

BIOLOGY & BIOCHEMISTRY

Department of BIOLOGY & BIOCHEMISTRY

Mission Statement

The mission of the Department of Biology and Biochemistry is to teach students the foundational concepts and skills of the sciences through a Christian worldview. Students are trained to apply the scientific method, to analyze observations quantitatively and qualitatively, and to integrate knowledge between scientific disciplines. Students learn to value scientific inquiry as a means of exploring God's general revelation in the natural world.

The Department of Biology & Biochemistry prepares students for careers in science and for a wide variety of professional schools, including graduate programs in biology, biochemistry, and health professions such as medicine, nursing, physician assistant, dentistry, chiropractic, pharmacy, and physical therapy. Biology and biochemistry exert more influence in our society than ever before, and the department strives to be in the vanguard of an approach to education based on inquiry and critical thinking within the framework of a Christian worldview.

NOTE: WHEN A STUDENT RECEIVES A "U" GRADE FOR THE LAB PORTION OF A SCIENCE COURSE, HE/SHE RECEIVES CREDIT FOR THE COURSE, BUT THE COURSE DOES NOT COUNT FOR LABORATORY SCIENCE CREDIT IN CORE CURRICULUM.

Biochemistry Major Bachelor of Science

Biochemistry is the study of carbohydrates, proteins, lipids, nucleic acids, and the processes of these molecules in the body. A rapidly developing discipline within the sciences, biochemistry intersects with physiology, medicine, cell biology, genetics, etc. In recent years the pace of biochemical discovery has accelerated due to the profound transformation wrought by recombinant DNA technology. Biochemistry majors will be well prepared to enter the work force or pursue (master's/Ph.D.) graduate degrees, medical school, or other professional training. The degree is granted upon completion of credits specified on pages 48–49 (40 credits must be successfully completed in 3000- or 4000-level courses).

- **Scientific & Quantitative Literacy** courses in core curriculum: natural science courses PHY1101/1101L or 1201/1201L; mathematics course MAT2121.
- **Biochemistry majors** must receive a C- or better in all prerequisite courses. In addition, they must have a cumulative grade point average of at least 2.0 in all courses with BIO, CHE, and PHY prefixes in order to graduate.

Required Courses 49–50 cr

BIO1011/1011L	Principles of Biology I	4
BIO1012	Principles of Biology II	4
BIO3231/3231L	Biochemistry I	5
BIO3232	Biochemistry II	4
BIO3246/3246L	Genetics or	
BIO4841/CHE4841	Research/Chemistry Research	4–5
BIO4835	Senior Seminar [OCE, WCE].	2
CHE1021/1021L	Principles of Chemistry I	4
CHE1022/1022L	Principles of Chemistry II.	4
CHE3101/3101L	Organic Chemistry I.	5
CHE3102/3102L	Organic Chemistry II	5
CHE3321	Physical Chemistry	4
PHY1102/1102L	Fundamentals of Physics II	4

Students are strongly encouraged to take additional BIO courses to count towards the general elective requirements.

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SEE PAGE 50 FOR EXPLANATION AND PREREQUISITES.

Biology Major Bachelor of Science

Through a sequence of core courses, the biology major provides students with a comprehensive study of the various sub-disciplines of biology including cell and molecular biology, organismal biology, genetics, and ecology. Opportunities for research, independent study, and practical internships further strengthen each student's degree and résumé. The major is a flexible program that contains four unique tracks: Cellular and Molecular Biology, Environmental Biology, General Biology, and Pre-Medical/Pre-Professional Biology. After completing the biology core requirements, students are able to select from a wide variety of science electives to prepare for any profession in the biological sciences: **Clinical Health Sciences**, including medical, dental, veterinary, physician assistant, doctor of nurse practitioner, public health, physical therapy, chiropractic, etc.; **Research Sciences**, including biomedical industry, M.S. and Ph.D. programs in cellular and molecular biology, plant and environmental science, forensic science, genetics, etc. The degree is granted upon completion of credits specified on pages 48–49 (40 credits must be successfully completed in 3000- or 4000-level courses).

