

## **CHEM 231-001 WI, Quantitative Analysis Laboratory Spring 2014**

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**Hours:** **Wednesdays, 11:00-11:50 AM** or by appointment  
**Course Time and Location:** Wednesdays, 3:00 – 6:50 PM in Disque 409

### **Course Objectives**

#### **Overview**

The objective of CHEM 231: Quantitative Analysis Laboratory is two-fold. First and foremost, this is a lab course whose primary objective is to introduce classical “wet” methods of analytical chemistry, in addition to briefly exploring instrumental methods of quantitative analysis such as absorption spectrophotometry, gas chromatography (GC) and high-performance liquid chromatography (HPLC). Second, the entire quarter will be devoted to the statistical treatment of experimental data obtained via volumetric and instrumental methods of analysis. As a result, the accuracy and precision of the results obtained will be a large focus for this course.

In addition to the experimental aspect, this course has also been designated as a Writing Intensive Course for the Drexel Chemistry curriculum. Writing intensive courses are courses required in every discipline to fulfill a graduation requirement for students to complete three writing intensive classes, two in their major and one as an elective. In this course, you will submit both formal and informal writing assignments spread throughout the quarter and learn the conventions of writing in the field of chemistry via a laboratory notebook and weekly lab reports. In this way, writing will be a tool for critical thinking and learning. You will also create a longer writing intensive lab report to be submitted at the end of the term. You will have the opportunity to revise your formal writing through the submission of drafts, both with a peer reader and the lab instructor.

#### **Specific objectives**

To learn and master the basic skills needed to perform quantitative analytical measurements (mass and volume measurements, quantitative transfer, etc.)

To understand and apply a variety of chemical reactions (precipitation, acid-base, complexation, and oxidation-reduction) for the quantitative analysis of three or more certified unknowns

To introduce students to formal laboratory report writing

To learn how to calculate the concentration of an analyte in an unknown sample (and the associated uncertainty, when applicable)

To learn how to handle the statistical treatment (mean, standard deviation, 95% confidence interval, etc.) of experimental data obtained via volumetric and instrumental methods of analysis

To understand the difference between accuracy and precision of the results obtained



- b) Data Tables– include the raw data (data collected during the lab) and the statistical treatment of the data (Grubbs or Q-test, mean, standard deviation, confidence interval, etc.)  
Students are not permitted to use the Excel functions for standard deviation (i.e. =stdev) and 95% confidence interval. Failure to show how you calculated your values will result in a reduction of points. Report all results with the proper number of significant figures.
- c) Discussion– 1 full page, double-spaced, font size 12 is the minimum required amount and should include possible sources of error. Important discoveries and results found in the data analysis should be described in detail. Difficulties, failures, and sources of possible error in the laboratory experiment are also good topics to discuss. Results of precision should be reported as the mean and 95% confidence limits for replicate determinations or a propagation of error estimate for a single determination.
- d) Conclusions– a basic summary of the concepts that were learned/experienced in the lab.
- e) Answers to the Post-Lab Questions

### **Quantitative Unknowns 25 %**

A grade will be assigned based on the accuracy and precision of the results obtained. For quantitative results, the following grading scale based on percent relative error (% RE) will be employed.

Grade	Wet chemical experiment	Instrument-oriented experiment
A+ = 98	0.00-0.10 %	≤ 0.5 %
A = 95	0.10-0.20 %	0.5-1.0 %
A- = 91	0.20-0.30 %	1.0-2.0 %
B+ = 88	0.30-0.40 %	2.0-3.0 %
B = 85	0.40-0.55 %	3.0-4.5 %
B- = 81	0.55-0.75 %	4.5-6.0 %
C+ = 78	0.75-1.00 %	6.0-7.5 %
C = 75	1.00-1.25 %	7.5-9.0 %
C- = 71	1.25-1.50 %	9.0-12.0 %
D = 65	1.50-2.0 %	12.0-15.0 %
F = 0-60	> 2.0 %	> 15.0 %

### **Writing Intensive Lab Report 15%**

The results obtained during the volumetric analysis of chloride (week 2) will be written-up as a detailed lab report. Additional guidelines and requirements for this assignment are provided in the lab manual and will be described in detail during the course of the term. The student will be required to write two drafts, one to be reviewed with a peer reader from the writing center during week 6, the second with the lab instructor during week 8. The final report will be submitted on the last day of class. Each meeting missed will result in a letter grade deduction from the overall grade received on this assignment.

