

# CHEMISTRY AND BIOCHEMISTRY

LUC.EDU/CAS

Loyola University Chicago's Chemistry Department offers small classes and personal interaction. Extra assistance is available outside the classroom through faculty appointments and student affiliate groups.

Students are encouraged to do research with faculty members. Professors also enable student researchers the opportunity to present their findings at meetings and to publish their work, giving them experience that is highly valued by employers and graduate schools.

Loyola's chemistry students use state-of-the-art equipment necessary for sophisticated chemical research. Most chemistry courses are held in Flanner Hall and the Quinlan Life Sciences Education and Research Center.

## Career Opportunities

In recent years, about one-third of Loyola's BS in Chemistry graduates have begun their careers. The other students go on to graduate or professional schools.

Loyola chemistry graduates are employed at companies such as E.I. DuPont, Eli Lilly, Pfizer, Sherwin-Williams, 3M Corporation, Shell Oil, Borg-Warner, Universal Oil Products, Baxter Labs, Continental Can, Cook County Environmental Protection Agency, Stauffer Chemical Company, and many others. In addition to industry, many chemistry majors go on to professional schools in law, medicine, or dentistry.



Access to modern facilities and equipment at the Quinlan Life Sciences Education and Research Center provides many opportunities for students to participate in research alongside professors.

## THE PROGRAMS

The department offers the following degree programs:

Graduate:

- PhD in Chemistry
- MS in Chemistry (thesis based)
- MS in Chemistry (course based)

Dual-degrees (5 years):

- BS Chemistry/MS
- BS Biochemistry/MS
- BA Chemistry/MEd (Masters of Education)

Undergraduate majors:

- Bachelor of Science (BS) in Chemistry
- Bachelor of Science (BS) in Biochemistry
- Bachelor of Arts (BA) in Chemistry

Minors:

- Minor in Chemistry

Related majors:

- Bioinformatics (Interdisciplinary)
- Biophysics
- Environmental science (Interdisciplinary)
- Forensic science (Interdisciplinary)

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# CHEMISTRY AND BIOCHEMISTRY

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## THE MAJORS [CONTINUED]

The PhD degree prepares graduate students for high level jobs in such areas as academia, industry and government laboratories.

The MS degrees and the dual BS Chemistry/MS and BS Biochemistry/MS degrees are ideally suited for students seeking mid-level jobs in industry, whereas the BA in Chemistry/MEd degree qualifies students for teaching high-school chemistry.

The BS degrees are best suited for students planning to enter the chemical profession directly, or for those planning to go on to graduate school in chemistry, environmental science, biochemistry, or professional schools such as medicine or dentistry, which rely heavily on a strong knowledge of chemistry.

The BA degree is most appropriate for pre-professionals or others whose future careers may rely heavily on knowledge areas outside chemistry, including business, education, law, and other fields.

Students receiving the BS degree in Chemistry are certified by the department as being eligible for full membership in the American Chemical Society. Students receiving the BA degree in Chemistry are initially eligible for associate membership only.

### Graduate Programs

The Department of Chemistry offers programs leading to the MS and PhD degrees in which more than 30 graduate students are currently enrolled. Their presence offers additional opportunities for undergraduate chemistry majors to explore career options with recent graduates from other universities.

The Graduate programs offer specialization in Analytical Chemistry, Biochemistry, Chemical Education, Inorganic Chemistry, Organic Chemistry and Physical Chemistry. In addition, research projects are also offered in areas that cross traditional boundaries such as bioorganic, bioinorganic, biophysical, and environmental chemistry. For more information on graduate programs visit [luc.edu/chemistry/graduate\\_program.shtml](http://luc.edu/chemistry/graduate_program.shtml).

### Dual-degree Programs (5 years) BS/MS Chemistry or Biochemistry

This masters degree track allows qualified chemistry Loyola undergraduates to complete MS degree in one year following the acquisition of a BS degree. Chemistry majors on track to complete physical chemistry lecture and laboratory by the end of their junior year may apply to the program during their junior year. Students accepted into this program will begin taking graduate classes during

their senior year that count toward fulfilling requirements for both BS and MS degrees. Successful students will complete 24 hours of 400 level coursework by the end of their fifth year. Students must complete at least three hours of directed research as part of the 24 hour requirement. Admission requirements and application procedures may be found on the chemistry department website [http://www.luc.edu/chemistry/undergraduate\\_program.shtml](http://www.luc.edu/chemistry/undergraduate_program.shtml)

### BA Chemistry/MEd (Masters of Education)

Numerous job opportunities are available for students interested in becoming science teachers for grades 6-12. In fact, in Illinois the need for science teachers is critical. This dual-degree program takes five years to complete and enables students to earn both the BA and MEd degrees along with state certification necessary to teach middle- and high-school grades. Earning a BA and MEd offers greater opportunities for advancement and higher salary base for the graduate than earning certification alone at the undergraduate level. Additionally, the program allows a student to complete enough coursework in another science content area in order to meet requirements for multiple content endorsements on their certification, such as both chemistry and biology or both chemistry and physics. A candidate with multiple endorsements in science content may have the competitive edge when applying for teaching positions.

