

Biological Sciences, B.A.

Overview

The Department of Biological Sciences offers a Bachelor of Arts (B.A.) degree that is intended for students who wish to combine their interest in science with their interest(s) in other discipline(s) across campus. For schedule planning feedback, advising support, and/or sample four year schedules please contact the Biological Sciences Undergraduate Programs Office (bio-ungrad@andrew.cmu.edu).

Program Learning Outcomes

Upon graduation recipients of the B.A. degree in Biological Sciences will:

- Recall and understand foundational knowledge in genetics, biochemistry, cell biology, and experimental methodology (i.e. core courses required of all majors).
- Apply foundational knowledge to develop an understanding of specialized fields in Biological Sciences (i.e. topics covered in advanced electives 300-level+).
- Apply the scientific method to generate knowledge and solve problems.
- Apply acquired knowledge to analyze and interpret data.
- Identify and critically evaluate scientific information relevant to Biological Sciences from multiple sources.
- Clearly, logically, and accurately communicate Biological Sciences content in written and oral formats.
- Practice working collaboratively in teams and demonstrate effective teamwork.
- Recall and understand the principles of the responsible conduct of research and apply selected aspects of the responsible conduct of research (i.e. data management and citation of sources).

The curriculum requirements for the B.A. degree are distributed as follows:

Degree Requirements

Biological Sciences		Units
03-151	Honors Modern Biology	10
or 03-121	Modern Biology	
03-201	Undergraduate Colloquium for Sophomores	2
03-231	Honors Biochemistry	9
03-320	Cell Biology	9
	*New course number (03-240) starting Fall 2027	
03-220	Genetics	9
	*New course number (03-330) starting Fall 2027	
or 03-221	Genomes, Evolution, and Disease: Introduction to Quantitative Genetic Analysis	
03-343	Experimental Techniques in Molecular Biology	9-12
or 03-124	Modern Biology Laboratory	
03-411	Topics in Research	1
03-412	Topics in Research	1
03-xxx	General Biology Electives ¹	18
03-3xx	Advanced Biology Electives ¹	18
Total Biology units		86-89

¹ Details on electives can be found in the "Biological Sciences Electives" section (see below).

Chemistry		Units
09-105	Introduction to Modern Chemistry I ²	10
or 09-107	Honors Chemistry: Fundamentals, Concepts and Applications	
09-106	Modern Chemistry II	10
09-217	Organic Chemistry I	9
09-218	Organic Chemistry II	9
09-207	Techniques in Quantitative Analysis	9
Total Chemistry units		47

² Students who complete 09-107 with an A grade will be exempted from the requirement to take 09-106 Modern Chemistry II.

Mathematics, Physics, and Computer Science		Units
02-120	Programming for Scientists	12
or 15-110	Principles of Computing	
or 15-112	Fundamentals of Programming and Computer Science	
21-120	Differential and Integral Calculus (prerequisite: 21-090)	10
21-122	Integration and Approximation	10
33-121	Physics I for Science Students	12
or 33-141	Physics I for Engineering Students	
33-122	Physics II for Biological Sciences and Chemistry Students	9
or 33-142	Physics II for Engineering and Physics Students	
Total Mathematics, Physics, and Computer Science units		53

Elective courses		Units
MCS Nontechnical Breadth Requirements		75
Free Electives		96-99
Total Elective units		171-174

360Minimum number of units required for degree:

MCS Technical Breadth Requirements

Majors entering CMU and majoring in Biological Sciences (or affiliated majors) in the Fall of 2015 or beyond will fulfill the MCS Technical Breadth requirements as follows:

- Life Sciences: any courses in this category except for the 03-xxx courses.
- Physical Sciences: 09-105, 09-106, 33-121 and 33-122
- Math/CS/Stats: 21-120 and 21-122
- STEM Elective: will be filled by courses above or any STEM course from the approved list.

