CH 204 – Introduction to Chemical Practice
Fall 2009

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Office hours: Fridays 11:am – noon or by appointment – don't hesitate to ask!

Web Site: http://anderson.cm.utexas.edu/courses/ch204

The course web site has announcements and useful information, pdf versions of my lectures (posted the weekend before the lecture), and pdf versions of all handouts given out in class. It also has a TA list with e-mail addresses, a schedule of all CH204 TA office hours, grading information, an ever-growing course FAQ, and lots of bright colors.

Teaching Assistants: http://anderson.cm.utexas.edu/courses/ch204/TAs.html

TA office hours: http://anderson.cm.utexas.edu/courses/ch204/officehours.html

Storeroom: Tiffany Murray WEL 4.134

Undergraduate Chemistry Office: WEL 2.212 **Phone:** (512) 471-1567, (512) 471- 4983

Address all questions regarding registration, adds, drops, etc. to this office.
The last date to drop this course without possible academic penalty is **September 23, 2009**.
The last day to drop this course for academic reasons is **October 21, 2009**.

Required course materials and supplies

1. Leytner, S. *General Chemistry Lab Manual*; McGraw-Hill Higher Education, **Fall 2009 edition** (available through the University Co-op).
2. A bound laboratory notebook with duplicate numbered pages (sold at the Duplicating Office in WEL 2.228 or at the Co-op).
3. Combination lock.
4. Calculator.

What to expect in this class

This is a hands-on course designed to teach you a variety of laboratory skills, and make you comfortable in a lab setting. You will learn the proper use and handling of glassware, techniques and processes common to many scientific labs, and standard methods for recording observations and data.

The course consists of a weekly one-hour lecture immediately followed by a four-hour lab. Most labs won't take all four hours, but one or two might. We start late in the semester because the Labor Day holiday throws off our weekly meeting schedule and we finish early, so the full semester's workload gets smushed into about ten weeks. During those ten weeks, expect a workload that is a lot heavier than normal for a measly two credit class. The benefit to this is that you will be finished with this course and have turned in your final assignment before Thanksgiving, and will have more time to prepare for finals in your other classes.

The lab reports for CH204 will sometimes take five or six hours to complete. Don't wait until the weekend to start on them. Get started early when TA and instructor help is readily available. All of us are easier to reach during the week than we are on weekends. Even chem nerds like us have lives outside of Welch.

Dr. Anderson's Monday/Tuesday sections of CH204 are run somewhat differently from Dr. Lyon's Wednesday/Thursday sections, so if your friends in her sections tell you something different, check with Dr. Anderson or your TA, or better yet, *read the fine syllabus*, 'cuz it's all in here.

Lectures

The lectures each week will cover the theoretical background behind that week's experiment, and also provide practical tips for carrying out the experiment. They will often show sample calculations to help get you started on the write-up. You are encouraged to take notes during the lectures since some of the material covered will not be in the CH302 textbook or the CH204 lab manual. You are strongly encouraged to at least pay attention during lecture if you can't be bothered to write anything down. There will also be short quizzes given at the end of most lecture sessions which will cover the previous week's material, so if you decide to work on your lab report in class instead of paying attention to the lecture, you will likely end up getting your butt kicked on the quiz a week later. Weekly butt-kickings on the quizzes are the fastest way and most irrevocable way to torpedo your grade in this class, and then you get to do it all over again in the spring.

Quizzes

Quizzes will typically be 3 – 4 questions and you will have about 15 minutes to complete them. The quizzes will cover material related to the experiment you performed the week prior in lab. Questions are drawn from the previous week's lecture, the lab manual introduction to the experiment, the pre-lab and post-lab problems, and experimental procedures and calculations required for the previous week's lab. There will be a total of 9 quizzes (there is no class meeting, and therefore no quiz, the week after Experiment 10). The lowest quiz grade will be dropped and the rest will count towards 30% of your grade. If you do the math, this means that the 8 quiz grades that you keep each make up 3.75% of your overall course grade.

