CHM 158 Laboratory
Fall 2009

Instructor: Hari Prasad, Ph.D.
Office: 349 HHS
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Office Hours: T.W.T.H 12:00 – 1:00 p.m. or by appointment
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Teaching Assistants: Beth Donovan and Smedley Tetteh

Course: CHM 158 lab (part of a 5 credit course)
CRN: 40580
Section: 003
Room: 230/240 HHS
Day: XXXXXX Thursday
Time: 1:30 – 4:30 p.m.

Required Items:
* Students are required to print the **Experiment including Data/Observation Sheets and Post-Laboratory/Summary Sections** for each experiment. The experiments used in CHM 158 laboratory are available to you on the Moodle website associated with this class. ([https://moodle.oakland.edu](https://moodle.oakland.edu))
* Safety Goggles (not safety glasses). These are available for purchase from the bookstore.

You are responsible for **supplying your own SAFETY GOGGLES. You will need to bring both the printed data sheets and safety goggles with you to every class.**

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**Experiment Schedule**

<table>
<thead>
<tr>
<th>Date</th>
<th>Expt #</th>
<th>Experiment</th>
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<tbody>
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<td>9/10</td>
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<td>Course Overview &amp; Check-In</td>
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<tr>
<td>9/17</td>
<td>1</td>
<td>Safety, Experiment #1 – Kinetics: Part I</td>
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<tr>
<td>9/24</td>
<td>2</td>
<td>Experiment #1 - Kinetics: Part II</td>
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<tr>
<td>10/1</td>
<td>2</td>
<td>The Equilibrium Constant: Part I</td>
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<tr>
<td>10/8</td>
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<td>The Equilibrium Constant: Part II – Quiz on Equilibrium Constant</td>
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<tr>
<td>10/15</td>
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<td>Acids and Bases: Part I</td>
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<tr>
<td>10/22</td>
<td>3</td>
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<td>10/29</td>
<td>4</td>
<td>Buffers: Part I</td>
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<td>Modeling Acids (Room 230)</td>
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<td>Enthalpy (240) – Quiz on Thermochemistry</td>
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<tr>
<td>11/12</td>
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<td>Modeling Acids (Room 240)</td>
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<td>11/12</td>
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<td>Enthalpy (230) - Quiz on Thermochemistry</td>
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<td>11/19</td>
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<td>Electrochemistry: Part I</td>
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<td>11/26</td>
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<td>Thanksgiving break</td>
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<td>12/03</td>
<td>7</td>
<td>Electrochemistry Part II- Quiz on Electrochemistry</td>
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<tr>
<td></td>
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<td>Check-out</td>
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**Last day for Official Withdrawal is November 5, 2009.** If you drop this course, please come in and check out of the lab drawer. You will be charged a check-out fee ($10.00) and a key replacement fee ($15.00) if you don't check out of your drawer. The last day to check-out of your drawer is **Friday, December 4, 2009.**
Catalog Description:

Integrated lecture-laboratory. Chemical reactions, kinetics, equilibrium, acid-base chemistry, thermodynamics and electrochemistry.

Course Prerequisites: CHM 144 and 147 or 157.

General Course Overview:

CHM 158 is a lecture-laboratory course that represents the second half of a two semester course in general chemistry. This syllabus covers the laboratory portion of the class. CHM 158 focuses on the factors that influence the rates and equilibrium of chemical reactions. Experiments are performed and reported in groups of three to four students. A student’s performance in this class contributes 20% to his or her final score in CHM 158. A detailed description of this laboratory course follows.

Course Documents:

Most of the information describing the course and the experiments is available on the Moodle website associated with this class. In some cases, students are required to print these documents and bring them to class (for example, the experiment data sheets and grading forms).

Required Materials:

Safety Goggles: Students must supply their own safety goggles. Safety glasses are not allowed.

A laboratory notebook.

Helpful But Not Required: Data analysis by the group is easiest if one group member can bring a laptop computer to lab.

Laboratory Groups: The experiments will be performed in groups of three to four students. The lab groups will be assigned on the first day of class. Every student is expected to make an equal contribution to the execution of the laboratory experiments and to the production of the reports. The instructor should be informed of any “free-loading” group members. Students will have an opportunity to rate the performance of their team members. The average rating received by each student will partially determine the grade received by the student.

