

Biochemistry

Department of Biochemistry

School of Medicine and Biomedical Sciences
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Overview

Biochemistry addresses the chemical principles that underlie biological processes. The course of study in biochemistry emphasizes macromolecular structure and function, control of gene expression, and metabolic regulation as they relate to basic and biomedical science. The strength of the program lies in the extensive research experience in the laboratories of the faculty.

About our Degrees

The curricular goals of the department are to teach research based analytical and problem solving skills. This prepares graduates for graduate and professional biological science programs as well as direct employment in many areas.

Acceptance Criteria

Applications accepted after three semesters.

Minimum GPA of 2.0 overall.

Minimum GPA of 3.0 in prerequisite courses.

Advising Note: Minimum GPAs of 2.0 in biochemistry courses, and 3.0 in prerequisite courses, are needed to graduate.

Acceptance Information

Students interesting in applying to biochemistry are encouraged to submit an application in their second semester, sophomore year and/or completion of prerequisite courses. Applications are submitted online at: <http://medicine.buffalo.edu/biochemistry/education/undergraduate/apply.html>.

Number of applicants/year: 20

Number of accepted majors/year: 15

Total number of majors currently enrolled: 27

Suggested Introductory Courses

- [BIO 200](#) Evolutionary Biology
- [BIO 201](#) Cell Biology
- [CHE 101](#) General Chemistry I
- [MTH 141](#) College Calculus I
- [PHY 107](#) General Physics I

Degree Requirements

Please see [Degrees and Policies](#).

About our Courses

The Biochemistry department offers didactic and seminar-based courses along with in-depth lab experience. In addition to a course in basic biochemistry, the department offers two undergraduate courses designed to familiarize students with cutting-edge biochemical research. These courses are offered in the second semester of the junior year and the first semester of the senior year, and because of their limited enrollment offer extensive opportunities for students to interact one-on-one with faculty. In addition, our undergraduate majors have the opportunity to carry out individual research projects in faculty labs.

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The average class size for prerequisite courses in science and chemistry is approximately 200. Courses for students in their junior and senior year are no larger than twenty. TAs are not used for our upper level-courses.

Although not required for majors, [BIO 205](#) is a good course for those students who are interested in exploring biochemistry.

For course descriptions, please see [Courses](#).

About our Faculty

The research interests of biochemistry faculty encompass many of the most active areas of modern biomedical research. These include analysis of the relationship between macromolecule structure and function, the molecular pathology of inherited human disease, regulation of gene expression, and molecular determinants of development and differentiation. Faculty employ a wide variety of cutting-edge research tools in these projects, including the use of transgenic animals, gene arrays, analysis of molecular structure, and high throughput proteomics studies.

Biochemistry faculty have been recognized for their excellence in teaching by their receipt of teaching awards. In addition, the research achievements of our faculty have been recognized by receipt of the Stockton Kimball Prize, and by their being named as UB and SUNY Distinguished Research Professors. In addition, many of our faculty serve regularly on national grant review panels, or on the editorial boards of major journals.

See a list of our [Undergraduate Faculty](#).

Acceptance Information

The course requirements of the first two years are common to a number of science majors and allow the student considerable flexibility at the end of the sophomore year. There is no minor available in biochemistry.

Students interesting in applying to Biochemistry are encouraged to submit an application in their second semester, sophomore year and/or completion of prerequisite courses. Applications are submitted online at:
<http://medicine.buffalo.edu/biochemistry/education/undergraduate/apply.html>

Extracurricular Activities

Majors frequently belong to the [Pre-Professional Health Student Club](#) and the [Undergraduate Biology Association](#).

Students are encouraged to attend our weekly seminar series and are required to participate in the annual departmental Research Day which showcases current research activity in the department.

See the [UB Student Association](#).

