Chemistry 3131: Analytical Chemistry II

(Instrumental Analysis)

Course Outline, Winter 2012

Contact Information

Instructor: C. D. MacKinnon (CB-4038/CB-2030, 343-8327)
Office Hours: M – F 11:0 – 12:00 (or by appointment)
E-mail: craig.mackinnon@lakeheadu.ca
Class: W, F 2:30 – 4:00 pm, RB-2044
Laboratory: Th 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.

Policy on Electronic Communication Equipment

Students attending class are expected to follow the Code of Student Behavior, and refrain from activities that distract their fellow students. This includes the use of any electronic communication equipment (cell phones, Blackberries, etc.). Laptops may be used to take notes only (not for games!). NO ELECTRONIC COMMUNICATION EQUIPMENT WHATSOEVER IS ALLOWED DURING QUIZZES/EXAMS (calculators are allowed).

Policy on Plagiarism

Plagiarism is a serious academic offense. In order to prevent any misunderstandings about what constitutes plagiarism, the Department of Chemistry has prepared a document that clearly defines plagiarism, gives several examples and lists the possible penalties. Students will have to sign a Plagiarism Certification that verifies that they have read and understoond the consequences of plagiarism as discussed in the *Code of Student Behaviour and Disciplinary Procedures* and the *Chemistry Department Policy on Plagiarism and Academic Integrity*.

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

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 (2012 edition)

The **method of evaluation** is as follows:
30% laboratory (6% for Exp. 3, 4% for all other experiments, 4% technique mark)
- reports are due 1 week after the lab is performed
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

LAB SCHEDULE

Date	Expt 1 UV-vis	Expt 2* Fluorescence	Expt 3 ICP	Expt 4* Electrochem	Expt 5* GC	Expt 6* HPLC
January 12	Group 1 Group 10	Group 2		Group 3	Group 4	Group 5
		Group 7		Group 8	Group 9	Group 6
January 19	Group 4 Group 5	Group 6		Group 7	Group 8	Group 9
January 26	Group 7 Group 8	Group 10		Group 1	Group 2	Group 3
February 2	Group 2 Group 9	Group 4		Group 5	Group 6	Group 1
February 9	Group 3 Group 6	Group 1	Group 8 Group 9	Group 10	Group 5	Group 7
February 16		Group 8	Group 2 Group 4	Group 6	Group 7	Group 10
March 1		Group 3	Group 5 Group 6	Group 2	Group 1	Group 4
March 8		Group 5	Group 3 Group 7	Group 9	Group 10	Group 8
March 15		Group 9	Group 1 Group 10	Group 4	Group 3	Group 2
March 22	S N O W D A Y !					

* denotes a lab done in pairs; other labs are done individually