Make-up Laboratories: Make-up laboratory experiments will only be granted for students who have experienced extreme circumstances and notified the instructor within 12 hours of the missed lab. The instructor is the sole judge of the circumstances that qualify as a condition sufficient for a make-up. If the instructor is not notified within 12 hours of a missed lab, then the student will not be allowed to make-up the laboratory. Failure to attend labs places an extra burden on a student’s laboratory group members. Groups should report students that miss more than one laboratory session. Students that miss more than one lab period you will be given a score of 0% for the laboratory portion of CHM 158.
Grading: Grades will be based on the total points earn by the student. The final percentage will be forwarded to the lecture instructor for incorporation into the overall CHM 158 grade. Each group will turn in seven laboratory reports. These reports will be given one grade. The grades will then be individually adjusted for each laboratory group member based on the peer-evaluation scores. The first laboratory will not be impacted by the peer evaluations. Labs 2-4 will have a 25, 50, and 75% peer impact factors, respectively. Labs 5-7 will have 100% peer impact factors. Lab reports are due at the beginning of the lab period that follows the completion of an experiment. Late reports lose credit as follows: 1 day late = -10% of possible total points; each additional day late = -10% of possible points. Note: 5 minutes late and 24 hours late both count as “1 day late”). Lab report grades will be posted throughout the semester on the Moodle website. Students will be allowed to look at their graded reports in the laboratory, but they will not be allowed to take them from the laboratory. Quizzes will also be given at the conclusion of Experiments 2, 3, 6, and 7. 10% of a student’s final grade will be assigned by the instructor based on each individual student’s attendance, participation, behavior, preparation, etc.

Extra Credit or Dropped Scores: There is no extra credit or dropped scores.

Closing of the University: In the event that the University closes on a day when class is held forcing the class to be cancelled, the scheduled events for the cancelled class day will be conducted on the next meeting.

Academic Conduct Policy: Cheating on examinations, plagiarism, falsifying reports/records, and unauthorized collaboration are considered serious breaches of proper academic conduct. It is the student’s responsibility to consult the instructor if uncertainty exists on what may or may not be deemed misconduct. Falsifying laboratory data or using the data of others is considered to be a serious violation of the academic conduct policy. The Oakland University policy on academic conduct will be strictly followed with no exceptions. See catalog under Academic Policies and Procedures. Students found guilty of academic misconduct by the Academic Conduct Committee will receive a course grade of 0.0. Note: This grade is not just for the laboratory portion of the class but for the entire 5 credit hours of CHM 158.

Safety Requirements: This laboratory will strictly adhere to the code of safe conduct outlined in the “Oakland University Undergraduate Chemical Laboratory Safety Manual”. This manual is available on the course website. Students are required to read and understand this manual. Students must complete and pass a safety quiz that is part of the Safety Manual prior to starting the first experiment. Students that do not follow safe practices will be expelled from the course.

Laboratory Waiver: If you are repeating this course, you may be able to waive the laboratory portion of the current course. You may choose to use the laboratory scores from the first course if: (1) your average in the laboratory portion of that course was at least 75% and (2) you were enrolled in that course no more than three years ago. If you wish to apply for a laboratory waiver, you must complete a General Chemistry Laboratory Waiver form. These forms are available in the Department of Chemistry office, 260 Science and Engineering Building (SEB). This laboratory waiver form must be completed and returned to your current lecture instructor during the first week of the current semester. You must attend the laboratory portion of the course until the waiver is approved.

Add/Drops: The University add/drop policy will be explicitly followed. It is the student’s responsibility to be aware of the University deadline dates for dropping the course. If you drop the class you must still check-out. If you drop without checking-out you will be fined $25.
Special Considerations: Students with disabilities who may require special considerations should make an appointment with campus Disability Support Services. Students should also bring their needs to the attention of the instructor as soon as possible.

Additional Information Regarding CHM 158 Laboratory

Group Learning

Much of the course work that you do will be done as a member of a team. You will be assigned to a team during the first laboratory period. It is important that you understand some of the goals and benefits of group learning.

