**WHAT YOU WILL NEED FOR THIS COURSE BEGINNING WEEK 2:**

**Experiments:**  First Year Chemistry Laboratory Manual, MTU Department of Chemistry, 2004-2005 edition (available at the bookstores)

**Eye protection:**  Visorgogs or safety goggles (may be purchased at Chem Stores, B002, in basement of Chem Sci Bldg). Note that safety glasses are not approved for first-year chemistry labs.

**Proper attire:**  Wear clothing that provides the most protection. Shorts, skirts or dresses must be knee length or longer. Open shoes (sandals) are not allowed. You will be required to go home and change if you are not dressed appropriately.

**Reference Text:**  Chemistry, 4th ed., Oxtoby, Freeman, & Block (CH1120 lecture text)
| Week 1  
(10-14 Jan) | Introduction, Safety, Check In |
|-------------|--------------------------------|
| Week 2  
(17-21 Jan) | Aluminum Recycling, #2 |
| Week 3  
(24-28 Jan) | Determination of an Equilibrium Constant, #7 |
| Week 4  
(31 Jan - 4 Feb) | Galvanic Cells, to be distributed in lab week 3 |
| Week 5  
(7-11 Feb) | Winter Carnival- No CH1120 Labs |
| Week 6  
(14-18 Feb) | Determination of the Rate Law of a Reaction, #9 |
| Week 7  
(21-25 Feb) | Lab Quiz |
| Week 8  
(28 Feb-4 Mar) | VSEPR Theory, to be distributed in lab week 7 |
| Week 9  
(14-18 Mar) | Spectroscopy of Food Dyes, #26 |
| Week 10  
(21-25 Mar) | Preparation of a Coordination Compound, #21 |
| Week 11  
(28 Mar-1 Apr) | Electrolysis & Faraday's Law, #10 |
| Week 12  
(4-8 Apr) | Polymer experiment, to be distributed in lab week 11 |
| Week 13  
(11-15 Apr) | Lab Practical |
| Week 14  
(18-22 Apr) | Evaluations, Clean up, & Check out |
ABSENCES: You may make up work for excused absences only. The lab supervisor decides whether an absence is excused, not your instructor. Excused absences include those due to university sponsored field or athletic trips, or illness. In the event of a university sponsored activity, the student is responsible for contacting the lab supervisor before the missed lab session. In case of illness, the student must contact the lab supervisor as soon as he or she knows the lab session will be missed. The student may be required to present written confirmation of the reason for the absence. If in doubt about whether an experiment can be made up, you must contact the lab supervisor, not your instructor.

To report an absence, see (Rm 508B), phone (487-2044), or e-mail (lareilly@mtu.edu) your lab supervisor. To arrange for a make up session, you will need to discuss the arrangements with your supervisor. This means that you should phone or visit her at your earliest opportunity. If contacted in ample time, the lab supervisor will reschedule you into another lab session the same week. All makeup labs must be performed within one week of the absence. Also note that you are responsible for understanding the material contained in the missed experiment for the laboratory quiz and practical.

If more than two experiments or one lab quiz or one lab practical is missed and not made up, you will automatically fail the lab component of this course. If you fail the lab component, you also fail the entire CH1120 course.

LAB GRADING: 153 points total, see following point distribution:

<table>
<thead>
<tr>
<th></th>
<th>Points</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experiments (based on effort):</td>
<td>108pts</td>
<td>(70%)</td>
</tr>
<tr>
<td>Lab Quiz (based on correctness):</td>
<td>15pts</td>
<td>(10%)</td>
</tr>
<tr>
<td>Lab Practical (based on correctness):</td>
<td>30pts</td>
<td>(20%)</td>
</tr>
</tbody>
</table>

Experimental: Each of the nine experiments have 12 points associated with it (108 points total, 70%). The following grading criteria applies to all of the experiments.

Three (3) points for the following:

- **Effort in preparing for each lab** (coming to lab on time, with approved eye protection and drawer combination, properly dressed, and prelab assignments completed)
- **Effort during lab** (knowledge and understanding of the procedure and chemistry involved; organization and ability to budget time, common equipment check in/out procedures followed, cooperation and attitude)
- **Safety rules followed** (approved eye protection worn at all required times, proper waste disposal, clean work areas, labware cleaned at completion of experiment)

Six (6) points for the following: **Effort in completing the report sheet** (data and observations recorded correctly and comprehensively, one example of each calculation performed shown in detail, appropriate graphs, inclusion of units and labels on data, data recorded in ink, one single line through mistakes). **Grading criteria for these points will differ for each experiment**.
Three (3) points for the following: Effort in completing the postlab questions (clear, concise and comprehensive answers) Good effort = 3 pts, Average effort = 2 pts, Poor effort = 1 pt, Not done = 0 pts.

