

# BACHELOR OF SCIENCE IN CHEMISTRY

## Why study chemistry?

Because understanding the atomic and molecular nature of matter informs us about ourselves and our universe, and creating and finding applications for new and modified forms of matter helps to conserve and enhance our world.

## Undergraduate Admission

### Admission to KU

All students applying for admission must send high school and college transcripts to the Office of Admissions. Unless they are college transfer students with at least 24 hours of credit, prospective students must send ACT or SAT scores to the Office of Admissions. Prospective first-year students should be aware that KU has qualified admission requirements that all new first-year students must meet to be admitted. Consult the Office of Admissions (<http://admissions.ku.edu>) for application deadlines and specific admission requirements.

Visit the Office of International Student and Scholar Services (<http://www.iss.ku.edu>) for information about international admissions.

Students considering transferring to KU may see how their college-level course work will transfer on the Office of Admissions (<http://credittransfer.ku.edu>) website.

## Admission to the College of Liberal Arts and Sciences

Admission to the College is a different process from admission to a major field. Some CLAS departments have admission requirements. See individual department/program sections for departmental admission requirements.

## Chemistry Programs

The B.S. degree prepares students for graduate school and professional careers. The B.A. degree is for the student who wants to understand the fundamental principles of chemistry and to study a number of other fields. Both are based on a high school background that includes at least 1½ years of algebra and 1 year of geometry. High school courses in chemistry and physics are desirable but are not required. Many chemistry majors are preparing for medical school or for graduate study in chemistry and related fields. For graduate school, the common body of knowledge in the B.A. program is the minimum prerequisite. For premedical students, much of the knowledge will be important in their careers. Even more important, however, is the training in logical thinking, drawing conclusions from experimental observations, and digesting and understanding scientific information.

## First- and Second-Year Preparation

Because study in chemistry requires preparation in mathematics and physics as well as a structured series of courses in chemistry, students should begin meeting major requirements in the first year. Students planning to major in chemistry should consult a chemistry department major advisor during their first semester to develop a 4-year plan for degree completion. It is particularly important to take CHEM 170 (or CHEM 130 or CHEM 190) and CHEM 175 (or CHEM 135 or CHEM 195) in

the first year and CHEM 201, CHEM 330 (or CHEM 380) and CHEM 331 in the second year. For those seeking a B.S. degree it is also important to complete CHEM 335 (or CHEM 385) and CHEM 336 in the second year as well as their mathematics preparation (MATH 125, 126, 127 and CHEM 250) and physics preparation (PHSX 211 & PHSX 216, and PHSX 212 & PHSX 236) in the first 2 years.

## Requirements for the B.S. Degree

### General Education Requirements

All students must complete the KU Core.

### Chemistry Prerequisite or Co-requisite Knowledge (27-28)

Majors must complete courses as specified in each of the following areas. Majors are advised to take honors courses when eligible. These hours do not contribute to the minimum number of hours required for the major.

Calculus I. Satisfied by one of the following:	4
MATH 125 Calculus I or MATH 144 Calculus I, Honors	
Calculus II. Satisfied by one of the following:	4
MATH 126 Calculus II or MATH 144 Calculus II, Honors	
Calculus III. Satisfied by one of the following:	4
MATH 127 Calculus III or MATH 144 Calculus III, Honors	
Mathematical Methods for the Chemical Sciences. Satisfied by:	3
CHEM 250 Mathematical Methods for the Chemical Sciences	
General Physics I. Satisfied by one of the following:	5
PHSX 211 General Physics I & PHSX 216 and General Physics I Laboratory	
PHSX 213 General Physics I Honors	
General Physics II. Satisfied by one of the following:	4
PHSX 212 General Physics II & PHSX 236 and General Physics II Laboratory	
PHSX 214 General Physics II Honors	
Biochemistry. Satisfied by one of the following:	3-4
BIOL 600 Introductory Biochemistry, Lectures	
BIOL 636 Biochemistry I	
<b>Chemistry Core Knowledge and Skills (47)</b>	
Majors must complete courses as indicated in the following areas:	
Chemistry for the Chemical Sciences I. Satisfied by one of the following:	5
CHEM 170 Chemistry for the Chemical Sciences I	
CHEM 130 General Chemistry I	
CHEM 190 Foundations of Chemistry I, Honors	
Chemistry for the Chemical Sciences II. Satisfied by one of the following:	5
CHEM 175 Chemistry for the Chemical Sciences II	
CHEM 135 General Chemistry II	
CHEM 195 Foundations of Chemistry II, Honors	
Seminar I. Satisfied by:	0.5
CHEM 180 Seminar I	
Laboratory Safety in the Chemical Sciences. Satisfied by:	1
CHEM 201 Laboratory Safety in the Chemical Sciences	