Practical Experience and Special Academic Opportunities

Notable Program Features

The core of the biochemistry program provides a link between didactic courses and learning from the literature and research presentations in the [BCH 401](#), [BCH 403](#), [BCH 404](#), [BCH 405](#), [BCH 407](#) series. State of the art facilities within the Biochemistry Department include a MALDI-TOF Mass Spectrometer, 2D-Differential In-Gel Electrophoresis equipment, and a BIAcor Instrument. Students also have access to core facilities located throughout the University and RPCI to support their research.

Opportunities for Undergraduate Research and Practical Experience

The Biochemistry Major requires students to complete 8 credit hours of research in an active laboratory. This provides an opportunity for students to work on an independent project as part of a research team with faculty, graduate students, technical staff and postdoctoral fellows. As part of this research experience the student is required to present a poster describing their research, usually done at the annual Biochemistry Research Day.

Independent study opportunities are available with permission of an instructor.

Honors, Awards, and Scholarships

Honors Program

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Students who complete an acceptable report describing their research and who have a minimum GPA of 3.25 overall are eligible for departmental honors.

Awards

- John F. Moran Memorial Award, presented to the graduating senior with the highest grade in [BCH 403](#).
- Deborah, Christopher, and Adam White Memorial Award, presented to the outstanding senior with the highest overall GPA and acceptance into medical school.
- Outstanding Senior Award, presented to the student who has maintained a high level of academic performance throughout their undergraduate career.

Career Information and Further Study

Students with good laboratory and analytical ability and interest in the chemical basis of life will excel in biochemistry.

80% of our students go on to professional schools in dentistry and medicine or graduate school.

Alumni in Biochemistry have been employed in the following fields:

- Agronomy
- Biochemistry
- Chemistry
- Consumer protection
- Education
- Engineering
- Environmental science
- Food and drug analysis and technology
- Genetics
- Health related professions
- Nutrition
- Patent law
- Pharmaceuticals
- Sales

Degrees Offered

Undergraduate: BS

Graduate: MA, PhD

Links to Further Information About this Program

- [Undergraduate Catalog](#)
- [Undergraduate Admissions](#)
- [Graduate Admissions](#)
- [Department of Biochemistry](#)
- [School of Medicine and Biomedical Sciences](#)

Biochemistry - B.S.

Acceptance Criteria

Applications accepted after three semesters, and/or after the student has completed the prerequisite courses.

Minimum GPA of 2.0 overall.

Minimum GPA of 3.0 in prerequisite courses.

Advising Notes

Minimum GPAs of 2.0 in biochemistry courses, and 3.0 in prerequisite courses, are required to graduate.

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Prerequisite Courses

Two of the following three BIO courses: [BIO 200](#) Evolutionary Biology, [BIO 201](#) Cell Biology, and [BIO 205](#) Fundamentals of Biological Chemistry

[BIO 215](#) Fundamentals of Biological Chemistry Laboratory

[CHE 101](#) General Chemistry

[CHE 102](#) General Chemistry

[CHE 201](#) Organic Chemistry

[CHE 202](#) Organic Chemistry

[MTH 141](#) College Calculus I

[MTH 142](#) College Calculus II

[PHY 107](#) General Physics I

[PHY 108](#) General Physics II

[PHY 158](#) General Physics II Lab

Required Courses

[BCH 401](#) Introduction to Research

[BCH 403](#) Biochemical Principles

[BCH 404](#) Advanced Topics in Biochemistry

[BCH 405](#) Research Topics in Biochemistry

[BCH 407](#) Research Presentations

[BCH 498](#) Undergraduate Research Participation in Biochemistry

[CHE 319](#) Physical Chemistry

One restricted chemistry elective*

300/400-level science/math electives** (10 credit hours)

Summary

Total required credit hours for the major...82-84

See [Baccalaureate Degree Requirements](#) for general education and remaining university requirements

Recommended Sequence of Program Requirements

FIRST YEAR

Fall [BIO 200](#), [CHE 101](#), [MTH 141](#)

Spring [BIO 201](#), [CHE 102](#), [MTH 142](#)

SECOND YEAR

Fall [CHE 201](#), [PHY 107](#), one elective

Spring [BIO 215](#), [CHE 202](#), [PHY 108](#), [PHY 158](#)

