CHEMISTRY, B.S.

Program Description

The Chemistry major provides a background in all the fundamental fields of chemistry (organic, inorganic, biochemistry, analytical, and physical). The chemistry major curriculum emphasizes not only theoretical knowledge, data analysis, and coursework, but hands-on laboratory education and experience with chemistry implementation (including NMR, IR, voltammeter, calorimetry, etc.). Many chemistry major students also choose to do their own independent research projects to obtain an American Chemical Society approved degree, recognized in chemistry for its rigor and quality. Our chemistry classrooms utilize active-learning chemistry pedagogy and one-on-one student/professor interactions. Since 1963, The Chemistry major has been continually approved by the of the American Chemical Society illustrating the consistent high quality of the program.

Why Take This Major?

The La Salle Chemistry major has a long history of academic excellence and alumni that have gone on to distinguished careers in science, medicine, and industry. Our graduates have attended some of the best graduate schools in the area and in the country including University of Pennsylvania, Johns Hopkins University, University of Michigan, Ohio State University, Temple University, and Drexel University. Many of our students have become physicians, lawyers, or teachers, while other graduates have obtained lucrative employment in chemical, biochemical, and pharmaceutical industries.

No matter what their chosen career path, our graduates excel because our department trains them in the critical thinking and problem solving. As a liberal arts university, La Salle has a curriculum that offers a solid background in the fundamentals of chemical science coupled with a broad-based education. Students are made aware of the interconnections of chemistry with the other sciences and also with the social sciences, business, and the humanities. With such an education, our graduates leave La Salle as dynamic, adaptable, and prepared individuals ready for almost anything they will face in the future.

Degree Earned

Bachelor of Science (B.S.)

Required for Graduation

- Courses
  - Major: 17 Courses: 12 Chemistry, 2 Math, 2 Physics, 1 Computer Science
- Credits
  - Major: 67
  - Total: minimum 130
- GPA
  - Major: 2.0
  - Cumulative: 2.0

Student Learning Outcomes

- Students will execute chemical experimental laboratory techniques.
- Students will communicate scientific ideas and research both orally and in writing to both general and scientific audiences.
- Students will persist, think critically, and problem solve in tackling complex scientific problems.
- Students will explain the importance of biochemistry in addressing societal issues.
- Students will explain, visualize, and interpret chemistry at a macroscopic or (molecular) microscopic level.

Progress Chart

Level One - Core Courses

12 courses and 2 modules required.

Major Requirements

Major requirements include 4 Level Two ILO requirements*, fulfilled through the major.*

Students in this major must complete **17 Courses (12 Chemistry, 2 Math, 2 Physics, 1 Computer Science)** for this major.

Code	Title	Credits
Level One - Core Courses		
Universal Required Courses		
Students must complete the following 4 courses.		
ILO 8.1: Written Communication (https://catalog.lasalle.edu/undergraduate/ilo/)		
ENG 110	College Writing I: Persuasion	3
ILO 5.1: Information Literacy (https://catalog.lasalle.edu/undergraduate/ilo/)		
ENG 210	College Writing II: Research	3
ILO 1.1: Understanding Diverse Perspectives (https://catalog.lasalle.edu/undergraduate/ilo/)		
FYS 130	First-Year Academic Seminar [1]	3
ILO 2.1: Reflective Thinking and Valuing (https://catalog.lasalle.edu/undergraduate/ilo/)		
REL 100	Religion Matters	3
Elective Core Courses		
Students must complete 1 course in each of the following 4 ILOs.		
ILO 3.1a: Scientific Reasoning (https://catalog.lasalle.edu/undergraduate/ilo/)		
CHM 111	General Chemistry I	4
ILO 3.1b: Quantitative Reasoning (https://catalog.lasalle.edu/undergraduate/ilo/)		
MTH 120	Calculus I	4
ILO 6.1: Technological Competency (https://catalog.lasalle.edu/undergraduate/ilo/)		
CSC 152	Computer Technology for the Sciences	3
ILO 8.1a/12.1: Oral Communication/Collaborative Engagement (https://catalog.lasalle.edu/undergraduate/ilo/)		
Choose course within ILO (https://catalog.lasalle.edu/undergraduate/ilo/)		3
Distinct Discipline Core Courses		
Students must complete 1 course in each of the following 4 ILOs. Each course must be from a different discipline. (A "discipline" is represented by the 3- or 4-letter prefix attached to each course.)		
ILO 4.1: Critical Analysis and Reasoning (https://catalog.lasalle.edu/undergraduate/ilo/)		

