

Course Title: Analytical Chemistry-I
Course Code: CH-210
Credit Hours: 3-1
Prerequisite: Nil
Course Objectives

1. To familiarize students with various titration techniques for chemical analysis including Gravimetric Methods of Analysis, Acid-Base Titrations, Redox Titrations and Complexometric Titrations.

Recommended Books

2. Fundamentals of Analytical Chemistry by Douglas A. Skoog, Donald M. West, F. James Holler and Stanley R. Crouch, Mary Finch Publications USA. 9th Ed. 2014, ISBN-13:978-0-495-55828-6
3. Analytical Chemistry by Gary D. Christian Wiley Publisher, 6th Ed. 2014.

Detailed Contents

4. Gravimetric Methods of Analysis. Precipitation Gravimetry, Gravimetric Titrations, Calculation of Results from Gravimetric Data and Applications of Gravimetric Methods
5. Titrations in Analytical Chemistry. Some Terms Used in Volumetric Titrations, Standard Solutions, Volumetric Calculations, Titration Curves
6. Principles of Neutralization Titrations: Solutions and Indicators for Acid/Base Titrations, Titration of Strong Acids and Bases, Titration Curves for Weak Acids, Titration Curves for Weak Bases, The Composition of Solutions During Acid/Base Titrations
7. Complex Acid/Base Systems: Mixtures of Strong and Weak Acids or Strong and Weak Bases, Polyfunctional Acids and Bases, Buffer Solutions Involving Polyprotic Acids, Calculation of the pH of Solutions of NaHA, Titration Curves for Polyfunctional Acids, Titration Curves for Polyfunctional Bases, Buffer Solutions, The Henderson-Hasselbalch Equation, Titration Curves for Amphiprotic Species, Composition of Polyprotic Acid Solutions as a Function of pH, Applications of Neutralization Titrations.
8. Redox Titration: Calculating Redox Equilibrium Constants, Constructing Redox Titration Curves, Oxidation/Reduction Indicators, Potentiometric End Points, Applications of Oxidation/Reduction Titrations, Determination of Chromium Species in Water Samples
9. Complexation and Precipitation Reactions and Titrations
The Formation of Complexes, Titrations with Inorganic Complexing Agents, Organic Complexing Agents, Aminocarboxylic Acid Titrations

Course Outcomes

10. After studying this course students will be able to perform chemical analysis by various gravimetric, acid/base, redox and complexometric titrations.
11. Detail of Lab Work, workshop practice (if applicable):
 - a. Two experiments based on gravimetric analysis
 - b. Three experiments based on acid-base titrations

- c. Three experiments based on complexometric titrations
- d. Three experiments based on redox titrations
- e. Two experiments based on non-aqueous titrations
- f. Two experiments based on Karl-Fischer titrations