

Brandeis University
Summer School 2008
CHEM 18A General Chemistry I Laboratory

Instructor

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Teaching Assistants

Lab Schedule

1:00-5:30 M, Th; Kalman 210

Lab Manual

Custom Laboratory Manual for General Chemistry I and II, M. Govindan, Prentice Hall. Available at Brandeis University bookstore.

Objectives

The main objective of a laboratory course such as this is to give the student a feel for how chemistry is carried out in practice. In addition, the **manipulative skills developed**, the discipline of **good experimental technique** and the development of skills of **observation and practical problem solving** will be invaluable to a later professional or research career.

Many students, especially those with a poor lab background in chemistry are frightened by the prospect of lab and thus leave their common sense and normal good judgment at home when coming to the lab. Laboratory is not something to be frightened of, nor is it a place to lose your practical sense. The experiments in this course are designed to slowly introduce you to important laboratory techniques and then you will be applying these to real problems that one normally encounters in chemistry. In the early stages, you should concentrate on making sure that:

- a) you master the technique,
- b) understand the reason for certain procedures of a technique, and
- c) understand for what general purpose a technique is used.

There is a tendency to think that once you have completed an experiment you can forget it. DON'T! The beginning experiments are designed to familiarize you with their techniques which will be necessary for the later experiments.

Preparation for Lab

Students frequently treat labs as a "cookbook" experience. While it is true that good chemists make good cooks, the reverse is not necessarily true. If you approach lab as a cookbook experience it will not be much fun, nor will you learn anything (except how to follow a recipe). There will be short pre-lab orientations before each lab where the important principles of the experiment will be emphasized. However, this is not to take the place of your pre-lab preparations. The orientation sessions will only cover the important points of the experiments and the question you may have after studying the experiments. You must prepare for the labs in advance by **STUDYING** (not just reading) each experiment before coming to the lab. You must submit answers to the review questions (pre-lab questions) at the beginning of the laboratory session. The instructor reserves the right to deny laboratory participation if you have not done the pre-lab assignment. In addition, after each lab you should go back and evaluate what you have done by writing a report on the experiment. The report is due at the beginning of next laboratory session along with the pre-lab assignment for the next experiment.

Pre-Lab Assignments, Laboratory Reports and Grading

Each experiment will involve a pre-lab assignment and a laboratory report, the latter to be completed after the experiment. Pre-lab assignments will be graded along with the lab reports and post-lab assignments and will constitute 90% of the lab grade. The other 10% will be instructor's evaluation of your preparation, conduct and performance in the laboratory. Lab reports are due the next lab period. Penalty will be assessed for reports submitted late – 5% per day.

Laboratory Notebook and Reports

A laboratory notebook must be used to record **all information and data** collected during an experiment – this is available at the chemistry stockroom (cost: \$12). The purpose of a notebook is to have a permanent record of the experimental work and should contain enough background information and experimental details so that someone else can repeat your experiment without additional help. The instructor will periodically inspect the notebook and include that in his/her evaluation of your experimental work.

Before Lab:

Before you come to the lab, you are asked to read the pre-lab discussion in the manual, and write in your lab notebook (it makes automatic copies unless you put the cardboard sheet underneath) the following: Title of the Experiment, Date, Objective (Purpose), Procedure and answers to the assigned pre-lab questions. The procedure can be an outline but should provide sufficient information to allow a chemist to repeat the experiment with only your notebook as a guide. Describe the steps to be carried out including the quantities of chemicals to be used and the duration of heating/cooling (if applicable). On the other hand you need not describe well-established procedures such as cleaning of glassware, operation of simple instruments or equipment, which are familiar to most chemists.

During the Lab (Recording Observations)

During the lab you will be collecting data or recording observations. The observations include any color changes, temperature changes, evolution of gas (indicated by bubbling or effervescence), appearance of product, etc. These must be entered directly in the lab notebook (and not on loose paper to be copied later to lab notebook). The lab notebook is not expected to be a neat finished product. The data tables or recording of observations are expected to be somewhat messy but with a little prior planning (such as preparing a blank data table ahead of time) you can make it presentable. For purely quantitative experiments, no descriptive observations may be needed. In these and some other cases it may be more convenient to record the data and observations in the data tables of the lab manual directly. If you make an error cross out the mistake, provide an explanation (no erasures, white out or blacking out data). Ask your TA to initial your data table at the end of the lab.

End of the Lab

Also at the end of each lab period, you are to submit to your TA, the copy from your lab notebook that has been completed so far for the experiment. If time permits, you should complete the necessary calculations. By doing the calculations and getting the results, you will discover how successful you have been. The results may indicate that you should repeat a portion of the experiment, which will be possible depending on the time left in the lab.

Lab Report:

A report on the experiment is due the next lab period. What remains to be done for the report are any remaining calculations, presenting data and results in table form (if it is not already done), sample calculations, completion of graphs (if any), a conclusion that summarizes the finding in the experiment, and answers to post-lab questions.

This will typically entail submitting the tear-out report sheets from the lab manual, completing calculations or graphs using Excel, summarizing the results, writing a conclusion (see below), and answering the post-lab questions. Each student must write his/her report even for the experiments that may be conducted with a partner. You may consult each other but the report should be your own.

