CHEMISTRY FOR ENGINEERS LAB -- CHEM-1050 **Fall Semester -- 2009**
Lab Syllabus **Dr. Douglas J. Miller**

TEXT: Laboratory Manual from Chemical Education Resources (Required, new, not used). Be sure to get the **CHEM-1050** copy, **not** the CHEM-1110 copy!

INSTRUCTOR: Any directions from your Instructor, Mr. Eric Johnson, will supersede directions in this syllabus. Mr. Johnson will be the one who manages the labs and grades the reports. Most questions pertaining to lab reports, lab scheduling, and lab grading should be directed to Mr. Johnson.

MEETING TIMES: Sections are listed in your course schedule. 1050-01 signifies that you are in lab section 01. Sections 01 (Tuesday), 03 (Wednesday), and 05 (Thursday) meet one week and alternate with sections 02 (Tuesday) and 04 (Wednesday). Tuesday and Thursday labs meet at 8 AM. Wednesday labs meet at 3 PM. There are **NO** labs on Mondays or Fridays.

Sections 01, 03, and 05 begin on August 25-27. Sections 02 and 04 begin on September 1 - 2. Each lab section normally meets every other week. Lab section 02 meets on November 24 before Thanksgiving vacation whereas lab section 04 meets on December 2. A tentative lab schedule appears at the end of this syllabus. Changes are quite possible and you will be notified of such changes either by E-mail or in class.

You are responsible for checking your E-mail and WebCT frequently since updates, instructions, and new lab material are normally delivered in this manner. Not reading my E-mails correlates highly with poor grades, although the converse does not necessarily hold true. My E-mails **self-delete** after about two weeks of languishing unopened in your inbox.

GRADING (or why is my lab grade so low?):

You earn points in this lab through good laboratory work and satisfactory completion of the pre- and post-lab questions. Neither simple attendance nor excessive effort automatically entitles you to a high grade.

Each experiment will normally have a set of pre-lab questions on WebCT which are often, but not always, worth five points. You **must** complete the WebCT pre-lab questions by the starting time of your scheduled lab day. A grade of zero will be recorded for any pre-lab not taken by the deadline. There is generally a one hour time limit when taking the WebCT pre-lab quiz, and you are allowed all the typical "open-book" resources when taking this quiz (but no direct answers from other students). Temporary CedarNet outages are insufficient grounds for non-completion of quizzes since you have several days during which you may take a quiz. Check your quiz grades on WebCT since no warnings are issued for missed quizzes. The pre-labs in the lab manual should not be handed in unless you are instructed to do.

In addition to the WebCT quiz, each lab exercise will usually have a data & analysis section and a set of post-laboratory questions. A data/analysis section and post-lab questions appear in your manual but are often supplemented or replaced with material on WebCT. Your grade will be based on the quality of your experimental results and your performance on all sections of the lab exercise. Each lab is worth a total of 20 lab points (frequently, 5 points each for the pre- and post-lab work and 10 points for the Report and Calculations/Results).

The safety module, TECH-600, includes both a Chemistry Laboratory Safety Agreement and Laboratory Safety Quiz which must be completed before you will be permitted to carry out any further work in the laboratory. The Safety Quiz is completed in lab on your first day in lab. MISC-408, Representing Data Graphically, provides background for the procedure carried out on your first day. The actual procedure for this lab will be located on WebCT.

The data/analysis section and post-lab questions are graded by Mr. Johnson. Direct lab questions to him. This material is, unless you specify otherwise, returned either in lab or via the campus mail system. Questions about WebCT should be directed to me.

LAB REPORTS (or, how to gain or lose lab points):

