BIOCHEMISTRY - B.S.

College of Arts and Sciences
Department of Chemistry and Biochemistry
www.kent.edu/chemistry

About This Program

Our Biochemistry program equips you with the knowledge and skills needed to understand the molecular basis of life. With hands-on experiences in state-of-the-art labs and guidance from our experienced faculty, you'll develop the strong foundation in biochemistry needed for careers in research, medicine and pharmaceutical fields. Read more...

Contact Information

- Program Coordinator: **Diane Stroup** | dstroup1@kent.edu | 330-672-3352
- Speak with an Advisor
- Chat with an Admissions Counselor

Program Delivery

- **Delivery:**
  - In person
- **Location:**
  - Kent Campus

Examples of Possible Careers and Salaries*

Agricultural and food science technicians

- 4.1% about as fast as the average
- 24,200 number of jobs
- $41,970 potential earnings

Biochemists and biophysicists

- 4.0% about as fast as the average
- 34,600 number of jobs
- $94,270 potential earnings

Bioengineers and biomedical engineers

- 4.7% about as fast as the average
- 21,200 number of jobs
- $92,620 potential earnings

Biological science teachers, postsecondary

- 9.3% much faster than the average
- 64,700 number of jobs
- $85,600 potential earnings

Biological technicians

- 4.9% about as fast as the average
- 87,500 number of jobs
- $46,340 potential earnings

Chemical engineers

- 4.4% about as fast as the average
- 32,600 number of jobs
- $108,540 potential earnings

Environmental engineers

- 3.1% about as fast as the average
- 55,800 number of jobs
- $92,120 potential earnings

Forensic science technicians

- 14.1% much faster than the average
- 17,200 number of jobs
- $60,590 potential earnings

Genetic counselors

- 21.5% much faster than the average
- 2,600 number of jobs
- $85,700 potential earnings

Medical scientists, except epidemiologists

- 6.1% faster than the average
- 138,300 number of jobs
- $91,510 potential earnings

Occupational health and safety technicians

- 4.8% about as fast as the average
- 22,100 number of jobs
- $53,340 potential earnings

Pharmacists

- -3.3% decline
- 321,700 number of jobs
- $128,710 potential earnings

Additional Careers

- Biochemical Engineers
- DNA Analysts
- Fermentation Technicians
- Genetic Engineers
- Grant Writers
- National Institutes of Health Officers
- Quality Control Technicians
- Research Scientists
- Science Writers and Communicators

* Source of occupation titles and labor data comes from the U.S. Bureau of Labor Statistics' Occupational Outlook Handbook. Data comprises projected percent change in employment over the next 10 years; nation-wide employment numbers; and the yearly median wage at which half of the workers in the occupation earned more than that amount and half earned less.

Admission Requirements

The university affirmatively strives to provide educational opportunities and access to students with varied backgrounds, those with special

talents and adult students who graduated from high school three or more years ago.

First-Year Students on the Kent Campus: First-year admission policy on the Kent Campus is selective. Admission decisions are based upon cumulative grade point average, strength of high school college preparatory curriculum and grade trends. Students not admissible to the Kent Campus may be administratively referred to one of the seven regional campuses to begin their college coursework. For more information, visit the admissions website for first-year students.

First-Year Students on the Regional Campuses: First-year admission to Kent State's campuses at Ashtabula, East Liverpool, Geauga, Salem, Stark, Trumbull and Tuscarawas, as well as the Twinsburg Academic Center, is open to anyone with a high school diploma or its equivalent. For more information on admissions, contact the Regional Campuses admissions offices.

International Students: All international students must provide proof of English language proficiency unless they meet specific exceptions. For more information, visit the admissions website for international students.

Transfer Students: Students who have attended any other educational institution after graduating from high school must apply as undergraduate transfer students. For more information, visit the admissions website for transfer students.

Former Students: Former Kent State students or graduates who have not attended another college or university since Kent State may complete the reenrollment or reinstatement form on the University Registrar's website.

Admission policies for undergraduate students may be found in the University Catalog.

Some programs may require that students meet certain requirements before progressing through the program. For programs with progression requirements, the information is shown on the Coursework tab.