Organic Chemistry I (Lecture and Lab). Satisfied by:	5
CHEM 330 Organic Chemistry I or CHEM 380 Organic Chemistry I, Honors	
CHEM 331 Organic Chemistry I Laboratory	
Organic Chemistry II (Lecture and Lab). Satisfied by:	5
CHEM 335 Organic Chemistry II or CHEM 385 Organic Chemistry II, Honors	
CHEM 336 Organic Chemistry II Laboratory	
Physical Chemistry I Satisfied by:	4
CHEM 530 Physical Chemistry I	
Physical Chemistry II (Lecture and Lab). Satisfied by:	6
CHEM 535 Physical Chemistry II & CHEM 537 and Physical Chemistry Laboratory	
Analytical Chemistry (Lecture and Lab). Satisfied by:	5
CHEM 620 Analytical Chemistry & CHEM 621 and Analytical Chemistry Laboratory	
Instrumental Methods of Analysis, Satisfied by:	2
CHEM 635 Instrumental Methods of Analysis	
Systematic Inorganic Chemistry. Satisfied by:	3
CHEM 660 Systematic Inorganic Chemistry	
Advanced Inorganic Laboratory. Satisfied by:	2
CHEM 661 Advanced Inorganic Laboratory	
Seminar II. Satisfied by:	0.5
CHEM 695 Seminar II	
Select one of the following: (Fulfills KU Core Goal 6)	3
CHEM 636 Instrumental Methods of Analysis Laboratory or CHEM 698 Undergraduate Research Problems or CHEM 699 Undergraduate Honors Research	

## Major Hours & Major GPA

KU Core Goal 6 is satisfied by either CHEM 636 Instrumental Methods of Analysis Laboratory, or 3 credit hours of CHEM 698 or CHEM 699. While completing all required courses, majors must also meet each of the following hour and grade-point average minimum standards:

### Major Hours

Satisfied by 47 hours of major courses.

### Major Hours in Residence

Satisfied by a minimum of 15 hours of KU resident credit in the major.

### Major Junior/Senior Hours

Satisfied by a minimum of 35.5 hours from junior/senior courses (300+) in the major.

### Major Junior/Senior Graduation GPA

Satisfied by a minimum of a 2.0 KU GPA in junior/senior courses (300+) in the major. GPA calculations include all junior/senior courses in the field of study including F's and repeated courses. See the Semester/Cumulative GPA Calculator. (<http://clas.ku.edu/undergrad/tools/gpa>)

## Biological Chemistry Option

This option is available to students interested in the biological applications of chemistry. The curriculum is compatible with many pre-health-professions programs and prepares the student for graduate study or career opportunities.

## General Education Requirements

All students must complete the KU Core.

### Chemistry Prerequisite or Co-requisite Knowledge (24)

Majors must complete courses as specified in each of the following areas. Majors are advised to take honors courses when eligible. These hours do not contribute to the minimum number of hours required for the major.

Calculus I. Satisfied by one of the following:	4
MATH 125 Calculus I or MATH 145 Calculus I, Honors	
Calculus II. Satisfied by one of the following:	4
MATH 126 Calculus II or MATH 146 Calculus II, Honors	
Calculus III. Satisfied by one of the following:	4
MATH 127 Calculus III or MATH 147 Calculus III, Honors	
Mathematical Methods for the Chemical Sciences. Satisfied by:	3
CHEM 250 Mathematical Methods for the Chemical Sciences	
General Physics I. Satisfied by one of the following:	5
PHSX 211 General Physics I & PHSX 216 and General Physics I Laboratory PHSX 213 General Physics I Honors	
General Physics II. Satisfied by one of the following:	4
PHSX 212 General Physics II & PHSX 236 and General Physics II Laboratory PHSX 214 General Physics II Honors	

### Chemistry Core Knowledge and Skills (47)

Majors must complete courses as indicated in the following areas:

