CHEM 111
Section 009
Fall 2013

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Lab:  T 11:00 AM – 1:45 PM
Office Hours:  M & F 11:15 AM – 12:05 PM
Web page:  http://chemistry.bd.psu.edu/halmi

Course Description

CHEM 111 is a one-credit introductory general chemistry laboratory. It is designed to complement the lecture course CHEM 110 (or CHEM 106). The students are introduced to laboratory safety and good experimental technique, how to keep a proper lab notebook, interpret data, and write a formal report. The course introduces laboratory experimentation in the context of a variety of specific topics, such as reactions in solutions, spectroscopy, acids and bases, and the synthesis and analysis of chemical compounds. GN credit for CHEM 111 requires that CHEM 106, CHEM 110 or CHEM 110H also be completed. Prerequisite or concurrent: CHEM 110 or CHEM 106.

Required Materials

Lab Handouts:  Downloaded from website: http://chemistry.bd.psu.edu/halmi
Lab Notebook:  Bound carbonless carbon copy notebook (50 or 100 pages)
Goggles:  Any goggles or safety glasses with side-shields
Combination Lock:  Bring your own or purchase from the chemistry club during lab (no keys please)
Other:  Flash drive (please store away from chemicals)

Laboratory Schedule

<table>
<thead>
<tr>
<th>Date</th>
<th>Experiment</th>
<th>Points</th>
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</thead>
<tbody>
<tr>
<td>Sept 3</td>
<td>Check-in &amp; Laboratory Safety</td>
<td>-</td>
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<tr>
<td>Sept 10</td>
<td>Introduction to Chemistry Techniques (Parts I, II and III)</td>
<td>-</td>
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<tr>
<td>Sept 17</td>
<td>Techniques (Part IV) continued</td>
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<td>Sept 24</td>
<td>Properties of Hydrates</td>
<td>20</td>
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<td>Oct 1</td>
<td>Rust and Other Oxides</td>
<td>20</td>
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<tr>
<td>Oct 8</td>
<td>Ionic Reactions in Aqueous Solution &amp; Coordination Compounds with Copper(II) (Part I) *</td>
<td>20</td>
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<tr>
<td>Oct 15</td>
<td>Coordination Compounds with Copper(II) continued (Part IIA &amp; IIB)</td>
<td>-</td>
</tr>
<tr>
<td>Oct 22</td>
<td>Coordination continued (Part IIC)</td>
<td>20</td>
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<tr>
<td>Oct 29</td>
<td>Analysis of Commercial Antacids Containing Calcium Carbonate (Part I) &amp; Formal Lab Report due</td>
<td>30</td>
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<tr>
<td>Nov 5</td>
<td>Antacids (Part II) continued</td>
<td>20</td>
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<tr>
<td>Nov 12</td>
<td>Molar Mass and the Ideal Gas Law</td>
<td>20</td>
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<tr>
<td>Nov 19</td>
<td>Calorimetry and Hess’s Law (including graphing assignment) &amp; Check-out</td>
<td>20</td>
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<tr>
<td>Nov 26</td>
<td>No lab – Happy Thanksgiving</td>
<td>-</td>
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<tr>
<td>Dec 3</td>
<td>Final assessment, rewrites for formal written lab, &amp; graphing assignment for Hess’s Law data due</td>
<td>40</td>
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* The Coordination Compound Experiment will require a formal written lab report. On October 8th you are only expected to complete the prelab for Ionic Reaction experiment. The prelab for the coordination compound experiment will be due October 15th.
Policies & Lab Safety

All students are responsible for safety in the laboratory and must understand the following safety rules.

1. **Always wear eye protection while inside a chemistry lab.** The requirement that you wear approved safety goggles in the laboratory is mandatory and is most effective in preventing the largest number of potential accidents of serious consequence. Each time it is necessary for the instructor to remind a student of the policy, two points will be deducted from lab courtesy points. Those unwilling to comply with this rule will be excluded from the course. Contact lenses absorb many organic vapors and may lead to severe eye irritation. Please try not to wear contact lenses in the lab.

2. Be sure you know the location of the fire extinguishers, eyewashes, safety showers and exits.

3. Report any accident immediately to your instructor. If fire extinguishers are used, make sure you report this fact to the instructor immediately so that it can be recharged.

4. Noxious or highly toxic chemicals must be weighed in a hood. Transfer the weighed material to your own hood in a stoppered or corked container.

5. You may work in the laboratory only when an instructor is in the same lab supervising.

6. No one is allowed in the prep room without the instructor’s permission.

7. The use of rubber gloves for all chemical manipulations is recommended. If you spill any chemical on yourself, wash the effected part immediately with water.

8. Dress properly for work in the lab. Shorts are not permitted unless a long lab apron is worn. Open-toe sandals cannot be worn in the lab. Wear old clothing and if possible use a lab coat for protection. Students will be sent home if proper clothing is not worn. Long hair must be tied back.

9. Dispose of chemicals in the proper containers provided and record on waste disposal list. Do not leave unlabeled containers in the lab and/or in your lab desk. Dispose of all trash properly.

10. Always replace the cap on a reagent bottle after use and return all reagent and solvent bottles to their proper place immediately! If you empty a bottle, take it to the instructor for refilling.

11. **Keep balances clean!!!** The balances are worth almost $2000 each!! Brushes and tissues are provided to allow you to clean up solid spills. Liquid spills should be reported to instructor.

12. Clean your desktop and sink before you leave the laboratory so that they will be ready for the next person who works at your bench. Be certain that no items such as filter papers collect in the sink.