Choose course within ILO (https://catalog.lasalle.edu/undergraduate/ilo/)		4
ILO 9.1: Creative and Artistic Expression (https://catalog.lasalle.edu/undergraduate/ilo/)		
Choose course within ILO (https://catalog.lasalle.edu/undergraduate/ilo/)		3
ILO 10.1: Ethical Understanding and Reasoning (https://catalog.lasalle.edu/undergraduate/ilo/)		
Choose course within ILO (https://catalog.lasalle.edu/undergraduate/ilo/)		3
ILO 11.1: Cultural and Global Awareness and Sensitivity (https://catalog.lasalle.edu/undergraduate/ilo/)		
Choose course within ILO (https://catalog.lasalle.edu/undergraduate/ilo/)		3
Universal Required Modules		
Students must complete the following 2 non-credit modules. [2]		
ILO 7.1a (https://catalog.lasalle.edu/undergraduate/ilo/)		
Health Literacy Module		
ILO 7.1b (https://catalog.lasalle.edu/undergraduate/ilo/)		
Financial Literacy Module		
Major Requirements		
Level Two		
Students must complete 1 course/learning experience in each of the 4 commitments.		
ILO 2.2: Broader Identity (Capstone Course/Experience) (https://catalog.lasalle.edu/undergraduate/ilo/)		
CHM 480	Chemical Research (ILO 2.2)	3-4
or CHM 499	Chemistry Capstone	
Select one ILO from 3.2a, 3.2b, 4.2, 5.2, 6.2, 7.2a, or 7.2b: Expanded Literacies (https://catalog.lasalle.edu/undergraduate/ilo/)		
CHM 202	Organic Chemistry II (ILO 3.2a)	4
or CHM 331	Thermodynamics and Kinetics	
ILO 8.2b: Effective Expression (Writing-Intensive Course) (https://catalog.lasalle.edu/undergraduate/ilo/)		
CHM 320	Organic Laboratory Methods (ILO 8.2b)	4
Select one ILO from 10.2, 11.2, or 12.2: Active Responsibility (https://catalog.lasalle.edu/undergraduate/ilo/)		
CHM 212	Quantitative Analysis (ILO 12.2)	4
All Other Required Courses		
CHM 111	General Chemistry I	4
CHM 112	General Chemistry II	4
CHM 201	Organic Chemistry I	4
CHM 202	Organic Chemistry II	4
CHM 212	Quantitative Analysis	4
CHM 311	Instrumental Analysis	4
CHM 320	Organic Laboratory Methods	4
CHM 332	Quantum Mechanics and Spectroscopy	4
CHM 331	Thermodynamics and Kinetics	4
CHM 403	Advanced Inorganic Chemistry	4
CHM 411	Biochemistry I	4
CHM 499	Chemistry Capstone	1
CSC 152	Computer Technology for the Sciences	3
MTH 120	Calculus I	4
MTH 121	Calculus II	4
PHY 105	General Physics I	4
PHY 106	General Physics II	4
Free Electives		
In addition to the requirements listed above, students must take enough courses to the fulfill graduation credit requirements for their School and major.		
Total Credits		**118-119**

1

NOTE. The following students use Level 2 Capstone Experience in Major instead of FYS 130 First-Year Academic Seminar: Honors, BUSCA, Core-to-Core, Transfer, and Non-Traditional/Evening.

2

The Modules are **not** required for Transfer Students, Core-to-Core Students, or BUSCA Students. BUSCA students are required to take modules if/when they pursue a bachelor's degree.