Cellular and Molecular Biology Track (49–51 cr)

- **Scientific & Quantitative Literacy** courses in core curriculum: natural science course CHE1021/1021L; mathematics course MAT2055 or higher.
- **For all natural science courses**, must receive a C- or better in all prerequisite courses. In addition, biology majors and minors must have a cumulative grade point average of at least 2.0 in all courses with BIO, CHE, and PHY prefixes in order to graduate.

Biology Core	19 cr
BIO1011/1011L Principles of Biology I	4
BIO1012 Principles of Biology II	4
BIO2113/2113L Principles of Biology III	4
BIO4835 Senior Seminar [OCE, WCE]	2
CHE3101/3101L Organic Chemistry I	5

Required Courses	26–27 cr
BIO3145/3145L Microbiology	4
BIO3246/3246L Genetics	5
BIO3347 Cell Physiology or	
BIO3348/3348L Cell Biology	4–5
CHE1022/1022L Principles of Chemistry II	4
CHE3102/3102L Organic Chemistry II	5
PHY1101/1101L Fundamentals of Physics I or	
PHY1201/1201L Engineering Physics I	4

Selectives	4–5 cr
BIO3157/3157L Human Anatomy	4
BIO3158/3158L Human Physiology	4
BIO3231/3231L Biochemistry I	5
BIO3232 Biochemistry II	4
BIO3236 Immunology	4
BIO4355 Developmental Biology	4
BIO4841/CHE4841 Research/Chemistry Research	1–4
BIO4995 Biology Internship	1–4
MAT courses numbered 2122 or higher	
CHE courses numbered 3321 or higher	
PHY courses numbered 1102 or higher	
Au Sable Institute* courses	

Students are strongly encouraged to take additional BIO, MAT, PHY, or CHE courses to count towards the general elective requirements and gain experience through research or internship opportunities.

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* SEE RELATED INFORMATION ON PAGES 20, 37–38

Environmental Biology Track (49 cr)

- **Theological Philosophy** course in core curriculum: PHI2016.
- **Scientific & Quantitative Literacy** courses in core curriculum: natural science course CHE1021/1021L; mathematics course MAT2055 or higher.
- **For all natural science courses**, must receive a C- or better in all prerequisite courses. In addition, biology majors and minors must have a cumulative grade point average of at least 2.0 in all courses with BIO, CHE, and PHY prefixes in order to graduate.

Biology Core	19 cr
BIO1011/1011L Principles of Biology I	4
BIO1012 Principles of Biology II	4
BIO2113/2113L Principles of Biology III	4
BIO4835 Senior Seminar [OCE, WCE]	2
CHE3101/3101L Organic Chemistry I	5

Required Courses	20 cr
ASI3300 Geographic Information Systems or	
ASI3620 Environmental Applications for Geographic Information Systems	4
BIO2016 Our Changing Climate	2
BIO3017 Analysis of Vegetative Communities Lab	2
BIO3175/3175L Ecology	4
BIO3277/3277L Conservation Biology	4
CHE1022/1022L Principles of Chemistry II or	
ASI3320 Environmental Chemistry*	4

Selectives	10 cr
BIO2015 Sustainable Urban Agriculture	2
BIO2116/2116L Animal Biology	4
BIO3015/3015L Field Ornithology	4
BIO3145/3145L Microbiology	4
BIO3215/3215L Plant Biology	4
BIO3246/3246L Genetics	5
BIO4841/CHE4841 Research/Chemistry Research	1–4
BIO4995 Biology Internship	1–4
Au Sable Institute* courses	4–12

Students are strongly encouraged to take additional BIO, MAT, PHY or CHE courses to count towards the general elective requirements and gain experience through research or internship opportunities.

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General Biology Track (50 cr)

- **Scientific & Quantitative Literacy** courses in core curriculum: natural science course CHE1021/1021L; mathematics course MAT2055 or higher.
- **For all natural science courses**, must receive a C- or better in all prerequisite courses. In addition, biology majors and minors must have a cumulative grade point average of at least 2.0 in all courses with BIO, CHE, and PHY prefixes in order to graduate.

