
Chemistry 126: Introductory Chemistry Laboratory II

I. Instructors & Teaching Lab Coordinator

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II. Class Meetings

Chemistry 126 meets in Tomsich Hall 103 once each week for a three-hour laboratory. Because safety notes and other important information may be discussed in the pre-lab introductions, students must be on time to participate in the lab. Experiments are designed to be completed within the allotted time period, though some may run over. Students finishing lab work before the official end time are expected to remain to analyze results or begin post-lab exercises. For labs executed in small groups, this is a particularly good time to discuss your results with other group members.

III. Materials and Resources

- *Chemistry 126 Laboratory Manual* (Distributed by instructor during the first week of classes)
- Goggles – can be reused from Chem 123
- Basic scientific calculator
- Laboratory notebook (you may continue to use your notebook from CHEM 123 or contact Carolyn Waggoner to purchase a new notebook)
- Electronic resources for the course will be placed on the course Moodle page (<https://moodle.kenyon.edu>)

IV. Co-requisites/Pre-requisites

CHEM 124 is a co-requisite for CHEM 126 lab if you did not pass CHEM 122. Withdrawing late (WL) from this lab does not require withdrawing from CHEM 124; they are separate courses with separate grades.

V. Studying

Students are expected to work outside of the regular meeting time to prepare for lab (by reading the lab manual and related texts) and analyze results. You should be studying ~4 hours a week outside of class for a 0.25 credit course. To assist you, the instructors have office hours scheduled during the week, and peer chemistry tutors are available at *The Math and Science Skills Center* (in Tomsich 101) every Sunday, Tuesday, and Thursday from 7-10 pm.

VI. Evaluation

Component	Weight
Completion of Experiments Safely & Laboratory Reports	80
Quizzes	10
Exam	10

Each lab exercise will be scored such that 50% of the grade is for the safe completion of the experimental work and 50% of the grade is for the report (notebook pages for the Introduction, Procedure, and Analysis sections, with attachments).

VII. Laboratory Notebooks and Reports

An important goal for this course is to continue developing effective science communication skills through the use of your lab notebook and by presenting your results and analysis as calculations, graphs, annotated spectra and short discussions.

You will use your laboratory notebook for three aspects of your experimental work:

1. Before coming to lab, to prepare for the experiment you will conduct by writing an 'Introduction' section; carbon copies of your 'Introduction' page(s) must be submitted at the beginning of class.
2. While working in the lab, to record all of your work in a 'Procedure' section; carbon copies of your 'Procedure' page(s) must be submitted at the end of class, before leaving the lab.
3. After you complete your lab work, to communicate your results as an 'Analysis' section with attachments (graphs or spectra); carbon copies of your 'Analysis' page(s), along with attachments must be submitted to the instructor by the time and day announced by your instructor.

These components of your laboratory notebook constitute a significant part of your course grade (see below). It is essential that your laboratory notes and reports are clearly written and can be understood by someone who is otherwise unfamiliar with the experimental work you conducted. Detailed explanations of how to use your laboratory notebook to record your experimental work is described in the CHEM 126 *Laboratory Notebook Guide*.

Reports submitted late will receive a penalty of 10% for each 24 hours it is late. Reports submitted more than 5 days late will not be accepted.

VIII. Moodle Quizzes

Starting the second week of the course, a pre-lab quiz will be available on Moodle before the beginning of each new laboratory experiment (multiple-week experiments will only have a quiz before the first week of the lab). To receive credit, you must complete the quiz before your lab section meets. The quizzes will have a 45 minute time limit and you will have unlimited attempts to receive the best grade. The motivation for administering quizzes is to encourage you to be well-prepared for your laboratory work.

IX. Exams

One exam will be given during the last week of the semester (April 27-April 30). Attendance is mandatory. There will be no make-up exams given unless the absence is excused.

X. Attendance Requirements

Class meetings and the completion of the experiments are an essential part of this course and as such, students are required to attend their assigned laboratory section every week. If you are not able to attend a laboratory meeting, please contact the instructor by e-mail or phone as soon as you realize you will not be able to attend, and arrange to make up the work. (To make up work in a different laboratory section, you must have permission from *both* instructors involved prior to the start of the lab experiment.)