Sometimes calling them "quizzes" has the effect of trivializing their importance to your overall grade, so consider the quizzes as a comprehensive final exam that is given in weekly installments to make them easier to study for. If you would study for a comprehensive final exam that is worth 30% of your grade, then take some time each week to review the material for the quiz. **No make-up quizzes will be offered for students who miss class.** If you miss a quiz for any reason, that will be the one you drop. If you miss more than one quiz, you start taking zeroes.

Laboratory

The laboratory work is the backbone of the course, and accounts for 70% of your grade. Most of the experiments will be performed individually; the last three will be performed in groups of two. Do not hesitate to ask me or your TA whenever you have questions or are not sure how to perform certain tasks. A question can take a couple minutes, but a lab mistake can cost you two hours.

Be prepared for lab before you arrive. Have a completed preliminary experimental write-up (explained below) in your notebook. Make sure you understand the purpose of the experiment and are familiar with the procedure. If you slowly bumble your way through the experiment because you are unprepared, it will be obvious to your TA, who will be annoyed because you are wasting his or her time by showing up unprepared, and you will lose points.

There are four separate assignments for each experiment: Pre-lab, Report, Discussion Questions, and Post-lab. The Pre-Lab and Post-Lab will be done online in the Quest system. The Report and Discussion Questions should be written in your lab notebook, and the copy pages torn out and turned in. The online assignments must be completed by the posted due dates, and the Report and Discussion Questions should be turned in to your TA at the beginning of your lab session the week after you perform the experiment. Always tear out the COPY page from your notebook to turn in each assignment. Never tear out an original page from your notebook for any reason.

1. **Pre-lab** – Each experiment in the lab manual includes five Pre-lab questions. These questions will be answered online using Quest. Each Pre-lab is worth 10 percent of your lab grade for that experiment.

2. **Report** – The report includes the title of the experiment, the objectives of the experiment (written in your own words), chemical equations for any chemical reactions that will be carried out as part of that experiment, all data and collected during the experiment and any observations made, sample calculations, and conclusions, such as identification of unknowns. There is a sample report with discussion questions on the Freebies page of the course web site to show you what this should look like. As part of some experiments (2, 3, 4, 7, and 8), you will be required to identify an unknown compound or calculate the concentration of an unknown solution, and you will be graded on the accuracy of your results in these experiments. The Report and Discussion Questions combined are worth 65 percent of your lab grade for that experiment. A late penalty of 10% per day (excluding weekends and holidays) will be assessed for reports that are not turned in at the beginning of the lab period.

3. **Discussion Questions** – These questions should be answered in usually one or two complete and well thought out sentences. Don't just provide simple one-word answers, and don't write a long, rambling essay that you hope contains the correct answer in there somewhere. Even though the Discussion Questions are not numbered in the lab manual, you should number your answers in your lab notebook to make it easier for your TA to grade. (Happy TA's grade easier. It's a proven fact of psychology.)

4. **Post-lab** – Each experiment in the lab manual also includes a Post-lab made up of five problems relating to the chemistry covered in that experiment. The Post-lab problems will be answered using the online Quest system. Every Post-lab is worth 20 percent of your lab grade for that experiment. You do not have to do the experiment in order to do the Post-lab problems. Since I often make up quiz questions that are similar in concept to the Post-lab problems, make sure you pay particular attention to these.

5. **TA Safety/Technique Evaluation** – The last 5% of your lab grade each week is made up of what we call a TA Safety/Technique Evaluation, or simply TA points. Each week in lab your TA will assign you 0 – 5 points based on your preparedness and competence in the laboratory. These are basically free points given to you for showing up prepared, observing safety rules, and cleaning up after yourself. If you have to be repeatedly reminded to wear your goggles, it will cost you points. If you show up wearing shorts or sandals, it will cost you points. If you did not do a preliminary lab write-up, you will lose points. If you came in unprepared and took longer than necessary to complete the experiment, you will lose points. If you do not clean up after yourself, you will lose points. There are no TA points for the first experiment.

