Introduction to Analytical Chemistry

Chemistry 215

Section: D100

Term: 1998 Spring

Instructor: Dr. D. Sharma

Office: C-7022

Discussion Topics: Under construction

General Course Description:

The underlying principles of analytical measurement science will be introduced and developed in this course. The concepts and principles of solution equilibria are fully developed throughout the course from a classical and the modern perspective of species measurement. Solid and gas phase species measurement are covered at the introductory level.

Complexometric reaction equilibria involving metal ions and multidentate ligands. Step-wise formation reactions in solution are treated from the perspective of individual species measurement. Titrimetric, separations (both chromatographic based and non-chromatographic based), spectroscopic, and electrochemical methods of solution species measurement are introduced in this course. (Spectroscopic methods are covered at an introductory level). Exposure to the advantages and limitations of each of these methods through participatory discussion/seminar presentations is an integral part of this course.

The section on mass spectrometry introduces one of the most powerful techniques available for the study of gas phase species. Operation of the mass spectrometer is covered at the introductory level, with the emphasis being placed on understanding the information that a hyphenated technique (e.g., gas chromatography - mass spectrometry) can provide.

2 lecture hours/week; 0 tutorial hour/week; 4 lab hours.

Lecture Topics:

Introduction/Laboratory Preparation.

Complex Solution Equilibria; Complexometric Reactions, Complex Solubility, Multiprotic Acids and Base

Measurement of Solution Species; Electrochemical (Potentiometry, Coulometry, Voltammetry) and Spectroscopic Methods.

Mass Spectroscopy; Introduction, Structure Elucidation Concepts.

Laboratory Experiments:

1. Titrimetry: Determination of calcium by complexometric titiration with EDTA.

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2. Titrimetry: Implementation of acid/base theory in the programming of an automated titrimeter to potentiometrically determine mixtures of complex acids and bases in solution.

3. Solubility: Application of electrochemical and spectroscopic techniques to determine complex solubility constants.

4. Coulometry: Introduction.

5. Voltammetry: Introduction.

6. GC - MS: Introduction to mass spectrometry.

7. Thermal Methods: Introduction to Thermal Analysis and Principles of Sampling.

Grading: 30% Midterm Exams (2x15%); 30% Final Exam; 40% Laboratory and Lecture Assignments.

Required Texts: Skoog, West & Holler, "Fundamentals of Analytical Chemistry". 7th Ed. 1996. Holt, Rinehart.

Recommended Texts: None

Materials/Supplies: None

Prerequisite/Corequisite: Prerequisite: CHEM 103 and CHEM 118.

Notes: None