

# CH 204 – Introduction to Chemical Practice

## Spring 2007

**Instructor:** Dr. Brian Anderson

**Office:** WEL 5.220A **Phone:** (512) 475-6729

**E-mail:** banderson@cm.utexas.edu

**Web Site:** <http://courses.cm.utexas.edu/banderson/ch204/>

**Office hours:** Monday 10:00 – 11:30 or by appointment – don't hesitate to ask!

**Lecture room:** WEL 2.312

**Teaching Assistants:** See page 9 of this syllabus for a listing of all TA's and section numbers

**TA office hours:** Cubicle C (1st floor of WEL building).

Tuesday 1:00 – 2:00 Jae / Dmitry

Wednesday 1:00 – 2:00 Tori / Shreya

3:30 – 4:40 Ashley

Thursday 1:00 – 2:00 Wei-chen / Christina

3:00 – 4:00 Josh / Travis

Also check the schedule posted on Cubicle C for additional office hours held by the TA's of other CH 204 classes.

**Storeroom:** Ethan Greene 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 **Feb 12, 2007**.

The Q-drop deadline is **March 26, 2007**.

### Required course materials and supplies

1. Leytner, S. *General Chemistry Lab Manual*; McGraw-Hill Higher Education, **Spring 2007 edition** (available at the University Co-op).
2. A bound laboratory notebook with duplicate numbered pages (sold by the University Co-op or by Duplicating in WEL 2.228 or by the Student Affiliates of the American Chemical Society).
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, including 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.

### Lectures

The lectures each week will cover background material necessary for the experiment being performed, and also provide practical tips for carrying out the experiment and sample calculations to help get you started on the write-up. You are strongly encouraged to take notes during the lectures since some of the material covered is not contained within the textbook or the laboratory manual. There will also be short quizzes given at the end of each lecture session, covering the previous week's material.

## Quizzes

Quizzes will typically be 3 – 4 questions and you will have about 10 – 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. The lowest quiz grade will be dropped and the rest will count towards 30% of your grade. **No make-up quizzes will be offered.** If you miss a quiz for any reason, that will be the one you drop.

Consider the quizzes to be a final exam, given in nine weekly installments. If you would not study for a final exam that was worth 30% of your grade, then do not study for the quizzes. If you *would* study for a final exam, then take some time each week and study for the quizzes.

## Laboratory

The laboratory 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 your TA whenever you have questions or are not sure how to perform certain tasks. You will not be penalized for asking questions.

Lab reports are comprised of three sections: Pre-Lab, Report and Discussion Questions, and Post-Lab. These should all be written out in your lab notebook. Each one should be started on a new page. Tear out the *COPY* page from your notebook to turn in each assignment. Leave the original in the notebook.

1. **Pre-lab** – Each experiment in the lab manual includes five pre-lab questions. These should be done before coming to lab and are due during the first 5 minutes of lab on the day the lab is performed. Each pre-lab is worth 5 points. A late penalty of 0.5 point (10%) grade reduction per day (excluding weekends and school holidays) will be assessed on pre-labs turned in after the deadline.
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, and conclusions, such as identification of unknowns. The report also includes answers to the discussion questions section of the experiment in the lab manual. These questions should be answered in complete sentences, not simple one-word answers. The report is due one week after the experiment is performed. Every report is worth 40 points. A late penalty of 4 points (10%) grade reduction per day (excluding weekends and holidays) will be assessed on reports turned in after the deadline.
3. **Post-lab** – Each experiment in the Lab Manual also includes a post-lab section made up of five problems relating to the chemistry covered in that experiment. Answers to the post-lab problems are due with your report one week after the experiment is performed. Every post-lab is worth 10 points. Remember to show your work. A late penalty of a 1 point (10%) grade reduction per day (excluding weekends and holidays) will be assessed for the post-labs turned in after the deadline. The post-lab for Experiment 7 is due one week after completing the first part of the lab.
4. **Unknown Summary Sheet** (if applicable) – As part of some experiments (2, 3, 4, 7, and 8), you are required to identify an unknown compound or calculate the concentration of an unknown solution. These results are reported on an unknown summary sheet, which is turned in along with your report one week after finishing the experiment. Every unknown summary sheet is worth 20 points, and will be graded based solely on accuracy. The same late penalty of 10% per day (excluding weekends and holidays) will be assessed for late reports and late unknown summary sheets.

