Bachelor of Science in Biochemistry

Biochemistry

Biochemistry is the study of life at the level of individual molecules. Biochemistry lies at the intersection of cell biology, physiology, organic chemistry, and physical chemistry. The B.S. Biochemistry major includes two semesters of calculus, one year of biochemistry, analytical chemistry, biological physical chemistry, and upper-division courses in cellular mechanisms and related elective courses.

Undergraduate Admission

Admission to KU

All students applying for admission must send high school and college transcripts 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 International Support 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 the University Registrar (https://registrar.ku.edu/credittransfer/) website.

First- and Second-Year Preparation

Because biology study requires preparation in other sciences, students should begin meeting major requirements in the first year. It is particularly important to take CHEM 130 and CHEM 135 in the first year and, for several majors, to take CHEM 330, CHEM 331, CHEM 335, and CHEM 336 in the second year. Ideally, most majors should also take BIOL 150 and BIOL 152 during the first year, as well as BIOL 105.

Students completing a B.S. in Biochemistry may not complete a minor in Chemistry.

Requirements for the B.S. Degree in Biochemistry

In addition to degree and major requirements for all plans and subplans, all students must complete the KU Core.

Code	Title	Hours
General Science Requirements		
Majors must complete the following general science requirements that serve as foundational courses for this major.		
Biology Orientation Seminar. Satisfied by:		
BIOL 105	Biology Orientation Seminar	
Chemistry I. Satisfied by one of the following:		
CHEM 170	Chemistry for the Chemical Sciences I	
CHEM 130	General Chemistry I	
CHEM 190 & CHEM 191	Foundations of Chemistry I, Honors and Foundations of Chemistry I Laboratory, Honors	
Chemistry II. Satisfied by one of the following:		
CHEM 175	Chemistry for the Chemical Sciences II	
CHEM 135	General Chemistry II	
CHEM 195 & CHEM 196	Foundations of Chemistry II, Honors and Foundations of Chemistry II Laboratory, Honors	
Organic Chemistry I. Satisfied by one of the following:		
CHEM 330	Organic Chemistry I	
CHEM 380	Organic Chemistry I, Honors	
Organic Chemistry I Laboratory. Satisfied by:		
CHEM 331	Organic Chemistry I Laboratory	
Organic Chemistry II. Satisfied by one of the following:		
CHEM 335	Organic Chemistry II	
CHEM 385	Organic Chemistry II, Honors	
Organic Chemistry II Laboratory. Satisfied by:		
CHEM 336	Organic Chemistry II Laboratory	
Calculus. Satisfied by:		
MATH 115 & MATH 116	Calculus I and Calculus II	
MATH 125 & MATH 116	Calculus I and Calculus II	
MATH 125 & MATH 126 & MATH 127	Calculus I and Calculus II and Calculus III	
Physics. Satisfied by one of the following options:		
Option 1: General Physics I & II		
PHSX 211 & PHSX 216	General Physics I and General Physics I Laboratory	
PHSX 212 & PHSX 236	General Physics II and General Physics II Laboratory	
Option 2: College Physics I & II		
PHSX 114 & PHSX 115	College Physics I and College Physics II	
Biostatistics. Satisfied by:		
BIOL 370	Introduction to Biostatistics	
Biochemistry Course Requirements		
Satisfied by completing 36 hours from courses below.		
Principles of Molecular and Cellular Biology. Satisfied by one of the following:		3
BIOL 150	Principles of Molecular and Cellular Biology	
BIOL 151	Principles of Molecular and Cellular Biology, Honors	
Principles of Organismal Biology. Satisfied by one of the following:		3
BIOL 152	Principles of Organismal Biology	
BIOL 153	Principles of Organismal Biology, Honors	
Introductory Biology Lab for STEM Majors. Satisfied by:		2
BIOL 154	Introductory Biology Lab for STEM Majors	
Principles of Genetics. Satisfied by one of the following:		4
BIOL 350	Principles of Genetics	
BIOL 360	Principles of Genetics, Honors	
Cell Structure and Function. Satisfied by:		3
BIOL 416	Cell Structure and Function	
Biochemistry I. Satisfied by:		4
BIOL 636	Biochemistry I	