Biological Sciences Electives

The following specifications apply to Biological Sciences electives:

- At least 18 units must be at the 03-3xx level or above, exclusive of 03-445 and 03-545 and interdisciplinary electives.
- One interdisciplinary elective may count as a general biology elective.
- Up to 18 units of 03-445 Undergraduate Research and/or 03-545 Honors Research may count as general biology electives; a maximum of 36 units of research can count for the minimum units required for graduation.
- Courses in biology taken through cross-registration or study abroad at another university may count as electives if prior permission is obtained from the Director of Undergraduate Studies, Dr. Amanda Willard (awillard@cmu.edu).

Departmental Electives Group

03-113	Biologies in Text and Film	9
03-117	Frontiers, Analysis, and Discovery in Biological Sciences	6
03-118	Beer: A Yeast's Perspective	6
03-119	Biology for Life Special Topics Micro	3
03-120	Biology for Life Special Topics Mini	6
03-124	Modern Biology Laboratory	9
03-125	Evolution	9
03-128	Biology for Life Special Topics	9
03-129	Human Health and Disease	9
03-132	Basic Science to Modern Medicine	9
03-133	Neurobiology of Disease	9
03-135	Structure and Function of the Human Body	9
03-140	Ecology and Environmental Science	9
03-161	Molecules to Mind	9

03-230	Human Anatomy and Physiology *Offered only in Doha	9
03-350	Developmental Biology	9
03-351	Computation and Biology Integrated Research Lab	9
03-360/02-319	Genomics and Epigenetics of the Brain	9
03-362	Cellular Neuroscience	9
03-363	Systems Neuroscience	9
03-365	Neural Correlates of Learning and Memory	9
03-366	Neuropharmacology: Drugs, Brain and Behavior	9
03-380	Virology *Offered only in Doha	9
03-390	Molecular and Cellular Immunology	9
03-391	Microbiology	9
03-410	Special Topics in Biological Sciences	Var.
03-435	Cancer Biology	9
03-439	Introduction to Biophysics	10
03-442	Molecular Biology	9
03-444	Precision Medicine *Offered only in Doha	9
03-445	Undergraduate Research	Var.
03-451	Advanced Developmental Biology and Human Health	9
03-511	Computational Molecular Biology and Genomics	9
03-545	Honors Research	9
03-711	Computational Molecular Biology and Genomics	12
03-713	Bioinformatics Data Integration Practicum	6
03-728	Genome Editing Biotechnology	6
03-729	Entrepreneurship and protein-based drug development	6
03-730	Advanced Genetics	12
03-737	Biosensors	6
03-738	Synthetic Biology	6
03-740	Advanced Biochemistry	12
03-741	Advanced Cell Biology	12
03-742	Advanced Molecular Biology	12
03-751	Advanced Developmental Biology and Human Health	12
03-762	Advanced Cellular Neuroscience	12
03-763	Advanced Systems Neuroscience	12
03-766	Advanced Neuropharmacology: Drugs, Brain and Behavior	12
03-791	Advanced Microbiology	12

Interdisciplinary Electives Group

Up to one of the following courses may count as a general biology elective:

02-331	Modeling Evolution	12
02-425	Computational Methods for Proteogenomics and Metabolomics	9
02-450	Automation of Scientific Research	9
02-510	Computational Genomics	12
02-512	Computational Methods for Biological Modeling and Simulation	9
02-518	Computational Medicine	12
02-740	Bioimage Informatics	12
09-518	Bioorganic Chemistry: Nucleic Acids and Carbohydrates	9
09-519	Bioorganic Chemistry: Peptides, Proteins and Combinatorial Chemistry	9
09-530	Chemistry of Gene Expression	9
21-127	Concepts of Mathematics	12
21-259	Calculus in Three Dimensions	10
21-260	Differential Equations	9
36-200	Reasoning with Data	9
42-202	Physiology	9
85-170	Foundations of Brain and Behavior	9