Chemistry for the Chemical Sciences I. Satisfied by one of the following:	5
CHEM 170 Chemistry for the Chemical Sciences I CHEM 130 General Chemistry I CHEM 190 Foundations of Chemistry I, Honors	
Chemistry for the Chemical Sciences II. Satisfied by one of the following:	5
CHEM 175 Chemistry for the Chemical Sciences II CHEM 135 General Chemistry II CHEM 195 Foundations of Chemistry II, Honors	
Seminar I. Satisfied by:	0.5
CHEM 180 Seminar I	
Laboratory Safety in the Chemical Sciences. Satisfied by:	1
CHEM 201 Laboratory Safety in the Chemical Sciences	
Organic Chemistry I (Lecture and Lab). Satisfied by:	5
CHEM 330 Organic Chemistry I or CHEM 380 Organic Chemistry I, Honors CHEM 331 Organic Chemistry I Laboratory	
Organic Chemistry II (Lecture and Lab). Satisfied by:	5
CHEM 335 Organic Chemistry II or CHEM 385 Organic Chemistry II, Honors CHEM 336 Organic Chemistry II Laboratory	
Physical Chemistry I Satisfied by:	4
CHEM 530 Physical Chemistry I	
Physical Chemistry II (Lecture and Lab). Satisfied by:	6

CHEM 535 & CHEM 537	Physical Chemistry II and Physical Chemistry Laboratory	
Analytical Chemistry (Lecture and Lab). Satisfied by:		5
CHEM 620 & CHEM 621	Analytical Chemistry and Analytical Chemistry Laboratory	
Instrumental Methods of Analysis Satisfied by:		2
CHEM 635	Instrumental Methods of Analysis	
Systematic Inorganic Chemistry. Satisfied by:		3
CHEM 660	Systematic Inorganic Chemistry	
Advanced Inorganic Laboratory. Satisfied by:		2
CHEM 661	Advanced Inorganic Laboratory	
Seminar II. Satisfied by:		0.5
CHEM 695	Seminar II	
Select one of the following: (Fulfills KU Core Goal 6)		3
CHEM 636 or CHEM 695 or CHEM 695	Instrumental Methods of Analysis Laboratory Undergraduate Research Problems Undergraduate Honors Research	
<b>Biological Chemistry Core Knowledge and Skills (16)</b>		
Principles of Molecular and Cellular Biology. Satisfied by:		4
BIOL 150	Principles of Molecular and Cellular Biology	
Biochemistry. Satisfied by:		7
BIOL 636	Biochemistry I	
BIOL 638	Biochemistry II	
Biochemistry Laboratory. Satisfied by:		2
BIOL 637	Introductory Biochemistry Laboratory	
Biological Chemistry Required Electives		
Majors choosing this option should select 1 elective (3 hours) from the following:		3
BIOL 350	Principles of Genetics	
BIOL 400	Fundamentals of Microbiology	
BIOL 416	Cell Structure and Function	

## Major Hours & Major GPA

While completing all required courses, majors must also meet each of the following hour and grade-point average minimum standards:

### Major Hours

Satisfied by 47 hours of major courses.

### Major Hours in Residence

Satisfied by a minimum of 15 hours of KU resident credit in the major.

### Major Junior/Senior Hours

Satisfied by a minimum of 35.5 hours from junior/senior courses (300+) in the major.

### Major Junior/Senior Graduation GPA

Satisfied by a minimum of a 2.0 KU GPA in junior/senior courses (300+) in the major. GPA calculations include all junior/senior courses in the field of study including F's and repeated courses. See the Semester/Cumulative GPA Calculator (<http://clas.ku.edu/undergrad/tools/gpa>).

## Chemical Physics Option

This option allows students to focus on the theoretical basis of chemistry. Students are prepared for graduate programs or employment.

## General Education Requirements

All students must complete the KU Core.

### Chemistry Prerequisite or Co-requisite Knowledge (29-30)

Majors must complete courses as specified in each of the following areas. Majors are advised to take honors courses when eligible. These hours do not contribute to the minimum number of hours required for the major.

Calculus I. Satisfied by one of the following:		4
MATH 125	Calculus I	
or MATH 144 Calculus I, Honors		
Calculus II. Satisfied by one of the following:		4
MATH 126	Calculus II	
or MATH 144 Calculus II, Honors		
Calculus III. Satisfied by one of the following:		4
MATH 127	Calculus III	
or MATH 144 Calculus III, Honors		
Differential Equations. Satisfied by one of the following:		3
MATH 220	Applied Differential Equations	
MATH 320	Elementary Differential Equations	
Elementary Linear Algebra. Satisfied by:		2
MATH 290	Elementary Linear Algebra	
General Physics I. Satisfied by one of the following:		5
PHSX 211	General Physics I	
& PHSX 216 and General Physics I Laboratory		
PHSX 213	General Physics I Honors	
General Physics II. Satisfied by one of the following:		4
PHSX 212	General Physics II	
& PHSX 236 and General Physics II Laboratory		
PHSX 214	General Physics II Honors	
Biochemistry. Satisfied by one of the following:		3-4
BIOL 600	Introductory Biochemistry, Lectures	
BIOL 636	Biochemistry I	
<b>Chemistry Core Knowledge and Skills (47)</b>		
Majors must complete courses as indicated in the following areas:		
Chemistry for the Chemical Sciences I. Satisfied by one of the following:		5
CHEM 170	Chemistry for the Chemical Sciences I	
CHEM 130	General Chemistry I	
CHEM 190	Foundations of Chemistry I, Honors	
Chemistry for the Chemical Sciences II. Satisfied by one of the following:		5
CHEM 175	Chemistry for the Chemical Sciences II	
CHEM 135	General Chemistry II	
CHEM 195	Foundations of Chemistry II, Honors	
Seminar I. Satisfied by:		0.5
CHEM 180	Seminar I	
Laboratory Safety in the Chemical Sciences. Satisfied by:		1
CHEM 201	Laboratory Safety in the Chemical Sciences	
Organic Chemistry I (Lecture and Lab). Satisfied by:		5
CHEM 330	Organic Chemistry I	
or CHEM 380 Organic Chemistry I, Honors		
CHEM 331	Organic Chemistry I Laboratory	
Organic Chemistry II (Lecture and Lab). Satisfied by:		5