Recommended Course Sequence

Course	Title	Credits
First Year		
First Semester		
CHM 111	General Chemistry I	4
MTH 120	Calculus I	4
	Credits	**8**
Second Semester		
CHM 112	General Chemistry II	4
MTH 221	Calculus & Anal Geom II	4
	Credits	**8**
Second Year		
First Semester		
CHM 201	Organic Chemistry I	4
PHY 105	General Physics I	4
	Credits	**8**
Second Semester		
CHM 202	Organic Chemistry II	4
PHY 106	General Physics II	4
CHM 212	Quantitative Analysis	4
	Credits	**12**
Third Year		
First Semester		
CHM 332	Quantum Mechanics and Spectroscopy	4
CHM 311	Instrumental Analysis	4
	Credits	**8**
Second Semester		
CHM 331	Thermodynamics and Kinetics	4
CHM 320	Organic Laboratory Methods	4
	Credits	**8**
Fourth Year		
First Semester		
CHM 403	Advanced Inorganic Chemistry	4
CHM 411	Biochemistry I	4
	Credits	**8**
Second Semester		
CHM 499	Chemistry Capstone	1
	Credits	**1**
	Total Credits	**61**

Dual Major Requirements

Chemistry majors wishing to double major in Biochemistry, their two elective courses in Biochemistry should be BIO courses.

Minors

- Chemistry, Minor (https://catalog.lasalle.edu/undergraduate/arts-sciences/natural-sciences/chemistry-bs/chemistry-minor/)

Course Descriptions

Chemistry

CHM 105 Principles of Chemistry
This three-credit course introduces the basic principles of chemistry with a focus on mathematics and problem solving skills. Equal emphasis is given to the acquisition of correct conceptual understandings and the development of computational skills related to selected chemistry topics. This intent of this course is to prepare students for success in general chemistry (CHM 111-112). This course does not count towards the major. No pre-requisite classes are required to take this course.

CHM 111 General Chemistry I
General Chemistry I provides a firm basis for understanding the fundamentals of chemistry. This course covers atomic and molecular structure, stoichiometry, thermochemistry, and the periodic table. The descriptive chemistry is principally concerned with the reactions of nonmetals and of ions in solution. The course consists of three hours of lecture and three hours of laboratory. Prerequisite(s): MTH 101 (C+ or better) or equivalent

CHM 112 General Chemistry II
General Chemistry II builds on the concepts of General Chemistry I and focuses on gasses, properties of solutions, kinetics, equilibrium, acid-base chemistry, and electrochemistry. The laboratory experiments reinforce the concepts covered in lecture. The course consists of three hours of lecture and three hours of laboratory. Prerequisite(s): CHM 111 (C- or better)

CHM 140 Forensic Science: Crime Scenes
This course is for both science and non-science majors. The course will delve into the history of the development of crime scene investigation, with a focus on the hands-on applications of these techniques. Students will analyze real crime case studies to understand how different areas of criminalistics have been used historically. Students will also learn to perform the scientific techniques used to solve crime. The skills learned in the course may include crime scene re-construction, statistics, hair analysis, glass analysis, fingerprint analysis, and other key aspects of chemistry, physics, biology, biochemistry, and toxicology used in this field. The course will consist of 3 credits of lecture and 1 credit of laboratory.

CHM 150 Consumer Chemistry
Consumer Chemistry is a non-mathematical examination of the development of fact and theory in chemistry and the utilization of chemistry by society. Topics may include energy, pharmaceuticals, environmental effects, food additives, or synthetic materials. No prior knowledge of chemistry required. The course consists of three hours of lecture/laboratory sessions.

CHM 152 Criminalistics for Non-Physical Science Majors
This course is for non-science majors who are interested in learning more about how evidence from a crime scene is collected, analyzed, and evaluated. Of necessity, the course will be numerical in nature, but not math-intensive. As a multidisciplinary area of study, the course will use concepts from chemistry, biology, biochemistry, physics, toxicology, statistics, and other fields and will employ hands-on learning activities and laboratories, group work, and the traditional lecture format to convey the course material. The course consists of four hours of lecture/laboratory sessions.

CHM 161 Chemistry of The Life Sciences
Chemistry for the Life Sciences is a course for students typically majoring in nursing or nutrition. The course gives a general knowledge of chemistry (mostly inorganic) with an emphasis on health-related topics and problem-solving strategies. Descriptive and quantitative principles are discussed. This course consists of three hours of lecture and three hours of laboratory. Prerequisite(s): High School Algebra

CHM 170 Special Topics

CHM 171 Special Topics

CHM 201 Organic Chemistry I
Organic Chemistry is the study of compounds containing carbon. This course is focused on the structure, bonding, and stereochemistry of these compounds together with an introduction to reactions, reaction mechanisms, and synthesis. This course, as well as CHM 202, is intended for students majoring in chemistry, biochemistry, and biology as well as those pursuing a career in the health professions. The laboratory introduces techniques used in organic synthesis, separation, purification, and structure elucidation. The course consists of three hours of lecture and three hours of laboratory. Prerequisite(s): CHM 112 (C- or better)

