

Chemistry 365  
Analytical Chemistry  
Syllabus— Winter 2009

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OFFICE HOURS: TR 11:15-12:15, W 9:00-10:00 AM, F 9:00-12:00 & 2:30 – 3:30 PM or by appointment

Textbook/Reading Materials:

Quantitative Chemical Analysis, by D.C. Harris, 7<sup>th</sup> edition. Freeman (the publisher) has supplemental information regarding Analytical Chemistry on their web site: <http://www.whfreeman.com/qca7e>. I encourage you to visit the site for sample online quizzes “Chemical Analysis on the Web”, spreadsheets, living graphs as well as additional exercises.

There is no lab manual for this course. However, you will need a bound lab notebook, a set of 3x5 index cards, and a scientific calculator. You will be responsible for downloading labs from the publisher’s web site as indicated on the lab syllabus.

Grading

Review quiz and unannounced quizzes	100	
Four Exams (4 @ 100 points) .....	400	<b>no</b>
On-line quizzes (from Harris’ website) .....	150	<b>make-ups</b>
ACS Standardized Final Exam .....	100	<b>will be</b>
Laboratory .....	550	<b>given!</b>
 TOTAL .....	 1300	

Hour exams will be given on or near the dates shown on the syllabus, depending on how much or how little time we spend on each topic. The final exam is the multiple choice, standardized, ACS Analytical exam. Most of the labs are graded based on accuracy!

Answers to all quizzes and exams will be posted in the glass cabinet outside my office

**I WILL POST, ON MY WEB SITE, A SAMPLE COPY OF AN EXAM FROM A PREVIOUS ANALYTICAL CLASS ONE WEEK BEFORE EACH EXAM.**

The lecture schedule on the following page is only an outline of the material that we MAY cover during the semester. Exams, problems sets, etc. will be assigned based on the amount of material that we cover during each time period. The course is flexible enough that we can add or delete material depending on the time it takes to cover each topic.

## Chemistry 365 Winter 2009 : Topics and Readings

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<u>Week beginning</u>	<u>Topic</u>	<u>Reading</u>
January 12 <sup>th</sup>	What is Analytical Chemistry?	Harris 0
	<i>Measurements - Review on your own</i>	Harris 1
	Analytical Figures of Merit & Statistics	Harris 3-4
	• <i>On line quiz assignment(s)</i>	
January 19 <sup>th</sup>	Calibration Methods	Harris 4-5
	Review of Chemical Equilibrium	Harris 6
January 26 <sup>th</sup>	Volumetric analysis	Harris 7
	Activity and the systematic treatment of equilibrium	Harris 8
February 2 <sup>nd</sup>	Monoprotic Acid-Base equilibria <b>FIRST HOUR EXAM (excluding chapter 9)</b>	Harris 9
February 9 <sup>th</sup>	Polyoprotic Acid-Base Equilibria	Harris 10
	• <i>On line quiz assignment(s)</i>	
February 16 <sup>th</sup>	Acid-Base Titrations	Harris 11
February 23 <sup>rd</sup>	Chelating ligands and their prey	Harris 12
March 2 <sup>nd</sup>	Fundamentals of Electrochemistry <b>SECOND HOUR EXAM (excluding chapter 14)</b>	Harris 14
March 9 <sup>th</sup>	<i>Spring Break!</i>	
March 16 <sup>th</sup>	Potentiometric measurements: ISEs	Harris 15
March 23 <sup>rd</sup>	Fundamentals of and Instruments for Spectroscopy	Harris 18, 20
March 30 <sup>th</sup>	Atomic and Molecular spectroscopy <b>THIRD EXAM</b>	Harris 19, 21
April 6 <sup>th</sup>	Introduction to Analytical Separations	Harris 23
April 13 <sup>th</sup>	Gas and liquid chromatography	Harris 24-25
	Mass Spectrometry	Harris 22
	• <i>On line quiz assignment(s)</i>	
April 20 <sup>th</sup> 3	Ion Chromatography and Electrophoresis <b>FOURTH EXAM</b>	Harris 26
April 27 <sup>th</sup>	<b>FINAL EXAM WEDNESDAY APRIL 29<sup>TH</sup> 6:45 – 8:45 PM</b>	

You are required to keep a bound laboratory notebook for all your experimental data. Harris gives some suggestions on notebook keeping and basic good lab practices in Chapter 2 (sec 2-2). You should be well organized, careful, and detailed in keeping your notebook. You may find it useful to use the first few pages as a “Table of Contents” so that you can easily find lab data. All entries and all reports **MUST BE MADE IN INK**. Never erase or cross out recorded data. A simple slash through an entry will allow you to read it at a later time, in case your original value was the correct one! Data should never be recorded on scrap pieces of paper, or torn out of your bound record book.

**Your lab notebook must be turned in along with a 3x5 index card that summarizes your analytical results for each experiment.** The following information should be included on your index card: name, date, experiment performed, unknown number, quantitative result, and an estimation of error. Your grade will depend on the accuracy of your result, but sloppy notebooks will lower your lab grade. Errors in analytical results are often caused by calculation errors. Therefore, a set of clear sample calculations in your notebook can help me find and correct errors (and help your grade).

Experiments are due on the dates indicated on the lab schedule. **Late labs will be penalized ten points per day.** Weekends and holidays count the same as weekdays. **YOU WILL RECEIVE NEGATIVE POINTS ON LABS THAT ARE MORE THAN FIVE DAYS LATE!** If you are having difficulty with calculations, please come see me **BEFORE** the due date! **Points for accuracy vary with each lab – I will provide you with more information on this prior to each exercise.**

You are required to attend lab at the time that you registered for it. During this time period, we will be discussing techniques, equipment, calculations, safety precautions, and we will point out the location of all reagents, etc.

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Laboratory Schedule

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<b><u>Week Beginning</u></b>	<b><u>Exercise</u></b>	<b><u>Reading</u></b>
January 19	Statistical evaluation of Acid-base Indicators Results due January 30	Exp. 5 - download PDF file from the Harris web site also, read Harris 3-4
January 26	Gravimetric Determination of Calcium as $\text{CaC}_2\text{O}_4 \cdot \text{H}_2\text{O}$ Results due February 6	Exp. 2 – download PDF file from the Harris web site
February 2	Sulfate in Water by Turbidity Results due February 13	supplemental and Harris 19 (skim) and Harris Table 7.1, 131m
February 9	Using a pH electrode for an Acid-base titration Results due February 20	Exp. 7 - download PDF file from the Harris web site and supplemental
February 16	Carbonate Determination using an Automated Titrator Results due February 27	supplemental and Exp. 8 – download PDF file from the Harris web site
February 23	$\text{Ca}^{2+}$ and $\text{Mg}^{2+}$ in Natural Waters Results due March 6	Exp. 11 – download PDF file from the Harris web site
March 2	Spectrophotometric Determination of Iron Results due March 20	Exp. 24 download PDF file the Harris web site
March 16	relax and catch up!	
March 23	ISE Results due April 3	supplemental
March 30	Atomic Absorption Spectroscopy Results due April 10	Exp. 25 – download PDF file from the Harris web site
April 6	Gas Chromatography Results due April 17	supplemental
April 13	HPLC Results due April 24	Exp. 31 – download PDF file from the Harris web site