

CHEMISTRY 260

Spring 2012

Book required : "Spectrometric Identification of Organic Compounds," 7th ed., by Silverstein and Webster

A copy of an instrumental analysis textbook will be on library reserve.

Goals:

A. For the following techniques, which we will concentrate on, you should understand the theory, understand how the instrument works, and be able to interpret the data:

- Ultraviolet and visible spectroscopy
- Infrared spectroscopy (IR)
- Nuclear magnetic resonance (NMR) spectrometry
- Mass spectrometry (MS)
- Atomic absorption spectroscopy (AA)
- Gas chromatography (GC)
- Thin-layer chromatography (TLC)
- High-performance liquid chromatography (HPLC)

B. You should know what the following techniques are and what they are used for:

- Thermal analysis
- Electrochemistry

C. You should be able to:

- Identify an organic compound from its spectra
- Understand how statistics is used in analytical chemistry and interpret a statistical analysis of data
- Write a scientific report

Reports. For each technique we cover in lab, you will write a report (a total of 5). See the lab section, below, for more information. Reports turned in late will lose points, unless arrangements are made in advance.

Exams.

Exam I will be in 2 parts and will cover spectroscopy; it will be given the week after spring break (March 19-23). There will be no lab that week; the exam may be taken anytime that week, including the regular lab time, with the following due times:

Part 1	Due by 5:00 Thursday, March 22
Part 2	Due by 5:00 Friday, March 23

(Of course, each part can be taken and completed earlier).

Exam II will be in 2 parts and will cover only those topics covered since Exam I; it may be taken any time the last 7 class days (Apr. 21-25, Apr. 30, and May 1), with the following due times:

Part 1	Due by 5:00 Monday, April 30
Part 2	Due by 5:00 Tuesday, May 1

(Of course, each part can be taken and completed earlier).

Any part of an exam turned in after the due time will receive no credit.

For an exam, as noted on the Honor Code pledge, you may use no materials other than the exam itself. While you will take the exam on a computer, you may not use any files on the computer nor any information from the Internet.

Writing.

“Of all those arts in which the wise excel, Nature's chief masterpiece is writing well.”
– Andre Breton

This course is not designed to teach you to write; the expectation is that as a sophomore, you are already writing at the college level. The goals for a writing-intensive courses such as this one are:

- (1) To give you practice and experience writing in a particular discipline;
- (2) To help you learn the material by writing about it – “Writing to Learn.”

Chemistry 260 is different from most other science classes; as this is a writing-intensive class, your grade on lab reports and exams won't be based just on how much you show you know, but also on how you write what you know. If a lab report is not well written, is not in proper English and scientific style, and is not well organized, it will not receive a high grade, regardless of the correctness of its content. This applies to exams too, but writing comprises a larger portion of the

grade on the lab reports, as you have the opportunity to spell check, proof read, have others proof read, and seek assistance from the writing center.

Problem Set. There will be a spectroscopy problem set assigned; this is to be treated like a take-home exam. The assignment will be given before spring break and will be due Friday, March 23 (the Friday after spring break). You may use only your book(s) and lecture notes for the problem set. This is not a writing assignment, so you don't have to compose a report. You will have a choice of problems, so find ones you can work out without asking for assistance.

Project. There will be a final project – you will divide into 2 groups; each group will choose one of the instruments and prepare a video illustrating the theory, the operation, and what the results are used for. Participation by all persons in the group is necessary to earn that portion of the grade (see below).

Honor Code. The Honor Code applies to the exams, the problem set, and the lab reports. It is permissible to discuss a lab report prior to writing it up, but the report itself must be your work alone. The lab report for Experiment 2 (Report 2) will be written jointly by the students who worked together on the experiment. These students will turn in one report and all students in the group will receive the same grade on the report. See the Honor Code handout for more information.

