

Chemistry 3368
Integrated Chemistry Laboratory II
Spring 2002

Instructor info Prof. Dina C. Merrer
Office: Altschul 705
Phone: 854-9631
Email: *dmerrer@barnard.edu*

Course times Lecture T 12:00-12:50 am (in Altschul 806)
Laboratory W 1:10-5:00 pm (in Altschul 615)

Laboratory instructor Mrs. SuQing Liu
Office: Altschul 615B
Phone: 854-5971
Email: *sqliu@barnard.edu*
Mrs. Liu will assist with the laboratories and some of the grading.

Course objective

The objective of this course is to learn about the instruments, techniques, theories, and calculations of different types of spectroscopy.

Course text/materials

- Laboratory manual – provided
- Individual reference folders for each experiment – you will be provided with these prior to running each experiment; you must return them when you hand in your laboratory report

Reserve materials

The following are available at the Reserves Desk in Lehman Library. They are intended to provide supplementary (i.e., helpful!) information to you for writing your lab reports and preparing your talk.

- Atkins, P. *Physical Chemistry*, Freeman, 2001.
- Alberty, R.A.; Silbey, R.J. *Physical Chemistry*, Wiley, 1992.
- McQuarrie, D.A. *Quantum Chemistry*, 1983.
- Skoog, D.A.; Holler, F.J.; Nieman, T.A. *Principles of Instrumental Analysis, 5th Ed.*, Saunders, 1998.
- Shoemaker, D.P.; Garland, C.W.; Nibler, J.W. *Experiments in Physical Chemistry, 6th Ed.*, McGraw-Hill, 1996. Also, the 3rd Ed., 1974, is on reserve.
- Shriver, D.F.; Atkins, P.W. *Inorganic Chemistry, 3rd Ed.*, Freeman, 1999.
- Purcell, K.F.; Kotz, J.C. *Inorganic Chemistry*, Saunders, 1977.
- Course binder will contain laboratory manual and any other pertinent materials.

Grading

Laboratory reports: There are six (6) laboratory experiments for this course, each taking two laboratory periods. You will write formal laboratory reports for five (5) of these. Each of the 5 written reports will be valued at 100 points apiece.

Reports are due exactly **one week** from the day you finish the experiment, and are to be submitted to **Prof. Merrer by 1:10 pm** on that day. See the experiment schedule that follows for exact due dates. Should you not hand in a report by the due date, you will lose 3 points from that report for each weekday (M-F) that the report is late. The only acceptable excuses are the following: (1) a **serious illness** requiring a visit to health services, (2) an **important personal or family emergency**, or (3) **equipment failure**. Should any of these occur, you must contact me within 24 hours of the deadline. *No reports will be accepted more than two weeks late.*

More details on lab reports follow below.

Oral presentation: The sixth experiment will be presented orally in a 30-minute presentation during the last week of classes, on **May 1**. The oral presentation may be done on Power Point, transparencies, chalkboard, etc. The talk will be valued at 100 points. See the experiment schedule that follows to see for which experiment you will present a talk.

Office hours Location: Altschul 705
 Tuesday: 1:00-2:00 pm
 Wednesday: 11:00 am-12:00 pm ... and by appointment (of course!).

Expectations

Before lab: You should plan on spending at least ½ hour preparing for each lab period. This entails reading the manual for your experiment, any pertinent background information, and doing all pertinent calculations *in your lab notebook* prior to starting the experiment.

During lab: Mrs. Liu and I will be rotating among the 5 experiments that will be going on at once. We expect you to come to lab prepared for the day's experiment and to work steadily and safely (neither rushing nor dawdling).

You must wear eye protection at all times in the laboratory. You should not wear contact lenses at any time in the lab, even under goggles.

You are required to clean up after yourself, especially the instruments that you have used that day. It goes without saying that if questions arise during the experiment, be sure to ask them!!

After lab: The bulk of time that you will spend on this course will be in doing the post-lab calculations and write-up. You should expect to spend 15-20 hours writing each report. The lab report format follows below.

Laboratory notebooks

You will need one lab notebook with numbered pages and carbon pages. Upon completion of each lab period, you will hand in the carbon pages of your notebook to Prof. Merrer.

The “rules of the lab notebook” are:

- (1) Everything you do in the lab should be recorded *directly* into the notebook – **in pen**.
- (2) It should be possible for another person to repeat everything you have done from your record.
- (3) No erasing. If you make a mistake, simply cross it out with one line and continue on.