CHM 202 Organic Chemistry II
The second semester of Organic Chemistry builds on the foundation established in CHM 201. The functional group and mechanistic approach to organic reactions allows for a more in-depth approach to organic synthesis. The use of basic spectral methods as a means of structure elucidation is also covered in this course. The course consists of three hours of lecture and three hours of laboratory. Prerequisite(s): CHM 201 (C- or better)

CHM 212 Quantitative Analysis
This course covers important areas of analytical chemistry, including statistics, error analysis, chemical equilibria, electrochemistry, and colorimetry. This course consists of three hours of lecture and three hours of laboratory. Prerequisite(s): CHM 112 (C- or better)

CHM 262 Organic Chemistry for The Life Sciences
CHM 262 is a one-semester course in organic chemistry designed to be particularly applicable to students majoring in nutrition and other health sciences. The subject matter includes organic chemistry principles: the naming of compounds, identification of functional groups, and chemical reactions. A particular emphasis is made in the coverage of reactions that are common to both organic and biochemistry. An effort will be made to make the examples and problems as health-related as possible. This course consists of three hours of lecture. Prerequisite(s): CHM 161 (C- or better)

CHM 263 Biochemistry for the Life Sciences
CHM 263 is a one-semester course in biochemistry designed to be particularly applicable to students majoring in nutrition. The subject matter includes biochemical principles (identification and properties of proteins, carbohydrates, lipids, nucleic acids, metabolic pathways, etc.). An effort will be made to make the examples and problems as health-related as possible. This course consists of three hours of lecture. Prerequisite(s): CHM 262 (C- or better)

CHM 265 Criminalistics for Physical Science Majors
Criminalistics for Physical Science Majors is a course for physical science majors who are interested in learning more about how evidence from a crime scene is collected, analyzed, and evaluated. The course employs hands-on learning activities, group work, and the traditional lecture format to convey the course material. Forensic science is a multidisciplinary field, and, as such, the course touches on areas of chemistry, biology, biochemistry, physics, toxicology, statistics, and other fields. The course consists of four hours of lecture/laboratory sessions. Prerequisite(s): CHM 201 (C- or better)

CHM 270 Special Topics

CHM 306 Quantum Chemistry
This elective course emphasizes chemical applications of group theory and quantum mechanics applied to molecular structure. Discussion of spectroscopic selection rules, symmetry and chemical bonding, and the spectroscopy of transition metal complexes are also included. The prerequisite for this course is CHM 332 or permission of the instructor. This course has three hours of lecture. (S)

CHM 311 Instrumental Analysis
CHM 311 covers the theory and practice of physical measurments with modern chemical instrumentation. The course is divided into two parts: spectroscopic and separation methods. Topics include UV-visible, FT-IR, fluorescence, and magnetic resonance spectroscopies as well as mass spectrometry, gas and liquid chromatographies. The course consists of three hours of lecture and three hours of laboratory. Prerequisite(s): CHM 112 (C- or better) or permission from instructor

CHM 320 Organic Laboratory Methods
This is a course in modern methods of organic synthesis and structure elucidation. This laboratory-intensive course emphasizes asymmetric synthesis, green chemistry, advanced spectral methods, and literature searching. The course consists of 75 minutes of lecture and six hours of laboratory. Prerequisite(s): CHM 202 (C- or better)

CHM 331 Thermodynamics and Kinetics
This course applies the principles of thermodynamics and kinetics to explain the behavior of gases, liquids, solids, and solutions. Topics include the elucidation of chemical equilibria, phase transitions, reaction mechanisms, and statistical ensembles of energy states. The course consists of three hours of lecture and three hours of laboratory. Prerequisite(s): CHM 202, MTH 121, PHY 106 (C- or better in all)

CHM 332 Quantum Mechanics and Spectroscopy
This course uses the formalism of quantum mechanics to understand fundamental chemical systems. It explores atomic and molecular structures, molecular vibrations, and molecular rotations. It also explores the use of spectroscopy to probe these chemical processes. The course consists of three hours of lecture and three hours of laboratory. Prerequisite(s): CHM 112, MTH 221, PHY 106 (C- or better in all)

CHM 350 Cooperative Education
This course normally involves full-time, paid employment in a cooperating firm to provide on-the-job training (part-time positions at least six months in duration may qualify). The experience involves appropriate job-related learning assignments under faculty supervision. The position must be approved by the Department Chair. Consult the Associate Director for Experiential Education in Career Services before registering or for further information.