Introductory Biochemistry Laboratory. Satisfied by:		2
BIOL 637	Introductory Biochemistry Laboratory	
Biochemistry II. Satisfied by:		4
BIOL 638	Biochemistry II	
Analytical Chemistry. Satisfied by:		3
CHEM 400	Analytical Chemistry	
Analytical Chemistry Laboratory. Satisfied by:		2
CHEM 401	Analytical Chemistry Laboratory	
Physical Chemistry. Satisfied by one of the following:		3
CHEM 510	Biological Physical Chemistry	
CHEM 530	Physical Chemistry I	
Biochemistry Required Electives		
Satisfied by completing 9 hours of BIOL courses numbered 400 or higher. No more than 3 hours of BIOL 423 Non-Lab Independent Study and/or BIOL 424 Independent Study (combined) can be applied towards the elective requirement.		9
Capstone Course		
Advanced Biochemistry Laboratory. Satisfied by:		3
BIOL 639	Advanced Biochemistry Laboratory	
Total Hours		**45**

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 45 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 12 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 (https://sis.ku.edu/gpa-calculator/).

Below is a sample 4-year plan for students pursuing the B.S. in Biochemistry. To view the list of courses approved to fulfill Core 34, please visit the KU Core 34 page (https://catalog.ku.edu/core34/).

This degree plan assumes students will have the equivalent of MATH 101 or MATH 104 prior to the freshman year, fall semester.

Freshman

Fall	Hours	Spring	Hours
BIOL 150 or 152 (Major Requirement)[2]	3	BIOL 152 or 150 (Major Requirement)[2]	3
CHEM 170 or 130 (Core 34: Natural and Physical Sciences (SGE))[040***, 3]	5	BIOL 154 (Major Requirement)	2
BIOL 105 (General Science Requirement)[1]	1	CHEM 175 or 135 (General Science Requirement)	5
Core 34: English (SGE)[010]	3	MATH 115 or 125 (Core 34: Math and Statistics (SGE))[030*, 3]	3-4
Core 34: Communications (SGE)[020]	3	Core 34: English (SGE)[010]	3
	15		**16-17**

Sophomore

Fall	Hours	Spring	Hours
BIOL 350 (General Science Requirement)	4	BIOL 370 (General Science Requirement)	4
CHEM 330 (General Science Requirement)	3	BIOL 416 (Major Requirement)	3
CHEM 331 (General Science Requirement)	2	CHEM 335 (General Science Requirement)[4]	3
MATH 116 (General Science Requirement)	3	CHEM 336 (General Science Requirement)[4]	2
Core 34: Arts and Humanities (SGE)[060]	3	Core 34: Social and Behavioral Science (SGE)[050]	3
	15		**15**

Junior

Fall	Hours	Spring	Hours
PHSX 114 or 211 ***and*** 216 (General Science Requirement)	4-5	PHSX 115 or 212 ***and*** 236 (General Science Requirement)	4
BIOL 636 (Major Requirement)[4]	4	BIOL 638 (Major Requirement)[4]	4
BIOL 637 (Major Requirement)[4]	2	BIOL 639 (Major Requirement; Capstone)[4]	3
CHEM 400 (Major Requirement)[4]	3	Core 34: Arts and Humanities (SGE)[060]	3
CHEM 401 (Major Requirement)[4]	2		
	15-16		**14**

Senior

Fall	Hours	Spring	Hours
Core 34: Global Culture (SGE)[070]	3	BIOL Elective 400+ (Major Requirement)[5]	3
CHEM 510 or 530 (Major Requirement)[4]	3	Core 34: US Culture (SGE)[070]	3
BIOL Elective 400+ (Major Requirement)	3	Second Area of Study/ Elective/Degree/Junior-Senior Hours[5]	3
BIOL Elective 400+ (Major Requirement)	3	Second Area of Study/ Elective/Degree/Junior-Senior Hours[5]	3
Core 34: Social and Behavioral Science (SGE)[050]	3	Second Area of Study/ Elective/Degree/Junior-Senior Hours[5]	3
	15		**15**

Total Hours 120-122

1 BIOL 105:Biology Orientation Seminar (1 hour online course) can be taken the summer prior to your freshman year.

2 Concurrent or prior enrollment in CHEM 170/CHEM 130 is required. BIOL 151 is the honors equivalent of BIOL 150 and offered in

the fall semesters. BIOL 153 is the honors equivalent of BIOL 152 and offered in the spring semesters.