Grading:	Exam I	25 %
	Exam II	25 %
	Problem set	5 %
	Lab	40 %
	Video	5 %

CHEMISTRY 260 LAB

- 1. Before the lab.** You should come into the lab with some knowledge of the experiment to be performed. This means having read the experiment and reviewed your class notes and the relevant textbook sections.
- 2. During the lab.** The experiment must be performed and completed during the lab period. Work efficiently and make good use of your time. You are expected to be present in the lab until the experiment is finished and to participate in all parts. Most of the glassware and chemicals needed can be obtained from the stockroom. Chemical preparation will be carried out in the prep room; use a hood when necessary. The instruments are expensive and must be handled carefully. If an instrument is broken, this not only involves the expense of repairing it, but may also entail down time before service can be arranged.
- 3. After the lab.** Before leaving the lab, all equipment must be cleaned and put away. Any equipment obtained from the stockroom must be returned.
- 4. Safety.** Proper safety precautions must be observed at all times. This means wearing approved safety glasses, no eating or drinking in the lab or instrument room, wearing proper protective clothing (e.g., no sandals), not wearing contact lenses, and no unauthorized experimentation.
- 5. Reports.** All data collected in lab should be recorded in a notebook. All people in a lab will work on the same experiment and instrument. This means everybody must participate in each part of the procedure -- preparation, instrument operation, and clean-up. The report itself is to be your work alone -- any collaboration is a violation of the Honor Code. (For Experiment 2, two students will work together to prepare a single report; both students will receive the same grade.) In most cases, there will be only one original record of the data obtained directly from the instrument. If so, one person should turn in the original with his or her report and the others should mention whose report includes this record. If desired, you may copy or photocopy the data for your own report.
- 6. Report style.** A written report is required for each technique investigated. The report is due at the beginning of the lab as noted on the schedule. The report should include:
 - a. Your name and the names of the others who worked on the experiment.
 - b. Date of experiment and date of report.
 - c. Number and title of experiment.
 - d. Technique and theory.
 - e. Description of apparatus used.
 - f. Brief description of the problem investigated.
 - g. Data (normally organized into tables).
 - h. Graphs, equations, diagrams, etc., where appropriate.
 - i. Results

j. Discussion and conclusions.

Reports must be written in proper scientific English -- using passive voice and past tense where appropriate. Reports should be word processed and double-spaced; they must be neat and legible with correct spelling, grammar, and punctuation. They must be printed in black ink, with 12-point type, and on one side of the paper only. Normally, you should avoid writing anything in -- use the word processor instead.

- 7. Grading.** Reports will be graded on a 100-point basis. You will be graded on the report itself (style, organization, completeness), your data, your results. The most important aspect is your writing and your explanation of theory and instrumentation. Some of the grading will, by the nature of the reports, be subjective.

Your lab grade will be computed by averaging the report grades and an evaluation of your performance in lab (participation, handling of equipment, clean-up, safety procedures).

- 8. Writing the reports.** For the first two reports, I will critique a draft which you will rewrite. For the first three reports, I will post a general outline to our class conference. After that, however, I expect you to write your reports without assistance from me. You may use the writing center and you may have someone else in the class look over your report. I will make available in my office sample reports from previous years. You may look at these reports before writing your own to see the style and the major components; you may look at them after you've written your paper to see if you omitted anything, or put something in the wrong place, or to perhaps find a diagram you'd like to include in your paper. However, it is an Honor Code violation to use the sample reports, directly or indirectly (paraphrasing), to write your report. Thus, you may not take notes from these sample papers. They are not intended to be used to write your paper.

9. How Experiments and Reports Go Together.

Report Number	Experiment Number	Technique
1	1-A and 1-B	uv-vis spectroscopy
2	2	NMR and IR spectroscopy, mass spectrometry
3	3	atomic absorption spectroscopy
4	4	gas chromatography
5	5-A and 5-B	liquid chromatography

SCHEDULE

Date	Experiment
Feb. 2	1-A (UV-VIS)
Feb. 9	1-B (UV-VIS)
Feb. 16	2 (IR-NMR-MS)
Feb. 23	---
Mar. 1	---
Mar. 8	3 (AA)
Mar. 15	--- (spring break)
Mar. 22	---
Mar. 29	4 (GC)
Apr. 5	5-A (TLC)
Apr. 12	5-B (HPLC)
Apr. 19	---
Apr. 26	---

Date	Report
Feb. 7	Draft of theory/instrumentation parts of Report 1 due
Feb. 14	Draft of procedure/ results/discussion parts of Report 1 due
Feb. 21	► Report 1 due Draft of theory/ instrumentation parts of Report 2 due*
Feb. 28	Draft of procedure/results/discussion parts of Report 2 due
Mar. 9	► Report 2 due by 4:00
Mar. 19-23	<i>Exam I</i> this week (see due times on page 2 above) <i>Problem set</i> due by Friday, Mar. 23, 4:00
Mar. 27	► Report 3 due
Apr. 3	► Report 4 due
Apr. 17	► Report 5 due
Apr. 21-May 1	<i>Exam II</i> this week (see due times on page 2 above) <i>Videos</i> due by Wed, May 2, 4:00

(Reports are due in class on the dates listed above)

* This is a long report and you will be collaborating with another author. Start it well before the draft is due – you don't have to wait until you've done the experiment to begin writing the theory and instrumentation parts of the report.