Program Requirements

Major Requirements

Code	Title	Credit Hours
Major Requirements (courses count in major GPA)		
BSCI 10120	BIOLOGICAL FOUNDATIONS (ELR) (KBS) (KLAB)	4
BSCI 30140	CELL BIOLOGY	4
BSCI 30156	ELEMENTS OF GENETICS	3
BSCI 30171	GENERAL MICROBIOLOGY	4
CHEM 10060	GENERAL CHEMISTRY I (KBS)	4-6
or CHEM 10970	HONORS GENERAL CHEMISTRY I (KBS)	
or CHEM 11060	GENERAL CHEMISTRY I BOOST (KBS)	
CHEM 10061	GENERAL CHEMISTRY II (KBS)	4
or CHEM 10971	HONORS GENERAL CHEMISTRY II (KBS)	
CHEM 10062	GENERAL CHEMISTRY I LABORATORY (KBS) (KLAB)	1
CHEM 10063	GENERAL CHEMISTRY II LABORATORY (KBS) (KLAB)	1
CHEM 30105	ANALYTICAL CHEMISTRY I	3
CHEM 30107	ANALYTICAL CHEMISTRY LABORATORY I (WIC) [1]	1
CHEM 30301	INORGANIC CHEMISTRY I	3
CHEM 30475	ORGANIC CHEMISTRY LABORATORY I (ELR)	1
CHEM 30476	ORGANIC CHEMISTRY LABORATORY II	1
CHEM 30481	ORGANIC CHEMISTRY I	3
CHEM 30482	ORGANIC CHEMISTRY II	3
CHEM 40251	ADVANCED BIOLOGICAL CHEMISTRY LABORATORY (WIC) [1]	2
CHEM 40261	BIOCHEMISTRY: BIOMOLECULE STRUCTURE AND FUNCTION	3
CHEM 40262	BIOCHEMISTRY: METABOLISM AND GENE EXPRESSION	3
CHEM 40263	PHYSICAL BIOCHEMISTRY	3
CHEM 40567	PHYSICAL CHEMISTRY FOR LIFE SCIENCES	4
CHEM 40568	ELEMENTARY PHYSICAL CHEMISTRY LABORATORY	1
MATH 12002	ANALYTIC GEOMETRY AND CALCULUS I (KMCR)	4-5
or MATH 12021	CALCULUS FOR LIFE SCIENCES	
MATH 12022	PROBABILITY AND STATISTICS FOR LIFE SCIENCES	3
or MATH 30011	BASIC PROBABILITY AND STATISTICS	
Physics Electives, choose from the following:		10
PHY 13001 & PHY 13002 & PHY 13021 & PHY 13022	GENERAL COLLEGE PHYSICS I (KBS) and GENERAL COLLEGE PHYSICS II (KBS) and GENERAL COLLEGE PHYSICS LABORATORY I (KBS) (KLAB) and GENERAL COLLEGE PHYSICS LABORATORY II (KBS) (KLAB)	
PHY 23101 & PHY 23102	GENERAL UNIVERSITY PHYSICS I (KBS) (KLAB) and GENERAL UNIVERSITY PHYSICS II (KBS) (KLAB)	
Additional Requirements (courses do not count in major GPA)		
UC 10001	FLASHES 101	1
Foreign Language (see Foreign Language College Requirement below)		8
Kent Core Composition		6
Kent Core Mathematics and Critical Reasoning		3
Kent Core Humanities and Fine Arts (minimum one course from each) [2]		9
General Electives (total credit hours depends on earning 120 credits hour, including 39 upper-division credit hours) [3]		5
Concentration or Additional Requirements		
Choose from the following:		15
Additional Requirements for Students Not Declaring a Concentration		
Pre-Medicine/Pre-Osteopathy/Pre-Dentistry/Pre-Podiatric Medicine Concentration		
Minimum Total Credit Hours:		**120**

1. A minimum C grade must be earned to fulfill the writing-intensive requirement.
2. PHIL 21001 is recommended for students in the Pre-Medicine/Pre-Osteopathy/Pre-Dentistry/Pre-Podiatric Medicine concentration.
3. The following are recommended for students in the Pre-Medicine/Pre-Osteopathy/Pre-Dentistry/Pre-Podiatric Medicine concentration: COMM 15000, ECON 22060, ECON 42086, PSYC 40111, PSYC 41363, SOC 42563.

