CHEM 111
General Chemistry Laboratory
Fall 2010

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Section 007:
Office Hours: Monday 2:30 – 4:25 PM
Web page: http://chemistry.bd.psu.edu/halmi

Thursday 9:00 – 10:45 AM

Course Description

This laboratory is an introduction to quantitative experimentation in chemistry. The laboratory will follow closely with the subject material as it is presented in the lecture, CHEM 106 (or CHEM 110). This course is designed to reinforce the chemical principles necessary to succeed in understanding some of the basic principals in general chemistry. Along with CHEM 106 (or CHEM 110) this course fulfills the general education requirement for natural sciences (GN).

Required Materials

Carbonless duplicate laboratory notebook (50 or 100 pages)
One combination lock
Goggles or safety glasses

Laboratory Notebook

From the very first day of class, you will be recording all data and results in a carbonless duplicate laboratory notebook. You will be graded on your organization of data as well as your results. There are guidelines on how to keep a good laboratory notebook at the end of this syllabus. (See Laboratory Notebook Section.)

Prelabs

Prior to each new laboratory, it is expected that each student download and thoroughly read the day’s experiment. Labs can be downloaded from the web page:

http://chemistry.bd.psu.edu/halmi.

In order to begin an experiment, each student is required to hand in a prelab assignment. It will cover material that you are going to need for that particular experiment and is worth 10 points. A proper prelab should include answers to the prelab questions written neatly in your laboratory notebook. At the start of class, you will be expected to hand in the original top copy of the notebook pages keeping the duplicate pages for yourself. If you do not hand in the prelab at the start of class, you will not receive credit for that prelab assignment and you will not be permitted to begin the laboratory experiment until it has been completed. If you need help with the prelab assignment, please stop by office hours or make an appointment to speak with me before your laboratory time. Questions on the prelab assignment will not be answered once you have entered the laboratory.
Lab Reports

All data collected during lab should be recorded on the appropriate pages in your laboratory notebook. (See Laboratory Notebook Section.) Each lab report will be completed during lab and handed in to the instructor at the end of the lab period and will consist of data, data treatment (calculations) and answers to any post-laboratory questions. This will enable you to ask questions during the laboratory. In the case of experiments that last more than one week, you must show your data sheet and/or lab notebook to your instructor and obtain their signature. In experiments where you work in pairs, each student should take their own notes and must submit separate lab reports. This does not mean two copies of the same report, it means doing your own work. (See Academic Penalty Section.) Lab reports will be graded on experimental technique, quality of results, treatment of data and overall quality of work. Any labs that are missed must be made-up during that week or by special arrangement with the instructor. Any lab not made up within the allotted time will be recorded as a score of zero.

Graphing Assignment

Presenting and interpreting data is a critical skill in any laboratory setting. To this end, there will be one graphing homework assigned during the semester worth 10 points. You will be asked to graph your data for the Hess’s Law experiment. The assignment will be due the week after the Hess’s Law lab is performed. Additional details will be provided in class.

Formal Written Lab Report

You will be required to write a formal lab report for one of the laboratory experiments that you perform during the semester. Guidelines for writing your formal lab report are at the end of this syllabus. (See Guidelines for the Formal Written Laboratory Report.) If you receive an unsatisfactory grade on your report, you may rewrite it to receive up to one half of the points missed. When you hand in the rewrite, you must also hand in your original report.

Final Assessment

At the end of the semester you will be assessed on the skills and concepts you learned in CHEM 111. This written assessment worth 30 points will involve multiple choice and short answer. The questions will be based on lab technique, calculations performed in the laboratory and concepts studied in the laboratory.

Lab Safety & Courtesy

There are 20 points assigned for lab safety and courtesy. This includes safety awareness as well as appropriate behavior in the laboratory. Please be on time for lab; constant tardiness will not be tolerated. Any unsafe or inappropriate behavior will result in a deduction of courtesy points. All students must wear goggles in the laboratory at all times. Each time it is necessary for the instructor to remind a student of this, two points will be deducted from the lab courtesy points. If all of your courtesy points are used up, then deductions will be from your lab report score. If you refuse to put your goggles on, then you will be asked to leave the laboratory with a score of zero for that particular lab. Appropriate laboratory dress is expected including no open toed shoes, sandals or shorts/skirts unless wearing a lab coat. Long hair must be tied back. In addition, once your check in your desk, you are responsible for the contents. Failure to check out will result in a lowering of one letter grade for the course and a $25 service fee billed to your student account.
Grading