CHEM 335	Organic Chemistry II or CHEM 385 Organic Chemistry II, Honors	
CHEM 336	Organic Chemistry II Laboratory	
Physical Chemistry I Satisfied by:		4
CHEM 530	Physical Chemistry I	
Physical Chemistry II (Lecture and Lab). Satisfied by:		6
CHEM 535	Physical Chemistry II	
& CHEM 537	and Physical Chemistry Laboratory	
Analytical Chemistry (Lecture and Lab). Satisfied by:		5
CHEM 620	Analytical Chemistry	
& CHEM 621	and Analytical Chemistry Laboratory	
Instrumental Methods of Analysis Satisfied by		2
CHEM 635	Instrumental Methods of Analysis	
Systematic Inorganic Chemistry. Satisfied by:		3
CHEM 660	Systematic Inorganic Chemistry	
Advanced Inorganic Laboratory. Satisfied by:		2
CHEM 661	Advanced Inorganic Laboratory	
Seminar II. Satisfied by:		0.5
CHEM 695	Seminar II	
Select one of the following: (Fulfills KU Core Goal 6)		3
CHEM 636	Instrumental Methods of Analysis Laboratory	
or CHEM 695	Undergraduate Research Problems	
or CHEM 695	Undergraduate Honors Research	
<b>Chemical Physics Core Knowledge and Skills (12)</b>		12
Majors must complete 2 courses from each of the following groups:		
Group I		
PHSX 313	General Physics III	
& PHSX 316	and Intermediate Physics Laboratory I (PHSX 313 and PHSX 316 should be taken concurrently)	
PHSX 518	Mathematical Physics	
PHSX 521	Mechanics I	
PHSX 615	Numerical and Computational Methods in Physics	
PHSX 623	Physics of Fluids	
PHSX 655	Optics	
PHSX 681	Concepts in Solids	
Group II		
PHSX 531	Electricity and Magnetism	
PHSX 621	Mechanics II	
MATH 646	Complex Variable and Applications	
MATH 647	Applied Partial Differential Equations	
CHEM 698	Undergraduate Research Problems	
CHEM 750	Introduction to Quantum Mechanics	

Satisfied by a minimum of 35.5 hours from junior/senior courses (300+) in the major.

#### Major Junior/Senior Graduation GPA

Satisfied by a minimum of a 2.0 KU GPA in junior/senior courses (300+) in the major. GPA calculations include all junior/senior courses in the field of study including F's and repeated courses. See the Semester/Cumulative GPA Calculator (<http://clas.ku.edu/undergrad/tools/gpa>).

## Departmental Honors

Undergraduates may apply for admission to the departmental honors program after completion of an analytical, organic, and physical chemistry course but no sooner than the beginning of the junior year. Highly motivated and superior B.A. and B.S. students are admitted to the honors program. Honors in chemistry are awarded to students who have been admitted to the program and who have completed the following requirements with superior performance, including an overall KU GPA 3.25 and a major GPA of 3.5.

1. At least 2 semesters of CHEM 699 (4-8 hours total) resulting in a written thesis.
2. Evaluation and approval of the thesis by a faculty advisory committee.
3. Oral presentation of the thesis results at a special departmental seminar or other approved forum.

For an application form and further information, consult the department office.

## Major Hours & Major GPA

While completing all required courses, majors must also meet each of the following hour and grade-point average minimum standards:

#### Major Hours

Satisfied by 47 hours of major courses.

#### Major Hours in Residence

Satisfied by a minimum of 15 hours of KU resident credit in the major.

#### Major Junior/Senior Hours