Additional Requirements for Students Not Declaring a Concentration

Code	Title	Credit Hours
Major Requirements (courses count in major GPA)		
Major Electives, choose from the following:		9
Strongly Suggested Electives		
BSCI 40174	IMMUNOLOGY	
BSCI 40220	BIOINFORMATICS	
BSCI 40430	ANIMAL PHYSIOLOGY	
or BSCI 40460	ADVANCED HUMAN PHYSIOLOGY	
BSCI 40462	ADVANCED HUMAN PHYSIOLOGY: READINGS AND CASE STUDIES	
BTEC 40191	SEMINAR: RECENT DEVELOPMENTS IN BIOTECHNOLOGY	
CHEM 40109	BIOANALYTICAL CHEMISTRY	
CHEM 40113	CHEMICAL SEPARATIONS	
CHEM 40264	MEDICAL BIOCHEMISTRY	
CHEM 40295	SPECIAL TOPICS IN BIOCHEMISTRY	
CHEM 40365	BIOLOGICAL INORGANIC CHEMISTRY	
CHEM 40796	INDIVIDUAL INVESTIGATION [1]	
Other Suggested Electives		
CHEM 30106	ANALYTICAL CHEMISTRY II	
CHEM 30108	ANALYTICAL CHEMISTRY LABORATORY II (WIC) [2]	
CHEM 40195	SPECIAL TOPICS IN ANALYTICAL CHEMISTRY	
CHEM 40302	INORGANIC CHEMISTRY II	
CHEM 40364	INTERMEDIATE INORGANIC CHEMISTRY LAB	
CHEM 40395	SPECIAL TOPICS IN INORGANIC CHEMISTRY	
CHEM 40451	ORGANIC MATERIALS CHEMISTRY	
CHEM 40476	SPECTROSCOPIC IDENTIFICATION OF ORGANIC COMPOUNDS	
CHEM 40477	INTERMEDIATE ORGANIC CHEMISTRY LABORATORY	
CHEM 40478	SYNTHESIS OF ORGANIC LIQUID CRYSTALS	
CHEM 40483	INTERMEDIATE ORGANIC CHEMISTRY	
CHEM 40495	SPECIAL TOPICS IN ORGANIC CHEMISTRY	
CHEM 40559	NANOMATERIALS	
CHEM 40571	SURFACE CHEMISTRY	
CHEM 40595	SPECIAL TOPICS IN PHYSICAL CHEMISTRY	
Additional Requirements (courses do not count in major GPA)		
Kent Core Social Sciences (must be from two disciplines)		6
Minimum Total Credit Hours:		**15**

1 Maximum 4 credit hours of CHEM 40796 may be applied toward major electives.

2 A minimum C grade must be earned to fulfill the writing-intensive requirement.

Pre-Medicine/Pre-Osteopathy/Pre-Dentistry/Pre-Podiatric Medicine Concentration Requirements

Code	Title	Credit Hours
Concentration Requirements (courses count in major GPA)		
BSCI 40430	ANIMAL PHYSIOLOGY	3
or BSCI 40460	ADVANCED HUMAN PHYSIOLOGY	
Concentration Electives, choose from the following:		6
BSCI 30517	HUMAN ANATOMY	
or BSCI 30518	VERTEBRATE ANATOMY	
BSCI 40174	IMMUNOLOGY	
BSCI 40220	BIOINFORMATICS	
BTEC 40191	SEMINAR: RECENT DEVELOPMENTS IN BIOTECHNOLOGY	
CHEM 30106	ANALYTICAL CHEMISTRY II	
CHEM 40109	BIOANALYTICAL CHEMISTRY	
CHEM 40264	MEDICAL BIOCHEMISTRY	
CHEM 40302	INORGANIC CHEMISTRY II	
CHEM 40365	BIOLOGICAL INORGANIC CHEMISTRY	
CHEM 40477	INTERMEDIATE ORGANIC CHEMISTRY LABORATORY	
CHEM 40483	INTERMEDIATE ORGANIC CHEMISTRY	
CHEM 40796	INDIVIDUAL INVESTIGATION [1]	
Additional Requirements (courses do not count in major GPA)		
PSYC 11762	GENERAL PSYCHOLOGY (DIVD) (KSS)	3
SOC 12050	INTRODUCTION TO SOCIOLOGY (DIVD) (KSS)	3
Minimum Total Credit Hours:		**15**

