

General Chemistry I Laboratory

Chem 120L

Monday 4-5, 5-6 pm

Fall 2019

Instructors

PreLab: Dr. David Green (david.green@pepperdine.edu)
Laboratory: Dr. Kelsey Brereton (kelsey.brereton@pepperdine.edu)
Dr. Jane Ganske (jane.ganske@pepperdine.edu)
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REQUIRED MATERIALS

Laboratory manual: *Experiments and Investigations in General Chemistry, 3rd Ed*, Green, Ganske, Fritsch.

The Official Laboratory Research Notebook (Jones and Bartlett) – all procedures, data, results, calculations, and solutions to problems will be recorded in the laboratory notebook. **The side-bound version is preferred.**

Scientific calculator

Approved laboratory safety goggles and lab coat (available in bookstore or through the SAACS).

STUDENT LEARNING OUTCOMES

The specific Learning Outcomes aligned to the Chemistry Program Learning Outcomes include evaluation of every course participant on their technical competence in the laboratory with respect to properly handling apparatus and chemicals and operating the chemical instrumentation.

In addition to technical proficiency, reports of laboratory results and analyses will be presented in a modified scientific format. The effectiveness of presentation and the linguistic quality of the report will be evaluated.

PURPOSE

The overall goal of the laboratory course is to provide students with a practical understanding of some of the principles, laws, and theories of chemistry. Each student should gain competence in solving chemical problems of varying difficulty utilizing problem solving strategies such as dimensional analysis, application of standard formulae, and synthesis of new formulae and algorithms from prior knowledge obtained in this and other courses. In addition, every student should increase their competence in the use of basic laboratory equipment, electronic data collection apparatus, manual and spreadsheet analysis of data, and overall comfort in designing and performing laboratory procedures.

While the major foci are on the basic principles of chemistry and the analytical methods necessary to explore these principles, the specific goals are that every participant will...

- ✓ recognize that chemistry is an experimental science and, as such, cannot be completely mastered without also experiencing personally the “hands-on” aspects of science.
- ✓ recognize and appreciate that there may be multiple approaches to the solution of a problem and that there may be a “best” approach which is different from that learned in the past.
- ✓ understand that success in this course depends, in part, upon a working knowledge of the mathematics of chemistry as well as the chemical concepts underpinning the problem at hand.
- ✓ understand that success in this course also depends, in part, upon the dedication and commitment of each participant to work cooperatively with their laboratory team.

Upon successful completion of this course every course participant should be able to:

- ✓ Use common and specialized laboratory equipment properly, safely, and efficiently.
- ✓ demonstrate the skills necessary to solve chemical problems, paying careful attention to achieving adequate and appropriate accuracy and precision.
- ✓ show mastery of material by confidently demonstrating a solution to a colleague.
- ✓ recognize, in a list of data given for a problem, information which is required for obtaining a solution to a problem and that which is superfluous.
- ✓ solve a variety of problems dealing with physical and chemical properties of substances
- ✓ write in scientific format reports of the theory, experimental method, and results of an analysis.

PHILOSOPHY

Because chemistry is an experimental science, the opportunity for hands-on experience is integral to understanding the material and the way in which chemistry is done. **The laboratory course is independent of the lecture so some divergence from lecture should be anticipated and, indeed, expected.** You will be expected to study for lab just as you would for lecture. Your instructors believe that it is in the laboratory where you learn the practice of chemistry; that is, techniques, methods, observation, etc. The laboratory augments and is augmented by the lecture.

RELATIONSHIP TO THE SEAVER COLLEGE MISSION

From The Mission of Seaver College of Pepperdine University: *“Seaver College exists to provide a link between the knowledge and wisdom of the past and present with the challenges of the future. The college is essentially a community...[of] teachers committed to a life of instruction and scholarship [and] students preparing to assume responsible roles in contemporary society....”*

This course is designed to provide the framework on which hangs a significant portion of the body of basic chemistry knowledge, allowing the perceptive participant to glance into the richness of the microscopic world from a macroscopic point of view, and to provide the foundation for further studies in the sciences. Over the course of the semester, the successful participant will develop new and expand upon existing skills in critical thinking, mathematics, and the scientific method. Since chemistry is by its very nature an experimental science, honesty and integrity in the acquisition and analysis of data is at the very core of the scientific process. It is part of our role as practicing scientists to defend the nature of scientific discourse and to expose pseudoscience and scientific dishonesty.