A survey (American Society for Training and Development and the U.S. Dept. of Labor, 1988) of major businesses and industrial firms, concluded that if students are to reach the workplace well equipped to cope with the “real world” they must have the opportunity to learn:

- how to learn
- how to listen and communicate orally
- adaptability based on creative thinking and problem solving
- group effectiveness characterized by interpersonal skills and teamwork
- organizational effectiveness and leadership

These skills are among the things that you should learn in Chemistry 158, in addition to becoming familiar with the process of experimentation and learning some chemistry. Research has shown that most students learn better, develop interpersonal skills and enjoy a course more when it is conducted in a group learning environment. This does not mean that students simply work side by side on a problem, or the best student works while the others watch. Rather, a group that is functioning well will exhibit interdependence. Everyone contributes something to the group. The more effort that you put into the group, the more you are likely to be rewarded in terms of skills learned and, ultimately, in terms of your grade.

When people work in groups, it is important that they be able to communicate with each other without conflict. Sometime during the semester a group member may say or do something you disagree with or something that annoys another student. Please bear in mind that it is ok to be critical of ideas but it is not ok to be critical of the person expressing the idea. If you criticize the person it is almost certain to cause hard feelings and affect group functioning.

Try to avoid win/lose situations. The goal of this lab is to develop problem solving skills, not to engage in conflicts where one person’s ideas dominate. In the context of solving problems in the general chemistry lab, group members may feel temporarily perplexed and discouraged. It is important to know that being temporarily perplexed is a natural state of problem solving. If you know immediately how to solve a problem, then it is an exercise and not a problem.
WHAT YOU SHOULD DO

Before Lab.

You need to be prepared. At a minimum you should:

· Study the relevant sections of this lab procedure and basic skills document and any other assigned reading material. You need to think about what you will do at each stage of the experiment as you read it. Note any questions you have or points of uncertainty. You should discuss these with your group members and if questions still arise with the instructor or teaching assistant. These labs are designed for you to “discover” many things so don’t expect the instructor or teaching assistant to directly answer your question if they relate to something that you need to find experimentally.

· Listen carefully to any comments about future labs that the instructor or teaching assistant makes during laboratory discussion periods. Note you will not be told what to do for the experiments or what results you will find -- part of your job is to figure out these details.

· Complete the pre-laboratory assignment (in this lab manual). This must be turned in at the beginning of the laboratory period. This is how we know that you have prepared for the laboratory. If you do not complete your pre-lab before coming to lab, you will be asked to stay outside the lab until the pre-lab is completed and then you can only receive a maximum of 50% of the total pre-lab points. Note: unlike CHM 157 the answers to the pre-lab will not be posted.

Students often find it helpful to work in groups when preparing for laboratory. Since how well you do depends, in part, on the data that your classmates collect, everyone benefits when their classmates are better prepared. If the objective of the lab or the background material is not clear, seek assistance before lab. Possible sources of assistance are your team members, other classmates, the instructor, and the teaching assistants. You may submit a single prelab sheet for your group. This sheet should show the names of all group members and the group number. If anyone disagrees with the answers on the group sheet, he/she may submit an individual sheet.

During Lab.

Record all of your observations. Chemistry is an experimental science. If you don’t record your observations you aren’t doing chemistry. This lab manual contains forms that you can use to record your data. If you don’t like these forms, you can prepare your own (make sure that you record all of the necessary data). Follow the correct laboratory procedures you learned in CHM 157 for recording data. (Use ink; don’t erase errors but strike out with a single line so old value is still legible and write corrected value next to it; be neat so all data is legible; use proper number of significant figures; show units, etc.) At the conclusion of each lab period, you need to have you TA initial the data forms that you have completed (all of the data forms have a line for TA initials). Your data form should not be changed once your TA has initialed it. These experimental data (together with other data measured by the rest of the class) will form the basis for your post-lab discussion and for your post-lab report. Each team member should record all data on his/her data sheets. However, only one set of data sheets will be submitted with the group report.
After Lab.

Quizzes

Many experiments will be concluded with a short quiz. It is imperative that a student understands the experiment if they hope to do well on these quizzes.

Lab Report. Lab reports are due at the start of the lab period following the period of the post-lab discussion. Lab reports must be stapled in the upper left corner and include the following in the order shown:

1) grade sheet
2) pre-lab (if handed back)
3) data sheets
4) graphs
5) post-lab report
6) group member assessment sheets.

A single report may be submitted by each group and must show on the grade sheet page the names of all group members and the group number. If anyone disagrees with any part of the group report, he/she may submit an addendum to the report whose grade will replace that for the part in question of the group report. Addendums should be stapled at the back of the group report. For experiments with individual unknowns, the data sheets for the unknowns should be stapled at the back of the group report. Be sure these data sheets show your name and unknown number.

