

## Chemistry 222 - Spring 2012 Analytical Chemistry

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<b>Office Hours:</b>	TR 11-12, 2-3, and by appointment	<b>Fax:</b>	(312) 996-0431
<b>Lecture:</b>	TR 12:30-1:45 230 SES	<b>Website:</b>	<a href="http://www.chem.uic.edu/audrey/chem222">http://www.chem.uic.edu/audrey/chem222</a>

**Textbook:** Daniel C. Harris, *Quantitative Chemical Analysis*, 8th Edition (W. H. Freeman and Company, 2010); *Solutions Manual for Quantitative Chemical Analysis*; on-line homework, [www.saplinglearning.com](http://www.saplinglearning.com)

**Laboratory:** bound laboratory notebook capable of providing carbon (carbonless) copies; chemical splash goggles.

### COURSE REQUIREMENTS / POLICIES

**Goals:** CHEM 222 is an introduction to the principles and practices of analytical chemistry. Often the more descriptive term quantitative analysis is given to this discipline. The focus of the course is on the separation and analysis of chemical substances. Analysis means to both identify a chemical substance and to determine its amount. The laboratory portion of the course is balanced by an in-depth review of general chemistry principles (in particular, stoichiometry and equilibrium) as applied to the problem of separating and quantifying substances from mixtures. Your grade will be based upon the accuracy of your laboratory results.

**Prerequisites:** Grade of C or better in CHEM 114 or in CHEM 118 or the equivalent.

**Registration:** Concurrently register for the lecture and a laboratory section. It is not permitted for students to register for one laboratory section and do their work in another.

**Disability Accommodations:** Students who require accommodations for access and participation in this course must register with the Office of Disability Services (ODS) at (312) 413-2183 (voice) or (312) 413-0123 (TTY).

**Add or Drop the Course:** After the first week you must obtain permission from the instructor to add the course. Drop deadline of Friday, January 20 without penalty. Deadline of Friday, March 17 to use optional drop at your college office and receive grade of W on transcript.

**Examinations:** Exams will following the tentative schedule (Exams I and II will last 75 minutes):

Exam	Date
Exam I	Tuesday, February 14
Exam II	Tuesday, March 27
Final	Friday, May 4

**Laboratory:** A maximum of two labs can be missed. All missed labs receive a grade of zero. There are **no make-ups** for the labs. Lab reports are generally due one week after the lab is performed. Any student more than 15 minutes late **will not be admitted to lab**. Any lab report more than 15 minutes late **will not be accepted**.

**Homework:** Homework assignments will be given that complement the material presented during each lecture. It is essential that you do these in a timely manner in order to keep pace with the course and lecture material. **Homework will be done on-line** via [www.saplinglearning.com](http://www.saplinglearning.com). Additional lecture assignments will be given roughly every other week. **No late assignments** will be accepted.

**Missed Assignments:** Occasionally a student may miss an assignment due to illness or similarly serious reasons. If you present a justifiable, documented reason for missed work it will be graded as an excused absence. University regulations require that you **notify the instructor within the first two weeks of the semester** if you foresee that you will miss a scheduled exam or laboratory for religious or other justifiable reasons.

**Academic Dishonesty:** Academic dishonesty **will not be tolerated**. Submission of homework, laboratory data, and reports obtained from or written by others is academic dishonesty. Any student found cheating will be immediately assigned a grade of F. Further disciplinary action will then be discussed with the Department and Dean.

**Grading:** Including a passing grade in both lecture and lab portions, your grade will be based upon the following:

final exam		500
hourly exams	2 at 250 points each	500
laboratory	16 at 100 points each	1600
notebook turned in at end of semester		100
quiz	5 at 50 points each	250
homework	13 at 10 points each	130
assignments (maximum)		200
		3280 Total Points

## LECTURE

You are expected to attend the lectures and you are responsible for all in-class handouts and announcements. The final answer to "What will be on the exam?", can only be had by diligent lecture attendance and good notes.

## LABORATORY

**Analytical TAs:** Your TA supervises the laboratory and maintains the safety standards. They will briefly describe the experimental details for each new experiment and must be shown the prelab before experimental work can start. They will have two office hours per week to help you with lab reports and homework.