ATTENDANCE

This is a laboratory course and, as such, completion of the experiments, investigations, problem sessions, etc. are required. Failure to attend a laboratory session will result in a grade of zero for that lab period and failure to complete 3 or more labs may result in withdrawal from the course and a failing grade. Note that the required pre-laboratory discussion is scheduled for Monday evening 4-5 or 5-6 PM. Roll will be taken.

Failure to attend pre-lab will make you ineligible to attend lab for the week and will, therefore, result in a zero for the week!

Arriving to pre-lab after 5:10 pm is considered an absence and will make you ineligible to attend lab.

These are non-negotiable policies.

EXCUSED ABSENCES

The following are the only accepted excused absences for missing a quiz, lab experiment or test, or submitting lab reports late without penalty:

- A serious illness requiring medical attention. Confirm of medical attention is required.
- Death of an immediate family member.
- Travel as a part of a recognized University organization. Arrangements must be made at least one week PRIOR to the time of travel. Recognized university organizations are defined very narrowly. If unsure, ask the PreLab professor.

PREPARATION FOR LABORATORY

You are expected to come to pre-lab each week on time and with your textbook, your laboratory notebook, and the laboratory manual. In-class notes may also be useful for theoretical and background information necessary for acquiring and analyzing the necessary data. You are expected to have read the laboratory investigation before coming to pre-lab.

QUIZZES

Each lab meeting will begin with a short quiz that covers information for the lab to be done that week. Quizzes begin promptly at the start of the lab period. Material and information from the laboratory report being turned in that week and, possibly, prior labs could also be on the quiz. It is your responsibility to ensure that you understand the material and procedures from the each week's laboratory experience. Your lab reports are submitted as a group, but the quizzes are individual.

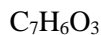
Missed quizzes cannot be made up.

LABORATORY REPORTS

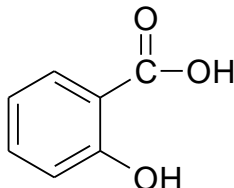
A written report of the results of your laboratory work is due at the beginning of the first laboratory period following the completion of the work unless otherwise informed. One report is due from each group. Late reports will receive a penalty of not less than 50% per day. The laboratory manual has complete instructions on writing your laboratory reports. All reports must be typed. Handwritten chemical formulae, chemical structures, and mathematical equations will be accepted. However, we recommend the following software for Microsoft Windows users:

Chemical Structure Drawing:

ACD/ChemSketch (Advanced Chemistry Development Laboratories), Symyx Draw (Biovia Dassault Systemes), or KnowItAll (KnowItAll Informatics System, BioRad). Knowing the rules of writing structures, you can convert



into

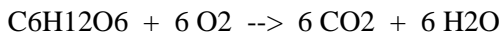


quickly with a very professional appearance.

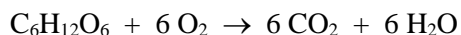
The best thing about these three chemical drawing packages is that they are free. Links to Accelry/Draw, ACD/ChemSketch, and KnowItAll are available at the Useful Resources area of the course website.

Chemical Formula Formatting: (may not work with MS Suite 365)

Christopher King's *Chemistry Formatter* add-in for MS Word and MS Excel is an excellent macro add-in if you use the Microsoft Office suite. There are no versions of the add-in for other word processor or spreadsheet programs. The intelligent chemistry formatter, when properly installed, eliminates the need to select 'format|font|subscript' for the formula stoichiometry in a chemical formula and usually gets the charge placement correct on ions. You can also get excellent looking chemical equations quickly. For example, consider the chemical equation



Simply highlight the entire equation, apply the chemistry formatter add-in with one mouse click, and the equation becomes



Additionally, showing a number in proper exponential notation is easy. Perhaps, because of textual context, a result such as 0.00115 g needs to be presented in exponential notation. Since typing the value in proper exponential notation syntax is time consuming, there is a temptation to simply type 1.115E-3 since, after all, that's the way the value is displayed on the calculator. However, with the *Chemistry Formatter*, the unconventional (and incorrect) presentation shown previously is easy to correct. By highlighting the value and applying the formatter, 1.115E-3 g in one mouse click becomes 1.115×10^{-3} g.