<table>
<thead>
<tr>
<th>Category</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prelabs</td>
<td>110</td>
</tr>
<tr>
<td>Laboratory Reports</td>
<td>160</td>
</tr>
<tr>
<td>Final Assessment</td>
<td>30</td>
</tr>
<tr>
<td>Formal Written Lab Report</td>
<td>30</td>
</tr>
<tr>
<td>Graphing Assignment</td>
<td>10</td>
</tr>
<tr>
<td>Lab Courtesy</td>
<td>20</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>360</strong></td>
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</tbody>
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Grades

- **A** 93-100%
- **A-** 90-92%
- **B+** 87-89%
- **B** 83-86%
- **B-** 80-82%
- **C+** 77-79%
- **C** 70-76%
- **D** 60-69%
- **F** 0-59%

Learning Resource Center

The Learning Resource Center promotes the academic success of Penn State Erie students through peer tutoring and study skills advising. Tutoring is free and available in most subject areas. Information can be found at [http://psbehrend.psu.edu/Academics/academic-services-1/Lrc](http://psbehrend.psu.edu/Academics/academic-services-1/Lrc).

Note to students with disabilities

Penn State welcomes students with disabilities into the University's educational programs. If you have a disability-related need for modifications or reasonable accommodations in this course, contact the Disability Specialist in the Office of Student Affairs, Room 115 Reed Union Building, 898-6111. For more information see [http://pennstatebehrend.psu.edu/student/Educational%20Equities/DISABILITY.htm](http://pennstatebehrend.psu.edu/student/Educational%20Equities/DISABILITY.htm).

Academic Penalty

It is expected that each student will do his/her own work on all assignments including daily problems, homework, quizzes and exams. There are severe penalties for plagiarism and cheating. Proven cases of academic dishonesty will result in an **XF** for the course. For more information see the Academic Integrity & Academic Dishonesty (Senate Policy 49-20) at [http://www.psu.edu/ufs/policies/](http://www.psu.edu/ufs/policies/) or Behrend’s Academic Integrity policy at [http://psbehrend.psu.edu/intranet/faculty-and-staff/faculty-resources/academic-integrity](http://psbehrend.psu.edu/intranet/faculty-and-staff/faculty-resources/academic-integrity).
## Tentative Schedule of Experiments

<table>
<thead>
<tr>
<th>Week of</th>
<th>Experiment</th>
<th>Points</th>
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<tbody>
<tr>
<td>Sept 8</td>
<td>Check-in &amp; Laboratory Safety</td>
<td>-</td>
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<tr>
<td>Sept 15</td>
<td>Introduction to Chemistry Techniques</td>
<td>-</td>
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<tr>
<td>Sept 22</td>
<td>Introduction to Chemistry Techniques (continued)</td>
<td>20</td>
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<tr>
<td>Sept 29</td>
<td>Properties of Hydrates</td>
<td>20</td>
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<tr>
<td>Oct 6</td>
<td>Rust and Other Oxides</td>
<td>20</td>
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<tr>
<td>Oct 13</td>
<td>Ionic Reactions in Aqueous Solution <em>(Formal Written Lab Report)</em></td>
<td>20</td>
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<tr>
<td></td>
<td>Coordination Compounds with Copper(II): Part I</td>
<td>-</td>
</tr>
<tr>
<td>Oct 20</td>
<td>Coordination Compounds with Copper(II): Part IIA &amp; Part IIB</td>
<td>-</td>
</tr>
<tr>
<td>Oct 27</td>
<td>Coordination Compounds with Copper(II): Part IIC</td>
<td>20</td>
</tr>
<tr>
<td>Nov 3</td>
<td>Analysis of Commercial Antacids Containing Calcium Carbonate <em>(Formal Written Lab Report Due)</em></td>
<td>- 30</td>
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<tr>
<td>Nov 10</td>
<td>Analysis of Antacids Containing Calcium Carbonate (continued)</td>
<td>20</td>
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<tr>
<td>Nov 17</td>
<td>Molecular Weights and the Ideal Gas Law</td>
<td>20</td>
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<tr>
<td>Nov 24</td>
<td>Thanksgiving Break - No Lab</td>
<td>-</td>
</tr>
<tr>
<td>Dec 1</td>
<td>Calorimetry and Hess’s Law <em>(Graphing assignment)</em></td>
<td>20</td>
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<tr>
<td>Dec 10</td>
<td>Final Assessment <em>(Graphing Assignment Due Check-out)</em></td>
<td>30 10</td>
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**Laboratory Notebook**

A laboratory notebook is a chemist's most valuable tool. It contains the permanent written record of a researcher's mental and physical activities from experiment and observation, to the understanding of new phenomena. A laboratory notebook is a researcher's diary. The act of writing the notebook forces one to stop and think about what is being done in the laboratory. After the experimental data is recorded, the researcher begins to study, analyze, evaluate, and interpret the notebook. New ideas and questions are written down and the laboratory notebook evolves into an expression of the Scientific Method.

