

This is the good stuff! General Chem lab is where you get to see chemistry happening, smell chemistry happening, feel chemistry happening. Where you get to try things out, make predictions, and test those predictions. Where you get to make things and measure things and monitor things and tweak things and see what happens. Oh, baby, hold me back! This is too much fun!

Ahem...

In keeping with my excitement about lab work (see above) and recognizing the possibilities offered by our new format of linking General Chemistry lecture sections with particular lab sections, I want to make a special effort this semester to make the lab portion of our course as much fun as possible. I hope that you will take full advantage of your energetic and highly capable lab assistants, and of me, to help you overcome any hurdles you may encounter in procedure or understanding. And I encourage you to play around a bit -- feel free to suggest alternatives to the formalized procedure in the lab manual if you find that there is some related question or experiment that you would rather explore. This *is* a chance to dabble in cool science. Make use of it!

### **The Goal**

My goal for this portion of General Chemistry is simple: to give you an opportunity to really *experience* experimental chemistry. All the information that follows is intended to help you do that -- human and material resources you can muster, simple guidelines to keep us all safe in the process of investigation, exercises to help you adequately prepare for, make records of, and reflect upon each week's investigation. I hope that you will give me lots of feedback as we go so that your lab assistants and I can make this a great learning experience for you.

### **Materials**

*Guide to Experimental Chemistry, Fall 2001* (Denison University)

Laboratory notebook

Laboratory goggles

### **Lab Assistants**

Elizabeth Carlisle

Ryan Hollister

Lara Kuck

### **Attendance Policy**

It is impossible to learn from a lab class if you aren't present. Therefore, you *must* complete all laboratory assignments in order to pass this course. It's that simple. If you become aware of an unambiguous *need* to miss a lab some week, please contact me as far as possible in advance. If you've been ill, please provide me with supporting documentation from Student Health or the Academic Support office. In either case, it may be possible for you to make up the lab by visiting another lab section; otherwise we'll work out a special arrangement.

### **Laboratory Attire**

In order to minimize the potential of danger to you from the accidents that can occur in any laboratory, I insist that you observe the following clothing guidelines **AT ALL TIMES**:

- goggles must be worn while you are within the laboratory
- no open-toed shoes are allowed in the laboratory
- no above-knee skirts, shorts, or dresses are allowed in the laboratory unless they are worn underneath a lab coat

## **Pre-labs, notebooks, and lab reports**

***Before you come to lab each week*** To make the most of lab, especially given how little time we have to play with these experiments each week, you must prime your mental pump -- you must read and think about the experimental situation.

Each section in your lab manual includes a pre-lab exercise ("preparation" sheet). I encourage you to look these over as a sort of self-test to help ensure that you understand key aspects of the lab exercise before coming in each week, but I will *not* ask you to hand them in.

Based on what is in the manual, you should write a brief title and objective in your notebook before each meeting. Some people also like to write a thumbnail overview of the procedure in their notebook, to follow as they go through the exercise in lab, while others prefer to write down the procedure and their observations as they go along. The choice is yours, so long as you have a written procedure in your notebook at the end of the day.

To ensure that you have read and thought about the day's lab activity, we will start each lab session with a short (10 minute) quiz. Each quiz will contain three questions and will be open-book/open-notes. The questions will address, in loose terms, the questions:

- Did you read and understand the description of the exercise in the manual?
- Can you process the data that you will be collecting in lab this week?
- Have you been thinking about how this lab and previous labs fit together in the larger context of General Chemistry?

If you don't understand the preparation sheet for the lab, please ask for help, as the quizzes will often pursue similar issues. I will also occasionally send out corrections or comments on the lab or the lab manual in the days leading up to our weekly lab sessions. Although I will try to remember to mention these in class, I will usually distribute them by email, so please be in the habit of checking your email regularly.

