

CHEMISTRY 325
Quantitative Analysis
Fall 2008

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Office Hours: M 10-11 W 11-12 Th 10-12 F 11-1
Others by appointment

Text: *Quantitative Chemical Analysis*, by Daniel C. Harris, 7th edition, (W.H. Freeman, 2007)

Text Website: <http://bcs.whfreeman.com/qca7e>

Other Needs: Calculator with statistics calculations capability
Bound laboratory notebook
Safety goggles

Class Meetings: M-W 12:00-1:15

Laboratory: Th 1:30-5:30 pm

About the Course: Analytical Chemistry is the science of exploiting the chemical reactivity and physical properties of elements and compounds in order to detect their presence and quantify their concentrations. The diversity of analytes and sample matrices encountered in the natural world requires the Analytical chemist to be a problem solver in regards to isolating analytes from their matrices. This course deals mostly with classical concepts and procedures in Analytical Chemistry that still find widespread use in analytical laboratories. In the laboratory, you will also be introduced to the use of modern instrumentation in chemical analyses. We will also revisit, reinforce, and expand upon some chemical concepts you have already been exposed to, (such as acid-base equilibria), because understanding an analytical process requires a firm grasp of the underlying chemical principles. Since the "product" for an Analytical chemist often is a numerical data set, we will also explore statistical treatments of data, significant figures, and spreadsheet use.

In the laboratory, you will need to razor-sharpen your techniques and skills. You will also be required to write a lab report for some experiments. Your reports will be graded not only on the accuracy and precision of your results, but also on your scientific writing style and general approach to the lab report. You must learn to write in a scientific style which reduces verbiage without sacrificing detail. (Verbiage = More words than are required for clarity or precision (Webster's New Collegiate Dictionary))

Lab Reports

Labs designated with (FR) on the above schedule designate that a full report is required. Those labs with an (A,R) designation only require an abstract and a results page. Lab reports are due one week after the lab is performed. Lab reports submitted late lab will lose 10% of their full value for every 24 hour period past the due date.

FULL REPORTS will include the following sections (For details, refer to the report writing guide):

Abstract A brief (3-5 sentences) paragraph describing the goals, methods, and outcomes of the experiment.

Introduction Background information for the experiment.

Methods A description of the methods and equipment used to perform the analyses.

Results Outcomes of the experiment. Sample calculations included. Numerical results must be easy to find and read.

Discussion Meaning of the results, any surprises, and experimental difficulties.

Points/Grades

The available points in the class are as follows:

Three in-class exams.....	300
Final comprehensive exam.....	150
5 Abstract & Results @ 15 pts. each...	75
5 Full Reports @ 25 pts. each.....	125
TOTAL	650

Grading Schedule: 100-93 A 92-90 A- (Percent of total 89-88 B+ 87-83 B 82-80 B- available points) 79-78 C+ 77-73 C 72-70 C- 69-68 D+ 67-60 D <60 F

Academic Honesty: Any form of academic dishonesty will result in an "F" for the course and referral to the Vice President for Student Affairs (see LCSC Student Handbook). As defined in the LCSC Student Handbook at www.lcsc.edu/student-services/StudentHandbook.htm (code of conduct), Academic Dishonesty is any of the following:

Cheating- intentionally using or attempting to use unauthorized materials, information, or study aids in any academic exercise. The term academic exercise includes all forms of work submitted for credit hours.

Fabrication- intentional and/or unauthorized falsification or invention of any information or the source of any information in an academic exercise.

Collusion- facilitating academic dishonesty- intentionally or knowingly helping or attempting to help another to commit an act of Academic Dishonesty.

Plagiarism- the deliberate adoption or reproduction of ideas or words or statements of another person as one's own without acknowledgment.

Access and Accomodation: If you need course adaptations or accommodations because of a disability, if you have emergency medical information, or if you need special assistance in case the building is evacuated, please make an appointment to see me as soon as possible.

Chemistry 325

Report Writing Guide

Your formal reports will consist of five sections:

- Abstract
- Introduction
- Methods
- Results
- Discussion

Abstract

Writing a good abstract is a necessary skill in scientific communications. An abstract should communicate:

- What the question or problem to be solved is
- How you went about answering the question or solving the problem
- What your results are
- Any major findings from your experiments or conclusions that can be drawn.

In essence, you need to give a little bit of information from each of the other four sections of your formal report. However, you need to do it succinctly, getting a lot of mileage out of every word you write. The abstract should be no more than 5 sentences in length.

Introduction

The introduction should give a sense of why you are doing the experiment. Examples of appropriate topics to discuss in the introduction include:

- A bit of background on the analyte(s) of interest in the experiment. For example, if you are analyzing calcium in water samples, you might say why people are generally interested in analyzing calcium in water samples.

- A bit of background on the analytical technique(s) you are using. For example, if you are doing a gravimetric analysis, you might say in general terms how a gravimetric determination works, and give some details on your particular experiment.

- Any chemical reactions pertinent to the experiment should be included in the introduction.

Reports for Chem 325 will be written as if we are writing them for a scientific journal. That means you should never write things like: "The purpose of this experiment was to gain experience in titrating.", or "The purpose of this experiment was to improve our laboratory skills." Always refer to the analytical problem at hand when discussing the purpose of the experiment. The introduction should be anywhere from 1-3 paragraphs.

Methods

This section is a description of how you did your experiment. Do not just cut and paste from your lab handouts, especially since the entire lab handout may not apply to your particular experiment. This section should be written as a narrative, rather than as a numbered or bulleted list. This section should be written so that anyone who picks up your lab report will be able to duplicate your experiment.

Calculations should also go in this section. You do not need to show all of your calculations, but you should give an example calculation of each type that was performed.

Results

Results only go in this section. Present your results in a way that makes it easy to see them and easy to understand them. For example, use larger, bold face fonts that make these results stand out. Sometimes a person looks at a report and only wants to see the bottom line quickly. Make it easy for them! Use tables and/or graphs when appropriate. Always give tables and graphs a title and a number (e.g. Table 1. Concentration of Ca^{2+} in unknown samples)

Always include units with your results, and report your results to the proper number of significant figures. When possible, you should also report the uncertainties in your results as a standard deviation or relative standard deviation.

Discussion

Discuss your findings here. Include any observations you had that were unexpected, or explain any anomalies in your results.

References

If you used any materials, (books, journal articles) to help you in the preparation of your report, reference them here.

All reports must be written on a word processor and stapled together. The reports are due one week following the completion of the experiment, at the beginning of the lab. Late lab reports are reduced in value by 20% for each 24 hour period following the due date.