**Unknowns:** Unknowns will be given out by the stockroom and you should immediately record your unknown number (clarify with stockroom personnel if it is not legible). Omission of your unknown number from your cover sheet will reduce your report grade by 5%. If you need a second unknown your report grade will be reduced by 20%

**Lab Report Procedure:** Your lab report will consist of the following

1. Completed cover sheet with all entries filled out.
2. Analysis section on a separate page showing sample calculations that justify your results.
3. Copies of all graphs, plots, linear regression parameters (originals will remain in your lab notebook).

## LABORATORY NOTEBOOK

A bound laboratory notebook capable of providing carbon (or carbonless) copies is required. For each experiment a record of all lab activities, observations, and comments is to be kept and all data collected is to be recorded in the notebook. At the end of each lab period your TA will sign the data pages used that day and you will turn in the originals of these pages to your TA. The laboratory notebook will be submitted the first laboratory period of the last week of class (Week 15) for grading. The notebook will be periodically checked by your TA for its being appropriately used. The notebook should be logically organized so that your progress through each experiment can be readily followed. The notebook must comply with the following:

1. contain a table of contents
2. pages numbered and dated
3. no torn out pages; neatly cross out any unwanted pages
4. use correct English grammar, spelling, and punctuation throughout
5. all data, observations, comments, analyses, and results written legibly in blue or black ink
6. contain a completed **pre-lab** written before experimental work can start:
  - a) title for the lab
  - b) one concise paragraph describing the experiment to be performed written in **your own words**
  - c) a flow chart or outline for the experimental procedure written in **your own words**
  - d) outline of calculations used to convert experimental data into the answers required in the lab cover sheet
  - e) good lab practice would also entail preparing tables for the data you expect to collect that day
7. all data entered **directly** into the lab notebook - TAs will confiscate data written on loose sheets
8. contain data for **all** assigned experiments
9. clearly indicate all final data and final results
10. corrections to items made by drawing a single horizontal line through the item to be corrected; no white-out
11. data pages signed by the TA on the date the data is recorded
12. all plots, graphs, computer-generated material, and photocopies (do **not** copy lab procedure) neatly taped, glued, or stapled into notebook; all fitting of data to straight lines done by linear least squares regression with slope, intercept, correlation and standard deviations of slope, intercept, and fit given

## SAFETY

You must **always wear chemical splash glasses or goggles in the lab**. This is mandated by an Illinois statute. There are no exceptions to this policy. If you are found without proper eye protection, you will be removed from the lab. Flagrant violation will result in dismissal from the course and a grade of F. Safety considerations also demand the proper use of equipment, suitable disposal of leftover chemicals (**never** down the sink), and appropriate attire (*i.e.*, avoid short clothing and open-toed shoes). In a laboratory area drinking, eating, chewing, and smoking are strictly prohibited. Keeping the working area clean is an absolute must. These requirements cannot be overstated and violations will have serious repercussions. One will be asked to leave the laboratory if she or he is exposing themselves or their fellow classmates to dangerous lab practices. Two students will be assigned each week to maintain order and cleanliness in the lab. These students are **not** the dishwashers for the class!