The Lab Quiz and Lab Practical are designed to assess your skill in performing basic lab techniques, ability to make thorough observations, record keeping skills, ability to communicate your findings, understanding of significant figures, ability to solve problems, and knowledge of safety procedures.

SAFETY: Chemistry as an experimental science is an exciting subject, however, experimentation in a chemistry lab has an element of danger and risk associated with it. This is particularly true if the surroundings, tools, or techniques are unfamiliar to you. It is important to be prepared and to think safety - both for yourself and others in the lab. If in doubt about the safety of any procedure, ASK the instructor before proceeding. To keep the risk to a minimum, you are expected to adhere to the following rules, regulations and safe techniques. This information applies to laboratory students in all chemistry teaching labs.

RULES, REGULATIONS AND SAFE TECHNIQUES

1. Do not enter the teaching laboratory until an instructor or supervisor is present. Guests are not allowed in the lab. The Prep Room, Rm. 514, is off limits to students.

2. On the first day of lab, determine the location and use of all emergency and safety equipment: safety shower, eye wash and fire extinguisher. Ask your instructor if you are uncertain. Locate the nearest emergency exit and telephone. Know the emergency evacuation route (posted on the lab door) and emergency telephone number (1-2-3).

3. Wear safety goggles at ALL times while in the lab, even during clean up. Contact lenses are not recommended.

4. Wear clothing that provides the most protection - a lab coat or apron is recommended. Shorts, mini-skirts and sandals are not allowed. Confine long hair and sleeves when working. Do not wear your favorite clothing to lab.

5. Do only the assigned experiment.

6. In case of chemical contact with skin or eyes, flush affected area with running water for 15 minutes. Use faucets, safety showers or eye wash, as necessary. Remove all contaminated clothing immediately.

7. Never eat, drink or taste anything (food or chemicals) while you are in the laboratory. Do not place fingers, pencils, pipets, etc. in your mouth. Never rub your eyes.

8. Report all accidents or injuries to your instructor immediately, even seemingly minor ones.

9. Always avoid unnecessary hazards. Keep working surfaces clean at ALL times. Do not sit or lean on bench surfaces. Keep the floor clean of tripping hazards. Jackets and bookbags should be stored on the coat racks. Stools and chairs are not permitted in the aisles. Drawers should be closed except when removing equipment.
10. Wash your hands and arms thoroughly before leaving the lab.
11. Read the labels on reagent bottles to make sure you have the right reagents. (Report empty reagent bottles to your instructor.)
12. Do not return excess reagents to stock containers; share with a classmate or dispose of it properly.
13. Dispose of waste properly. This means:
   a. Broken glass - glass disposal container (EXCEPTION: broken mercury thermometers must be reported to your instructor for proper disposal. See #14.)
   b. Water-soluble liquids - flush down sink
   c. Paper products - waste basket
   d. Solid wastes and water-insoluble waste - properly labeled waste containers. Do not throw solid materials into sinks.
   e. If you are uncertain of the proper waste disposal, consult your instructor.
14. Report all chemical spills immediately and clean up the spill as directed by your instructor. Acid spills should be neutralized with sodium bicarbonate (baking soda) before wiping up with a damp sponge. Broken mercury thermometers are treated as a chemical spill and must be reported to your instructor for proper disposal.
15. Do not test odors by direct inhalation from the container. Fan the vapors gently towards your nose.
16. Always add concentrated acid to water and acids to bases. Pour slowly while stirring the mixture constantly.
17. Always use a suction bulb (never your mouth) when filling a pipet.
18. Do not insert pipets directly into reagent bottles. Transfer an approximate amount into a beaker or other container.
19. Do not force glass tubing and/or thermometers into rubber stoppers. Always lubricate the hole in the stopper with glycerin or soapy water and protect your hand with a towel when inserting tubing or thermometers.
20. Never use an open flame (gas burner) in the vicinity of flammable materials and never leave a lighted burner unattended.
21. Return all equipment clean and to its proper location. Do not put common equipment in your drawer.