Discussion/Conclusion:

In this section, you get the opportunity to explain your results. You should clearly describe (not just state) how your results answer the question stated in the purpose. Do they make sense? Are they what you expected? Any difficulties or unusual happenings should also be noted here — except for accidents which you fixed. If needed, error analysis should also be included in the discussion.

If there are any questions in the lab handout that need to be answered, this is the place to do that, but set it out as a separate section.

The following general hints may help you to write a good lab report:

- Generally, personal pronouns are avoided in technical writing. Certainly, you should not use the pronouns, “you” and “I.” This is often done by the use of passive voice. Past tense is

preferred since you are reporting what you did. Occasionally, the use of “we” may be necessary to avoid awkward sentence structure in passive voice.

- Part of your laboratory report grade is based on the results you obtained in lab. Because your results are an indication of how well you performed the experiment, it is equally important that I understand what your results mean, so that I can give you credit for having done the experiment well. However, any fabrication of experimental result constitutes academic dishonesty and will be dealt with according to the policies outlined below.
- The best grades will be given to the students who write thorough lab reports which are clear and succinct. When I finish reading a lab report, I want to have the impression that you completely understand:
 - What the purpose of the lab was
 - How the results were obtained
 - What the results mean
 - Significant sources of error and how they could be corrected.
- You do not receive a grade for a lab if you do not submit a report.

Attendance

Attendance is required. A missed laboratory or a late arrival (>30 min) to the lab without a satisfactory medical excuse will result in a grade of *zero* for that experiment. A satisfactory medical excuse is a note written by a licensed health care provider (a note from a relative would not be sufficient) indicating that the student was indisposed during the lab period. Repeated tardiness (lateness <30 min) will also result in penalties.

Academic Integrity Policy

Your attention is drawn to the appropriate sections on academic integrity in the Brandeis University Student Handbook – see: http://www.brandeis.edu/studentlife/sdc/rr/html/rr_section4.html. Rules and regulations contained in the Handbook will be strictly applied. There will be some experiments in which you will be working with a partner in collecting the data. However, you are expected to write the laboratory report independently.

The relevant paragraphs pertaining to academic integrity are quoted below:

4. Maintenance of Academic Integrity

4.0 Every member of the University community is expected to maintain the highest standards of academic integrity. A student shall not submit work that is falsified or is not the result of the student's own effort. Infringement of academic honesty by a student subjects that student to serious penalties, which may include failure on the assignment, failure in the course, suspension from the University or other sanctions (see Section 21). A student who is in doubt regarding standards of academic honesty in a course or assignment should consult the faculty member responsible for that course or assignment before submitting the work. A student's lack of understanding is not a valid defense to a charge of academic dishonesty.

4.1 A student's name on any written exercise (e.g., examination, report, thesis, theme, notebook, laboratory report, computer program, etc.), or in association with an oral presentation constitutes a

representation that the work is the result of that student's own thought and study. Such work shall be stated in the student's own words, and produced without the assistance of others, except for quotation marks, references, and footnotes that accurately acknowledge the use of other sources (including sources found on the Internet). Talking during an examination, or possession or use of unauthorized materials or equipment during an examination constitutes an infringement of academic honesty. Attempting to receive credit for work not originally submitted also constitutes an infringement of academic honesty.

4.2 In some instances, a student may be authorized by a faculty member to work jointly with (an)other student(s) in solving problems or completing projects. However, students may not collaborate on assignments without explicit permission from the instructor. To provide, either knowingly or through negligence, one's own work to assist another student in satisfying a course requirement constitutes an infringement of academic honesty. Aid from personnel associated with University-sanctioned tutoring services is acceptable; tutor-assisted work submitted for a grade should be done with approval of the instructor.

4.3 Unless permission is received in advance from the faculty member in charge of the course involved, a student may not submit, in identical or similar form, work for one course that has been used to fulfill any academic requirement in another course at Brandeis or any other institution. A student who perceives the possibility of overlapping assignments in courses should consult with the appropriate faculty members before presuming that a single effort will fulfill requirements of both courses.

Disability Statement

If you are a student with a documented disability, please see the Summer School Office staff immediately so that all appropriate accommodations can be made. No accommodations will be made retroactively. You should contact me immediately if you have any special need(s) requiring accommodations in the event that the classroom/building must be evacuated.

Tentative Schedule of Experiments

Date	Title	Reading	Pre-Lab Questions
June 2	1. Orientation and Laboratory Safety	pp. xxxvii-xlii	
June 5	2. Separation of the Components of a Mixture Chemical Formulas	pp. 26-32 37-44	1-5, 8, 12 2-5, 8-12
June 9	Chemical Reactions	51-56	1-9
June 12	Chemical Reactions of Copper and Percentage Yield	63-66	3, 4, 6-10
June 16	1. Paper Chromatography	73-86	1-6, 9
June 19	2. Molecular Modeling Gravimetric Determination of P	89-94	3-6, 9, 12
June 23	Reactions in Aqueous Solutions	101-106	1-7
June 26	Heat of Neutralization	113-117	1-9
July 30	Molar Mass of a Vapor	127-133	1-4, 6,7,12
July 3	Check Out and Final Lab report due		