6. **Notebook Grade** – at the end of the semester, you are required to turn in your laboratory notebook, including copies of all graphs that were made during the course. The TA's will check the notebooks for completeness, and they will be available for pick-up from the stockroom when final grades are posted. We do this for two reasons: 1) the lab notebook should be a complete record of all the lab work you have done during the semester, and keeping a reliable notebook is part of learning good laboratory techniques, and 2) if any questions should arise after a particular lab was graded and returned, having your lab notebook available makes it easier for Dr. Anderson and the TA's to resolve the issue more quickly. You will receive 5 points, or the equivalent of 5% of your Experiment 1 grade (which did not include TA points) for turning in your notebook.

All lab assignments are due during the first 5 minutes of lab. Turn in any late papers directly to one of the CH204 TA's, to me, or to Tiffany in the stockroom (4.134) as soon as possible. If the stockrom is closed, there is a wooden mailbox outside their door for turning in late assignments. *Do not* wait until the next week to turn in late papers. The penalty is assessed daily, so each day you wait to turn it in means more points are lost.

What you should do BEFORE you come to lab

It is important that you prepare for each week's experiment in advance so that you don't waste time in lab or make costly mistakes:

- Read and understand the experimental procedure before coming to class. Relevant pages from your CH301/302 textbook are listed at the end of every experiment for additional reading. You can also e-mail me or your TA or just Google the topic if you have questions after reading the lab manual.

- Complete the **Pre-lab** assignment in Quest before coming to class.

- Complete the **Preliminary Experimental Write-up** in your lab notebook before coming to class. The Preliminary Experimental Write-up is a head start on your lab report. It will save you time and make you less likely to make mistakes. Your Preliminary Experimental Write-up should include:
  - Your name, unique #, your TA's name, and the date
  - Title of the experiment
  - Objective of the experiment (formulated in your own words!)
  - Equations for chemical reactions carried out that week
  - Blank tables ready for data collection (example data tables are provided in the manual, just copy them into your notebook).
  - Blanks for writing down any other data you will collect (such as temperature, sample weights, etc.)

Unlike Dr. Lyon's sections of CH204, Dr. Anderson's sections are not required to complete a protocol before coming to class, and are allowed to work from their lab manuals in the lab.

As you collect data in lab, write it directly into the tables in your Preliminary Experimental Write-up. Enter all of your experimental observations ***directly into your notebook***. *Do not* record data in your lab manual, on scraps of paper towel, on your hands, or on disposable plastic weighing boats. At the end of the laboratory period, have your TA **sign your data** collected during the lab session in your laboratory notebook. Do not leave the lab without your TA's signature in your lab notebook.

Your Lab Report must include:

Your Preliminary Experimental Write-up
Data organized into tables; experimental observations
Sample calculation(s)
Graphs if applicable
Conclusions relating to any unknowns that were analyzed
Answers to Discussion Questions

Make sure to clearly identify all the different components of your laboratory report (e.g. "Discussion Questions for Experiment #__").

After doing the experiment, you must complete the **Post-lab** for the previous week's experiment using the online Quest system.

Laboratory notebook

- Use your lab notebook for data collection and observations and laboratory reports.
- *No chatspeak in the notebook.* Use real English words and sentences.
- Always use ink in your notebook. Use a pen that makes good carbonless copies.
- Never tear out original pages from your notebook. Always turn in the COPY page.
- If you made a mistake, cross it out with a single line. If there is any unused space left on the page, cross it out with a single diagonal mark.
- Write neatly and legibly. If your TA can't read it, he or she will just give you a big fat 0 because the TA's have 36 lab reports to grade every week and can't waste time deciphering your illegible scrawl after I just told you to write neatly and legibly.
- At the top of EVERY page of your notebook write down your name, your TA's name, date, and the section number (unique #).
- Always start your Preliminary write-up for each experiment on a new page.
- Number the answers for your discussion questions. Answers will generally be a sentence or three long. Use complete sentences made with real words. Correct punctuation and grammar are appreciated as well.
- At the end of the semester you will have to submit your laboratory notebook to your TA for grading. The notebook should be a complete record of everything you did in the lab, and should include copies of any graphs you made for the experiments.