Biology Core **19 cr**

BIO1011/1011L	Principles of Biology I	4
BIO1012	Principles of Biology II	4
BIO2113/2113L	Principles of Biology III	4
BIO4835	Senior Seminar [OCE, WCE]	2
CHE3101/3101L	Organic Chemistry I	5

Required Courses **9 cr**

BIO3246/3246L	Genetics	5
PHY1101/1101L	Fundamentals of Physics I or	
PHY1201/1201L	Engineering Physics I	4

Biology Electives **22 cr**

BIO1025	Medical Terminology	2
BIO2015	Sustainable Urban Agriculture	2
BIO2116/2116L	Animal Biology	4
BIO2825/2825L	Honors Topics in Biology	2 or 4
BIOX805	Topics in Biology	2–4
BIO3015/3015L	Field Ornithology	4
BIO3145/3145L	Microbiology	4
BIO3157/3157L	Human Anatomy	4
BIO3158/3158L	Human Physiology	4

BIO3159	Pathophysiology	4
BIO3175/3175L	Ecology	4
BIO3231/3231L	Biochemistry I	5
BIO3232	Biochemistry II	4
BIO3236	Immunology	4
BIO3276/3276L	Field Biology	4
BIO3277/3277L	Conservation Biology	4
BIO3347	Cell Physiology	4
BIO3348/3348L	Cell Biology	5
BIO4355	Developmental Biology	4
BIO4841/CHE4841	Research/Chemistry Research	1–4
Au Sable Institute* courses		4–8
Additional BIO-prefix courses numbered 2116 or higher		
MAT-prefix courses numbered 2055 or higher		

Students are strongly encouraged to take additional BIO, MAT, PHY or CHE courses to count towards the general elective requirements and gain experience through research or internship opportunities.

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Pre-Medical/Pre-Professional Biology Track (56–58 cr)

- **Theological Philosophy** course in core curriculum: PHI2016.
- **Scientific & Quantitative Literacy** courses in core curriculum: natural science course CHE1021/1021L*; mathematics course MAT2055 or higher.
- **For all natural science courses**, must receive a C- or better in all prerequisite courses. In addition, biology majors and minors must have a cumulative grade point average of at least 2.0 in all courses with BIO, CHE, and PHY prefixes in order to graduate.

Biology Core **19 cr**

BIO1011/1011L	Principles of Biology I*	4
BIO1012	Principles of Biology II	4
BIO2113/2113L	Principles of Biology III	4
BIO4835	Senior Seminar [OCE, WCE]	2
CHE3101/3101L	Organic Chemistry I*	5

Required Courses **27 cr**

BIO3231/3231L	Biochemistry I*	5
BIO3246/3246L	Genetics	5
CHE1022/1022L	Principles of Chemistry II*	4
CHE3102/3102L	Organic Chemistry II*	5
PHY1101/1101L	Fundamentals of Physics I* or	
PHY1201/1201L	Engineering Physics I*	4
PHY1102/1102L	Fundamentals of Physics II* or	
PHY1202/1202L	Engineering Physics II*	4

Selectives **10–12 cr**

BIO1025	Medical Terminology	2
BIO2116/2116L	Animal Biology	4
BIO3145/3145L	Microbiology	4
BIO3157/3157L	Human Anatomy*	4
BIO3158/3158L	Human Physiology*	4

BIO3159	Pathophysiology	4
BIO3236	Immunology	4
BIO3347	Cell Physiology	4
BIO3348/3348L	Cell Biology	5
BIO4355	Developmental Biology	4
BIO4841/CHE4841	Research*/Chemistry Research*	1–4
BIO4995	Biology Internship	1–4
Au Sable Institute** courses		4

Students are strongly recommended to have a GPA of 3.5 or higher in order to be competitive for professional programs. Students are strongly encouraged to take additional BIO courses and PSY1005, 2108, and SOC1035 to count towards the 16 credits in the enhanced curriculum (free electives) needed for the total of 125 credits for the degree program. Courses should be selected based in part on material covered in entrance exams and requirements for the student's desired professional program. Additionally, students should gain experience through research or internship opportunities.