Planned and Excused Absence. If you must miss an experiment for an athletic, religious, or other type of event, you must inform your instructor at least one week before the lab and arrange to make up the missed experiment, preferably during the same week as the absence occurs.

Note: You will not receive credit for the experiment unless your absence is excused by Student Support staff (ex. the Deans, Physician, Director of Counseling). Only two (2) planned absences are allowed — additional absences are considered unexcused and cannot be made up.

Illness. If you miss an experiment because of illness, you must go to the Health Center for examination and obtain an excused absence from the Campus Physician. You must also inform your instructor and arrange to make up the missed experiment. You will not receive credit for the experiment unless your absence is excused by the Campus Physician.

Unexcused Absence. You cannot make up an unexcused absence. Unless there are extenuating circumstances, a single absence will result in a grade of zero (0) for that experiment. Additional absences could result in expulsion from the course.

XI. Student Athletes

Meet with your instructor in the first week of classes to discuss any athletic conflicts. Only two (2) planned absences are allowed — additional absences are considered unexcused. Even with an Excused Absence you must make up the missed experiment. In consultation with your lab instructor, arrange for a make-up lab in the same week that the absence occurs. To make up work in a different laboratory section, you must have permission from *both* instructors involved prior to the start of the lab experiment.

XII. Students With Disabilities

Students who anticipate they may need accommodations in this course because of the impact of a learning, physical, or psychological disability are encouraged to meet with me privately early in the semester to discuss their concerns. In addition, students must contact Erin Salva, Director of Student Accessibility and Support Services (740-427-5453 or salvae@kenyon.edu), as soon as possible, to verify their eligibility for reasonable academic accommodations. Early contact will help to avoid unnecessary inconvenience and delays.

If your accommodation grants additional time on an exam, you must notify your instructor at least 1 week before the exam.

XIII. Bias/Discrimination/Harassment

Kenyon College seeks to provide an environment that is free of bias, discrimination, and harassment. If you have been the victim of sexual harassment/misconduct/assault we encourage you to report this. If you report this to a faculty member, she or he must notify our college's Title IX coordinator about the basic facts of the incident (you may choose whether you or anyone involved is identified by name). For more information about your options at Kenyon, please go to:

<http://www.kenyon.edu/directories/offices-services/title-ix/sexual-assault-and-harassment/>

XIV. Academic Honesty

Kenyon College is, at the core, an intellectual community of scholars – students and faculty – engaged in the free and open exchange of ideas. Critical to this lively exchange and deep engagement with ideas is the academic integrity of our work, both inside and outside the classroom.

At Kenyon we expect all students, at all times, to submit work that represents these standards of academic integrity. It is the responsibility of each student to learn and practice the proper ways of documenting and acknowledging those whose ideas and words you have drawn upon (see Academic Honesty and Questions of Plagiarism in the Course Catalog). Ignorance and carelessness are not excuses for academic dishonesty. Because collaborative work is an integral activity in the sciences, we wish to emphasize the difference between appropriate and inappropriate cooperation. A great deal of learning results from the exchange of ideas, and we encourage such exchanges both in laboratory and outside the laboratory. All materials submitted for a grade, however, must be prepared by you alone. Such materials include laboratory notebooks, lab reports, problem sets, quizzes, and examinations. If you are uncertain about the expectations for academic honesty in this class, please ask for clarification.

XV. Safety

You have and will continue to receive instruction on proper safety etiquette in the laboratory (ex. at the start of Chem 123 and in forthcoming prelab lectures. Additionally, questions relating to laboratory safety may appear on the quizzes or exams.

You are expected to conduct yourself in a safe manner at all times in the laboratory. Horse-play, unauthorized experimentation, or other ***activities deemed unsafe by the instructor will result in your immediate dismissal from the class for the day without the opportunity to make up the experiment.***

Safety rules are detailed in the orange document you signed at the beginning of CHem 123, Safety in Chemistry Department Laboratories, but some important rules include:

- ~ Wear shoes that cover your toes.
- ~ Legs must be covered by long pants or lab apron.
- ~ Do not eat or drink in the laboratory, and do not bring food or drink into the laboratory.
- ~ ALWAYS wear protective eyewear while you are in the laboratory.