All lab assignments are due during the first 5 minutes of lab. Turn in any late papers directly to one of the CH 204 TA's, to me, or to Ethan in the stockroom (4.134) as soon as possible. *Do not* wait until the next week to turn in late papers. The penalty is assessed daily, so each day you wait to turn something in means more points lost.

### What you should do **BEFORE** you come to lab

It is important that you prepare for each week's experiment in advance:

- 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 should also use the Internet as a resource if you are having difficulty with the material.
- Complete the **Pre-lab** assignments listed in the manual at the end of each experiment before coming to class. Write down the answers in your laboratory notebook. Write down the title "Pre-lab Problems for Experiment #\_\_" at the top of each page used for pre-lab answers for easier identification.
- Complete the **Preliminary Experimental Write-up** before coming to class. The preliminary experimental write-up is a head start on your lab report. It should include:
  - Your name, unique #, your TA's name, and a 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).

You **DO NOT** have to copy the whole experimental procedure from the manual into your notebook.

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 laboratory report is a continuation of the preliminary experimental write-up. It must include:

Your preliminary experimental write-up  
Data organized into tables; experimental observations  
Sample calculation(s)  
Graphs if applicable  
Answers to discussion questions.

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

Complete the **Post-lab** assignments listed in the manual at the end of each experiment before coming to class. Write down the answers in your laboratory notebook. Write down the title "Post-lab Problems for Experiment #\_\_" at the top of each page used for post-lab answers for easier identification.

## **Laboratory notebook**

- Use your laboratory notebook for pre-lab assignments, data collection and observations, laboratory reports, and post-lab assignments.
- Always use ink in your notebook.
- Never tear out original pages from your notebook. 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.
- Tear out and submit the COPY pages for grading.
- Write neatly and legibly. If we can't read it, we can't grade it.
- 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 the pre-lab assignment for every experiment on a new page.
- Always start your laboratory Report for every experiment on a new page.
- Always start the post-lab assignment for every experiment on a new page.
- Keep in mind that you will have to submit your laboratory notebook to your TA for grading at the end of the semester.

## **Safety**

- On the first day, your TA will show you around the lab and direct your attention to the various pieces of safety equipment, which include safety shower, eyewash fountains, fire blankets, 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). Failure to wear safety goggles will result in your expulsion from the laboratory and zero credit for the experimental part of that particular 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. Wear shoes that cover your feet completely. Sandals, clogs, and open-toe shoes are prohibited. If you want to wear shorts, bring a pair of sweat pants in your backpack for lab. If you dress inappropriately, you will have to wear a Tyvek suit from the stockroom and will lose safety points from your grade.

- 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.

- The use of cellular phones, tape, radio, CD, or MP3 players (including the use of headphones) is not allowed in the lab.

- Dispose of all the chemical waste into the designated waste containers located under the hood in every laboratory room.

- Always wash your hands with soap every time you leave the laboratory at the end of every lab period.

## **Storeroom**

For some experiments, you will need to borrow certain pieces of equipment 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. If you drop the class after the check-in, 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.

## Grading

Quizzes given during the lecture periods will make up 30% of your final grade. The lowest quiz grade will be dropped. Laboratory work will account for the remaining 70% of your grade. The breakdown for the laboratory work is approximately the following:

- Reports 41%
- Pre-labs 5%
- Post-labs 10%
- Unknown Summary Sheets 10%
- Lab Safety/Technique Evaluation and Notebook 4%

A lab safety/technique evaluation score will be assigned to you by your TA at the end of every laboratory period. You will have to submit your lab notebook to your TA for grading at the end of the semester.

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

- 90% and higher A
- 80% - 90% B
- 70% - 80% C
- 60% - 70% D

## 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 (for example, quiz, unknown summary sheet, lab report, etc.) 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. Unknown summary sheets submitted for regrade must be accompanied by the corresponding reports.

