Chemistry 3131: Analytical Chemistry II

(Instrumental Analysis)

Course Outline, Winter 2011

Contact Information

Instructor: C. D. MacKinnon (CB-4038 / CB-2030, 343-8327 / -8009)
E-mail: craig.mackinnon@lakeheadu.ca
Office hours: M-W, F 1:30-2:30 pm, or by appointment
Class: Tu, Th 5:30-7:00 pm, RB-2026
Laboraory: F 8:30-11:30 am, CB-2050

Overview

Materials can be analysed either by their chemical reactivity or their physical behaviour. This course deals with the latter, *i.e.*, the isolation and identification of unknown substances using analytical instrumentation based on spectroscopy, solubility, electrochemistry, etc. Both identification of unknown and quantitation of known species are important, depending on the situation, so both aspects will be covered.

Prerequisite: Chemistry 1130; Recommended: Chemistry 2411 or Engineering 2330
Text: Analytical Chemistry: An Introduction, Skoog, West, Holler, and Crouch, 7th Edition
Lab Manual: Chemistry 3131 Laboratory Manual (2010 edition)

Course Material

The course can be divided into roughly 5 sections, as follows:

1. Statistical Analysis (Chapter 7 and Section 21C)
   Calibration curves, confidence intervals
2. Absorption and Fluorescence Spectroscopy (Chapters 21 - 23)
   Interaction of light with matter, comparison of visible light spectroscopy experiments, spectrometers, Beer's Law, method of standard addition, infrared spectroscopy
3. Separation Methods (Chapters 24 - 26)
   Extractions, comparison of chromatographic methods, resolution, gas-liquid chromatography (GC) instrumentation, high-performance liquid chromatography (HPLC) instrumentation, capillary electrophoresis instrumentation
4. Electrochemical Methods (Chapters 16 - 20)
   Redox equations and electrochemical cells; instrumental and practical application of potentiometry, coulometry, voltammetry, and stripping methods
5. Mass Spectroscopy (Supplemental Material)
   Isotope patterns, inductively-coupled plasma (ICP) source, molecular sources, detectors, qualitative organic analysis

The **method of evaluation** is as follows:

30% laboratory (6% for Exp. 3, 4% for all other experiments, 4% technique mark)
35% final exam (to be scheduled by registrar)
5% assignment (on section 1 of the course)
30% three quizzes (on sections 2, 3, 4) worth 10% each
- these quizzes will be scheduled one week before they are written

Course Calendar:

Week of....	Tuesday Class	Thursday Class	Friday Lab
January 3			FIRST LAB!!
January 10		Assignment 1 due	
January 17			1st lab due
January 24			
January 31			2nd lab due
February 7			3rd lab due
February 14			4th lab due
February 21	S T U D Y B R E A K		
February 28			5th lab due
March 7			
March 14			6th lab due
March 21		Quiz 3	
March 28			

LAB SCHEDULE

Date	Expt 1 Blue Dye	Expt 2 Tonic Water	Expt 3 Steel	Expt 4 Electrochem	Expt 5 Beer (GC)	Expt 6 HPLC
January 7		Group 6	Group 3 Group 4	Group 5 Group 7	Group 1	Group 2
January 14	Group 5 Group 7	Group 8		Group 3 Group 1	Group 2	Group 6
January 21*	Group 2	Group 7	Group 1 Group 5	Group 8 Group 6	Group 3	Group 4
January 28	Group 1	Group 2	Group 7 Group 8		Group 4	Group 5
February 4*	Group 3 Group 4	Group 1	Group 2 Group 6		Group 5	Group 8
February 11*	Group 8	Group 4			Group 6	Group 7
February 18*		Group 3			Group 7	Group 1
March 4*	Group 6	Group 5		Group 2 Group 4	Group 8	Group 3
March 11	S N O W D A Y !					

* denotes a day on which an experimental writeup is due