There are important legal reasons for keeping a good notebook. A laboratory notebook is admissible in a court of law for patent claims. In cases of suspected fraudulence, the FBI will confiscate laboratory notebooks as physical evidence. In industry, a researcher's laboratory notebook is the property of the company. It is witnessed, signed, and collected each working day. The proprietary information the notebook contains rarely leaves the building. In this course, your laboratory notebook will be part of your grade. The main criteria for evaluation will be how clearly you indicate what you did and saw. It should be written so that if the notebook was sent to a chemical laboratory in anywhere in the United States, they could understand what you did and repeat the experiment.

Your data and observations are the heart of the experiment where you actually record data and observations that you make during the course of the experiment. These notes and data will allow you to test hypothesis and apply the Scientific Method in the data treatment and discussion section of your formal written lab report. Record the data as completely as possible in your notebook and leave interpretations for later. Don't be embarrassed about writing down mistakes or accidents---if you drop your product on the floor, record in your notebook "Oops, I dropped my product on the floor!" Write down everything!! Your results hinge on exactly what you do, not how nicely you sugar-coat them in the notebook. A few general notes which you should specifically pay attention to in this course:

1. Your name and course should be written on the notebook cover. All entries are recorded with a black or blue ball-point ink pen. The key to writing a good notebook is simple clarity: clear layout, clear descriptions, and good penmanship. A notebook which is filled with scribbles and scrawls will waste your time when you look for something and may actually be misleading.

2. Observations of chemical tests go directly and immediately into your notebook. Include balanced reactions (if not determined from the observations), data collected and maybe some derived quantities. If numerical data is obtained, it should be tabulated (with proper number of significant figures and units) in clearly labeled columns.

3. Use the proper names for labware and vessels. Was the sample weighed in a crucible, beaker or flask? What kind of flask? Was the volume measured with a graduated cylinder or a pipet? In what sequence were reagents mixed? Was "A" added to "B" or vice versa? How precisely were the reagents measured? Was the balance significant to 0.01 gram or 0.00001 gram?

4. How long did any reaction take? At what temperature? Did the color change occur immediately or after hours, minutes? Be as specific with your inlab notes as possible.

5. Make corrections by drawing a single line through the incorrect data. Be sure to leave the unwanted entry legible, as it may turn out to be correct.
Guidelines for the Formal Written Laboratory Report

A formal laboratory report is a scientist’s summary of the experiments used to reach and explain a conclusion. It is essential that a scientist not only be able to complete the experiments, but make the information available to others. This is typically done using a written report. Although CHEM 111 uses an abridged format, the following guidelines will help prepare you for subsequent courses where reports are routinely required.

General Report Guidelines

The following is a guide, with comments, on how to organize your report. The following five (underlined) headings are to be given exactly as indicated.

**Purpose:** State the reason you are going to do the experiment. It might be to learn a technique, to try a particular type of reaction, to analyze a compound or sample, to determine a constant, to verify a theory or a combination of these. Be specific. This should only be one or two sentences.

**Introduction:** This section includes the background of the problem, theory of a technique, theory to be investigated, or known reactions that you will be performing. Use sources (referenced at the end of the report) other than the laboratory manual, including your lecture textbook and the web.

**Data and Observations:** This should include your data shown in a table and any observations that you made during the experiment.

**Data Treatment and Discussion:** This is where you show the calculations, interpret the data and tabulate the answers. This section contains sample calculations, charts and graphs of treated data (clearly labeled as any notebook page), rearranged data and/or interpreted data. A connection should be made with the purpose. You should summarize the goal of your experiment, what was done and what was learned. Did the technique work as expected? How do you know? List possible sources of error and suggestions for eliminating them. Do not list vague things like “poor technique”, "human error" or "bad equipment". What could have been done differently (better?) and how could we improve this experiment. What additional questions did this experiment suggest? New ideas can also be recorded here.

**Conclusion:** Clearly summarize the specific results of the data treatment. The first sentence should be an answer to the purpose (often numerical). Your conclusion should not be more than two to three sentences long.

**Other Important Information**

Your typed (12 pt Times Font) laboratory report should have a cover page with your name, the date and the name of the experiment performed. When a report is written, never write using a first person reference. For example, the words I, we, you, they etc. should not be written in the laboratory report. When writing chemical formulas, you must use subscripts. For example water is \( \text{H}_2\text{O} \), not \( \text{H}_2\text{O} \). When equations need to be written, you should use an equation editor. This makes your equations look nice and neat. You should also use an equation editor to show the calculations that were performed in the laboratory. You can also make tables that are nice and neat by using the directions for your word processor program.