1 Maximum 3 credit hours of CHEM 40796 may be applied toward concentration electives.

Graduation Requirements

Minimum Major GPA	Minimum Overall GPA
2.000	2.000

Foreign Language College Requirement, B.S.

- Students pursuing the Bachelor of Science degree in the College of Arts and Sciences must complete 8 credit hours of foreign language.[1]
- The Bachelor of Science in Medical Laboratory Science is exempt from this requirement.[2]
- Minimum Elementary I and II of the same language

1 All students with prior foreign language experience should take the foreign language placement test to determine the appropriate level at which to start. Some students may start beyond the Elementary I level and will complete the requirement with fewer credit hours and fewer courses. This may be accomplished by (1) passing a course beyond Elementary I through Intermediate II level; (2) receiving credit through one of the alternative credit programs offered by Kent State University; or (3) demonstrating language proficiency comparable to Elementary II of a foreign language. When students complete the requirement with fewer than 8 credit hours and two courses, they will complete remaining credit hours with general electives.

2 The Bachelor of Science in Medical Laboratory Science exemption exists under another college policy (Three-Plus-One Programs).

Roadmaps

Additional Requirements for Students Not Declaring a Concentration

This roadmap is a recommended semester-by-semester plan of study for this major. However, courses designated as critical (!) must be completed in the semester listed to ensure a timely graduation.

	Semester One		Credits
!	BSCI 10120	BIOLOGICAL FOUNDATIONS (ELR) (KBS) (KLAB)	4
!	CHEM 10060 or CHEM 10970 or CHEM 11060	GENERAL CHEMISTRY I (KBS) or HONORS GENERAL CHEMISTRY I (KBS) or GENERAL CHEMISTRY I BOOST (KBS)	4-6
!	CHEM 10062	GENERAL CHEMISTRY I LABORATORY (KBS) (KLAB)	1
!	MATH 12002 or MATH 12021	ANALYTIC GEOMETRY AND CALCULUS I (KMCR) or CALCULUS FOR LIFE SCIENCES	4-5
	UC 10001	FLASHES 101	1
	Kent Core Requirement		3
		Credit Hours	**17**
	Semester Two		
!	CHEM 10061 or CHEM 10971	GENERAL CHEMISTRY II (KBS) or HONORS GENERAL CHEMISTRY II (KBS)	4
!	CHEM 10063	GENERAL CHEMISTRY II LABORATORY (KBS) (KLAB)	1
!	MATH 12022 or MATH 30011	PROBABILITY AND STATISTICS FOR LIFE SCIENCES or BASIC PROBABILITY AND STATISTICS	3
	Foreign Language		4
	Kent Core Requirement		3
		Credit Hours	**15**
	Semester Three		
!	BSCI 30156	ELEMENTS OF GENETICS	3
!	CHEM 30475	ORGANIC CHEMISTRY LABORATORY I (ELR)	1
!	CHEM 30481	ORGANIC CHEMISTRY I	3
	Physics Electives		5
	Foreign Language		4
		Credit Hours	**16**
	Semester Four		
!	BSCI 30140	CELL BIOLOGY	4
!	CHEM 30301	INORGANIC CHEMISTRY I	3
!	CHEM 30476	ORGANIC CHEMISTRY LABORATORY II	1
!	CHEM 30482	ORGANIC CHEMISTRY II	3
	Physics Electives		5
		Credit Hours	**16**
	Semester Five		
!	CHEM 30105	ANALYTICAL CHEMISTRY I	3
!	CHEM 30107	ANALYTICAL CHEMISTRY LABORATORY I (WIC)	1
!	CHEM 40261	BIOCHEMISTRY: BIOMOLECULE STRUCTURE AND FUNCTION	3
!	CHEM 40567	PHYSICAL CHEMISTRY FOR LIFE SCIENCES	4
	Kent Core Requirement		3
		Credit Hours	**14**
	Semester Six		
!	CHEM 40262	BIOCHEMISTRY: METABOLISM AND GENE EXPRESSION	3
!	CHEM 40568	ELEMENTARY PHYSICAL CHEMISTRY LABORATORY	1
	Kent Core Requirement		3
	Kent Core Requirement		3
	Kent Core Requirement		3
		Credit Hours	**13**
	Semester Seven		
!	BSCI 30171	GENERAL MICROBIOLOGY	4
	Major Electives		6
	Kent Core Requirement		3
	Kent Core Requirement		3
		Credit Hours	**16**
	Semester Eight		
!	CHEM 40251	ADVANCED BIOLOGICAL CHEMISTRY LABORATORY (WIC)	2
!	CHEM 40263	PHYSICAL BIOCHEMISTRY	3
	Major Elective		3
	General Electives		5
		Credit Hours	**13**
		Minimum Total Credit Hours:	**120**