[3] MATH 115 and CHEM 130 require a Math ACT score of 26+, a comparable SAT or KU Math Placement Exam score, or credit for a MATH 101 or MATH 104 equivalent course. MATH 125 requires a MATH ACT score of 28+, a comparable SAT or KU Math Placement Exam score, or credit for MATH 104.

[4] BIOL 636, BIOL 637, CHEM 400, CHEM 401, CHEM 510, and CHEM 530 are Fall only courses. CHEM 335, CHEM 336, BIOL 638, and BIOL 639 are Spring only courses.

[5] Hour requirements (incl. 45 jr/sr hrs) are typically met through Core 34, degree, major, second area of study and/or elective hours. Students completing the BGS with a major must choose a secondary area of study. Individual degree mapping is done in partnership with your advisor.

Please note:

Students may earn degrees in more than one major within biological sciences, or in a biological science and an area outside biology by meeting the requirements of both degree programs and taking at least 15 hours of courses unique to each major.

All students in the College of Liberal Arts and Sciences are required to complete 120 total hours of which 45 hours must be at the Jr/Sr (300+) level.

*Courses with a * designate courses that are degree requirements but can also be taken to fulfill the KU Core 34 requirement. If another course if used to fulfill the Core 34 requirement, the course listed is still required as a degree requirement.

Notes:

* - This course is a Required major course and is also part of Core 34: Systemwide General Education. If this course is not taken to fulfill the Core 34:SGE requirement, it must be taken in place of elective hours.

** - This course is a Recommended Core 34: Systemwide General Education course. This specific course is not required but is recommended by the program's faculty.

*** - This course is a Required Core 34: Systemwide General Education course. This program is approved by the Kansas Board of Regents to require this specific Core 34: Systemwide General Education course. If a student did not take this course it must be taken in addition to other degree requirements.

At the completion of this program, students will be able to:

- Explain the sources of genetic variation within populations, how variation is maintained or lost in populations and mechanisms of evolutionary change operating in populations and how these may lead to the formation of biological species. Use the principles of evolution to explain the diversity of life on Earth; describe evidence that supports the conclusion that evolution explains the diversity of life on Earth.
- Describe how organisms inherit genetic information that influences the location, timing, and intensity of gene expression. Explain that cells/organs/organisms have multiple mechanisms to perceive and respond to changing environmental conditions.
- Describe how complex networks are formed by interactions at many biological scales (i.e., molecules, genes, cells, tissues, organs, individuals and ecosystems), and that organisms integrate internal and external information to respond to environmental changes.
- Explain that biological structures exist at all levels of organization, from molecules to ecosystems, and the physical and chemical characteristics of a structure influence its function.
- Apply the scientific method and communicate scientific arguments, ideas, and results clearly and explicitly through writing and speech. Demonstrate a knowledge of the ethical considerations related to scientific research.
- Apply quantitative reasoning, mathematical, statistical, and/or informatics tools to explain, evaluate, and effectively interpret claims, theories, and assumptions in the biological sciences.

Departmental Honors

Undergraduate majors are eligible to graduate with honors in biology if they fulfill the following requirements:

1. Complete all course work required for the appropriate degree in biology.
2. Achieve a minimum grade-point average of 3.5 in the major.
3. Complete BIOL 499 Introduction to Honors Research with a grade of B or higher, or complete two credits total of BIOL 423 and/or BIOL 424 with a grade of B or higher
4. Complete BIOL 699 Biology Honors Research Colloquium with a grade of B or higher.
5. Complete an independent research project under the supervision of a faculty member in an area appropriate to the degree sought.
6. Submit an honors thesis to the honors committee once the research is complete and present the results of the completed research at the honors research symposium.

Specific guidelines and intent forms are available in the Undergraduate Biology Program office and online (http://www.kuub.ku.edu/). Candidates must declare their intent to graduate with honors at least 2 semesters before graduation.

Study Abroad

Consult an advisor at least 4 months before undertaking study abroad. Consult the Office of Study Abroad (http://www.studyabroad.ku.edu/), 108 Lippincott Hall, for information about study in one of the many countries (e.g., Scotland, Australia, Switzerland) with special arrangements with KU.