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Department of Chemistry, Faculty of Science, Chulalongkorn University

Course Coordinator Associate Professor Dr. Taweetham Limpanuparb

Course Description

Separation techniques and concepts of modern analytical methods essential for quantitative and qualitative characterization; treatment of the analytical data; principles and applications of chemical equilibria; electrochemical methods; separation methods; practical exercises involving infrared spectrometry, UV-vis spectrometry, gas chromatography-mass spectrometry

Course Objectives

- 1) Describe the applications of chemical equilibrium, electrochemistry, spectroscopy, separation techniques, and mass spectrometry in chemical analysis by classical and instrumental methods.
- 2) Compare and choose an appropriate analytical technique for a given analytical problem.
- 3) Perform experiments on chemicals and chemical reactions using appropriate apparatus and equipment with proper skills and safety concerns.
- 4) Calculate, discuss, and report the results and related quantities with the appropriate consideration of errors and application of statistics.

Prerequisite ICCH 102 General Chemistry II

Grading	Midterm Examination	30%	(Oct 16, 2023, 13:00-14:50)
	Final Examination	30%	(Dec 4, 2023, 13:00-14:50)
	In-Class Activities	10%	
	Pre-Lab Quiz	5%	
	Lab Techniques & Behavior	5%	
	Lab Report	20%	

Letter grade will be designated according to the MUIC criteria.

Score	90-100	85-89	80-84	75-79	70-74	65-69	60-64	< 60
Grade	A	B+	B	C+	C	D+	D	F

Learning Management Google Classroom
<https://classroom.google.com/c/NTYzODE0MDgwODIx?cjc=eeqq2ql>

Textbooks

1. *Quantitative Chemical Analysis* by Harris (any edition)
2. *Fundamentals of Analytical Chemistry* by Skoog (any edition)
3. ICCH 200 Lab Manual

Schedule Lecture portion and Pre-Lab will occur during 13:00-15:50.
 Lab will occur after 16:00 until the experiment is finished.

#	Date	Lecture (13:00-15:50)	Laboratory (16:00-17:50)
1	Sep 11	1. Introduction to Analytical Chemistry 1.1 What is Analytical Chemistry? 1.2 The Analytical Process 1.3 Errors in Chemical Analysis	Exp 1 Analytical Glassware and Apparatus
2	Sep 18	2. Chemical Equilibrium 2.1 Common Aqueous Equilibria 2.2 Effect of Electrolytes on Equilibrium	Exp 2 Preparation and Properties of Buffer Solution
3	Sep 25	3. Statistics in Analytical Chemistry 3.1 Confidence Interval 3.2 Detection of Outlier 3.3 Comparison of Means and Variances	Exp 3 Determination of Acetic Acid in Vinegar by Acid-Base Titration
4	TBA	4. Classical Methods of Analysis 4.1 Acid-Base Titration	Exp 4 Determination of Calcium Carbonate by Acid-Base Titration
5	Oct 2	4.2 Precipitation Titration 4.3 Gravimetry	Exp 5 Determination of Chloride in Normal Saline by Precipitation Titration
6	Oct 9	4.4 Complexometric Titration	Exp 6 Determination of Calcium in Milk by Complexometric Titration
7	Oct 16	Midterm Examination (13:00-14:50) [Content from #1-6]	Exp 7 Determination of Iron(II) by Redox Titration with KMnO_4
8	Oct 30	4.5 Redox Titration	Exp 8 Determination of Vitamin C by Iodometric Titration
9	Nov 6	5. Electrochemical Techniques 5.1 Potentiometry 5.2 Voltammetry 5.3 Karl Fischer Titration	Exp 9 Potentiometry: pH Measurement
10	Nov 13	6. UV-Visible Spectrophotometry 6.1 Molecular Absorption and Beer's Law 6.2 UV-Visible Spectrophotometer 6.3 Quantitative Analysis by UV-Vis	Exp 10 Determination of Fe(II) in Wastewater by Spectrophotometry with 1,10-Phenanthroline
11	Nov 20	7. Analytical Separation 7.1 Separation by Precipitation 7.2 Separation by Extraction 7.3 Introduction to Chromatography	Exp 11 Determination of Ascorbic Acid by Cyclic Voltammetry at Screen-Printed Electrode [Rotate]
12	Nov 27	8. Mass Spectrometry 8.1 Principles of Mass Spectrometry 8.2 Mass Analyzer 8.3 Ionization Methods 8.4 GC-MS	Exp 12 Analysis of Volatile compound by Gas Chromatography-Mass spectrometry [Rotate]
-	Dec 4	Final Examination (13:00-14:50) [Content from Week 8-12 and Lab portion]	

Chapters in lecture note are from Harris 9th ed and Skoog 10th ed.