Purpose:
The laboratory combined with the lecture is designed to reiterate the chemistry concepts learned in the classroom through hands-on experience. The laboratory portion of this class will familiarize one with basic laboratory techniques. In many instances the experiments demonstrate how these basic chemistry concepts relate to everyday life.

Absence Policy:
Students who are absent or planning on missing a lab should notify their lab instructor immediately. Make-up laboratory experiments will only be granted for students who have experienced extreme circumstances and notified the instructor within 12 hours of the missed lab. The instructor is the sole judge of the circumstances that qualify as a condition sufficient for a make-up. If the instructor is not notified within 12 hours of a missed lab, then the student will not be allowed to make-up the missed experiment and will receive a zero grade for that experiment. Failure to attend labs places an extra burden on a student’s laboratory partner. Students that miss more than one lab period will be given a score of 0% for the laboratory portion of CHM 157.

Laboratory Reports & Grading:
Although you will be working with a partner, each student will submit their own lab report. Lab reports are due at the beginning of the lab period that follows the completion of an experiment. Late lab reports lose credit as
follows: 1 day late = -10% of possible total points; each additional day late = -10% of possible points per day. (Note: 5 minutes late and 24 hours late both count as “1 day late.”) If you are absent the day the lab report is due, the lab is considered late and will follow the above guidelines for late lab reports. Lab report grades will be posted throughout the semester on the Moodle website. Students will be allowed to look at their graded reports in the laboratory, but they will not be allowed to take them from the laboratory. If the graded lab report is not returned to the instructor, they will receive a zero score for that lab.

Final grades will be based on the total points earned by the student. Each student will submit 8 lab reports (100 pt each) for a total of 800 points. The final percentage for the lab will be forwarded to the lecture instructor and be worth 20% of the overall CHM 157 grade. **No lab report scores will be dropped, and no extra credit will be given.**

**Safety Requirements**
All students are expected to abide by the safety requirements set forth by Oakland University. The code of safe conduct is in the Oakland University Undergraduate Chemical Laboratory Safety Manual. This document can be found on the Moodle website for this course. Each student is expected to read and understand the manual. Prior to starting the first experiment, each student must complete and pass the safety quiz which is also found on the Moodle website for this course. Students that do not pass the safety quiz will not be allowed to participate in the lab. Any student not following the code of safe conduct will be removed from the lab and receive a zero grade in the lab.

**Laboratory Waiver**
Any student that has completed CHM 157 at Oakland University within the last three years and has a grade of 75% or better in the lab is eligible for a laboratory waiver. If you wish to apply for a laboratory waiver, a *General Chemistry Laboratory Waiver Form* must be filled out and submitted to your current lecture instructor within the first week of the current semester. This form is located in the Department of Chemistry office (260 SEB). If your application for the laboratory waiver is approved, you will use the laboratory grade earned in the previous semester. You must attend the lab until the laboratory waiver has been approved. You **must** remain registered for the lab if the waiver is approved.

**Add/Drops**
It is the responsibility of the student to know the deadlines set forth by the University for add/drops. Any student that drops the lab is still required to check-out of the lab. Any student that does not check-out of the lab will be charged a $25 check-out fee.

**Special Considerations**
Students with disabilities who may require special considerations should make an appointment with campus Disability Support Services. Students should also bring their needs to the attention of the instructor as soon as possible.

**Closing of the University:**
In the event that the University closes on a day when class is held forcing the class to be cancelled, the scheduled events for the cancelled class day will be conducted on the next meeting.

**Academic Conduct:**
Students are expected to uphold the academic standards set by Oakland University. The work submitted by any student should be their own work. Students suspected of academic misconduct (Examples of academic misconduct are the submission of labs containing data that has been falsified, copying any part of your lab from a previously graded lab report, copying from other students, plagiarism, changing answers on your lab report after the report has been graded, the use of materials not authorized by the instructor, obtaining copies of old lab reports or answer keys, or another student completing the lab for you), will be reported to the academic conduct committee.
Students found guilty of academic misconduct for the laboratory will receive a zero grade for the course. Note: this is not just for the laboratory portion of the course, but the 0.0 grade is for the entire 5 credit hours of CHM 157. For further details see Academic Conduct Policies section (p. 100 – 102) in the 2008 – 2009 Undergraduate Catalog.

Laboratory Expectations:
Before Lab:
1. **Read the experiment.** This will familiarize you with the experiment, as well as allow you take the time needed to think about what you will do at each stage of the experiment.

