Chemistry 320 – 4 cr.
Organic Laboratory Methods
Spring Semester, 2020

Instructor: William A. Price, Ph.D.
Holroyd 345
(215)-951-1261
price@lasalle.edu

Web page: http://www1.lasalle.edu/~price/CHM320.HTM

Text: R.M. Silverstein, F.X. Webster, *Spectrometric Identification of Organic Compounds*, 8th Edition, John W. Wiley & Sons, New York, 2014 (7th edition is fine) - ***Recommended***

Required Materials:

Composition Notebook
Laboratory goggles and apron or lab coat
3-ring binder

Course Description and Objectives:

LECTURE (Wednesday, 2:00-3:15):

The lecture portion of the course will be devoted to several aspects of spectroscopy as applied to structure elucidation. Particular attention will be paid to nuclear magnetic resonance (NMR) spectroscopy. Part of every lecture will also involve a discussion of upcoming and ongoing laboratory projects. The course will begin with an overview of the NMR phenomenon followed by coverage of advanced aspects of proton NMR, carbon-13 NMR, correlated spectroscopies. We will also spend some time discussing mass spectrometry and infrared (IR) spectroscopy. Learning spectroscopy is akin to learning a foreign language: the more you work at it, you will begin to recognize patterns and your level of comfort will increase.

Numerous slides will need to be downloaded and perhaps printed. Some handouts will be distributed throughout the semester, so it is imperative that you maintain an *organized binder* - particularly since you will be able to use it on some in-class exercises. Problem sets will be assigned dealing with structure elucidation based on chemical and spectral information. The clear benefits of translating spectra into organic structures will allow for a more thorough appreciation and understanding of the physical and structural dynamics of organic chemistry.

Occasionally, we will have a problem of the week that you should work through before the next lecture. Links to each problem are on our class' web page.

LABORATORY (Monday and Thursday, 2:00-4:50):

It has long been suggested that most of one's learning in the field of chemistry takes place in the laboratory. This course clearly subscribes to that premise. The laboratory portion of CHM 320 consists of **six short (2-3 week) projects** designed to introduce a variety of new synthetic techniques, reaction types, separation methods, instrumental methods and overall, an enhanced diagnostic thought process. The goal is to develop the tools to solve scientific questions through experimentation and creative problem solving. Some of the projects will be carried out in pairs. It is essential that the project background reading be completed prior to a lab day since *occasionally some preliminary laboratory work is necessary* (finding glassware and equipment, drying reagents, glassware, etc.). Realistically, synthetic chemistry does not fit nicely into 3 hour blocks of time and so you should expect to spend some lab/instrumentation time outside of class. Each student is required to maintain a complete notebook throughout the semester. A careful record of all experimental conditions, observations, and data (including physical properties and spectral parameters) should be kept. These will be checked periodically

SEARCHING ON THE WEB:

SciFinder® Part of the process.™ **SciFinder Scholar Web Edition** *Register and log on using your lasalle.edu email address*

A significant portion of research will require that you use SciFinder Scholar. Five of the laboratory projects are accompanied by lead references to journal articles that give experimental details. There are also references that are cited within those articles that will be helpful as well. You should keep all of the papers in your binder. You should locate these articles very early in the course since some may have to be retrieved through inter-library loan services.

ChemSpider SyntheticPages beta **ChemSpider** is an interactive database of synthetic procedures. Register (it's free) and have access to innumerable procedures that you may find helpful as you search for a project. **ACS Web Editions** is now available through the library for immediate access to over 30 ACS journals (including *J. Chem. Ed.*). One problem set will focus on literature searching using on-line searching techniques. La Salle subscribes to **SciFinder Scholar** for which each of you will need to register. Other helpful databases can be found in First-Search and Proquest. Some advanced texts, spectral indices and reference books will also be needed.

Laboratory Reports:

All laboratory reports will be written as if being submitted for publication. The format and style that will be followed can be found in **Guidelines for Writing Laboratory Reports at La Salle University**.

Each report will include the following: **title**, **author(s)**, **date submitted**, an **abstract**, **introduction** with structures and reactions, any pertinent theory (mechanism, e.g.) and background information, **results and discussion** (including spectral interpretation), **conclusion**, **experimental section**, and **literature cited**. *All relevant spectra should be appended*, but only those that are referred to and analyzed in the text of your paper. All tables and figures should be imbedded in the text of the report, must have titles and must be referred to in the text of the paper as well. Structures should be drawn with a drawing program (e.g. Marvin-Draw, KnowItAll, ChemSketch, etc.).

Each write-up will begin with a 2-3 sentence abstract that generally discusses the scope of the project. Articles published in *J. Org. Chem.* or *Synthesis* will provide numerous examples of appropriate abstracts and experimental sections. The special project will be presented as a seminar with slides (lasting 12-15 minutes). The reports are due on the dates listed. Timely submissions (instructor's judgement) can be resubmitted after initial grading for a re-grade. A 20% penalty will be assessed to papers for each week the paper is late according to the schedule below.

The reports are due two weeks after the completion of the project. Timely submissions (instructor's judgement) can be resubmitted after initial grading. *A 5% penalty will be assessed to papers for each day the paper is late according to the schedule below*.

1st report due February 5
2nd report due February 26
3rd report due March 25
4th report due April 8
5th report due April 22
Seminar (6th report) is on April 30 at 2PM

Grading:

A breakdown for the grading in this course will be as follows (the instructor reserves the right to modify this as necessary):

5 laboratory reports	500 pts
1 project seminar	100 pts
3 problem sets	150 pts
mid-term exam	125 pts
final exam	125 pts
Total	1000 pts

Learning Objectives:

After completing this course students will

- be proficient in writing papers (reports) coherently and concisely using a scientific style (ACS guidelines);
- cite references using proper ACS citation format;
- use drawing programs to illustrate reactions and mechanisms
- be proficient in organizing and delivering a seminar;
- be able to read and interpret articles in the literature;
- be able to carry out experiments using literature procedures;
- be able to carry out literature searches using advanced scientific data bases;
- gain independence in the laboratory;
- understand the many nuances of organic synthesis including the practical applications of green chemistry and asymmetric synthesis
- learn to use and interpret data derived from IR and GC/MS instruments;
- be able to operate and interpret complex spectra derived from the 400 MHz NMR spectrometer.

Academic Integrity:

It is your responsibility to maintain a high degree of integrity in your work. Cheating of any kind will not be tolerated and will result in a failure in the course! The following are considered cheating: (a) Sharing of results and answers on lab reports, graded assignments, quizzes and exams; (b) Use of unauthorized materials during an exam (cell phones included); (c) Plagiarism, including copying a fellow student's lab report or homework; (d) Using chemical drawings from a published or unpublished document without reference. You are not to use exams, problem sets or graded labs from prior years. When in doubt, both parties involved in plagiarism (both the copier and the copyee) will be held responsible for the integrity violation. Please refer to the school's official Academic Integrity Policy for further information as well as the Student Guide to Rights and Responsibilities.

Students with Disabilities:

Students with disabilities should refer to the student handbook for resources that are available to them as well as compliance with the American Disabilities Act.

Syllabus Change Policy:

This syllabus is a guide and every attempt is made to provide an accurate overview of the course. However, circumstances and events may make it necessary for the instructor to modify the syllabus during the semester and may depend, in part, on the progress, needs, and experiences of the students. The instructor will give notice when changes to the syllabus are made.