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* COURSES TYPICALLY NEEDED FOR THE MCAT OR MEDICAL SCHOOL RÉSUMÉ

** SEE RELATED INFORMATION ON PAGES 20, 37–38

Biology Minor 16 cr

Required Courses: BIO1011/1011L, BIO1012; BIO2113/2113L; 4 credits selected from courses with BIO prefix numbered 3000 or higher.

Chemistry Minor 17–18 cr

Required Courses: CHE1021/1021L, 1022/1022L, 3101/3101L; one course selected from CHE3102/3102L, 3321, BIO3231/3231L, 3232.

Environmental Science Minor 16 cr

Required Courses: BIO2113/2113L, 3175/3175L, SCI1010/1010L; 4 credits selected from 2116/2116L, 3276/3276L, 3277/3277L, approved topics courses, or department chair-approved courses from Au Sable Institute.*

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Science Minor 16 cr

Required Courses: 16 credits in courses with BIO, CHE, or PHY prefixes (must include courses from at least two disciplines)

Science and Theology Minor 20 cr

Required Courses:

- Two courses (8 credits) with BIO, CHE, PHY, or SCI prefix
- 8 credits selected from BIA/BIB prefix (2–4 credits); BIO4841 (2–4 cr); BIO4995 (2–4 credits); PHI3035; PHI3805 (Topics); SCI1008/1008L; one additional BIO-, CHE-, PHY-, or SCI-prefix course (4 credits)
- SCI3037

BIOLOGY & BIOCHEMISTRY

Health Sciences Major Bachelor of Science

The Health Sciences major is primarily intended for students who intend to pursue the Masters in Nursing, Masters in Physician Assistant, Doctor of Physical Therapy, Masters in Nutrition, Masters in Public Health, etc. The degree is granted upon completion of credits specified on pages 48–49 (40 credits must be successfully completed in 3000- or 4000-level courses).

- **Theological Philosophy** course in core curriculum: PHI2016
- **Scientific & Quantitative Literacy** courses in core curriculum: natural science course BIO1011/1011L; mathematics course MAT2055.
- **Health Sciences majors** must receive a C- or better in all prerequisite courses. In addition, Health Sciences majors must have a cumulative grade point average of at least 2.0 in all courses with BIO, CHE, HPE, and HSC prefixes in order to graduate.

Required Courses **46–47 cr**

BIO1025	Medical Terminology	2	HSC4995	Health Sciences Internship	2
BIO3145/3145L	Microbiology	4	PSY1005	Introduction to Psychology	4
BIO3157/3157L	Human Anatomy	4	PSY2108	Lifespan Psychology	4
BIO3158/3158L	Human Physiology	4	BIO-prefix course numbered 1012 or above	4	
BIO3159	Pathophysiology	4			
CHE1021/1021L	Principles of Chemistry I	4			
CHE1022/1022L	Principles of Chemistry II or				
CHE3101/3101L	Organic Chemistry I	4–5			
HPE3006	Human Nutrition	4			
HSC4835	Senior Seminar for the Health Sciences [OCE, WCE]	2			

Work experience as a Certified Nursing Assistant is highly recommended.

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Health Sciences Minor **24 cr**

Required Course: BIO1011/1011L; select 20 credits from the following: BIO-, CHE-, HPE-, KIN-, PHY-, PSY-, or SOC-prefix courses, or other courses approved by the Dean of the College of Behavioral & Natural Sciences. BIO1009/1009L may not be counted in the minor.

Beta Beta Beta Biological Society

This prestigious National Biology Honors Society exists to provide educational and service opportunities to biology students. Membership is based upon sophomore class standing and earned GPA. Members plan and participate in society-sponsored activities such as guest speakers, career round-table discussions, field trips, research presentations, community service, and social gatherings.