Pre-Medicine/Pre-Osteopathy/Pre-Dentistry/Pre-Podiatric Medicine Concentration

This roadmap is a recommended semester-by-semester plan of study for this major. However, courses designated as critical (!) must be completed in the semester listed to ensure a timely graduation.

	Semester One		Credits
!	BSCI 10120	BIOLOGICAL FOUNDATIONS (ELR) (KBS) (KLAB)	4
!	CHEM 10060 or CHEM 10970 or CHEM 11060	GENERAL CHEMISTRY I (KBS) or HONORS GENERAL CHEMISTRY I (KBS) or GENERAL CHEMISTRY I BOOST (KBS)	4-6
!	CHEM 10062	GENERAL CHEMISTRY I LABORATORY (KBS) (KLAB)	1
!	MATH 12002 or MATH 12021	ANALYTIC GEOMETRY AND CALCULUS I (KMCR) or CALCULUS FOR LIFE SCIENCES	4-5
	PSYC 11762	GENERAL PSYCHOLOGY (DIVD) (KSS)	3
	UC 10001	FLASHES 101	1
		Credit Hours	**17**
	Semester Two		
!	CHEM 10061 or CHEM 10971	GENERAL CHEMISTRY II (KBS) or HONORS GENERAL CHEMISTRY II (KBS)	4
!	CHEM 10063	GENERAL CHEMISTRY II LABORATORY (KBS) (KLAB)	1
!	MATH 12022 or MATH 30011	PROBABILITY AND STATISTICS FOR LIFE SCIENCES or BASIC PROBABILITY AND STATISTICS	3
	SOC 12050	INTRODUCTION TO SOCIOLOGY (DIVD) (KSS)	3
	Foreign Language		4
		Credit Hours	**15**
	Semester Three		
!	BSCI 30156	ELEMENTS OF GENETICS	3
!	CHEM 30475	ORGANIC CHEMISTRY LABORATORY I (ELR)	1
!	CHEM 30481	ORGANIC CHEMISTRY I	3
	Physics Electives		5
	Foreign Language		4
		Credit Hours	**16**
	Semester Four		
!	BSCI 30140	CELL BIOLOGY	4
!	CHEM 30301	INORGANIC CHEMISTRY I	3
!	CHEM 30476	ORGANIC CHEMISTRY LABORATORY II	1