Peer readers are available to meet to review your draft(s) from 9-5 Monday through Friday in the Writing Center, as well as limited evening and weekend hours at Hagerty Library. You may contact the Writing Program in the following ways:

1. Go into the Writing Center, at 0032 MacAlister Hall (basement), and physically sign up for an appointment in the logbooks or see if a peer reader is available for a drop-in appointment.
2. Sign up for face-to-face appointments via the online scheduling system found at <http://drexel.mywconline.com>.

If you have never visited this site before, you will need to register. If you are a previous user, simply log in and choose "Peer Readers, Spring 2014".

Appointments on the peer reader schedule can be reserved for email consultation. If you are submitting a draft for electronic review:

1. Attach your draft in either Word format, preferably, or pdf format.
2. Include a brief description of the assignment, quote directly from the instructor's handout.
3. Include the deadline for the assignment.
4. Include the course, section, and professor.
5. Include that you need proof of a peer review.
6. Allow at least 36 hours and, during mid terms, and finals, as much as 60 hours (2.5 days) for a review to be sent back. Given that there are only a few peer readers with weekend hours, plan accordingly.

### **Final Exam 10%**

There will be a cumulative final exam covering fundamental topics presented in the laboratory experiments.

### **Academic Policies**

Please review the following links provided below

- **Academic Misconduct, Cheating, Fabrication, Plagiarism, Withdrawal of a Degree**  
[http://www.drexel.edu/provost/policies/academic\\_dishonesty.asp](http://www.drexel.edu/provost/policies/academic_dishonesty.asp)
- **Academic Honesty Policy**  
<http://www.drexel.edu/studentlife/judicial/honesty.html>
- **Course Drop Policy**  
[http://www.drexel.edu/provost/policies/course\\_drop.asp](http://www.drexel.edu/provost/policies/course_drop.asp)
- **Office of Disability Services**  
<http://www.drexel.edu/oed/disabilityResources/>
- **Course Change Policy**  
The instructor may make changes to the course during the term at her discretion. As changes are made to the course, students will be notified via BbVista, email, and will be made aware verbally at the beginning of the next scheduled class.

**Order of Experiments for CHEM 231 Spring 2014**

<b>Week</b>	<b>Date</b>	<b>Exp. #</b>	<b>Experiment Title</b>	<b>Report Style</b>
1	04/02/2014	1	Volumetric Glassware & Data Treatment	Lab Report
2	04/09/2014	4	Buret Re-Calibration (if needed); Volumetric Determination of Chloride by Fajans' Method	Writing Intensive Lab Report
3	04/16/2014	5	Acid-Base Titration and Purity of Potassium Hydrogen Phthalate (KHP)	Lab Report
4	04/23/2014	6	Volumetric Determination of Iron	Lab Report
5	04/30/2014	7-10*	Spectrophotometric Determination of Manganese in Steel	Lab Report
6	05/07/2014	7-10*	Mixture Analysis via Multiple- Wavelength UV-Visible Absorption Spectrophotometry <i>Meet with writing center for First Draft of Writing Intensive Lab Report</i>	Lab Report
7	05/14/2014	7-10*	Gas Chromatography	Lab Report
8	05/21/2014	7-10*	High-Performance Liquid Chromatography <i>Submit Second Draft of Writing Intensive Lab Report to TA</i>	Lab Report
9	05/28/2014	7-10*		
10	06/04/2014		Final Exam, Opportunity to Redo an Experiment <i>Writing Intensive Lab Report Due</i>	

\* Experiments 7-10 will be performed on a weekly rotation in groups of 2 or 3. Individual assignment of each experiment will be determined by the TA and will be provided 1 week prior to the assigned experiment.