Remember that simple tasks, often regarded as safe, can be dangerous if done improperly. The majority of accidents reported in the laboratory involve cuts from handling broken or chipped glassware and burns from touching hot objects. Always use good judgment and care when working in the lab.
EMERGENCY BUILDING EVACUATION PROCEDURE

1. The signal to evacuate the building in case of emergency is the building fire alarm. Prepare to evacuate the building when you hear the alarm. Shut off heat sources (hot plates and gas burners), turn off lights and electricity, and close windows and doors before you depart.

2. Leave the building in an orderly manner via the evacuation route posted on the door inside the laboratory. Walk, do not run or push. Do not use the elevators. Elevators are only for the use of rescue personnel during a building evacuation. The custodian brings the elevators to the first floor once the alarm is activated and anyone inside could become trapped.

3. Once outside, meet with your instructor at your designated meeting place. This location is different for each of the laboratories and is announced during the first lab session. If you do not meet your instructor, he or she will assume that you are trapped in the lab and send rescue workers into the building to look for you. You must stay 100 feet away from the building to enable rescue personnel to get to the site of the emergency.

4. In the event of an evacuation drill or false alarm, you may re-enter the building only when the Public Safety Officer at the scene gives the "All Clear" on a megaphone.

PREPARATION: Meaningful lab experiences require pre-laboratory preparation. Refer to your experiment schedule to determine which experiments will be performed at each session. A scientist ordinarily begins with a literature search. You should begin by reading the introductory information provided with each experiment. Additional reading may be assigned within the introductory material or by your instructor.

You must answer the prelab questions before coming to lab. This will help clarify your understanding of the reading. If you have any difficulty with the prelab, seek help from the lab supervisor for this course. When you arrive in lab, turn in your prelab immediately, then check your answers with the posted key. The answer key is a useful tool if used properly. You may use it to check your answers, but not to get your answers.

Read through the experimental procedure and review the postlab questions before coming to lab. This will help you use your time more efficiently in the lab and minimize the frustration associated with not knowing what is going on. The experiments can be completed in the allotted amount of time if you come to lab prepared.

It is important that you come to lab on time. Your instructor will give a brief introduction before you begin to work, noting key points about the experiment and special safety considerations.

Do not hesitate to ask your instructor questions. Your instructor is well educated and knowledgeable in the field of chemistry and is there to assist you in the laboratory. Your instructor is not a substitute for preparation, however, and will not do your experiment for you or give you answers to complete your reports.

Remember that some experiments must be extremely precise while others need only be approximate. Scientists and engineers must always keep in mind that unnecessarily careful measurement can steal time from other work. On the other hand, the results of rough
measurement can be misleading. It is important, therefore, to select the correct instrument and operate it skillfully to have a successful outcome.

First year chemistry labs don't require a high degree of mathematical sophistication, but reasonable skill in problem solving is necessary to complete the calculations and reports. The math skills required include: algebraic manipulations, dimensional analysis (factor-label method), manipulation of exponents, scientific notation, graphing and significant figures. You should review these topics and seek assistance as needed.

REPORTS AND RECORD KEEPING: A report form comes with each experiment. Responses should be clearly and completely written. Accurate reporting of experimental results is very important in laboratory work. Laboratory reports must comply with the following criteria. Failure to follow these guidelines will result in points being deducted from your report.

- Completed prelab questions are due at the beginning of each lab session and will be returned to you with your completed report the following session. After you have turned them in, check the prelab answer key to see if you were on the right track before you start the experiment.
- Each data and postlab page must be completely blank before you begin work.
- Reports must be written in permanent ink and must be written legibly.
- Record all your data and observations directly on the report sheet at the time they are obtained. Tables are provided to help you organize your numerical data. Blank spaces are provided for observations. Record initial and final observations whether a change has occurred or not. All observations are important!
- Data should be reported to the correct number of significant figures.
- No erasures are to be made on the report sheet. White-out (liquid paper) should not be used either.
- Corrections must be made by drawing a single line through the erroneous data and entering the correct data next to it. Complete obliteration of the erroneous data is not acceptable. See the examples posted in the laboratory of acceptable and unacceptable work.
- Reports and postlab questions are due the day the experiment is completed and must be turned in to your instructor before leaving the lab.

