Twin Cities Campus

Biochemistry B.S.

Biochemistry, Molecular Biology, & Biophysics TCBS

College of Biological Sciences

- Program Type: Baccalaureate
- Requirements for this program are current for Fall 2014
- Required credits to graduate with this degree: 120
- Required credits within the major: 74 to 86
- Degree: Bachelor of Science

Biochemists study molecules found in living organisms, particularly proteins, nucleic acids, lipids, and carbohydrates. Biochemistry majors focus their studies on the biosynthesis, metabolism, function, and regulation of these molecules of life. This information is essential to gain an understanding of many biological processes, including how diseases like cancer and diabetes develop, and to learn how genetic engineering and biotechnology can be used in ways that benefit society.

Earning a B.S. in biochemistry prepares majors for graduate study in biochemistry, or other biological sciences, professional training programs in the health sciences, careers in teaching, and entry-level positions in industries, agencies, and universities.

Biochemistry is an experimental science, and majors, especially those planning to pursue graduate studies in the field, should become acquainted with laboratory research approaches beyond those in the formal lab courses. Research options are available through BIOC 4994 or BIOC 4794W. Students should consult early with their faculty mentor to begin planning the research component of their major.

Program Delivery

This program is available:

- via classroom (the majority of instruction is face-to-face)

Admission Requirements

Freshmen students are usually admitted to pre-major status before admission to this major

A GPA above 2.0 is preferred for the following:

- 2.50 transferring from another University of Minnesota college
- 2.50 transferring from outside the University

For information about University of Minnesota admission requirements, visit the Office of Admissions website.

General Requirements

All students are required to complete general University and college requirements including writing and liberal education courses. For more information about University-wide requirements, see the liberal education requirements.Required courses for the major or minor in which a student receives a D grade (with or without plus or minus) do not count toward the major or minor (including transfer courses).

Program Requirements

Nature of Life/Nature of Science and Research

Nature of Life

BIOL 1805 - Nature of Life: Introducing New Students to the Biological Sciences (0.5 cr)
BIOL 1806 - Nature of Life, Part Two (0.5 cr)
BIOL 2905 - Nature of Life, Part III (0.5 cr)
BIOL 2906 - Nature of Life, Part IV (0.5 cr)

or **Nature of Science and Research**

BIOL 3001 - Nature of Science and Research (1.0 cr)
BIOL 2001 - Career Planning for Biologists (1.0 cr)

Quantitative Requirement

Quantitative I

MATH 1241 - Calculus and Dynamical Systems in Biology [MATH] (4.0 cr)
or MATH 1271 - Calculus I [MATH] (4.0 cr)

Quantitative II

Take 3 or more credit(s) from the following:

•BIOL 3270 *{Inactive}*(3.0 cr)

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•CSCI 1133 - Introduction to Computing and Programming Concepts (4.0 cr)
•CSCI 3003 - Introduction to Computing in Biology (3.0 cr)
•MATH 1272 - Calculus II (4.0 cr)
•STAT 3011 - Introduction to Statistical Analysis [MATH] (4.0 cr)
•BIOL 3272 - Applied Biostatistics (4.0 cr)
or BIOL 5272 - Applied Biostatistics (4.0 cr)

Chemistry
Chemical Principles I
CHEM 1061 - Chemical Principles I [PHYS] (3.0 cr)
CHEM 1065 - Chemical Principles I Laboratory [PHYS] (1.0 cr)
Chemical Principles II
CHEM 1062 - Chemical Principles II [PHYS] (3.0 cr)
CHEM 1066 - Chemical Principles II Laboratory [PHYS] (1.0 cr)
Organic Sequence
CHEM 2301 - Organic Chemistry I (3.0 cr)
CHEM 2302 - Organic Chemistry II (3.0 cr)
or CHEM 2304 *{Inactive}*(3.0 cr)

Physics
PHYS 1201W *{Inactive}*[PHYS, WI] (5.0 cr)
or PHYS 1301W - Introductory Physics for Science and Engineering I [PHYS, WI] (4.0 cr)
PHYS 1202W *{Inactive}*[PHYS, WI] (5.0 cr)
or PHYS 1302W - Introductory Physics for Science and Engineering II [PHYS, WI] (4.0 cr)

General Biology
BIOL 2002 *{Inactive}*[BIOL] (6.0 cr)
or BIOL 2002H *{Inactive}*[BIOL] (6.0 cr)
BIOL 2003 - Foundations of Biology for Biological Sciences Majors, Part II (3.0 cr)
or BIOL 2003H - Foundations of Biology for Biological Sciences Majors, Part II (3.0 cr)
BIOL 3004 - Foundations of Biology for Biological Sciences Majors, Part II Laboratory (3.0 cr)
or BIOL 3004H *{Inactive}*(3.0 cr)