!	CHEM 30482	ORGANIC CHEMISTRY II	3
	Physics Electives		5
		Credit Hours	**16**
	Semester Five		
!	BSCI 30171	GENERAL MICROBIOLOGY	4
!	CHEM 40261	BIOCHEMISTRY: BIOMOLECULE STRUCTURE AND FUNCTION	3
!	CHEM 40567	PHYSICAL CHEMISTRY FOR LIFE SCIENCES	4
	Kent Core Requirement		3
		Credit Hours	**14**
	Semester Six		
!	BSCI 40430 or BSCI 40460	ANIMAL PHYSIOLOGY or ADVANCED HUMAN PHYSIOLOGY	3
!	CHEM 40262	BIOCHEMISTRY: METABOLISM AND GENE EXPRESSION	3
!	CHEM 40568	ELEMENTARY PHYSICAL CHEMISTRY LABORATORY	1
	Kent Core Requirement		3
	Kent Core Requirement		3
		Credit Hours	**13**
	Semester Seven		
!	CHEM 30105	ANALYTICAL CHEMISTRY I	3
!	CHEM 30107	ANALYTICAL CHEMISTRY LABORATORY I (WIC)	1
	Concentration Elective		3
	Kent Core Requirement		3
	Kent Core Requirement		3
	Kent Core Requirement		3
		Credit Hours	**16**
	Semester Eight		
!	CHEM 40251	ADVANCED BIOLOGICAL CHEMISTRY LABORATORY (WIC)	2
!	CHEM 40263	PHYSICAL BIOCHEMISTRY	3
	Concentration Elective		3
	General Electives		5
		Credit Hours	**13**
		Minimum Total Credit Hours:	**120**

University Requirements

All students in a bachelor's degree program at Kent State University must complete the following university requirements for graduation.

NOTE: University requirements may be fulfilled in this program by specific course requirements. Please see Program Requirements for details.

Flashes 101 (UC 10001)	1 credit hour
Course is not required for students with 30+ transfer credits (excluding College Credit Plus) or age 21+ at time of admission.	
Diversity Domestic/Global (DIVD/DIVG)	2 courses
Students must successfully complete one domestic and one global course, of which one must be from the Kent Core.	
Experiential Learning Requirement (ELR)	varies
Students must successfully complete one course or approved experience.	
Kent Core (see table below)	36-37 credit hours
Writing-Intensive Course (WIC)	1 course
Students must earn a minimum C grade in the course.	
Upper-Division Requirement	39 credit hours
Students must successfully complete 39 upper-division (numbered 30000 to 49999) credit hours to graduate.	
Total Credit Hour Requirement	120 credit hours

Kent Core Requirements

Kent Core Composition (KCMP)	6
Kent Core Mathematics and Critical Reasoning (KMCR)	3
Kent Core Humanities and Fine Arts (KHUM/KFA) (min one course each)	9
Kent Core Social Sciences (KSS) (must be from two disciplines)	6
Kent Core Basic Sciences (KBS/KLAB) (must include one laboratory)	6-7
Kent Core Additional (KADL)	6
Total Credit Hours:	**36-37**

Program Learning Outcomes

Graduates of this program will be able to:

1. Apply broad-based chemical and biochemical knowledge to their profession.
2. Develop their abilities to plan and execute chemical and biochemical experiments.
3. Prepare and deliver written and oral scientific reports.

Full Description

The Bachelor of Science degree in Biochemistry provides strong preparation for students interested in pursuing graduate studies in biochemistry or medicine or planning a career as a practicing biochemist in industrial research and development, government research laboratories or academia.

With the selection of appropriate elective courses, students in the Biochemistry major meet the minimum requirements for certification by the American Chemical Society.

The Biochemistry major includes the following optional concentration:

- The **Pre-Medicine/Pre-Osteopathy/Pre-Dentistry/Pre-Podiatric Medicine** concentration is the recommended track for students preparing for careers in medicine, veterinary medicine, dentistry, physical therapy, physician assisting or podiatry.

Students interested in careers in pharmacy have the opportunity to earn this B.S. degree while completing their studies towards a Doctor of Pharmacy degree at Northeast Ohio Medical University (NEOMED). After three years at Kent State, students may apply to and attend NEOMED, and then transfer 20 credit hours of courses from NEOMED to complete their Kent State Biochemistry requirements.

In addition, Biochemistry students may apply early to the M.S. degree in Chemistry and double count 9 credit hours of graduate courses toward both degree programs. See the Combined Bachelor's/Master's Degree Program policy in the University Catalog for more information.