Safety

- The biggest safety concern we have in lab is that any lab surface may be contaminated with chemicals. It's easy to pick up chemical contamination on your hands without even realizing it, and then something as simple as absently rubbing your eye can result in excruciating pain and permanent damage to the eye. Always wear goggles in the lab. Besides protecting your eyes from broken glass or chemical splashes, wearing goggles also prevents you from absently rubbing an eye. Make sure you wash your hands before touching anywhere near your eyes in lab, and always wash your hands before you leave lab.

- The second biggest safety concern we have in our laboratories is broken glass. Glass breaks every week. Small pieces may fly through the air (so always wear goggles) and large pieces fall downward (so wear long pants and shoes and socks, not sandals).

- On the first day, your TA will show you around the lab and point out various pieces of safety equipment, which include a safety shower, eyewash fountain, fire blanket, and fire extinguishers. Make sure you know the location of the nearest emergency exits. In the event of an accident, do not panic. Call your TA, the instructor, or storeroom personnel immediately for assistance. They will help you resolve the situation.

- Wear safety goggles provided by the Chemistry Department at all times while you are in the laboratory. If you wear glasses, you still need to wear safety goggles (they will fit over your glasses). If you persistently refuse or "forget" to wear goggles, the TA will kick you out of lab and you will get a 0 for the experimental part of that lab.

- Wear appropriate clothing to the laboratory. No shorts or short skirts. Pants and skirts have to go all the way to the ankle. No bare-belly shirts – the lab benchtops are at belly level, and that's where many spills end up, so your belly must be covered. Wear shoes that cover your feet completely. Sandals, clogs, and open-toe shoes are prohibited. If you want to wear shorts, keep a pair of sweat pants in your lab drawer to wear during lab. If you come to lab dressed inappropriately, you will have to wear a Tyvek bunny suit from the stockroom. You will lose points for this and the Tyvek suit will make your butt look big.

- Keep coats and backpacks off the bench tops and the floor. There are coat hooks on the wall that can be used to hang coats and backpacks.

- No eating, drinking, or chewing gum is allowed in the laboratory at any time. Never put anything in your mouth while in the lab because you may have chemicals on your hands without realizing it.

- The use of cell phones, iPods, and MP3 players is not allowed in the lab.
- Dispose of all chemical waste into the designated waste containers located in the hood.
- *Always wash your hands when you leave the laboratory at the end of the lab period.*

Storeroom

The storeroom is room 4.134, located in the middle of the lab hallway near the clock and the stairs. For some experiments, you will need to obtain an unknown sample from the storeroom. Any time you need a piece of equipment, you will get it from the storeroom. Make sure you sign your name on the checkout list when you check out the equipment and cross your name off the list when you return it back to the storeroom. Clean any borrowed equipment before you return it. You are financially responsible for any equipment checked out to you, including the equipment in your lab drawer. To receive an unknown from the storeroom, you will need to fill out an unknown request slip that includes your name, lab room number, unique number, and drawer number.

If you drop the class after checking in to a drawer, you are required to check out your equipment drawer before the end of the semester. If you fail to check out on time, you will be charged a $15 checkout fee in addition to the charges for any missing or damaged equipment.

Restrooms

There is a men's room in the 4th floor hallway next door to room 4.124 (next to the stairs). The nearest women's restrooms are directly upstairs and downstairs from the men's room, on the 5th and 3rd floors. (I am told that there's a couch in the 5th floor women's restroom, but I don't know for sure because I'm not allowed to go in there. There is no couch in the 4th floor men's room, but don't go in there just to verify this, because it's pretty horrible in there.)

Grading

Quizzes given during the lecture periods will make up 30% of your final grade, and laboratory work will account for the remaining 70% of your grade. Your lowest quiz grade will be dropped, and your lowest lab report grade will also be dropped. If you miss a week of class and do not take the quiz or do the experiment, you will get a 0 on those assignments and those will count as your dropped scores. If you miss a second week, you will get zeroes again, but this time you're stuck with them. The lowest Pre-lab and Post-lab grades are <u>*not*</u> dropped. All of those assignments are required.