King's *Chemistry Formatter* is free to download and use. A link to the *Chemistry Formatter* can be found in the Useful Resources area of the course website.

Equation Writing and Editing:

The Microsoft Office suite comes packaged with a good equation editor (aptly named *Equation*). From Suite 2013 forward, it is installed automatically.

A better equation editor is *MathType* (Design Science, Inc.) for Windows and Mac. It is extremely powerful, but it is not free.

Using the MS Equation or MathType add-in, you can easily make



or the handwritten

$$k = Ae^{-E_a/RT}$$

look like a typeset equation:

$$k = A \cdot e^{-\left(\frac{E_a}{RT}\right)}$$

MathType can be purchased with an academic discount directly from [Wiris.com](http://www.wiris.com).

Preparing and Grading of Laboratory Reports:

The laboratory report should be prepared by the laboratory team working cooperatively. However, the report will be graded in sections and the separate section scores distributed to the individual group members. Each week the individual group members will be responsible for a different section of the laboratory report with, ideally, the team working together and convening prior to the due date of the report to assemble the completed report.

Additionally, each team member will prepare and turn in a handwritten abstract of the completed laboratory investigation. A successful abstract will require each team member to have understood the investigation as well as contributed to and read the completed laboratory report. Some key results of preparing an abstract of the report include 1) each team member contributes to the “quality control” of the completed report and 2) each team member reviews the essential concepts and calculations of the investigation in preparation for quizzes and the laboratory practical exam. Abstract scores will be assigned individually and the proper form of the abstract will be discussed in Pre-Lab.

Finally, when assigned in the investigation, the laboratory group will cooperatively complete and turn in the answers to the “Post-Lab Questions”. The questions will be graded and the team will receive a group grade.

EXAMS

There are no formal exams in the laboratory portion of the course.

NOTEBOOKS

You are required to maintain a scientific notebook throughout the semester. Specific guidelines for the notebook can be found in the laboratory manual. Your notebook is a legally-binding document, admissible in courts of law, of the work you have performed in the laboratory. Notebooks will be graded rigorously.

LAPTOP COMPUTERS

You are welcome to bring a laptop to PreLab and lab to take notes and collect data. However, please show the rest of the class, instructors, and the professor the respect of not checking e-mail, engaging in social media, or using your computer for any non-lab-related activity during class or lab.

SCIENTIFIC ETHICS AND “SECOND” SHEETS

As a scientist you have certain ethical responsibilities with respect to data collection, recording, and analysis. Data that has been collected in the laboratory can never be changed to suit your expected outcomes. To encourage every participant in the inviolate nature of recorded data, a copy of the data and procedures will be collected at the end of lab each week. Changes that are found in the original data to artificially improve results are considered a serious breach of scientific ethics and will be dealt with accordingly.

You are expected to conduct yourselves per the terms of the Seaver College Code of Academic Ethics. Any cheating (including plagiarism) will be punished as severely as allowed under University guidelines. Please see the laboratory instructor or the Seaver College Student Handbook for any questions about this policy. For assignments in which collaboration with your peers and other faculty is considered acceptable, you are encouraged, perhaps even expected, to do so provided you include a list of collaborators when submitting your assignments.

COURSE GRADING

You are naturally concerned how you will be graded in this course. There are many ways to accrue points; thus, a poor performance one time in a single category will not have a devastating effect on your lab grade. However, you should strive to excel in all aspects of your lab scores, thereby insuring the highest possible lab grade. By virtue of the nature of chemistry lab investigations, reports, and problem sessions it is impossible to successfully “cram” or otherwise condense the overall laboratory process into the day before (or day of) which assignments are due.

The semester laboratory grade will be approximately weighted as follows:

Prelab Attendance	10%
Laboratory Reports	35%
Laboratory Notebook	15%
Quizzes	15%
Problem Sessions	15%
Data Accuracy	10%

Absence from a laboratory period will result in a grade of zero. Material turned in late will receive a penalty of not less than 50% per day. **The laboratory grade is independent of the Chemistry 120 lecture grade.**

Your grade will be based on your final course average and determined by a fixed scale:

<u>Course Average</u>	<u>Grade</u>
100-94%	A
90-93%	A-
87-89%	B+
84-86%	B
80-83%	B-
77-79%	C+
etc.	