Laboratory reports

One of the goals of this course is to improve your skill at communicating scientific information. Writing is an essential way of doing that, and this is the reason for written reports. Reports are to be typed on standard 8.5 x 11” paper, not in the notebook. I encourage the use of spreadsheet, word processing, and other data manipulation programs in putting together a coherent report on your lab work.

Each of the 5 written lab reports will account for up to 100 points of your final grade. Fifteen (15) of the 100 points will be allocated in the following manner:

- 3 points format
- 3 points notebook
- 3 points error propagation
- 3 points units
- 3 points significant figures

For instance, you will lose 1 point (up to a maximum of 3 points lost) each time you give incorrect units, or give no units when they are required.

The other 85 points will depend on things unique to each report. Answer every specific question asked in the manual, give complete results including units and show all the requested graphs. A small part of your grade will depend on getting the correct result, but evaluation your own data correctly is more important.

Your grade does not depend on how the other people in the class do – i.e., everyone could potentially earn A’s. ☺

Computers

Computers are available to you in Altschul 613. To use this room, borrow a key from SuQing Liu (615B), Gwen Buchanan (421), or Maria Hasapoglou (607A). You will trade your Barnard ID for use of the key. Further rules are posted in Altschul 613. If you have computer questions that you cannot answer yourself from the computer help functions or from the manuals in 613, be sure to ask Prof. Merrer or Mrs. Liu.

Lecture Schedule

Chemistry 3368

Spring 2002

The following is the projected list of lecture topics for the semester:

Week #	Date	Topic(s)
1	January 22	Organizational materials; general spectroscopy
2	January 29	General spectroscopy
3	February 5	Brief survey of atomic and molecular spectroscopy
4	February 12	Selection rules
5	February 19	Rotational/vibrational spectroscopy (IR):
6	February 26	Harmonic vs. anharmonic oscillators, Birge-Sponer plots, Deslandres tables, FT spectrometers
7	March 5	Electronic spectroscopy:
8	March 12	Selection rules, electronic states, term symbols, Einstein
<i>Spring Break</i>	<i>March 19</i>	coefficients, photochemistry (fluorescence,
9	March 26	phosphorescence, Stern-Volmer kinetics)
10	April 2	Group theory: Symmetry, character tables, selection rules
11	April 9	Transition metal complexes:
12	April 16	Crystal field theory, Russell-Saunders coupling, Tanabe-Sugano diagrams (electronic spectra)
13	April 23	NMR
14	April 30	NMR wrap up; course evaluations

Experiment Schedule

Chemistry 3368

Spring 2002

Date	Haslinger	Kim	Musich	Perlson	Quraishi	Smenton	DUE DATE
Jan. 23 No Lab						
Jan. 30	I ₂	IR	AE	NMR	Ru	I ₂	Feb. 13
Feb. 6	↓	↓	↓	↓	↓	↓	
Feb. 13	IR	I ₂	I ₂	Ru	AE	NMR	Feb. 27
Feb. 20	↓	↓	↓	↓	↓	↓	
Feb. 27	AE	NMR	Ru	I ₂	I ₂	IR	Mar. 13
Mar. 6	↓	↓	↓	↓	↓	↓	
Mar. 13	Ru	Dye	IR	AE	NMR	Dye	Apr. 3
Mar. 20 Spring Break						
Mar. 27	↓	↓	↓	↓	↓	↓	
Apr. 3	Dye	AE	NMR	Dye	IR	Ru	Apr. 17
Apr. 10	↓	↓	↓	↓	↓	↓	
Apr. 17	NMR	Ru	Dye	IR	Dye	AE	May 1
Apr. 24	↓	↓	↓	↓	↓	↓	
May 1 Oral Presentations						May 1
	Ru	Dye	NMR	AE	I ₂	IR	

Dye assignment	DTTCI	DOTCI	HITCI	DTDCI	HIDCI	DODCI
AE unknowns	ANIL OPIN	BONA ARRO	PPLV OMAR	ROAR LOCK	NCNG LDMD	INPO DION

Experiment Abbreviations:

I₂ Electronic spectrum of I₂

Dye Visible spectrum of a conjugated dye

IR Infrared spectroscopy: High resolution spectra of HCl and DCl

AE Atomic emission spectroscopy

NMR NMR spectroscopy of hydrogen bonding between phenol and CCl₄

Ru Luminescence spectroscopy of Ru(bpy)₃Cl₂

Reports: You must submit formal written lab reports by 1:10 pm on the due date listed for the five experiments that you do not present orally. For the labs that you have a partner (i.e., I₂, Dye), you may do all work leading up to the lab report together, but you **must** submit **separate** and **independently-written** lab reports (i.e., each lab partner submits her **own** report).