Where calculations using data are involved, show one example of each type of calculation using data from your first trial. Always use units and labels in your calculations and pay attention to significant figures.

DRAWER EQUIPMENT (see following list): You will be assigned a drawer containing some of the equipment you will use, and be responsible for, during the semester. The contents of your drawer should be inspected and compared to the following equipment list to determine that all items are present and in acceptable condition. If uncertain of the identity of any piece of equipment on the list, see the illustrations posted on the bulletin board in the lab. List any broken or missing items on an equipment replacement form (available from your instructor). When you finish checking all of the equipment, bring the equipment replacement form to your instructor for replacement glassware. No replacements will be made after the
first day. Sign and return the check in card when you have all your equipment. Once you sign the check in card you are responsible for this equipment and will be charged for any breakage or loss. You must check out of your drawer at the end of the semester or if you drop the course. At that time, every item on the list must be in the drawer. Replacements can be purchased from Chem Stores, Room 8002 of the Chem Sci & Eng Bldg. Prices shown are approximate and do not include Michigan's 6% sales tax. Actual costs are subject to change without notice. Failure to check out results in a $25 fine in addition to charges for missing or broken equipment.

**DRAWER EQUIPMENT LIST**

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Drawer Equipment</th>
<th>Stock #</th>
<th>Approx. Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Beaker, 50 mL, Pyrex</td>
<td>00537</td>
<td>$ 1.58</td>
</tr>
<tr>
<td>1</td>
<td>Beaker, 100 mL, Pyrex</td>
<td>00538</td>
<td>$ 1.68</td>
</tr>
<tr>
<td>2</td>
<td>Beaker, 150 mL, Pyrex</td>
<td>00539</td>
<td>$ 1.62</td>
</tr>
<tr>
<td>1</td>
<td>Beaker, 250 or 400 mL, Pyrex</td>
<td>00540 or 541</td>
<td>$ 1.62 or 2.01</td>
</tr>
<tr>
<td>1</td>
<td>Beaker, any size, Pyrex</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Note: You need 6 beakers total.</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Erlenmeyer flask, 50 mL</td>
<td>00791</td>
<td>$ 1.77</td>
</tr>
<tr>
<td>1</td>
<td>Erlenmeyer flask, 125 mL</td>
<td>00792</td>
<td>$ 1.93</td>
</tr>
<tr>
<td>2</td>
<td>Erlenmeyer flask, 250 mL</td>
<td>00793</td>
<td>$ 2.08</td>
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<tr>
<td>1</td>
<td>Graduated cylinder, 10 mL</td>
<td>00685</td>
<td>$ 5.57</td>
</tr>
<tr>
<td>1</td>
<td>Graduated cylinder, 25 mL</td>
<td>00686</td>
<td>$ 2.55</td>
</tr>
<tr>
<td>1</td>
<td>Funnel, long stem</td>
<td>00179</td>
<td>$ 9.14</td>
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<tr>
<td>1</td>
<td>Large test tube, 25 x 150 mm</td>
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<td>$ 0.67</td>
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<tr>
<td>11</td>
<td>Small test tubes, 13 x 100 mm</td>
<td>01112</td>
<td>$ 0.23</td>
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<tr>
<td>1</td>
<td>Test tube rack</td>
<td>00981</td>
<td>$ 9.20</td>
</tr>
<tr>
<td>1</td>
<td>Test tube holder</td>
<td>00106</td>
<td>$ 4.09</td>
</tr>
<tr>
<td>1</td>
<td>Test tube brush</td>
<td>01121</td>
<td>$ 0.95</td>
</tr>
<tr>
<td>2</td>
<td>Medicine droppers</td>
<td>00227</td>
<td>$ 0.12</td>
</tr>
<tr>
<td>1</td>
<td>Spatula</td>
<td>00233</td>
<td>$ 2.27</td>
</tr>
<tr>
<td>2</td>
<td>Stirring rods, glass</td>
<td>00244</td>
<td>$ 0.37</td>
</tr>
<tr>
<td>1</td>
<td>Watchglass, 3 &quot; diameter</td>
<td>01101</td>
<td>$ 1.32</td>
</tr>
<tr>
<td>1</td>
<td>Evaporating dish, ceramic</td>
<td>00715</td>
<td>$ 4.63</td>
</tr>
<tr>
<td>1</td>
<td>Crucible bottom, ceramic</td>
<td>00665</td>
<td>$ 2.04</td>
</tr>
<tr>
<td>1</td>
<td>Crucible cover, ceramic</td>
<td>00673</td>
<td>$ 2.39</td>
</tr>
<tr>
<td>1</td>
<td>Triangular pipetem</td>
<td>01002</td>
<td>$ 2.55</td>
</tr>
<tr>
<td>1</td>
<td>Wire gauze square</td>
<td>00312</td>
<td>$ 0.78</td>
</tr>
<tr>
<td>1</td>
<td>Tongs, crucible</td>
<td>00270</td>
<td>$ 5.52</td>
</tr>
<tr>
<td>1</td>
<td>Wash bottle, 250 mL, plastic</td>
<td>00584</td>
<td>$ 2.14</td>
</tr>
<tr>
<td>1</td>
<td>Storage bottle w/ cap, plastic</td>
<td>00582</td>
<td>$ 0.89</td>
</tr>
<tr>
<td>1</td>
<td>Thermometer (-10 to 110\°C)</td>
<td>00993</td>
<td>$ 4.85</td>
</tr>
</tbody>
</table>
ACADEMIC INTEGRITY AND HONESTY: One of a scientist's (person's) most prized possessions is integrity. A scientist records all data and observations exactly as they occur, even if the unexpected is observed. Do not change data or observations to what you think they should be, but rather, try to explain the unexpected. Scientists learn by discussion with one another. You may also profit by discussion with your classmates, but not by copying from them.