Students must have a GPA of 3.0 or better to be admitted to the program, and must begin the program no later than the start of their junior year. Course requirements within the five years apply to both the 120 credit hours needed for the BA degree and the 30 credit hours of graduate-level work required for the MEd degree. Students must also take and pass the Illinois State Board of Education Test of Basic Skills and the Content Examination in Chemistry. As students progress through this program, they will compile a portfolio of their work to be presented at the completion of all course work.

### Requirements – Undergraduate Degrees

To obtain an undergraduate degree and prepare for a chosen field, students complete their major requirements, round out their education by learning important skills and values through Loyola's Core Curriculum, and develop their own special interests by taking general electives. For more information on the Core, visit [luc.edu/core](http://luc.edu/core), and for details on Chemistry major requirements [luc.edu/chemistry/undergraduate\\_program.shtml](http://luc.edu/chemistry/undergraduate_program.shtml)

**Note:** To graduate in four years and progress through the sequential curricula, chemistry majors must enter Loyola with very strong math skills and begin taking chemistry and math courses immediately.

### BS in Chemistry

Requirements include 14 chemistry courses totaling 39 credit hours; two required elective courses in chemistry totaling six credit hours; four physics courses totaling eight credit hours; and three mathematics courses totaling 12 credit hours. The department strongly recommends Undergraduate Research (CHEM 300).

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## BS in Biochemistry

The biochemistry major requirements include 19 required chemistry courses totaling 43 credit hours; seven courses in biology totaling 16 credit hours; two courses in mathematics totaling six credit hours; and four courses in physics totaling eight credit hours. The department also strongly recommends Undergraduate Research (CHEM 300).

## BA in Chemistry

Requirements for this degree include 12 courses in chemistry totaling 35 hours; four specified courses in physics totaling eight credit hours; and two courses in mathematics totaling eight credit hours.

## Minor in Chemistry

Students majoring in areas other than chemistry may satisfy requirements for a minor concentration in chemistry by completing 24 credit hours of chemistry with grades of "C" or better. Details can be found at [http://www.luc.edu/chemistry/undergrad\\_minor.shtml](http://www.luc.edu/chemistry/undergrad_minor.shtml).

## Mathematics Preparedness for Chemistry

Students wishing to register for a chemistry course need a background in mathematics commensurate with the computational requirements of the course. Evidence of math preparedness is obtained from results of a Math Placement Test (MPT) administered by the College of Arts and Sciences. Students who are found to be mathematically underprepared must pass Mathematics 117 with a grade of "C" or better before they are able to register for a chemistry course.

## Advanced Placement

The Department of Chemistry will award credit for a score of 4 or 5 on the Advanced Placement Chemistry Examination or scores of 6 or 7 on the International Baccalaureate Program, which merits eight hours of transfer credit for Chem 101, 102, 111 and 112 or Chem 105 & 106.

## The Faculty

The Department of Chemistry includes 17 full-time faculty members, all of whom have PhD degrees and are actively engaged in research as well as teaching.

Chairperson: **Richard C. Holz, PhD**, Pennsylvania State University: biological and inorganic chemistry