## Attendance and make-up policy

- Laboratory attendance is mandatory.
- You are allowed to miss ONE laboratory session during the semester for any reason, such as late registration, illness, any type of emergency, observance of religious holy days, going out of town for any reason, oversleeping, opting to study for another class, etc. You do not have to notify anybody about the missed lab. Your absence will be recorded by your TA and you will be scheduled automatically to make up the missed lab at the end of the semester during the make-up session. Additionally, you will get an automatic 1-week extension for any work that was due on the missed day. *No make-up quizzes will be given.*

**NOTE:** Experiments 5 through 7 are designed to be performed in sequence. In Experiment 5, you will synthesize an inorganic compound, and in Experiments 6 and 7 you will analyze the compound you created. If you miss Experiment 5, you will be provided a sample to work with to perform Experiments 6 and 7 so that you can continue in sequence with the rest of the class, and you will make up Experiment 5 at the end of the semester.

- More than one make-up lab will be allowed only under extreme circumstances. Those instances will be considered on a case-by-case basis. All the make-up requests for more than one missed lab must be made to Dr. Anderson within one week of the second missed laboratory session. For scheduled university events, you must give at least 14-day advanced notice. If you must miss more than one laboratory session due to observance of religious holy days, it is the policy of UT that the student must notify the instructor at least 14 days in advance. No make-up quizzes will be granted.

- All absences from the laboratory after the first one will be considered unexcused unless the instructor is notified in advance or documentation of a medical or family emergency is provided.
- An unexcused absence from the wet laboratory will result in a zero credit for the laboratory report and unknown summary sheet (if applicable) for the experiment performed on the missed day. In addition, a late penalty of 10% grade reduction per day for all of the assignments that were due on the missed day will apply.
- If you are more than 30 minutes late to the wet lab, you will not be permitted into the lab and will receive an unexcused absence for the missed laboratory with all the implications that come with it.
- If you leave the lab early without the permission from your TA, you will be given an unexcused absence for that laboratory and will receive zero credit for the laboratory report for the experiment performed on that day.

### **Scholastic Dishonesty**

Scholastic dishonesty and plagiarism will not be tolerated. Examples of scholastic dishonesty include copying pre-labs, post-labs, or any parts of a report or quiz from somebody else's work, providing your own pre-labs, post-labs, or any parts of a report or quiz to somebody else to copy, making up data, falsifying data, presenting somebody else's work as your own. Any student who is found to have cheated will be reported to the Student Judicial Office 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 me 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 for the well-being of the student.

### **Brief Summaries of the Experiments we will do this semester:**

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

In this experiment we will measure the mass of a known volume of Coke or Diet Coke to calculate the density of each liquid, and will compare the results. The main purpose of this experiment is to familiarize you with the lab glassware and analytical balances you will be using this semester, and also to review significant digits and the reporting of experimental error.

#### **Lab 2 Separation and Recovery of the Components of a Mixture**

In this experiment you will be given a mixture of sand, chalk dust, and salt, and will have to use chemical and physical means of separating and recovering the three solids. You will have to 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**

In this experiment you will react a series of ten chemical solutions with one another and record the observable results of the reactions (precipitations, mostly). 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 ten known solutions, you will determine the identity of your unknowns. You will be graded on the correctness of your response.

**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***

In this experiment you will be given an inorganic iron salt and will have to carry it through a series of reactions to convert it to a different 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***

In this experiment 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. By the end of this experiment you will have analyzed your iron crystals for both iron and oxalate, and should be able to calculate the chemical formula for your compound. You will report the iron and oxalate results and will be graded on accuracy. This experiment will be performed over two lab periods. The first week we meet we will do parts 2 and 3 of the experimental procedure (preparing standards and making up a calibration curve). The second week we will do parts 1 and 4 of the procedure (preparing and analyzing our sample crystals). The post-lab is due one week after completing the first half of the experiment, and the report and discussion questions are due one week after completing the second half.

**Lab 8 Thermochemistry**

In this experiment you will carry out a series of experiments in a styrofoam coffee cup calorimeter, and will measure the amount of heat that is generated by each reaction. Knowing the amount of heat generated, you will be able to determine the heats of reactions for some chemical reactions and the identity of an unknown solid metal. You will be graded on the accuracy of your results.

**Lab 9 Acid-Base Equilibria**

Previously you have done an acid-base titration using a strong base to titrate a strong acid. 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. You will do this by varying the concentrations of each reactant and measuring the effect on the rate of the reaction.