THIRD YEAR*

Fall [BCH 401](#), [BCH 403](#)

Spring [BCH 404](#), [BCH 498](#)

Fall and Spring One or two 300/400-level science/math elective(s)**

([CHE 319](#) may be taken in the third year)

FOURTH YEAR*

Fall [BCH 405](#), [CHE 319](#), [BCH 498](#)

Spring [BCH 407](#), [BCH 498](#)

Fall and Spring One or two 300/400-level science/math elective(s)**

*Third or fourth year students must take one course from among the following: [CHE 320](#) Physical Chemistry, [CHE 321](#) Inorganic Chemistry, [CHE 413](#) Instructional Analysis, [CHE 455](#) Advanced Organic Chemistry, [MCH 401](#) Principles of Medicinal Chemistry. Substitutions must be approved by the director.

**Of the 10 credit hours of upper-level didactic science electives approved by the department, four credit hours of mathematics beyond [MTH 142](#) may be included.

Summary

Required credit hours in biochemistry (includes 8 credits of [BCH 498](#)) and upper-level science.....36-37

Additional required science and math credit hours.....46-47

Required credit hours in science and math (all levels).....82-84

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BCH 401: Introduction to Research

Credits: 1
Semester(s): Fall
Type: LEC

For accepted students about to start the upper-division biochemistry program. Meets once per week for one hour, with scheduled library workshops. Includes critically reading a scientific paper, introduces library skills needed to do research, and correlates basic biochemistry knowledge with ongoing research programs in the Biochemistry department. Students use these presentations to help them arrange for 2 credit hours of [BCH 498](#) for the following semester.

BCH 403: Biochemical Principles

Credits: 4
Semester(s): Fall
Pre-requisites: [BIO 200](#) And [CHE 202](#)
Type: LEC

One semester general biochemistry course for science majors and students of pharmacy. Covers protein and membrane structure and function, metabolism, and nucleic acid structure and molecular biology.

BCH 404: Advanced Topics in Biochemistry

Credits: 3
Semester(s): Spring
Type: SEM

Covers five areas of biochemistry beyond the basic survey course [BCH 403](#). Requires literature reading. Covers each subject area in 5 lectures; 3 didactic lectures, one faculty led paper discussion, and one student presentation.

BCH 405: Research Topics in Biochemistry

Credits: 3
Semester(s): Fall
Pre-requisites: [BCH 404](#)
Type: SEM

Focuses on learning cutting-edge biochemistry by reading, analyzing, and discussing research papers. Emphasizes molecular and mechanistic aspects of signal transduction in growth, differentiation, development and cancer; and signaling in response to hormones to the nervous system.

BCH 407: Research Presentations

Credits: 1
Semester(s): Spring
Type: SEM

Students attend one research seminar of their choosing per week involving biochemistry and write a two- to three-page report of that seminar. If the student obtains a paper by the seminar speaker and incorporates that into the report, it takes the place of one seminar.

BCH 408: Gene Expression

Credits: 2
Semester(s): Spring
Type: SEM

Elective course that familiarizes students with up-to-date concepts in eukaryotic gene expression. Through a classroom discussion of selected papers, introduces students to current issues in gene transcription, mRNA processing, and their regulation. Augments classroom learning with detailed problem sets.

BCH 498: Undergraduate Research Participation in Biochemistry

Credits: 1-8
Semester(s): Fall, Spring, Summer
Type: TUT

The content of this course is variable and therefore it is repeatable for credit. The [University Grade Repeat Policy](#) does not apply.

Under the direction of faculty, the course consists of an original investigative project involving library and lab work. Open to majors as a research project. Requires one poster presentation. Students must complete 8 credit hours.

BCH 499: Independent Study

Credits: 1-4
Semester(s): Fall, Spring
Type: TUT

The content of this course is variable and therefore it is repeatable for credit. The [University Grade Repeat Policy](#) does not apply.

For students having specific academic interests or objectives; requires a department faculty sponsor before preregistration.