**James H. Babler, PhD**, Northwestern University: organic chemistry

**Miguel A. Ballicora, PhD**, University of Buenos Aires: biochemistry

**Daniel P. Becker, PhD**, Indiana University: organic chemistry

**M. Paul Chiarelli, PhD**, University of Nebraska: analytical chemistry

**Jacob W. Ciszek, PhD**, Rice University: inorganic chemistry

**David S. Crumrine, PhD**, University of Wisconsin: organic chemistry

**Patrick L. Daubenmire, PhD**, The Catholic University of America: chemical education

**Alanah Fitch, PhD**, University of Illinois: analytical chemistry

**Jan Florián, PhD**, Charles University: physical chemistry

**Daniel J. Graham, PhD**, Washington University: physical chemistry

**Albert W. Herlinger, PhD**, Pennsylvania State University: inorganic chemistry

**Daniel R. Killelea, PhD**, Tufts University: physical chemistry

**Dali Liu, PhD**, University of Oklahoma: biochemistry

**Duarte E. Mota de Freitas, PhD**, University of California, Los Angeles: bioinorganic chemistry

**Kenneth W. Olsen, PhD**, Duke University: biochemistry

**Martina Schmeling, PhD**, University of Dortmund: analytical chemistry

## Course Offerings (Credit Hours)

### CHEMISTRY (CHEM)

#### Undergraduate

<b>101</b>	General Chemistry A (non-majors) (3)
<b>102</b>	General Chemistry B (non-majors) (3)
<b>105</b>	Chemical Principles (4)
<b>106</b>	Basic Inorganic Chemistry (4)
<b>111</b>	General Chemistry Laboratory A (1)
<b>112</b>	General Chemistry Laboratory B (1)
<b>151</b>	Elementary Physiological Chemistry A (nurses) (4)
<b>152</b>	Elementary Physiological Chemistry B (nurses) (4)
<b>212</b>	Elementary Quantitative Analysis (Lecture) (3)
<b>214</b>	Elementary Quantitative Analysis Lab (1)
<b>221</b>	Organic Chemistry I (4)
<b>222</b>	Organic Chemistry II (4)
<b>223</b>	Organic Chemistry A (non-majors) (3)
<b>224</b>	Organic Chemistry B (non-majors) (3)
<b>225</b>	Organic Chemistry Laboratory A (non-majors) (1)
<b>226</b>	Organic Chemistry Laboratory B (non-majors) (1)
<b>240</b>	Inorganic Chemistry (3)
<b>300</b>	Undergraduate Research (1-3)
<b>301</b>	Physical Chemistry I (4)
<b>302</b>	Physical Chemistry II (3)
<b>303</b>	Physical Chemistry Laboratory (1)
<b>305</b>	Physical Biochemistry (3)
<b>306</b>	Physical Biochemistry Laboratory (1)
<b>310</b>	Instrumental Analysis (2)
<b>311</b>	Instrumental Analysis Laboratory (2)
<b>312</b>	Environmental Chemistry (3)
<b>313</b>	Environmental Chemistry Lab (1)
<b>340</b>	Advanced Inorganic Chemistry (3)
<b>341</b>	Advanced Inorganic Laboratory (1)

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- 361** Survey in Biochemistry (3)  
**362** Current Concepts in Biochemistry (3)  
**363** Biochemistry Laboratory (2)  
**365** Proteomics (3)  
**370** Biochemistry I (3)  
**371** Biochemistry II (2)  
**372** Biochemistry Laboratory I (2)  
**373** Biochemistry Laboratory II (2)  
**385** Advanced Enzyme Kinetics and Mechanisms(3)  
**386** Metabolic Processes and Supramolecular Biological Structures (3)  
**387** Plant Biochemistry (3)  
**395** Special Topics in Chemistry (1-3)  
**Graduate**  
**420** Advanced Organic Chemistry I: Structure, Mechanism and Reactions (3)  
**421** Advanced Organic Chemistry II: Synthesis (3)  
**422** Advanced Organic Chemistry III: Reaction Mechanisms (3)  
**425** Special Topics in Organic Chemistry (3)  
**429** Research in Organic Chemistry (1-9)  
**430** Physical Chemistry Survey (3)  
**431** Chemical Thermo-dynamics (3)  
**433** Chemical Kinetics (3)  
**435** Special Topics in Physical Chemistry (3)  
**436** Statistical Thermodynamics (3)  
**437** Quantum Mechanics I (3)  
**438** Quantum Mechanics II (3)  
**439** Research in Physical Chemistry (1-9)  
**441** Advanced Inorganic Chemistry (3)  
**445** Special Topics in Inorganic Chemistry (3)  
**449** Research in Inorganic Chemistry (1-9)  
**451** Chemical Methods of Analysis (3)  
**452** Electrochemistry (3)  
**454** Analytical Separation (3)  
**455** Special Topics in Analytical Chemistry (3)  
**456** Analytical Spectroscopy (3)  
**459** Research in Analytical Chemistry (1-9)  
**460** Biophysical Chemistry (3)  
**461** Biochemistry (3)  
**465** Special Topics in Biochemistry (3)

Information in this brochure is correct as of July 2011.

For the most up-to-date information, visit [LUC.edu/undergrad/academics](http://LUC.edu/undergrad/academics)

Loyola is an equal opportunity educator/employer.

- 469** Research in Biochemistry (1-9)  
**495** Teaching and Learning General Chemistry I (3)  
**496** Teaching and Learning General Chemistry II (3)  
**501** Directed Study (1-6)  
**509** Doctoral Research (1-9)  
**595** Thesis Supervision (0)  
**600** Dissertation Supervision (0)  
**605** Master's Study (0)  
**610** Doctoral Study (0)

## Core Curriculum

Loyola's Core Curriculum focuses on desired outcomes in addition to academic disciplines. This varied curriculum instills important skills which prepare students for success regardless of desired career paths. These skills include communications, critical thinking, ethical awareness, information literacy, quantitative and qualitative analysis, research methods, and technological literacy. Students develop these skills by completing Loyola's 10 required areas of knowledge through coursework, which includes a college writing seminar, artistic knowledge and experience, historical knowledge, literary knowledge, quantitative analysis, scientific literacy, societal and cultural knowledge, philosophical knowledge, theological and religious studies, and ethics.

Loyola's Core integrates values across the curriculum through 15 credit hours completed in the Core, major, or electives. These values focus on understanding and promoting justice, understanding diversity in the U.S. and the world, understanding spirituality or faith in action in the world, and promoting civic engagement or leadership. This 45-credit hour curriculum makes up about one-third of a student's coursework, is complemented by a major and electives, and may be completed at any time during the Loyola academic experience.

**For more information, please visit [LUC.edu/core](http://LUC.edu/core).**

## CONTACT US

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