XVI. Student Research

The Chemistry department encourages students with interests in the sciences to consider an independent research experience at some point during your undergraduate education. If you are interested in doing research within the Chemistry department, first check the faculty websites (www.kenyon.edu/academics/departments-programs/chemistry/chemistry/) for an introduction to each person's individual research. If you find one (or more) faculty with interests that pique your curiosity, contact those people to set up an appointment to talk further. Some research groups may be full when you initiate contact, but this status may change semester to semester.

CHEMISTRY 126: Biophysical/Medicinal Sections
Schedule of Experiments

Week of	Experiment	Assignments
Jan 12	Lab 1. Introduction to Structure and Nomenclature of Organic Compounds	Report
Jan 19	Lab 2. Infrared Spectroscopy	Pre-lab quiz and Report
Jan 26	Lab 3. NMR Spectroscopy – Part I	Pre-lab quiz
Feb 2	Lab 3. NMR Spectroscopy – Part II	Report
Feb 9	Lab 4. Synthesis of Aspirin – Part I	Pre-lab quiz
Feb 16	Lab 4. Synthesis of Aspirin – Part II	Report
Feb 23	Lab 5. Separation and Identification of Amino Acids	Pre-lab quiz and Report
	<i>Spring Break !!!</i>	
Mar 16	Lab 6. Introduction to GCMS; Organic Unknown : IR, NMR, and GCMS	Pre-lab quiz and Report
Mar 23	Lab 7. Development of a pH Indicator – Part I	Pre-lab quiz
Mar 30	Lab 7. Development of a pH Indicator – Part II	
Apr 6	Lab 7. Development of a pH Indicator – Part III	Report
Apr 13	Lab 8. Kinetic Analysis of Alkaline Phosphatase – Part I	Pre-lab quiz
Apr 27	Lab 8. Kinetic Analysis of Alkaline Phosphatase – Part II	Report
Apr 27	Exam and Check Out	

INTRODUCTORY CHEMISTRY LAB CORE CONCEPTS AND SKILLS

The expectation is that you will learn the following concepts and skills within the two introductory chemistry laboratory courses. Additionally, you will be responsible for using the skills throughout this lab course and all the chemistry lab courses that follow.

1. **lab notebooks:** proper recording of data and observations (refer to description in lab manual)
2. **lab safety:** see 15 points in “*Safety in Chemistry Department Laboratories*”
3. **preparing data and results:** proper labeling of spectra, graphs and tables; proper use of units; the ability to do unit conversion problems
4. **quantitative solid and liquid transfer:** use of proper techniques (ex. weigh-by-difference, reading volumes, use of density) and tools (ex. recognizing tolerance of different glassware).
5. **preparing solutions and calculating concentrations:** the ability to make dilutions and to make proper glassware choices in order to attain the desired accuracy of concentration; the ability to make the necessary calculations that will enable the proper preparation of solutions.
6. **nomenclature & structure representation:** *First semester:* bond line structure representations, basic acids and bases (prepare this list), inorganic salts and coordination compounds (prepare this list); names and symbols for elements 1-36. *Second semester:* organic nomenclature (we have this list).
7. **basic instrumentation:** *First semester:* know the physical molecular basis of UV-vis (electronic transitions). *Second semester:* IR (vibrational modes), NMR (nuclear spin) and mass spectroscopies (mass/charge of fragments).
8. **interpretation of spectral data.** annotation, modeling, and interpretation of spectra.
9. **reaction stoichiometry:** identification of the limiting/excess reagents, use of stoichiometry in titrations, the ability to calculate theoretical and percent yields.
10. **basic error analysis:** proper use of significant figures in calculations; recognize accuracy and precision and how to quantitatively describe each using percent error and standard deviation, respectively; recognize the types of error (systemic and random) and how to minimize error (identifying largest source of error, signal averaging, using trendlines/linear regression here); repeatability and reproducibility,
11. **names of common glassware and equipment:** know the proper names for the equipment in the lab drawer and any additional equipment used in experiments; use these names properly in formal communications such as laboratory reports.