

Chemistry 40
Laboratory and Conference Hour
Instructor: Torrey Glenn

Spring 2009

The **laboratory** component of this course serves two distinct purposes: 1) it is designed to reinforce chemical concepts from lecture through hands-on experience and 2) it serves as an introduction to the techniques, instruments, organization skills and communication skills used in the chemistry laboratory.

The **conference hour** is devoted to discussion and group work.

Schedule

Thursday 6:10-10:00 PM, Room: S-212

Required Materials

Chemistry 40 Laboratory Manual, 9th Edition (purple cover)
Bound Laboratory Notebook**
Safety Glasses
Scientific Calculator (non-programmable)
Mini-stapler

**As discussed in class, lab notebooks must be permanently bound (no spiral ring or perforated rip-out pages). You will be required to hand in duplicates of your lab notes with each lab report sheet. Carbonless duplicate laboratory notebooks are available in the college bookstore (recommended). Alternatively, you may photocopy your lab notes each week.

Lab Work

There are three components to your lab work: **pre-lab**, **in-lab** and **post-lab**.

Pre-lab

Read lab background and procedure *before* the lab session. Prepare the pre-lab portion of your laboratory notebook. This includes entering the experiment date and title, answering the assigned pre-lab questions and preparing any data tables that will be required. *Pre-lab work will be checked via notebook sign-off during conference hour.*

In-lab

Perform experiment. **Record, in ink, all data and observations directly in your bound laboratory notebook.** See "Keeping a Laboratory Notebook" below for more information. *In-lab work will be checked via in-lab observation. If necessary, suggestions for improvement will be made and noted in your lab notebook. Notebooks must be signed and dated by both student and instructor at la's end.*

Post-lab

After recording data and observations, you must process the data and clearly present the results of the experiment (communication is a *big* part of science). You will be required to complete a Laboratory Report Sheet following each experiment. *Post-lab work will be checked via grading of collected work. All lab work is due at the **beginning** of the following conference/lab session unless otherwise noted.*

Lab Policies and Keys to Success

Safety first! Always act in accordance with all lab safety rules. You are expected to learn and adhere to the safety guidelines outlined in the laboratory manual in order to ensure a safe laboratory environment for both yourself and the people near you. Additional safety precautions will be announced in class prior to experiments where a potential danger exists. If you have any questions regarding lab procedure or safety, ask for immediate help. Students who fail to follow all safety rules may be asked to leave the lab and/or suffer grading penalties.

Attendance is mandatory in both the conference hour and the lab. Any student who is absent from two or more sessions will be considered a non-participant and may be dropped from the course.

Lab grading is based on pre-lab (~25%), in-lab (~25%) and post-lab (~50%) work. Each experiment will be graded based on neatness, accuracy and completeness. Your lab grade is 22% of your overall course grade. Late work is not acceptable and, if unexcused, will be subject to a 50% grade mark down (acck!). Work received more than one class session late will not be accepted. An earned F in lab will result in a failing grade for the course.

Preparation is key. Laboratory time is valuable learning time; make use of it. Arrive prepared. Read lab experiment or exercise *before* lab. Do any necessary planning/calculations *before* lab. The more effort you invest in pre-lab work, the easier the in-lab and post-lab work will be.

Learning time is valuable. The lab is three hours each week; three hours of pre-scheduled chemistry time, three hours of hands-on, concept-clarifying, question-asking, discussion-prompting, maybe even thought-provoking time... You get the point! *Think* about what you see. Strive to make clear and true observations rather than simply following a fill-in-the-right-answer kind of strategy. Work to make concrete connections to lecture material. And finally, don't procrastinate about post-lab work; start post-lab work while the experiment is fresh in your mind.

Keeping a Laboratory Notebook

You will be required to keep a laboratory notebook in this class. The "General Guidelines" for properly keeping your lab notebook are listed on **pages 6 and 7 in your laboratory manual**. Included here are more detailed instructions. For each experiment (unless otherwise noted) you will be required to prepare your notebook pre-lab as describe below.

Pre-lab Notebook Instructions:

You are expected to come prepared for lab. Read the experiment, then prepare your notebook. All notebook entries must be written in **ink** (no pencil).

Pre-lab includes:

Title: Give a specific title.

Purpose: Briefly state the objectives of the experiment.

Procedure (or Method): Reference the procedure.