This is the breakdown for the laboratory work as a percentage of your lab grade and your overall course grade:

Assignment	% of Lab Grade	% of Overall Grade
Report/Discussion Questions	65	45.5
Pre-labs	10	7
Post-labs	20	14
TA Lab Safety/Technique Evaluation and Notebook Grade	5	3.5
Total	100%	70%

For a complete grading breakdown, see the Grading page of the course web site and the CH204 Point Breakdown on the Freebies page.

There is no end of semester final exam in this class. There will be no curve. The grade breakdown will be as follows:

Percentage	Grade	GPA
92 – 100%	A	4.00
90 – < 92%	A–	3.67
88 – < 90%	B+	3.33
82 – < 88%	B	3.00
80 – < 82%	B–	2.67
78 – < 80%	C+	2.33
72 – < 78%	C	2.00
70 – < 72%	C–	1.67
68 – < 70%	D+	1.33
62 – < 68%	D	1.00
60 – < 62%	D–	0.67
Below 60%	F	0.00

Regrades

You can request a regrade of your work within TWO WEEKS after you get it back from your TA. To be considered for a regrade, you must submit the original assignment in question accompanied by a written specific explanation of why you think you deserve a regrade. When submitted for regrade, the entire assignment (e.g. entire report or entire quiz) will be reviewed, which can possibly result in a lower grade. Regrades will not be considered for quizzes written in pencil.

Attendance

- Laboratory attendance is mandatory. The TA's will record attendance each week.
- If you know ahead of time that you will miss a lab but you do not want to drop your score for that week, notify Dr. Anderson via e-mail as soon as you know you will miss. It may be possible to squeeze you in at another time on Monday or Tuesday of that week.
- If you miss a week, you should still do the Pre-lab and Post-lab assignments for that experiment. You have a week to complete each of these assignments, and these scores are not dropped. Only one Quiz score and one Report/Discussion score will be dropped.
- If you arrive late to lecture after the quizzes have been handed out, you will not be given a quiz and you will receive a 0 for that week's quiz.
- If you are more than 20 minutes late to the lab, you will not be permitted into the lab and will receive a 0 for that week's experiment.
- *No make-up quizzes will be given for missed classes. None, I say.*
- If you leave the lab early without permission from your TA, you will receive zero credit for the laboratory report for the experiment performed on that day.
- You cannot redo a lab to get a higher grade. We do not have the space and staff resources to allow everybody to do that. Come prepared and do a good job the first time through.

Scholastic Dishonesty

Scholastic dishonesty and plagiarism will not be tolerated. Examples of scholastic dishonesty include copying someone else's pre-lab answers, post-lab answers, or any part of their report or quiz, providing your own pre-labs, post-labs, or any part of a report or quiz to somebody else to copy, making up data, changing data, falsifying data, or presenting somebody else's work as your own. Altering any graded paper and then resubmitting it for a regrade is also scholastic dishonesty.

CH204 students are not allowed to work together on pre-labs, reports, and post-labs. You may talk with other students about the material and your understanding of the concepts, but the work you turn in must be your own individual effort, not answers that were developed with somebody else or answers that were provided by somebody else.

If someone has offered you their old lab reports or other papers from a past semester of CH204, give them back today. We take considerable efforts to dissuade students from cheating and to catch them when they do. This course is rigged throughout with hidden tripwires and land mines designed specifically to catch cheating students, and every semester they catch some more. All student grades are recorded in duplicate to minimize the chance of accidental mistakes in the record, and student papers may be photocopied at random or with cause at any point throughout the semester. Any student who is found to have cheated will be reported to the Student Judicial Services in the Office of the Dean of Students with a recommended grade of F for the course.

Special note

If you require special assistance because of a physical or learning disability please notify Dr. Anderson immediately. Arrangements and necessary accommodations will be made in compliance with UT policy and the American Disabilities Act. For more information contact Student Dean's Office (471-6259, 471- 4641 TTY). All notifications and accommodations will be handled with utmost respect and confidentiality.

Brief Summaries of the Experiments we will do this semester:

Lab 1 Are the Densities of Coke and Diet Coke Different?