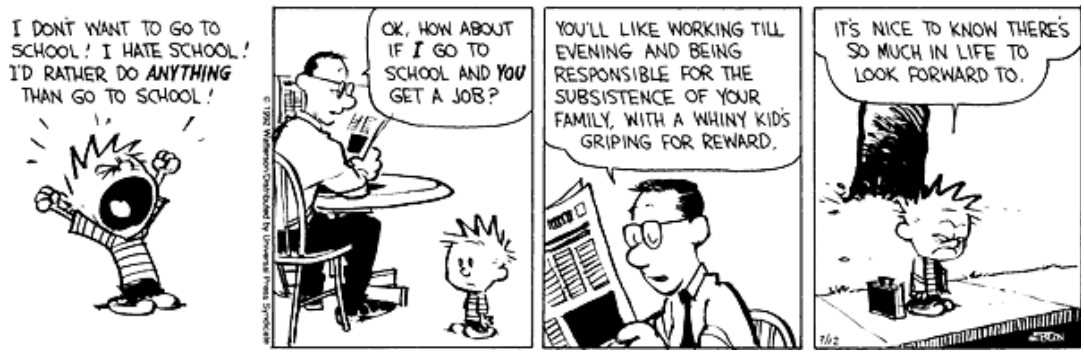
As you work in the lab, you are to enter your data on the **data sheets** that are provided with the exercise. **You must submit the original data sheets**, not a recopied version of them, as a part of your completed report. Your report may not be spotless but it can, and should, be neat. Cross out bad data with only a single line, not multiple lines. Do not use any form of white-out. Messy labs will be assessed a penalty, and illegible material will not be graded. Write down all information requested and any additional data that you feel might be important. Ask your instructor if you are uncertain about the value of a piece of information.

Requirements for Lab Reports (penalties apply when any are not met):

1. **PO Box number** must go in the upper right hand corner (above your name) of the top page.
2. **Your full, legible name must go in upper right hand corner of each page, especially the first page and on graphs.**
3. **The post-lab must go first (on top) unless otherwise specified.** The Data Sheets go next, followed by any calculation pages, then any graphs.
4. **You should print all lab files from their appropriate applications such as EXCEL (xls), WORD (doc), or ADOBE (pdf).** Deductions may be assessed on materials printed from some type of viewer application (such as found in GroupWise). Contact computer services or some other geek to find out how to print files from their appropriate applications.
5. **The papers must be stapled in the upper left hand corner.** No other method of attachment is allowed.

6. **All graphs, whenever possible, must be computer generated (preferably by EXCEL), unless you are instructed otherwise. Graphs done by hand are only accepted with permission and only when Excel graphs are not feasible.** Generally, for graphs, follow the guidelines located within MISC-408.) Clearly label the axes of each graph with title and units used, use appropriately sized units on the axes, place a title on the graph, and place your name on the upper right-hand corner of each page. Any graph must take up, at least, about half a page.
7. **SHOW ALL OF YOUR CALCULATIONAL WORK! All calculations, or at least a representative sample, must be shown either on the lab or on an extra attached sheet.** This also applies to any work done by a spreadsheet.
8. **No attached sheets should have "confetti edges" from being torn from a notebook or ring binder.**
9. **Avoid the temptation, no matter how great, to let any lab partner or classmate do your thinking and/or lab calculations for you!**
10. **Labs handed in later than the beginning of your next lab session are considered late and will be assessed late penalties.** The value of missing lab material will drop to zero at some point. Lab material for a particular lab is never accepted after that lab is handed back to the class as a whole.

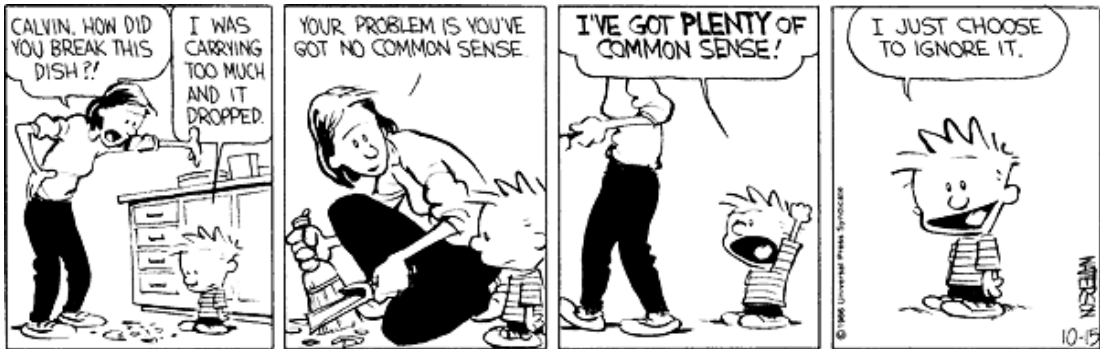
ATTENDANCE (and be sure to pack that brain to go with the body):



You must complete each exercise at your scheduled lab time unless you have permission from the lab instructor. If a conflict arises with a school-sponsored activity (field trip, national SAE meeting, etc.) or if you are ill on your regular lab day, you may complete the exercise on any other lab day on which that exercise is scheduled to be done (space permitting and with permission from all the lab instructors involved). No other type of make-up lab work is permitted. You may be excused from the work if you have a written explanation for your absence and the lab instructor approves the excuse. You may be excused from a maximum of one exercise. You must consult with your lab instructor concerning any additional lab exercises missed. The physical capacity of the lab room is 24 and is rarely exceeded. [**NOTE**: There are no Monday or Friday labs and there is no section 06 (a Thursday morning lab). Wednesday lab sections are normally already filled to near the room capacity of 24.]