Data/Observations Section: Set up necessary data tables for use during the experiment.

Pre-lab work will be checked off prior to the start of the experiment (usually in the conference hour). Failure to arrive prepared will result in a grade markdown.

In-lab Notebook Instructions:

During lab you will record your data and observations (in ink) directly into your lab notebook. No loose sheets of paper! Any loose-sheet data or graph should be glued/taped to the notebook page. If you make a mistake cross it out with a ~~single~~ single line (no obliterating scribbles!) and write the correction next to it. The 'mistake' should remain legible. (Can you think of a reason why?)

Post-lab Notebook Instructions:

After recording data and observations, you must process the data. You will often need to do calculations to get your results. You will then need to discuss those results and draw a conclusion. These sections are usually started while still in the classroom, but may be completed at home. Lab notebooks must be signed and dated by both the student and instructor before the student leaves lab. A report sheet will be provided at this time.

Post-lab includes:

Calculation Section:

All data processing calculations should occur here. This section does not need to be super neat, however, all numbers must include units and all calculations should be clearly labeled (so that anyone who might look at your notebook could understand what you are calculating).

Discussion and Conclusion Section:

The discussion and conclusion section is where you report and discuss your experimental results. Show that you understand the experiment: Explain, Analyze, Interpret.

Here are three discussion strategies:

1) Compare expected results with those obtained.

If there were differences, how can you account for them? Propose possible explanations for any unexpected or confusing results. Be specific; DO NOT say "human error"—this phrase is incredibly vague and conveys no valuable experimental information.

2) Analyze experimental error.

Was it avoidable? Was it a result of equipment? Suggest logical explanations for problems in the data. Explain how specific experimental errors could have affected the results. If the flaws result from the experimental procedure, explain how the procedure might be improved.

3) Explain your results in terms of theory.

Often learning-labs (the type of labs we're doing in Chem 40) are intended to illustrate important physical or chemical laws or relationships, such as chemical periodicity, the mole concept, or stoichiometry. How well has the theory been illustrated by the results of this experiment?

The discussion section should not be long (a few short paragraphs). Writing should be concise and to the point. The last brief paragraph must be a conclusion statement. State what you know for sure (your conclusion) based on your results from the lab.

Notes and Report Sheet Due the Following Lab

Duplicates of your lab notes will be due the following lab session (unless otherwise noted). You will staple these copies to the back of a Report Sheet. Report Sheets will be provided at the end of each laboratory meeting and will include a results summary section and space for you to answer the lab follow-up questions.

Chemistry 40 Lab Schedule

Glenn, Spring 2009

Date	Lab Manual	Lab Title	Due Dates
1/15	E1	Basic Algebra, Calculator and Graphing	Report Sheet - Due 1/22
1/22	E2	Laboratory Safety, <i>then</i> Measurements	Report Sheet - Due 1/29
1/29	E3	Separation of a Mixture	Report Sheet- Due 2/5
2/5	Handout	Electron Shell Model, <i>no prelab required</i>	TBA
2/12	Handout	Ionic Bond, Ionic Compounds, <i>no prelab required</i>	TBA
2/19	E5	Evidence for Chemical Reactions	Report Sheet- Due 2/26
2/26	E6	Precipitation Reactions	Report Sheet - Due 3/5
3/5	E7	The Mole Concept	Report Sheet - Due 3/12
3/12	E8	Synthesis and Composition of a Compound	Report Sheet- Due 3/19
3/19	Handout	Problem Solving Workshop, <i>no prelab required</i>	TBA
3/26	E11 E12	Chemical Families Periodic Properties of the Elements	Report Sheet - Due 4/2
4/2	Handout	Modern Atomic Theory, <i>no prelab required</i>	TBA
SPRING BREAK 4/4 -4/12			
4/16	E13	Electron Configuration and Lewis Dot Structures, <i>no prelab required</i>	Report Sheet - Due 4/23
4/23	E10	Specific Heat of Water	Report Sheet - Due 4/30
4/30	E16, I-II	Acid-Base Titration, Part I and II: Dilution and Standardization of NaOH	Report Sheet - Due 5/7
5/7	E16, III	Acid-Base Titration, Part III: Standardization of Unknown Formic Acid Solution	Report Sheet - Due 5/14
5/14	E14	Molar Volume of a Gas	Report Sheet - Due 5/19 (at Final Exam)