CHM 360 Part-Time Internship

CHM 370 Special Topics

CHM 403 Advanced Inorganic Chemistry
This course covers theoretical and practical aspects of chemical bonding, descriptive periodic trends, and molecular structure and symmetry of molecules. A special emphasis is given to the chemistry of the transition metals, including coordination and organometallic chemistry. This course consists of three hours of lecture and three hours of laboratory. Prerequisite(s): CHM 202

CHM 404 Adv Organic Topics
This is a course designed to extend the knowledge of organic chemistry with an emphasis on more advanced and modern synthetic topics not fully developed in the elementary courses. An emphasis on the literature of chemistry is also included. Prerequisites: CHM 201, 202, and 320 are prerequisites for this course. The course consists of three hours of lecture. (S)

CHM 411 Biochemistry I
Biochemistry I examines the biochemistry of proteins, carbohydrates, fats, vitamins, enzymes, and hormones from a chemist's perspective and emphasizes their role in metabolic processes. Laboratory work illustrates common techniques used to isolate, identify, and assay these molecules, such as chromatography, electrophoresis, and kinetic analysis. The course consists of three hours of lecture and three hours of laboratory. Prerequisite(s): CHM 202

CHM 412 Biochemistry II
Biochemistry II focuses on the storage, replication, transmission, and expression of genetic information. It also examines recombinant DNA methodology and physiological processes at the molecular level. Laboratory work includes the isolation and analysis of plasmid DNA, creation of a new plasmid, and transformation into bacterial cells. The course consists of three hours of lecture and three hours of laboratory. Prerequisite(s): CHM 411

CHM 444 Research in Chemistry I
This course provides the student with an opportunity to do research with a faculty member. The student and the faculty member agree on the research project before the student registers for the course.

CHM 445 Research in Chemistry II
This course is a continuation of the CHM 444 Research in Chemistry. It provides the student with an opportunity to continue to conduct research with a faculty member.

CHM 450 Cooperative Education
This course normally involves full-time, paid employment in a cooperating firm to provide on-the-job training (part-time positions at least six months in duration may qualify). The experience involves appropriate job-related learning assignments under faculty supervision. The position must be approved by the Department Chair. Consult the Associate Director for Experiential Education in Career Services before registering or for further information.

CHM 470 Special Topics
Occasionally, courses in "Bioinorganic Chemistry," "Advanced Organic and Organometallic Chemistry," or "Polymer Chemistry" may be offered as Special Topics. These courses are designed for juniors and seniors majoring in chemistry and/or biochemistry.

CHM 471 Special Topics

CHM 474 Special Topics

CHM 480 Chemical Research
These courses provide students with the opportunity to engage in individual chemical or biochemical research. The research can be either laboratory-based or theoretical in nature. The work is done under the supervision of a staff member. The courses are restricted to chemistry and biochemistry majors unless otherwise approved by the chair of the Chemistry and Biochemistry Department. The specific hours for the course are arranged with the supervising staff member with a minimum of six research hours per week.

CHM 481 Chemical Research
These courses provide students with the opportunity to engage in individual chemical or biochemical research. The research can be either laboratory-based or theoretical in nature. The work is done under the supervision of a staff member. The courses are restricted to chemistry and biochemistry majors unless otherwise approved by the chair of the Chemistry and Biochemistry Department. The specific hours for the course are arranged with the supervising staff member with a minimum of six research hours per week.

CHM 482 Chem Research III

CHM 483 Chem Research III

CHM 499 Chemistry Capstone
This is the capstone course for senior-level chemistry and biochemistry majors. It is intended to broadly expose students to select topics that span sub-disciplines in chemistry and current trends in chemical science. The course is discussion-based and student-driven, and students will be required to examine their scientific ideas through research, reflection, and communication of topics in the chemical sciences.

Program Contact Information

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