**Chemistry 222 - Syllabus - Spring 2012**  
**Dr. Audrey Dell Hammerich**

Week	LECTURE (REVISED) Text Chapter, Subject	Lab Day		LABORATORY Experimental Procedure (Text Reference)	Due*
		MT	WR		
1 1/8	0,1,2 - Review 3 - Experimental Error	no lab		check-in; intro; demonstrate proficiency on balance / in titration; Exp. 1 - Calibration of Volumetric Glassware (2-9, end of 2 - calibrating 50-mL buret)	
2 1/15	3,4 - Experimental Error, Statistics 4 - Statistics, <b>QUIZ 1</b>	no lab		Exp. 6 - Preparing Standard Acid and Base (end of 10)	1W4
3 1/22	4 - Statistics 5 - Calibration	Exp. 7 - Using a pH Electrode for an Acid-Base Titration (6-5,6-6,10-5,10-6,14-5)		Exp. 8 - Analysis of a Mixture of Carbonate and Bicarbonate (1-5,1-6,p.216)	1W4 W4
4 1/29	6 - Equilibrium 6 - Equilibrium, <b>QUIZ 2</b>	Exp. 5 - Statistical Evaluation of Acid-Base Indicators (3,4); begin heating sintered glass funnels for Exp. 2 (read 26-1 - 26-3)		Exp. 5 Con't; Exp. 2 - Gravimetric Determination of Ca as CaC <sub>2</sub> O <sub>4</sub> · H <sub>2</sub> O (1-4,2-7,2-8,26-1 - 26-3)	W5 W6
5 2/5	7 - Activity 7 - Systematic Equilibrium	Exp. 2 Con't; begin heating porcelain crucibles for Exp. 3		Exp. 3 - Gravimetric Determination of Fe as Fe <sub>2</sub> O <sub>3</sub> (1-4,2-7,2-8,26-1 - 26-3)	W7
6 2/12	<b>T - EXAM I</b> 8 - Monoprotic Acid/Base	Exp. 3 Con't		Exp. 12 - EDTA Titration of Ca <sup>2+</sup> and Mg <sup>2+</sup> in Natural Waters (11)	W8
7 2/19	8 - Buffers 8 - Buffer Problems	Exp. 14 - Iodimetric Titration of Vitamin C (15-2,15-7)		KH 4-4 - Determination of Glucose in Blood Serum (4-8,17)	1W9 W9
8 2/26	9 - Polyprotic Acid/Base 9,10 - Polyprotic Acid/Base, Titrations, <b>QUIZ 3</b>	Exp. 20 - Spectrophotometric Determination of Iron in Vitamin Tablets (4-8,17)		Exp. 20 Con't, Exp. 21 - Microscale Spectrophotometric Determination of Iron in Foods by Standard Addition (5-3,17)	1W10 W10
9 3/4	10 - Acid/Base Titrations 10,11 - Acid/Base Titrations, EDTA Titrations	Exp. 21 Con't		KH 4-2 - Determination of Mn in Steel (Standard Addition) (5-3,17,20)	1W11
10 3/11	11 - EDTA, <b>QUIZ 4</b> 8-11 - Overview	KH 4-2 Con't; KH 3-29 - Determination of Cu in Brass (4-8,19)		KH 3-29 Con't	W11
3/18		<b>SPRING BREAK</b>			
11 3/25	<b>T - EXAM II</b> 13- Electrochemistry	do ashing for ISE Measurement of NO <sub>3</sub> in Beef Jerky; KH 3-14 - Determination of Nicotine in Tobacco (Nonaqueous Titration) (10-9)		Ion-Selective Electrode Measurement of Nitrate in Beef Jerky (14-4,14-6, 14-7); KH 3-14 Con't	W12 W12
12 4/1	13 - Electrochemistry 14- Electrodes	DU 10.5 - Ion-Exchange Separation and Spectrophotometric Determination of Nickel and Cobalt (17,22-2,25-1)		DU 10.5 Con't	W13
13 4/8	14 - Potentiometry 15 - Redox Titrations	Separation of Fish Proteins by Gel Electrophoresis (text Box 9-3,25-6)		Fish Protein Con't	1W14
14 4/15	18 - Spectrophotometry, <b>QUIZ 5</b> 18, 20 - Spectrophotometry, Atomic Spectroscopy	DNA Fingerprinting with Gel Electrophoresis (25-6,25-7)		complete work; check out	1W15
15 4/22	26 - Gravimetric Analysis Precipitation Titrations Course Overview	turn in lab notebook		reserve time - period may be used	

\* All reports are due on WR of the indicated week except: Exps. 6/7 due on MT of Week 4, 1W4; Exp. 14 due on MT of Week 9, 1W9; Exp. 20 due on MT of Week 10, 1W10; KH 4-2 due on MT of Week 11, 1W11; Fish Protein Separation due on MT of Week 14, 1W14; and DNA Fingerprinting due on MT of Week 15, 1W15.