Biology Core
BIOL 4003 - Genetics (3.0 cr)
Take 1 or more course(s) from the following:
•MICB 3301 - Biology of Microorganisms (5.0 cr)
•BIOL 3407 *{Inactive}*(3.0 cr)
•BIOL 3408W *{Inactive}*[WI] (3.0 cr)
•EEB 3807 - Ecology (4.0 cr)
•BIOL 3409 *{Inactive}*(3.0 cr)
•BIOL 4004 - Cell Biology (3.0 cr)

Upper Division Life Sciences Electives
Take 6 or more credit(s) from the following:
•BIOL 3211 - Physiology of Humans and Other Animals (3.0 cr)
•BIOL 3407 *{Inactive}*(3.0 cr)
•BIOL 3408W *{Inactive}*[WI] (3.0 cr)
•BIOL 3409 *{Inactive}*(3.0 cr)
•BIOL 3411 *{Inactive}*(3.0 cr)
•EEB 3807 - Ecology (4.0 cr)
•EEB 3811W - Animal Behavior in the Field [WI] (4.0 cr)
•BIOL 4004 - Cell Biology (3.0 cr)
•PMB 4121 - Microbial Ecology and Applied Microbiology (3.0 cr)
•BIOL 5309 - Molecular Ecology And Ecological Genomics (3.0 cr)
•CHEM 2311 - Organic Lab (4.0 cr)
•CHEM 4001 - Chemistry of Biomass and Biomass Conversion to Fuels and Products [ENV] (4.0 cr)
•CHEM 4412 - Chemical Biology of Enzymes (3.0 cr)
•CHEM 4413 *{Inactive}*(3.0 cr)
•CSCI 3003 - Introduction to Computing in Biology (3.0 cr)
•EEB 5221 *{Inactive}*(3.0 cr)
•GCD 4034 - Molecular Genetics and Genomics (3.0 cr)
•GCD 4143 - Human Genetics and Genomics (3.0 cr)
•GCD 4151 - Molecular Biology of Cancer (3.0 cr)
•GCD 4161 - Developmental Biology (3.0 cr)
•GCD 4171 - Stem Cells in Biology and Medicine (3.0 cr)

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•GCD 5036 - Molecular Cell Biology (3.0 cr)
•MATH 5445 - Mathematical Analysis of Biological Networks (4.0 cr)
•PMB 4111 - Microbial Physiology and Diversity (3.0 cr)
•MICB 4131 - Immunology (3.0 cr)
•MICB 4151 - Molecular and Genetic Bases for Microbial Diseases (3.0 cr)
•MICB 4161W - Eukaryotic Microbiology [WI] (3.0 cr)
•MICB 4171 - Biology, Genetics, and Pathogenesis of Viruses (3.0 cr)
•NSCI 3101 - Neurobiology I: Molecules, Cells, and Systems (3.0 cr)
•NSCI 3102W - Neurobiology II: Perception and Behavior [WI] (3.0 cr)
•PHSL 3051 - Human Physiology (4.0 cr)
•PHSL 3061 - Principles of Physiology (4.0 cr)
•STAT 3021 - Introduction to Probability and Statistics (3.0 cr)
•STAT 3022 - Data Analysis (4.0 cr)
•STAT 4101 - Theory of Statistics I (4.0 cr)
•STAT 4102 - Theory of Statistics II (4.0 cr)

Biochemistry Core
BIOC 4331 - Biochemistry I: Structure, Catalysis, and Metabolism in Biological Systems (4.0 cr)
BIOC 4332 - Biochemistry II: Molecular Mechanisms of Signal Transduction and Gene Expression (4.0 cr)
BIOC 3960 *{Inactive}*(1.0 cr)
BIOC 4025W - Laboratory in Biochemistry [WI] (2.0 cr)
BIOC 4521 - Introduction to Physical Biochemistry (3.0 cr)
or CHEM 4501 - Introduction to Thermodynamics, Kinetics, and Statistical Mechanics (3.0 cr)
CHEM 4502 - Introduction to Quantum Mechanics and Spectroscopy (3.0 cr)