2. **Pre-lab assignment:** This is due at the beginning of the lab period before the lab starts. If you have not covered the material in lecture, you are still responsible for completing ALL of the pre-lab problems before class. The Pre-lab assignments are usually located between the procedure section and the data sheets in the experiment. The Pre-lab assignment pages should be printed and your answers hand-written directly on those pages. The pre-lab assignment should be submitted to the instructor upon entering the lab. You will not be allowed to work in the lab unless your pre-lab has been completed. An incomplete pre-lab assignment will lose 50% of the total pre-lab points possible.

3. **Procedure:** The Experimental Procedure needs to be hand-written on 8.5” x 11” paper. *No photocopies or printouts of the original document will be accepted.* The procedure should be prepared in an outline format (cookbook). Make sure to include safety precautions and any special handling techniques and diagrams within the outline. The procedure is also due at the beginning of the lab period. Please have the procedure out on the bench at the beginning of class to be initialed by your instructor or TA.

   *You will not be allowed to work in the lab unless your Pre-lab and procedure are complete. If your Pre-lab assignment or procedure is not complete when you enter the lab, you will be asked to leave the lab to finish this assignment in the hallway. You are then only eligible for 50% of the pre-lab and/or procedure assignment points for that lab. No additional lab time will be given to those that do not come prepared to lab.*

4. **Additional Reading:** Read any sections in the “Laboratory Skills” document that may pertain to the days experiment. This document is available on Moodle. (https://Moodle.oakland.edu)

5. **Data Sheets:** **Print a copy of the data sheets for the days experiment.** You will need these for class. If you do not have the data sheets with you, you will be required to go print out these pages before you can begin the lab.

6. If the objective of the lab or the background material is not clear, seek assistance before the lab. Possible sources of assistance include your classmates, the instructor, or the teaching assistant.

During Lab:
1. At the beginning of each lab, your instructor or teaching assistant will give a brief pre-lab lecture/discussion. This lecture will include pertinent information regarding laboratory techniques or that may be necessary for you to complete the lab safely. During this time you will also have an opportunity you to ask questions. You should listen carefully to any comments that are made regarding current and future labs. Note, you will not be told what to do or what the experimental results should be; part of your job is to figure out these details.

2. You are expected to be on time for lab. Students who are late to lab will not be given additional time to complete the lab.

3. You should conduct yourself in a manner that would provide a safe working environment in the lab for all students. Students acting in such a manner that would jeopardize the safety of any student will be asked to leave the lab and will receive a zero for the day’s work.
4. You should work efficiently with your lab partner. All labs are designed to be completed within the 3 hour lab period. No additional lab time will be given. This sometimes requires that the work be divided between you and your lab partner.

5. At the end of the day, all data MUST be initialed by the instructor or TA. Data sheets without initials will be given a zero. It is your responsibility to make sure your data sheets are initialed before leaving the lab.

6. Additional Lab notes:
   a. All data must be recorded in ink directly onto data sheets. No pencils or erasable ink pens allowed, as well as recording data on a separate sheet of paper is prohibited.
   b. Always use the proper number of significant figures.
   c. Always include units in any measurement.
   d. If you make a data entry/recording error, the following procedure for correcting that error is as follows.
      1. Any errors made in the lab should be crossed out with a single line and then the corrected data written next to the error where there is space. DO NOT SCRIBBLE OUT ERRORS!
         e.g. 0.0476 g 0.476 g
      2. Any data recording errors must be initialed by the instructor or TA before you leave the lab. Lab report data sheets submitted with errors not initialed by the instructor will lose data points.
   e. Reminder: Decimal numbers should include a zero in front of the decimal.
   f. No shorts or open toe shoes.
   g. The use of cell phones in the lab is prohibited.

Lab Reports:
1. Lab reports are due at the beginning of your next lab period.
   Turn in completed lab report to your instructor.
2. Lab reports should include the following:
   Grading-sheet with your name and partner’s name, procedure, data and observations, any graphs or tables, and post-lab questions
3. Pages should be in numerical order or in the order of how it is listed on the grading sheet.
4. The lab report must be stapled prior to coming to lab. If your lab report is not stapled prior to coming to lab, you will have five points deducted from your lab report score.
5. Your name should appear on all pages.
   Due to the large number of lab reports that are turned in, occasionally pages come loose during the process of submission and grading.