

Spring 2006

Chemistry 430: INSTRUMENTAL ANALYSIS

Instructor: Dr. Igor Lednev

Office hour: Fridays, 9:30-10:30 a.m.

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Text: Skoog, Holler and Nieman, "Principles of Instrumental Analysis", 5th edition

Course Outline:

Approximate Date	Chapter	Subject
T Jan 24	1,5 and Appendix 1	Introduction, Statistics, and Signals And Noise
Th Jan 26	6	Introduction to Spectrometric Methods
T Jan 31	7	Components of Optical Instruments
Th Feb 2	8	Introduction to Optical Atomic Spectrometry
T Feb 7	9	Atomic Absorption And Fluorescence Spectrometry
Th Feb 9 T Feb 14	10	Atomic Emission Spectrometry
Th Feb 16	Recitation	
T Feb 28	TEST # 1	
Th Mar 2	13,14	UV/Vis Molecular Absorption Spectrometry
T Mar 7	15	Molecular Luminescence Spectrometry
Th Mar 9	16,17	Infrared Spectrometry
T Mar 14 Th Mar 16	11,20	Atomic and Molecular Mass Spectrometry
T Mar 21	18	Raman Spectroscopy
Th Mar 23	Recitation	
T Mar 28	TEST # 2	

Th Mar 30	22,23	Electroanalytical Chemistry. Potentiometry
T Apr 4	24	Coulometry
Th Apr 6	25	Voltametry
T Apr 18	19	NMR
Th Apr 20		
T Apr 25	26	Introduction to Chromatography
Th Apr 27	27	GC
T May 2	28	HPLC
Th May 4	Recitation	
T May 9	TEST # 3	
T May 16	Final Exam	3:30 P.M. – 5:30 P.M.

The schedule of lectures is tentative, although every effort will be made to stay on schedule. The dates of the tests, however, are definite. Each test will cover the material presented in lectures up to the date of the test.

Grading Policies:

Three tests and the final exam	20% each
Laboratory	35%
Homework	5%

The best three scores from the three tests and the final exam will be used for the final grading, which will be done using an absolute scale.

Tests and the final exams:

The course is divided into three approximately equal parts. Three 50-min tests will be on the material covered in class up to the time of the test and since the last test.

The final exam will be made up of all the material covered in class.

All three tests and the final exam are compulsory for all students. If one of the tests or the final exam is missed, that test/final exam will be dropped from the final grading. If two or more tests/final exam should be missed for valid and appropriate reasons an oral test/final exam may be arranged.

Laboratory work grating:

This is an analytical lab. I assume you know and practice standard quantitative analysis techniques. A proper bound lab notebook is required (such as bound composition type). You have to prepare for each experiment by reading a corresponding chapter(s) in the textbook and lab description below. You have to understand clearly (i) how to perform an experiment and (ii) how to treat the obtained data.

A lab report should include a very brief summary of experimental purpose and method, all calculations, and plots made, as well as data (in tables) where practical, should be included. Generally a measure of precision is needed, such as a relative standard deviation in % of final results. Note this may vary widely in instrumental methods. Run, at least duplicate samples in all determinations for both standardizations and unknowns. Where practical, Instrumental readings should be checked. Report should be stapled together. Include a title page with your name and the dates the experiment was done, and date submitted.

Complete reports should be submitted no later than the lab meeting following completion of the experiment. Lab reports will lose 5 points/day if late, and will not be accepted (grade 0), if more than a week late. Up to 80% of lab grade is based on the accuracy and precision of the results. The remaining 20% is based on the completeness and quality of your report, including calculations. A grade of 50 on the report means the report must be corrected and resubmitted on a new due date. The grade will be reduced by 10 points after every revision. When resubmitting **do not remove or obscure any of the original**. Resubmit the entire original report, along with any added corrections. Labs finished, or reports returned with a 50 grade, on check-out day are due no later than the final exam. NOTE: All six experiments you do will be graded (none are “dropped”), and basic lab average is the average of all work done.

Homework:

Turn in your homework before the lecture begins on a due day. The homework will be examined to ensure that it is completed on time and that you have attempted to solve all problems. You should make sure to discuss any homework problems you are having trouble with during my office hour. You are unlikely to do well in class if you cannot do the homework.

