

Chemistry 212

Professor: Dr. Jay (Jiyeon) Kim

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Office hours: visit in 374D

12-2pm on Tuesday/Thursday

Text: Harris, Quantitative Chemical Analysis, **9th ed.** WH Freeman. (**Chapters 0-11**)

Chapter 0: Analytical Process

Chapter 1: Chemical Measurements

Chapter 2: Tools of the Trade

Chapter 3: Experimental Error

Chapter 4: Statistics

Chapter 5: Quality Assurance and Calibration Methods

Chapter 6: Chemical Equilibrium

Chapter 7: Let the Titrations Begin

Chapter 8: Activity and the Systematic Treatment of Equilibrium

Chapter 9: Monoprotic Acid-Base Equilibrium

Chapter 10: Polyprotic Acid-Base Equilibrium

Chapter 11: Acid-Base Titrations

The book will be used for assigning homework and for some of the figures in the chapters. This book is also a good reference if you plan to take instrumental analysis in the future.

Other resources: Skoog, Fundamentals of Analytical Chemistry, Thomson-Brooks/Cole
Chang, General Chemistry: the Essential Concepts, McGraw-Hill

Course objectives:

Precision and accuracy were introduced as terms in freshman chemistry, but not examined in any great depth. Both of these terms become central to the discipline of quantitative analysis. In freshman chemistry, you learned general lab techniques and calculations related to precision such as percent error were routinely calculated. However, in quantitative analysis, you will be trying to increase both the accuracy and precision of your results. The equipment will allow you to measure more precisely, so you will begin to push the limits of the "assumptions" that were made in freshman chemistry such as approximations in pH measurements and assuming that ions fully dissociate from a salt if you consider a salt "soluble". This was valid in earlier chemistry courses because you were usually limited by the equipment, graduated cylinders were usually used to measure volume and a 2 place balance was used for mass. In lab reports, you just listed "error" when the results didn't match the actual values you were trying to achieve. However, in this course, you will be dissecting that variance and making more precise measurements than you did in the lower level classes. Instead of two digits after a decimal on the balance, you will now be recording the mass of your materials to four decimal places. You will learn to measure your masses and volumes more carefully and be graded on your results. Statistical methods will be applied that will allow you to mathematically determine if a measurement can be discarded and will also be an estimate of the quality of your results. Finally, you will perform more rigorous calculations on your data than in freshman chemistry and eliminate many of the "assumptions" that were used in the freshman level courses. Chemistry 212 does away with the hand-waving we called "human error" and forces you to explain specifically "WHY" your results don't match the results you expected to achieve when performing a chemical experiment. This will involve both calculations resulting from equipment tolerances, but also how to minimize those "assumptions" we made to some of the theories previously used.

Studying:

This course moves extremely quickly. We will cover approximately 1 chapter per week, so it is important that you keep up with the workload. The material learned in each chapter will be used in subsequent chapters, so if you fall behind in the first few weeks, it's hard for you to catch up again. You are also expected to have retained the material you learned in freshman chemistry, especially error and moles/molarity calculations from the first semester of general chemistry and equilibrium calculations that were performed in the second semester. The final is entirely cumulative; a single question may require you to use techniques and concepts learned in several different chapters.

Notes, Assignments and Experiments

All class notes, assignments and Experiments will be posted in the Resources section of Sakai. I will be posting notes and the experiments approximately 1 week before they are covered so you have them ahead of time to use as a guide for reviewing the chapter material. Assignments will be announced in class.

Office Hours:

The office hour will be 12-2 pm on Tuesday/Thursday. If there is a time conflict, email me for an appointment. Visiting in group is also welcome. If you have lab questions, see **Surendra Puri**.

Disability Accommodations:

Any student with a documented disability is welcome to contact me as early in the semester as possible so that we may arrange reasonable accommodations. I have no problem making any accommodations you may need, but I need at least a week's notice to set up an alternate location for exams or quizzes. I also need documentation from Disabilities Services, so contact them first at 330 Memorial Union, 401-874-2098.

Sports or Other University Sponsored Events:

Please let me know the first week of classes if you need any accommodations made. Please let me know if you have any lab conflicts as well.

Course Grades:

The course is graded strictly by the grades you achieve on the assigned material, lab grades and exams. **There is no extra credit!** Any errors in grading must be brought to my attention within 1 week of the material being handed back. No changes in any grades will be made after that point. **You cannot bring all graded work to me at the end of the semester in the hope that you will get extra points.**

Scaling:

The scale for the course will be posted on the Sakai after each exam. Remember, the grade is based on the exams and quizzes together. 60% of the grade based on lecture material and 40% on the lab. All grades will be posted on Sakai with a letter grade as you proceed through the course.

Note: You need a C- to move on to any other Chemistry course in our department!

Lecture Grade: 60% of Grade

Exams: Each exam will have tentatively 5 questions each worth 20 points. There will be several parts per question. All work must be shown to get credit. Each exam will cover material from previous exams, so all exams are cumulative. Your exams and final are worth 50% of the overall grade. The final will have 10 questions that cover all the material that was learned in the course. **You cannot drop the final**, so if you miss it, you need to be in touch immediately to get it made up.

Tentative Exam Dates:

Exam 1: Tuesday, 9/26 in class

Exam 2: Tuesday, 10/10 in class

Exam 3: Tuesday, 11/14 in class

Exam 4: Tuesday, 12/5 in class

Final: Tuesday, 12/19 8-11am in class

Quizzes: Problem sets for your practice will be assigned throughout the course. You can work as team for these problem sets. Make sure that these problem sets will cover the exams. Quizzes will also be given in every class. The quiz grades are worth 10 % of the overall grade.

Lab: 40% of Grade

Lab Reports: Each lab is graded according to the rubric in the instructions given out in lab. Lab reports constitute 25% of the overall grade

Lab Notebook: You will be expected to maintain a lab notebook throughout the course. Explicit instructions and a rubric will be provided as to the grading of this document at the end of the semester. The lab notebook grade will be 5% of your overall grade.

Lab Final: You will be expected to do quantitative lab work for your final that will be based on the techniques you learn in the lab. You will be expected to do out all calculations during the lab that you need to support your results. Your grade on the final will be based on the accuracy of the results and is worth 10% of your overall grade in the course.