## Spring 2007 Schedule

MON	TUE	WED	THURS	FRI
January 15 <b>MLK Day</b> <i>No Classes</i>	16 <i>No Meeting</i>	17	18	19
22 <b>Check-In</b>	23 <b>Check-In</b>	24 <b>Check-In</b>	25	26
29 <b>Lab 1</b>	30 <b>Lab 1</b>	31 <b>Lab 1</b>	February 1	2
5 <b>Lab 2</b>	6 <b>Lab 2</b>	7 <b>Lab 2</b>	8	9
12 <b>Lab 3</b>	13 <b>Lab 3</b>	14 <b>Lab 3</b>	15	16
19 <b>Lab 4</b>	20 <b>Lab 4</b>	21 <b>Lab 4</b>	22	23
26 <b>Lab 5</b>	27 <b>Lab 5</b>	28 <b>Lab 5</b>	March 1	2
5 <b>Lab 6</b>	6 <b>Lab 6</b>	7 <b>Lab 6</b>	8	9
12 <b>S P R I N G</b>	13 <b>B R E A K</b>	14	15	16
19 <b>begin Lab 7</b>	20 <b>begin Lab 7</b>	21 <b>begin Lab 7</b>	22	23
26 <b>finish Lab 7</b>	27 <b>finish Lab 7</b>	28 <b>finish Lab 7</b>	29	30
April 2 <b>Lab 8</b>	3 <b>Lab 8</b>	4 <b>Lab 8</b>	5	6
9 <b>Lab 9</b>	10 <b>Lab 9</b>	11 <b>Lab 9</b>	12	13
16 <b>Lab 10</b>	17 <b>Lab 10</b>	18 <b>Lab 10</b>	19	20
23 <b>Make-Up</b>	24 <b>Make-Up</b>	25 <b>Make-Up</b>	26	27
30	May 1	2	3	4

## Teaching Assistants

### MONDAY AFTERNOON

Section	Lab Room	Teaching Assistant	e-mail
53195	4.116	Travis Hesterberg	TravisH@mail.utexas.edu
53200	4.122	Christina Wales	chwales@mail.utexas.edu
53205	4.124	Josh Biberdorf	josh.biberdorf@mail.utexas.edu
53210	4.138	Tori Kim	ToriK@mail.utexas.edu
53215	4.140	Ashley Garcia	ashsquirrel@mail.utexas.edu

### MONDAY NIGHT

Section	Lab Room	Teaching Assistant	e-mail
53295	4.116	Travis Hesterberg	TravisH@mail.utexas.edu
53300	4.122	Christina Wales	chwales@mail.utexas.edu
53305	4.124	Josh Biberdorf	josh.biberdorf@mail.utexas.edu
53310	4.138	Shreya Mitra	shreya_mitra@mail.utexas.edu
53315	4.140	Ashley Garcia	ashsquirrel@mail.utexas.edu

### TUESDAY MORNING

Section	Lab Room	Teaching Assistant	e-mail
53095	4.116	Yoon-Jae Kim	lastboy@mail.utexas.edu
53100	4.122	Ashley Garcia	ashsquirrel@mail.utexas.edu
53105	4.124	Wei-Chen Chang	wchang@mail.utexas.edu
53110	4.138	Shreya Mitra	shreya_mitra@mail.utexas.edu
53115	4.140	Dmitry Krapchetov	dmitry@che.utexas.edu

### WEDNESDAY NIGHT

Section	Lab Room	Teaching Assistant	e-mail
53320	4.116	Yoon-Jae Kim	lastboy@mail.utexas.edu
53325	4.122	Ashley Garcia	ashsquirrel@mail.utexas.edu
53330	4.124	Wei-Chen Chang	wchang@mail.utexas.edu
53335	4.138	Tori Kim	ToriK@mail.utexas.edu
53340	4.140	Dmitry Krapchetov	dmitry@che.utexas.edu

MORNING LABS:	Lecture 8 – 9:am	Lab 9:am – 1:pm
AFTERNOON LABS:	Lecture 12 – 1:pm	Lab 1 – 5:pm
NIGHT LABS:	Lecture 4 – 5:pm	Lab 5 – 9:pm