Office hour:

My office hour will be on Fridays from 9:30 a.m. to 10:30 a.m. I encourage you to come to my office hour to ask questions and to discuss any problems. I will work diligently helping students be successful in the course.

HOW TO DO WELL IN THE COURSE:

- ✓ Do reading assignments prior to the date of the lecture.
- ✓ Come to every class.
- ✓ After class, revise the notes and reread relevant part of the reading assignment.
- ✓ Do homework on time.
- ✓ Prepare for, come to, and work hard in laboratory.
- ✓ Come to talk with me during my office hour.

Laboratory Schedule:

Date	
Th Jan 26	Check-in, general lab introduction.
Th Feb 2	
Th Feb 9	
Th Feb 16	
Th Mar 2	
Th Mar 9	
Th Mar 16	
Th Mar 23	
Th Mar 30	
Th Apr 6	
Th Apr 20	
Th Apr 27	
Th May 4	Check-out (you must check out even if withdrawing early or risk a HOLD)

Choose six (6) experiments from the list below. Preference should be given for experiments in a number of different areas. Availability of experiments may vary. Always check with instructor or TA. Register for an experiment at least one week in advance. Some METHODS (see below) could be used by ONE STUDENT only during the same lab session.

Method		Experiment	Number of student who can do the experiment during the same lab session
Visible Absorption	1	Determination of Mn in Steel	6
	1A	Determination of pK_a	
Spectrophotometry	1B	Determination of Chelate Stoichiometry	1
	1C	Potentiometric Titration of Cu(II) with EDTA	
IR Absorption	2A	Quantitative IR Analysis	1
	2B	IR Spectra and Identification of an Inorganic Salt	
UV Absorption	3	Determination of Vitamin A in Cod Liver Oil	2
	3A	Spectra of Transition Metal Complexes	
Potentiometry	4	Titration of a Carbonate-Bicarbonate Mixture	1
	5	Determination of Chromium in Steel	
	9	Titration-Volumetric Precipitation-Cl/I mixture	
	10	Determination of F^-	
Conductance	6	Titration of Vanilla	1
	6B	Determination of K_{sp} by Direct Conductance	
Atomic Emission	11	Determination of Sodium and Potassium	1
Fluorescence	15	Determination of Fluorescein	1
	17	Determination of Vitamin B-1	
HPLC	22	Determination of Some HPLC Parameters	1

Homework:

Due Date	Chapter	Problems
Th Jan 26	1,5 and Appendix 1	1-10, 5-7, 5-8, 5-10, a1-3, a1-5, a1-12, a1-15, a1-19
T Jan 31	6	6-2, 6.4, 6-8, 6-14, 6-15, 6-19
Th Feb 2	7	7-1, 7-6, 7-7, 7-8, 7-12, 7-21
T Feb 7	8	8-1, 8-2, 8-4, 8-6, 8-10
Th Feb 9	9	9-3, 9-9, 9-14, 9-19
T Feb 14	10	10-1, 10-2, 10-6,
Th Feb 16	10	10-9, 10-10
T Mar 7	13,14	13-1a, 13-2a, 13-5, 13-21, 14-1bd, 14-8ac
Th Mar 9	15	15-1, 15-2, 15-3, 15-4, 15-11
T Mar 14	16,17	16-1, 16-13, 16-8, 17-2, 17-9
Th Mar 16	11	11-2, 11-6, 11-8, 11-11
T Mar 21	20	20-1, 20-2
Th Mar 23	18	18-1, 18-2, 18-3a, 18-6ab
T Apr 4	22,23	22-1a, 22-9, 23-1, 23-2, 23-5, 23-9a
Th Apr 6	24	24-1ac, 24-2ab, 24-6a
T Apr 18	25	25-2, 25-3
Th Apr 20	19	19-1, 19-2, 19-4, 19-5, 19-14
T Apr 25	19	19-28
Th Apr 27	26	26-1, 26-4, 26-9
T May 2	27	27-1, 27-2, 27-17
Th May 4	28	28-5, 28-10, 28-18