You will not be allowed to leave lab early for meetings of campus groups, for registration, for intramural sports, etc. If anyone insists that you must meet with them, contact your lab instructor and let him explain to the individual why you cannot make the meeting.

LABORATORY SAFETY (or, how to keep all the body parts you arrived with):



An important goal for any laboratory course is to avoid serious accidents or injuries. You must be willing to follow several rules in addition to applying your common sense to the lab situations you face. You all should have signed the **Chemistry Laboratory Safety Agreement** that commits you to obeying several safety rules. Habitual failure to follow safe laboratory practices may result in grade penalties (such as a grade of zero for that lab) and expulsion from the laboratory.

All safety regulations are important and must be obeyed; however, several will be mentioned more often than others. Safety is important both in the lab and in your daily lifestyle.

Splash-proof safety goggles must be worn continuously throughout the lab period. These must be worn even if you wear prescription lenses mounted in frames. Any time you are handling chemicals or glassware you risk the danger of eye injury. It is just as important that you wear eye protection when you wash beakers or weigh out samples on the balance as when you work at your lab bench. Goggles also protect you from the actions of your lab-mates, not just from your own actions.

You **must** wear clothing that is consistent with good laboratory safety; therefore, the University's Class Dress Code does not apply to laboratory work in chemistry. Older pants, slacks, or jeans should be worn, although female students may wear longer dresses if they desire. The goal is to cover up as much of the body as possible with clothing that you do not mind having a few acid holes in. This goal is often contrary to the prevailing sense of fashion. Shorts, pants with holes already in them, sandals, open-toed shoes, or high heels must never be worn in the laboratory. Female students should ensure that hair or jewelry does not hang down into the work area. Students dressed inappropriately for lab will be required to go back to their room to redress

properly. This exception to University dress codes does not extend to chapel or classes before or immediately following lab.

Leave your book bags and coats outside the lab or on the rack inside the laboratory (ENS 219). Never place these items on the laboratory benches or on the floor spaces near the benches, isles, or exits. Do not sit on the laboratory benches. Only place your notebooks on spaces that you have first inspected and wiped clean.

Consider space inside the hoods in the lab to be covered with the vilest of chemical substances and keep you head outside the hood door. Never place anything in or near your mouth while you are in lab. Use the beaker tongs, not crucible tongs, or a lifting device made from a strip of paper towel in order to lift and carry beakers. Note that burning-hot objects look much like room-temperature objects.

Common sense plays a major role in lab safety. If you are not sure about how to safely handle a substance or piece of equipment, ask your instructor. The lab exercises also provide some safety instruction. Specific safety precautions for the exercise of the week will be emphasized at the beginning of the lab period. Lab time can be a safe and enjoyable experience if you can relax in lab and think about what you are doing.

GENERAL LAB OPERATIONS (the ten commandments of lab?):

Good lab habits are important for your success and for your safety. The following rules apply each time you are in lab.

1. **DON'T PANIC!** Read ahead, plan, and move with deliberate thought.

2. **Attempt to use materials from a single drawer.** If you do not have an item called for in the lab procedure, check unused drawers or contact your instructor. You are not to rob drawers being used by a classmate to stock yours.

3. **Do not be embarrassed if you break something.** Have your instructor get a replacement for you. You can keep your drawer completely stocked if you will do this consistently.

4. **Clean all glassware and other equipment before leaving the lab.** This includes cleaning the counter space you used. Place, unless otherwise instructed, all material back into the appropriate student drawers or cabinets.

5. **Use distilled water sparingly and rarely rinse glassware directly under a distilled water tap.** It is each student's job to fill the clear-plastic distilled water bottles (most do not have labels) in the lab with distilled water from a verified distilled water tap (labeled DW). Clean your glassware by scrubbing it with a brush and soap solution, rinsing thoroughly with tap water and, finally, rinsing

three times with small portions of distilled water. Place the damp equipment into your drawers.

