

**QUANTITATIVE ANALYSIS
OUTLINE**

(H:\CH\Com Course Outlines\comm course 2041 s06.doc)

CHEMISTRY 2041

COMMON COURSE

Chemistry 2041

January 2007

Catalog Description: 2041

Chemistry 2041 - Quantitative Analysis - 4 Credits. Offered Spring Semester. Lecture 3 hours, lab 3 hours.

Lecture and laboratory course emphasizing the theory and practice of volumetric and instrumental analysis.

Prerequisites:

Chemistry 1062

Outline of Major Content Areas:

1. Measurement, Error and Statistics
2. Calibration
3. Sample Collection and Sample Preparation
4. Applications of Equilibrium Calculations to Complex Systems
5. Titrimetric Methods of Analysis
6. Precipitation Titrations
7. Theory of Neutralization Titrations
8. Titration Curves for Polyfunctional Acids and Bases
9. Electrochemistry
10. Oxidation/Reduction and Complex-Formation Titrations
11. Introduction to Spectroscopy

Requirements:

Reading assignments, questions and problems from the textbook, *Exploring Chemical Analysis*, 3rd Edition, by Daniel C. Harris. Completion of all laboratory experiments and laboratory notebook.

Course Objectives and Learning Outcomes:

1. The student will learn chemical principles of quantitative analysis including:
 - a. Stoichiometric relations
 - b. Evaluation of sources of error in analytical measurements
 - c. Principles of collection of statistically valid samples
 - d. Methods of sample preparation
 - e. Equilibrium and equilibrium calculations
 - f. Methods of end-point determination in volumetric analysis
 - g. Calculations associated with titrations
 - h. Precipitations, neutralization, and oxidation-reduction titrations
 - i. Electrochemistry
 - j. Fundamentals of Spectroscopic measurements
2. The student will learn laboratory skills including:
 - a. Use of the analytical balance
 - b. Use of pipet and buret
 - c. Keeping of a laboratory notebook
3. The student will learn laboratory methods involved in typical volumetric, and instrumental analysis.
4. The student will carry out accurate quantitative analysis of unknown samples.

5. The student will evaluate data obtained from quantitative analysis and will report the percentage of the substance analyzed for in each sample.

Experiments (tentative):

1. Calibration of Volumetric Glassware
2. Statistical Analysis of Laboratory Data
3. Spectrophotometric Detection of nitrate
4. Determination of an unknown base with acid base titration using a pH electrode
5. Determination of chloride -- Mohr titration
6. Determination of calcium by Complexometric Titration
7. Determination of chloride with an Ion Selective Electrode
8. Determination of calcium by Atomic Absorption Spectroscopy
9. Spectrophotometric determination of Iron.

Methods of Evaluation:

1. Three one-hour exams.
2. Questions and homework problems.
3. Laboratory determinations and laboratory notebook.
4. Comprehensive final exam.

Grades:

A – 90% B – 80% C – 70% D – 55%

Assessment:

During the semester a number of assessments will be performed in order to monitor students' progress, provide students the feedback, and to identify areas that require additional attention.