13. Food and drink are prohibited from the laboratory at all times.

14. You will be assigned a desk filled with valuable laboratory equipment. You are responsible for this equipment. At the end of the course, you must account for all the equipment. Any missing glassware will be charged to your student account. Failure to check out will result in extra fess and a full letter grade penalty.

**Courtesy Points**

There are 20 points designated for lab courtesy. Courtesy points will be deducted for any safety issues as well as poor behavior in the laboratory. Courtesy point deductions include but are not limited to violations of the safety rules above, arriving late to lab, lack of preparedness, and disrespectful behavior towards the instructor and/or students. Minor violations will result in a warning and point deduction; serious violations will result in immediate expulsion from the laboratory.
Prelabs

At the start of each lab you will be required to hand in a prelab assignment. It will cover material that you are going to have to know for that particular week. Each prelab is worth 10 points and there will be a total of 11 prelabs handed in. Please write the answers to the prelab questions in your laboratory notebook. You will hand in the top sheet of the notebook and keep the duplicate for yourself. Prelabs are to be handed in before lab begins. If a prelab is handed in less than five minutes late, five points will be deducted. After five minutes, no prelab will be accepted.

Laboratory Notebook

From the very first day of laboratory class, you will be recording data and results in your carbonless laboratory notebook. You will be graded on your organization of data as well as your results.

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 data recorded in 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 your hypothesis and apply the Scientific Method in the data treatment and discussion section of your lab reports. 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 sugarcoat them in the notebook. A few general notes which you should specifically pay attention to in this course include:

1. Observations of chemical tests go here. 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.

2. Use the proper names for lab equipment 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?

3. How long did any reaction take? Did the color change occur immediately or after hours, minutes?

4. 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.

Your name and course should be written on the front cover. Leave two pages to add a table of contents section. All entries are recorded with a black or blue ballpoint ink pen. The key to writing a good notebook is simple clarity: clear layout, clear descriptions, and good penmanship. A notebook filled with scribbles and scrawls will waste your time when you look for something and may actually be misleading.
Lab Reports

You are expected to download and read the day’s experiment before you come to the lab. All data should be recorded in the appropriate pages of your laboratory notebook. Each lab report is to be handed in 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 since your instructor will be present. In the case of experiments that last more than one week, you must show your data with all of your calculations up to that point to your instructor. In experiments where you work in pairs, each student must submit separate lab reports. This does not mean two copies of the same report, it means doing your own work. Lab reports will be graded on experimental technique, quality of results, treatment of data and overall quality of work.

Formal Written Lab Report

You will be required to write a one formal lab report during the course. Your lab report must be typed and should resemble a more formal laboratory report. There are seven required sections to the formal written lab report:

1. Cover page (including name, date and the title of the experiment)
2. Purpose
3. Introduction
4. Data and Calculations
5. Discussion
6. Conclusion
7. References: (include at least two outside references)

Before you begin, please consider the following guidelines. When a report is written, never write using a first person reference. For example, the words I, we, you, they etc. are not typically written in the laboratory report. When writing chemical formulas, you must use subscripts. For example water is H₂O, not H2O. When equations need to be written, please use an equation editor. You can also use the equation editor to show the calculations that were performed in the laboratory. Handwritten calculations will not be accepted. If applicable, include tables to summarize data. The following section headings MUST be included.

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, or to verify a theory or a combination of these. Be specific. The purpose 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 in the laboratory. The introduction should be at least one to two paragraphs long. DO NOT INCLUDE THE PROCEDURE. Use at least two sources other than the laboratory manual. Outside sources may include your lecture textbook, reference texts and legitimate websites. Do not cut and paste information directly from your sources; this is plagiarism and penalties will be given accordingly.

Data and Calculations: This section should include your data shown in a table (if applicable) and include observations that you made during the experiment. The data and calculation section is where you detail your data, make calculations and tabulate the answers. This section contains sample calculations, charts and graphs of treated data, rearranged data and/or interpreted data. Briefly describe the calculations you are showing in the formal written laboratory report.

Discussion: The discussion is the heart of the report. This is where a scientist takes the data and calculations and interprets the date while explaining the results and necessary conclusions. A connection should be made with the purpose. You should summarize the goal of your work, what was done and what was learned. Did the technique work as expected? How do you know? You should list possible sources of error and give suggestions for eliminating these errors. 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 one to two sentences long.

Reports that are hand written will not be accepted. Late penalties will apply. If you receive an unsatisfactory grade on your lab report, you may rewrite the report to receive up to one half of the points you missed. When you hand in your rewrite for your formal written lab report, you must also hand in your original report as well.
Graphing Assignment

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. This assignment is worth 10 points.

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 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. The assessment is worth 30 points of your grade.

Grading

<table>
<thead>
<tr>
<th>Component</th>
<th>Points</th>
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<tbody>
<tr>
<td>Laboratory Reports</td>
<td>160</td>
</tr>
<tr>
<td>Prelabs</td>
<td>110</td>
</tr>
<tr>
<td>Graphing Assignment</td>
<td>10</td>
</tr>
<tr>
<td>Formal Written Lab Report</td>
<td>30</td>
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<tr>
<td>Final Assessment</td>
<td>30</td>
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<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>
</table>

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/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 1 Reed Union Building, 898-7101. For more information see 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/ or Behrend’s Academic Integrity policy at psbehrend.psu.edu/intranet/faculty-resources/academic-integrity.