SAFETY IN THE LABORATORY

Safety Goggles

Safety goggles (not safety glasses) must be worn in the laboratory at all times when any chemical procedures are underway. Safety goggles may be purchased at the bookstore or through SAACS. Any student who is not wearing safety goggles will be asked to leave the laboratory, will not be allowed to make up the laboratory, and will receive a grade of zero for that experiment. The use of safety goggles in the laboratory is a zero-tolerance policy and is governed by university regulations and local, state, and federal laws.

Appropriate Dress

Students must dress appropriately for laboratory work. This means wearing a lab coat at all times. Open-toed shoes of any kind are unacceptable in lab. **You will be asked to leave and change clothes or shoes, if needed.** Make sure you come prepared, especially if you live off campus. Appropriate laboratory attire is a zero-tolerance policy and is governed by university regulations and local, state, and federal laws.

Hair

If your hair is longer than shoulder length you should tie it behind your head in order to avoid accidental contact with open flames or chemicals that might be on the lab bench.

Electronic Equipment

Audio/visual or other electronic equipment (except for calculators and computers) are not allowed in the laboratory unless the instructor is using such equipment for educational purposes.

Food and Beverages

You may not eat, drink, or bring food in the laboratory. It is likely to be placed in the trash by the lab instructor or TA.

SAVING GRADED MATERIAL

It is your responsibility to save all graded materials (exams, homework, etc.) for this class. As per university policies, all grade disputes must be settled by the midpoint of the next non-summer semester which immediately follows this course.

CELLULAR PHONES

If you bring a cellular phone to lab, please TURN IT OFF or silence the ringer. It is very impolite and unsafe to have incoming calls during lab. Answering calls during lab is not allowed and will adversely affect the lab grade.

WITHDRAW POLICY

Despite the independent nature and course number of the chemistry lecture and lab, except under extreme and unusual circumstances, you may not withdraw from lab and remain in lecture, or *vice versa*.

A WORD ON SORORITY, FRATERNITY, SPORTS, ETC.

Extracurricular activities such as debate, volunteering, community service, sororities, fraternities, athletics, drama and other artistic endeavors, etc. are important parts of your total education at Pepperdine University. However, these activities require a very significant time commitment. **It is your responsibility to keep up in class while involved in extracurricular activities.**

INTELLECTUAL PROPERTY STATEMENT

Course materials prepared by the instructor, together with the content of all lectures and review sessions presented by the instructor, are the property of the instructor. Video and audio recording of lectures and review sessions without the consent of the instructor is prohibited. Unless explicit permission is obtained from the instructor, recordings of lectures and review sessions may not be modified and must not be transferred or transmitted to any other person. Electronic devices other than calculators (e.g., laptops, cell phones, PDAs, calculators, and recording devices) are not to be used during lectures or exams without prior permission of the instructor.

COUNSELING CENTER and DISABILITY SERVICES

Students who feel that they may suffer from “test anxiety” or other academic obstacles despite exercising reasonable study and social habits may benefit by speaking to one of the staff in the Counseling Center.

Any student with a documented disability (physical, learning, or psychological) needing academic accommodations should contact the Disability Services Office (TCC264, x6500) as early in the semester as possible. All discussions will remain confidential. Visit www.pepperdine.edu/disabilityservices/ for additional information.

ONE LAST NOTE

If you are having any troubles with this class, or have any questions (in-class or out-of class problems) please come by and talk with the laboratory instructor. We are here for you. Even though it is a terrible cliché, there are no stupid questions. Please feel free to ask anything and we will do our best to assist you.

IMPORTANT DATES TO REMEMBER

8/30/2017	Last day of add/drop period
9/2/2017	Labor Day holiday. Laboratory is affected.
9/9/2017	Last day to change CR/NC status
10/4/2017	Faculty Conference. Laboratory is affected.
10/21/2017	Last day to withdraw with a grade of W
11/27/2017	Thanksgiving holiday. Laboratory is affected.
12/2/2017	Last day to withdraw with a grade of WP/WF
12/9/2017	Final exams

Disclosure Statement Required by the State of California

Warning: Natural Science's laboratories contain and certain class experiments or procedures will expose you to chemicals known to the state of California to cause cancer, birth defects, and other reproductive harm at levels which require a warning. For more information, contact your instructor or the Office of Regulatory Affairs at extension 4702.