

Chem 2511
Quantitative Analysis Laboratory
Fall 2006

Instructors: Dr. Anne Johansen e-mail: johanse@cwu.edu
Office: 207D Science Facility Office Hours: MW 10-11,
Telephone: 963-2164 and by appointment

Dr. Dion Rivera e-mail: riverad@cwu.edu
Office: 207A Science Facility Office Hours: M 11-12, T 3-4, W
Telephone: 963-2883 1-2, R 10-11 and by appointment

Laboratory: 217 Science Facility
W 12:00 - 5:50 p.m. (Dr. Johansen, TA Ryan Davis)
F 12:00 - 5:50 p.m. (Dr. Rivera, TA David Nguyen)

Objectives:

- 1) To investigate various analytical techniques used by chemists.
- 2) To make quantitative measurements with precision and accuracy.
- 3) To develop an ability to interpret experimental data within the limitations of the technique, to analyze the data statistically, and to draw valid conclusions.
- 4) To further develop laboratory notebook skills and to write succinct abstracts.

Prerequisites: Chem 183 and Chem 183 lab

Pre- or Corequisite: Chem 251

Textbook: Quantitative Chemical Analysis, 7th edition, Daniel C. Harris, 2007.

Notebook: Student Laboratory Research Notebook, Saunders Publishing

Webpage: <http://www.cwu.edu/~johanse/Chem251f06/LabProcedures.htm>

Laboratory Guidelines and Tentative Lab Schedule:

You **must** come to the lab prepared and use your time wisely as this schedule will take the entire quarter to complete. You will often be required to perform tasks in parallel (i.e., drying reagents in the oven prior to use), including working on parts of two different experiments simultaneously. You will progress through this course at your own individual paces; finishing the classical methods by the third week of October, followed by the instrumental techniques. Lab procedures are available on the course web site, <http://www.cwu.edu/~johanse/Chem251f06/LabProcedures.htm>.

Experiments

Points

Classical Methods and Statistics

- | | |
|--|------|
| 1) Basic Methods Review and Introduction to Statistical Analysis | [50] |
| 2) Calcium Analysis in Limestone | [50] |
| 3) Penny Statistics | [50] |
| 4) Preparing Standard Acid and Base; Analysis of Carbonate/Bicarbonate | [50] |

Instrumental Methods

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|--|------|
| 5) Potentiometric Halide Titration with Ag ⁺ | [50] |
| 6) Spectrophotometric Determination of Iron in Vitamin Tablets | [50] |
| 7) Gas Chromatographic Determination of Ethanol in Beverages | [50] |

Safety Issues:

Standard safety procedures should ALWAYS be followed. Any horseplay (including failure to wear goggles) during the laboratory period will not be tolerated.

You are responsible for researching the safety precautions for all chemicals used in each lab using the Material Safety Data Sheets located outside room 311.

Laboratory Notebook/Report Guidelines:

In this course you will begin to move away from filling in the blanks in prewritten reports toward developing individual lab reports which have to include a succinct, yet informative abstract (typed in a word processor), in addition to experimental and results sections (handwritten in the lab notebook).

- Purchase a bound notebook with duplicate, carbonless yellow pages from the bookstore and leave 2-3 pages in the front for a Table of Contents and a Calibration Table for Volumetric Glassware.
- **Date and initial your notebook each day** that you work in the laboratory as well as any day that you make entries in the notebook (such as when you do calculations and write-ups outside the laboratory).
- Use a descriptive title and start a new page when you begin work on a new experiment.
- It is correct scientific method to keep a neat, well-organized notebook; however, **never write data on loose sheets** to be transcribed later in neater form. (Hint: Leave yourself plenty of room for notes and observations.)
- **Always use a ballpoint pen** - using pencil or fiber pens has resulted in many a chemist watching important data run off the page when common solvents were spilled on the notebook.
- Put a line through any entry you would like to correct and **date and initial all changes** that you make.
- The importance of your lab notebook cannot be overemphasized for the yellow pages of your notebook will constitute a portion of your laboratory report.

Laboratory Reports

***Section A is due one the **first Monday (Wednesday)** after completion of the lab.

A. Short E-mail (5 points)

An e-mail that summarizes the final calculated results of the experiment is due to me (johansea@cwu.edu) **by Monday** after you complete the lab. I will respond in an e-mail to you within a day or two indicating the accuracy of the results, thus also serving as a warning flag for possible calculation errors. You are responsible for finding calculation errors **BEFORE** turning in the final report. If you have difficulty locating the problem take your laboratory notebook to the instructor or teaching assistant and discuss the problem. Common examples are the use of incorrect chemical equations and formulas, misplaced decimal points, omission of dilution factors, too few significant figures, and missing or incorrect units. Most of these can be avoided by diligent record keeping in the lab notebook.

***Section B is due **ONE WEEK and 2 days** after the completion of the lab. This will be on a Friday (Monday).

B. Laboratory Write-up

I. Abstract: (Word Processor) (10 points)

An abstract starts with an introductory sentence that places the work in a general context, followed by a general description of the technique used (not experimental details) and ending with final results of the work. It is essential that this section be carefully constructed for often readers will base their decision of whether or not to read an article on this brief synopsis. Include the main experimentally determined **result(s) along with the appropriate uncertainty(ies)** here. Although found at the beginning, the abstract is usually formulated last.

II. Experimental Section: (Lab Notebook) (5 points)

You do not need to rewrite the entire experimental procedure in your notebook. Rather, properly cite the **formal reference** and make sure to briefly document any changes that are made to the procedure (either in class or from the webpage handout). Also include the proper chemical nomenclature for any reagents used and the make and model of any instruments used (the serial number on the balance can often be helpful). In contrast to journal articles, which include this information in formal prose, you may simply list these materials at the beginning of the experimental section, **including any precautions** (as noted in the **Materials Safety Data Sheets**). Research the above information **prior** to coming to lab.

III. Results: (Lab Notebook) (30 points)

Record all measurements and observations that you make during the course of the experiment and include any required printouts from instruments. Data are usually entered into tables so plan accordingly (before lab), leaving considerable space for observations as well. **Most of the points awarded in this section will be based upon the accuracy and precision of your results.**

Late/Copied Work: Late reports will be penalized with 5% per day. Each day of the weekend or holiday counts as one day. Do your own work! Copied lab reports as well as the corresponding originals will both be given grades of zero.