Are the densities of Coke and Diet Coke different, and if they are, is the difference large enough that we can measure it using the equipment we have in lab? We will measure the masses of some volumes of both Coke and Diet Coke and see if we can tell the difference. The main purpose of this experiment is to familiarize you with the lab glassware and analytical balances you will be using this semester. We will also review significant digits and how to report experimental error.

Lab 2 Separation and Recovery of the Components of a Mixture

You will be given a mixture of salt, sand, and chalk dust, and will have to use chemical and physical means of separating and recovering the three solids. You will report the composition of your mixture as weight percents of each component, and will be graded on the accuracy of your results.

Lab 3 Qualitative Chemical Analysis

You will react a series of eleven chemical solutions with one another and record the observable results of the reactions (precipitations). You will then be given a set of five unknown solutions, and by reacting them with one another and comparing your results with those obtained for the eleven known solutions, you will determine the identity of your unknowns. You will be graded on the accuracy of your determinations.

Lab 4 Acid-Base Titration

In this experiment you will make and standardize a solution of NaOH and use that to titrate a series of acidic solutions to determine their acid content. As part of this, you will have to determine the identity and concentration of an unknown acid, and will be graded on your accuracy.

Lab 5 Synthesis and Analysis of a Complex Iron Compound. ***Part 1: Synthesis***

You will start with an inorganic iron salt and will carry it through a series of reactions to create a crystalline compound containing iron and oxalate. The crystals you obtain will be analyzed in the next two experiments to determine the chemical formula and the purity of your crystals.

Lab 6 Synthesis and Analysis of a Complex Iron Compound. ***Part 2. Oxalate Content by Redox Titration***

This week you will analyze the iron crystals you synthesized the week before, to determine their oxalate content. The amount of oxalate present is determined by redox titration using potassium permanganate.

Lab 7 Synthesis and Analysis of a Complex Iron Compound. ***Part 3. Spectrophotometric Determination of Iron Content***

In this experiment you will dissolve the crystals you created in Experiment 5 and convert the iron to a colored complex ion, and will then use a spectrophotometer to determine the amount of iron present based on how much light the solution absorbs at 510 nm.

Lab 8 Thermochemistry – this is a different experiment from the one in the lab manual

You will be given this experiment as a handout. The lab we will do consists of four short experiments involving heat transfers. You will determine the specific heat capacity of an unknown metal, and also the heats of reaction for a couple of chemical reactions. You will be graded on the accuracy of your results.

Lab 9 Acid-Base Equilibria

In Experiment 4 you did an acid-base titration using a strong base to titrate a strong acid to the endpoint. This week we will use a strong base to titrate a weak acid, and will determine the ionization constant (K_a) of the weak acid by titration and through the use of a pH meter, and will compare the results.

Lab 10 Chemical Kinetics Discovery Lab: ***Determination of Reaction Mechanism***

In this experiment you will be presented with an unknown reaction involving unknown reactants, and without ever knowing what the overall chemical reaction is, you will have to determine the individual steps by which the overall reaction proceeds along with identifying any catalysts and chemical intermediates that play a role in the reaction.

Fall 2009 Schedule

MON	TUE	WED	THURS	FRI
August 31 **Check-In**	September 1 **Check-In**	2	3	4
7 **Labor Day** **No Class**	8 **No Class**	9	10	11
14 **Lab 1**	15 **Lab 1**	16	17	18
21 **Lab 2**	22 **Lab 2**	23	24	25
28 **Lab 3**	29 **Lab 3**	30	October 1	2
5 **Lab 4**	6 **Lab 4**	7	8	9
12 **Lab 5**	13 **Lab 5**	14	15	16
19 **Lab 6**	20 **Lab 6**	21	22	23
26 **Lab 7**	27 **Lab 7**	28	29	30
November 2 **Lab 8**	3 **Lab 8**	4	5	6
9 **Lab 9**	7 **Lab 9**	8	9	10
16 **Lab 10**	14 **Lab 10**	15	16	17
23 **Last Assignments Due**	24 **Last Assignments Due**	25	26 Thanksgiving	27
30	December 1	2	3	4