Upper Division Biochemistry Electives
Take 1 or more course(s) from the following:
•BIOC 4351 - Protein Engineering (3.0 cr)
•BIOC 5213 *{Inactive}*(3.0 cr)
•BIOC 5216 - Current Topics in Signal Transduction (2.0 cr)
•BIOC 5309 - Biocatalysis and Biodegradation (3.0 cr)
•BIOC 5352 - Biotechnology and Bioengineering for Biochemists (3.0 cr)
•BIOC 5361 - Microbial Genomics and Bioinformatics (3.0 cr)
•BIOC 5444 - Muscle (3.0 cr)
•BIOC 5527 *{Inactive}*(4.0 cr)
•BIOC 5528 - Spectroscopy and Kinetics (4.0 cr)
•BIOC 5960 - Biophysical Spectroscopy (2.0 cr)

Upper Division Lab
Take 1 or more course(s) from the following:
•BIOC 4125 - Laboratory in Molecular Biology and Biotechnology (3.0 cr)
•GCD 4025 - Cell Biology, Development & Regeneration Laboratory (3.0 cr)
•GCD 5005 - Computer Programming for Biology (3.0 cr)
•MICB 4215 - Advanced Laboratory: Microbial Physiology and Diversity (3.0 cr)
•MICB 4225W - Advanced Laboratory: Microbial Genetics [WI] (3.0 cr)
•MICB 4235 - Advanced Laboratory: Virology, Immunology, and Microbial Genetics (3.0 cr)
•Students may use a maximum of seven credits of directed research toward a CBS degree.
Take 2 or more credit(s) from the following:
•BIOC 4225 - Laboratory in NMR Techniques (1.0 cr)
•BIOC 4325 - Laboratory in Mass Spectrometry (1.0 cr)
•BIOC 4994 - Directed Research (1.0 - 7.0 cr)
•BIOC 4794W - Directed Research: Writing Intensive [WI] (3.0 - 5.0 cr)

Upper-division Writing Intensive within the major
Students are required to take one upper-division Writing Intensive course within the major. If that requirement has not been satisfied within the core major requirements, students must choose one course from the following list. Some of these courses may also fulfill other major requirements.
Take 0 - 1 course(s) from the following:
•BIOC 4793W - Directed Studies: Writing Intensive [WI] (1.0 - 7.0 cr)
•BIOC 4794W - Directed Research: Writing Intensive [WI] (3.0 - 5.0 cr)
•PMB 3005W - Plant Function Laboratory [WI] (2.0 cr)
•PMB 3007W - Plant, Algal, and Fungal Diversity and Adaptation [WI] (4.0 cr)
•BIOL 3408W *{Inactive}*[WI] (3.0 cr)
•BIOL 3411W *{Inactive}*[WI] (4.0 cr)
•BIOL 4793W - Directed Studies: Writing Intensive [WI] (1.0 - 7.0 cr)
•BIOL 4794W - Directed Research: Writing Intensive [WI] (3.0 - 5.0 cr)

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- EEB 4330W - Animal Communication [WI] (3.0 cr)
- EEB 4609W - Ecosystem Ecology [ENV, WI] (3.0 cr)
- EEB 4793W - Directed Studies: Writing Intensive [WI] (1.0 - 7.0 cr)
- EEB 4794W - Directed Research: Writing Intensive [WI] (3.0 - 5.0 cr)
- GCD 4005W - Cell Biology-Writing Intensive [WI] (4.0 cr)
- GCD 4793W - Directed Studies: Writing Intensive [WI] (1.0 - 7.0 cr)
- GCD 4794W - Directed Research: Writing Intensive [WI] (3.0 - 5.0 cr)
- MICB 4141W *{Inactive}*[WI] (4.0 cr)
- MICB 4161W - Eukaryotic Microbiology [WI] (3.0 cr)
- MICB 4225W - Advanced Laboratory: Microbial Genetics [WI] (3.0 cr)
- MICB 4793W - Directed Studies: Writing Intensive [WI] (1.0 - 7.0 cr)
- MICB 4794W - Directed Research: Writing Intensive [WI] (3.0 - 5.0 cr)
- NSCI 3001W - Neuroscience and Society [CIV, WI] (4.0 cr)
- NSCI 3102W - Neurobiology II: Perception and Behavior [WI] (3.0 cr)
- NSCI 4793W - Directed Studies: Writing Intensive [WI] (1.0 - 6.0 cr)
- NSCI 4794W - Directed Research: Writing Intensive [WI] (3.0 - 5.0 cr)
- PMB 4516W - Plant Cell Biology: Writing Intensive [WI] (3.0 cr)
- PMB 4793W - Directed Studies: Writing Intensive [WI] (1.0 - 7.0 cr)
- PMB 4794W - Directed Research: Writing Intensive [WI] (3.0 - 5.0 cr)

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