Cheating is considered a serious offense and is not tolerated in the laboratory. Examples of cheating in the lab include: turning in a report for work not done, changing data to fit what you think it should be, copying old reports and possessing old reports in the laboratory.

Except for those experiments where you work with a partner or in a group, you are expected to collect data and observations and answer questions independently. Even in a team experiment, your report should be prepared independently, in your own words.

Read the following departmental academic integrity and honesty policy and be aware of the consequences, as ignorance is not a defense.

Department of Chemistry Policy on Academic Integrity and Honesty

In the preparation of students for responsible professional careers, Michigan Technological University expects honesty and integrity to be the ordinary way of life in all university activities. Plagiarism, cheating, fabrication, and facilitating academic dishonesty are forms of academic dishonesty and are defined in the university policy (see Definitions of Academic Dishonesty in the university policy). Although group study and group projects are often appropriate, it is expected that individual assignments and examinations will be the private efforts of the particular student. The following are specific problems of academic dishonesty that pertain to classes in the Department of Chemistry:

- Copying raw data for a lab without actually participating in the work resulting in the raw data, or without the permission of the instructor in charge of the course.
- Inventing raw data.
- Filling in parts of lab reports that require the raw data for calculations or interpretation before the data is collected.
- Holding discussions so thorough that they result in identical methods and numbers for problems for lab reports, homework assignments, and computer programs.
- To use old lab reports for anything more than format purposes without the permission of the instructor in charge of the course. (Because there is no need for formatting lab reports in this course, old lab reports are forbidden in the laboratory. Possession of old reports will be construed as an intent to cheat.)
- Allowing anyone to copy a lab report, homework, assignment, test, computer program, either now or in the future, without the permission of the instructor in charge of the course.

A student detected cheating, beyond any reasonable doubt, in the preparation of any individual assignment will be handled according to the following guidelines. A minor offense is defined as a
lab report or assignment counting for less than 10% of the final lab grade. A major offense is defined as a lab report, assignment, or test counting for 10% or more of the final lab grade.

**Minor Offense:**

- The grade for the particular assignment or lab report will be scored as a zero.
- The final grade for the laboratory component of the class will be dropped one full grade (10%).
- The Office of Student Affairs (OSA) will be notified and a record will be kept. The OSA will handle it as a major offense if the offender has any prior offense.

**Major Offense or Second Minor Offense:**

The OSA will be notified, who will take action consistent with procedures set forth in the university's *Academic Integrity and Honesty* policy.

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MTU complies with all federal and state laws and regulations regarding discrimination, including the *Americans with Disability Act of 1990 (ADA)*. If you have a disability and need a reasonable accommodation for equal access to education or services at MTU, please call Dr. Gloria Melton, Associate Dean of Students at 487-2212.