected to conform to these instructions and any other instructions given throughout the semester.