***Your laboratory notebook*** is your record of what you did and what you observed in lab. Good lab notebook entries will allow you to go back and reconstruct what happened during each experiment hours, days, or even years later. This permits you, as a scientist, to do two fundamental things -- to *reflect* on your experiments, and to *repeat* them should the need arise. Although most of us develop a personal style in our notebooks with practice, I recommend the following organization to get you started:

a) leave a few blank pages for a table of contents

b) for each lab,

- put your name, the date, and the name(s) of your lab partner(s) on the top of *every* page
- begin the description of the week's lab with a title and a few lines describing the purpose of the experiment(s) -- as noted above, to receive maximum benefit from thinking about why you are conducting the experiment, you must do this *before* coming to lab each week
- as mentioned above, before you come to lab you may wish to write out a summary of the procedure in your own words so that it will be easier for you to move quickly through the experiment. Again, this is up to you -- what matters is that you have a written procedure in your notebook by the time you are actually doing the experiment.
- as I go through the lab procedure during the pre-lab discussion, you should enter a "Notes On Procedure" section in your notebook. I ask you to do this to ensure that you are following along and taking note of what are often key points in the experimental protocol. Your alertness and accurate recording of these points should reduce your frustration with the particulars of the experiment and enhance everyone's safety in the laboratory.
- record the procedure you are following and *your observations as you follow it* in enough detail for a complete stranger to reconstruct what you did. You do not need to include painstaking detail, as long as you make reference to the step you are following from the lab manual. Remember, this is the fundamental purpose of your laboratory notebook: to document what you did and what you experienced in a manner that will be intelligible days, months, or years from now. If you find that it

is illegible, you may certainly re-write it, but *never throw out the original data*; simply add the prettier version to the original.

As mentioned in the lab manual, all descriptions of laboratory observations and data should be recorded *directly* into your lab notebook *IN PEN*. Mistakes should be lined out with a single line, rather than obliterated or whited-out. To help you to develop good note-taking skills in the laboratory, I ask that you hand in the yellow copy of your notes for feedback as you leave the lab each week. Please write clearly and darkly enough to ensure that the yellow copy of your notes is legible.

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**Lab reports** will be opportunities for you to reflect on what you did in lab and what your results mean. Typically, I will ask you to focus on only one or two questions, and for some labs I will ask you to explore different questions from those in the lab manual. Therefore it is *imperative that you pay attention to what it is that I want you to turn in*. In order to make this easier, I will send you my guidelines for each report by email. Be sure to refer to this message when you are composing your report.

For those weeks in which you are exploring the experiment as a group, I will ask you to submit a *joint* lab report. It is my intent that by working together to answer the questions and formulate your responses, you will learn from each other and come to a deeper understanding of the issues at hand than either of you is likely to arrive at alone. In order to ensure that all the members of your group are participating whole-heartedly in this collaborative learning, I will also ask you to submit, individually, a brief assessment of each of your group partners. This **peer assessment** will consist of one or a few sentences telling me how well you feel your partner(s)...

- participated in the execution of the lab experiment itself.
- seemed to understand the material you discussed together.
- helped you to understand the experiment more deeply.

If you find it useful, you may use a scale of "above average"/"average"/"below average" in your evaluations. I will keep track of how your peers assess your collaborative participation and will use these comments as a primary factor in determining your subjective lab score. All peer evaluations will be kept strictly confidential (except in cases of mutual consent). Please turn in your peer assessments via email by 5:00 pm on the Monday following each lab.

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Although I will not *require* it, I *strongly recommend* that you type your report. This not only makes it (typically) easier for me to read, but in my experience the quality of typed reports suggests that the process of typing helps students to reflect more thoroughly on the meaning of the experiments. Reports should be stapled and turned in (to the drop box in the Chemistry library) by 5:00 p.m. on the Monday following each lab. (Email submissions are fine as well.) Late lab reports should be turned in to me directly. Late reports turned in to the report drop box will not get picked up until one week after they were due; such reports *may* be graded, at my discretion. Over the course of the semester, there will be 11 reports plus one group poster presentation worth 4 reports.

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#### **(Probable) Assessment scheme**

Prelab quizzes	9 x 5 pts each =	45 pts
Lab notes	13 x 3 pts each =	39 pts
Lab reports	15 x 5 pts each =	75 pts
<u>Subjective assessment</u>		<u>31 pts</u>
TOTAL		190 pts

The subjective score will reflect my appraisal of how actively you are engaging the material and how responsible you are about your participation in lab, as well as your peers' appraisal of your participation in collaborative activities. It will NOT reflect the quality of your results.

The final point total will be scaled to count for 25% of your course grade for Chem 121.