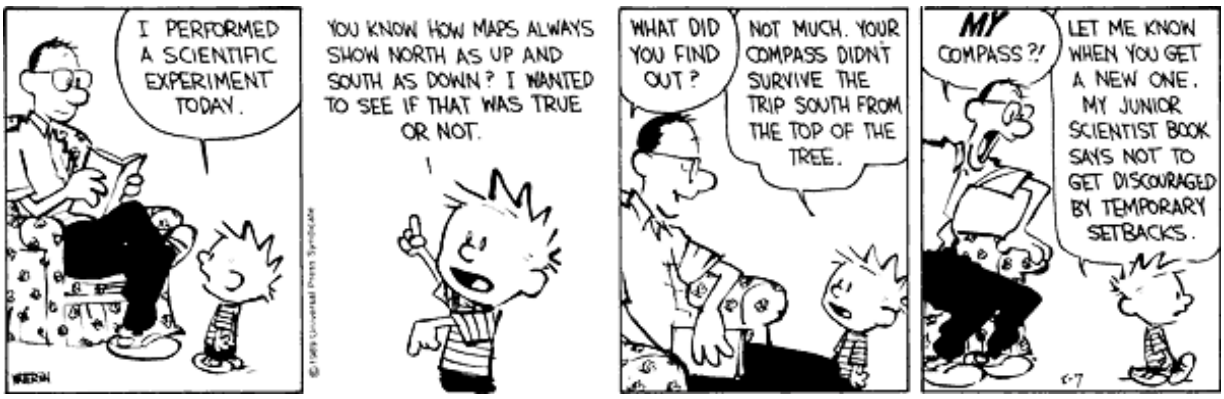
6. **Look at any labels on plastic lab bottles to ensure the identity of their contents as they may contain soap water or other chemicals instead of distilled water** (especially if they are not of the clear-plastic type).

7. **You may use wet glassware most of the time.** You will be told when to use dry equipment. Do **not** jam cheap paper towels into expensive, scientific glassware since removal of such material may prove problematic.

8. **Keep all working areas in the lab clean throughout the lab time.** Use a beaker as a temporary trash can for matches, litmus paper, etc.

9. **All spills of liquids or solids must be cleaned up immediately.** This is especially true around the expensive digital balances. Instructions for clean up of hazardous materials will be provided at the beginning of each lab session in which the material is used. Failure to keep the lab clean will force the instructor to take measures to ensure lab cleanliness.

10. Some of the wastes generated during the lab have special disposal procedures. We want to insure that none of these materials will be poured down the drains or put into the trash can in the lab. Labeled waste containers will be provided for many of the materials generated in the laboratory. Look for the containers and match your waste material with the correct container. Glass waste, in particular, goes into a cardboard receptacle labeled for that purpose.



LAB SCHEDULE NOTES (what and when):

The exercises are NOT necessarily performed in the order in which they are organized in the laboratory manual purchased from the bookstore. Take particular note of vacation times.

August 18 - 20: NO LABS

August 25 – 27 (01, 03, 05) and September 1 – 2 (02, 04):
General Laboratory Introduction/Safety Instruction
TECH 600: Practicing Safety in the Chemistry Laboratory
MISC 408: Representing Data Graphically

September 8 – 10 (01, 03, 05) and 15 – 16 (02, 04)
ANAL-605 -- Determining the Percent Water in an Unknown Hydrate

September 22 – 24 (01, 03, 05) and September 29 - 30 (02, 04):
STOI-475 -- Determining the Composition of a Cobalt(II) Nitrate Sample by Visible Spectroscopy

October 6 – 8 (01, 03, 05) and October 13 -14 (02, 04):
SYNT-341 -- Synthesis of Strontium Iodate Monohydrate

October 20 – 22 (01, 03, 05) and October 27 – 28 (02, 04):
ANAL-618 -- Standardizing a Sodium Hydroxide Solution

November 3 – 5 (01, 03, 05) and 10 – 11 (02, 04):
THER 609: Estimating a Heat of Neutralization

November 17 – 19 (01, 03, 05) and 24T (section 02) [Section 04 meets <u>after</u> vacation.]:
EQUL-616 -- Introducing Chemical Equilibrium

November 25 - 26: NO LABS!

December 2W (section 04):
EQUL-616 -- Introducing Chemical Equilibrium

Week of December 6: Final Exam period begins on Tuesday. Classes meet on Monday. No labs meet.