

# Biology Major, Neuroscience Specialization

## Program Requirements

- **Total units required:** 58

### Required Courses

Code	Title	Units
Biol 2960	Principles of Biology I	4
Biol 2970	Principles of Biology II	4
Chem 111A or Chem 105	General Chemistry I Principles of General Chemistry I	3
Chem 112A or Chem 106	General Chemistry II Principles of General Chemistry II	3
Chem 151	General Chemistry Laboratory I	2
Chem 152	General Chemistry Laboratory II	2
Chem 261	Organic Chemistry I with Lab	4
Chem 262	Organic Chemistry II with Lab	4
Math 132	Calculus II	3
SDS 2200 or Math 233 or SDS 3200	Elementary Probability and Statistics Calculus III Elementary to Intermediate Statistics and Data Analysis	3
Physics 191 or Physics 193	Physics I Focused Physics I	3
Physics 191L or Physics 193L	Physics I Laboratory Focused Physics I Laboratory	1
Physics 192 or Physics 194	Physics II Focused Physics II	3
Physics 192L or Physics 194L	Physics II Laboratory Physics II Laboratory	1
<b>Total Units</b>		<b>40</b>

Students may substitute Chem 401 Physical Chemistry I for Chem 262 Organic Chemistry II with Lab. Students who plan to take physical chemistry must take Math 233 Calculus III. SDS 2200 Elementary Probability and Statistics (required for the tracks in ecology and evolution and in genomics and computational biology) and Math 233 Calculus III are valuable, particularly for students interested in research. Students who have taken Math 233 may take SDS 3200 Elementary to Intermediate Statistics and Data Analysis rather than SDS 2200 Elementary Probability and Statistics for a more advanced treatment of statistics.

At least 18 units in advanced biology courses (numbered 300 or above) are required. These 18 units may not include Biol 303A, Biol 307A, Biol 3160, Biol 3180, Biol 343A, Biol 363, Biol 387, Biol 388, Biol 3900, Biol 4202, Biol 4582, Biol 487, or Biol 488; cross-listed courses originating in other departments (except Biol 354, Biol 360, Biol 4540, Biol 4580, Biol 4810, Biol 4820, and Biol 4833, which count as biology major credit despite external origins); courses in the School of Continuing & Professional Studies; or more than 3 units of history-of-science courses. Up to 6 units of Biol 500 may be counted toward the 18 advanced biology units, and up to 3 units of Biol 49XX seminar courses may be counted toward the 18 advanced biology units.

**Majors are required to take at least one course from each of the following three areas:**

*Area A: Cellular and Molecular Biology*

Code	Title	Units
Biol 324	Human Genetics	3
Biol 334	Cell Biology	3
Biol 3371	Eukaryotic Genomes	4
Biol 3481	Parasitology	3
Biol 349	Microbiology	4
Biol 424	Immunology	4
Biol 4344	Epigenetics	3
Biol 4492	Infectious Diseases: History, Pathology, and Prevention	3
Biol 451	General Biochemistry	4
Biol 4810	General Biochemistry I	3
Biol 4820	General Biochemistry II	3

*Area B: Organismal Biology*

Code	Title	Units
Biol 3057	Physiological Control Systems	3
Biol 3151	Endocrinology	3
Biol 328	Principles in Human Physiology	4
Biol 3411	Principles of the Nervous System	3
Biol 3421	Introduction to Neuroethology	3
Biol 3422	Genes, Brains, and Behavior	3
Biol 3424	Great Discoveries in Neuroscience	3
Biol 4023	How Plants Work: Physiology, Growth, and Metabolism	3
Biol 4030	Biological Clocks	3
Biol 4071	Developmental Biology	3
Biol 4072	Regenerative and Stem Cell Biology	3
Biol 4381	Cell-Based Tissue Engineering and Regenerative Medicine	3
Biol 4580	Principles of Human Anatomy and Development	3

*Area C: Evolution, Ecology and Population Biology*

Code	Title	Units
Biol 3220	Woody Plants of Missouri	3
Biol 3221	Research and Public Education in the Arboretum	3
Biol 347	Darwin and Evolutionary Controversies	3
Biol 3494	Microbes and the Environment	4
Biol 3501	Evolution	4
Biol 370	Animal Behavior	3
Biol 381	Introduction to Ecology	3
Biol 4181	Population Genetics (and Microevolution)	3
Biol 4182	Macroevolution	3
Biol 4183	Molecular Evolution	3
Biol 419	Community Ecology	3
Biol 4195	Disease Ecology	4
Biol 472	Behavioral Ecology	4

**Majors also must take an advanced laboratory course from the following list:**

Code	Title	Units
Biol 3110	Vertebrate Structure Laboratory	4
Biol 3423	Behavioral Genetics Laboratory	3
Biol 3491	Microbiology Laboratory	3
Biol 3492	Laboratory Experiments with Eukaryotic Microbes	3
Biol 3493	Bacterial Bioprospecting and Biotechnology	3
Biol 360	Biophysics Laboratory	3
Biol 404	Laboratory of Neurophysiology	4
Biol 4193	Experimental Ecology Laboratory	4
Biol 4220	Practical Bioinformatics	4
Biol 4342	Research Explorations in Genomics	4
Biol 434W	Research Explorations in Genomics (Writing-Intensive)	4
Biol 4522	Laboratory in Protein Analysis, Proteomics, and Protein Structure	3
Biol 4523	Molecular Methods in Enzyme Analysis	4
Biol 4525	Structural Bioinformatics of Proteins (Writing Intensive)	4

All courses to be counted toward a major in biology must be taken for a letter grade if a letter grade is offered. A grade of C- or better must be earned in all of these courses.

In special cases, students may earn credit for graduate courses offered by the Division of Biology & Biomedical Sciences.

## Specialization Requirements

- **Total units required (including the biology major requirements):** 60

Biology major requirements must be met with the following courses: Biol 3057, area A (Biol 334, Biol 451, Biol 4810, or Biol 4820), area B (Biol 3411), and any course in area C. Students must then choose one of the following laboratory pathways: (1) Laboratory Pathway 1: one of the following courses: Biol 3423, Biol 360, or Biol 404; or (2) Laboratory Pathway 2: any other upper-level biology laboratory course on the list of approved laboratory courses for the biology major plus 6 credits of Biol 500N and/or Biol 500U (Independent Research in Neuroscience). Students must select at least one biology elective (Biol 3110, Biol 3151, Biol 328, Biol 3421, Biol 3422, Biol 3424, Biol 4030, or Biol 4580) and one outside elective either in physics (Physics 350, Physics 355, or Physics 360) or psychology (Psych 330, Psych 360, or Psych 3604). SDS 2200 or SDS 3200 is recommended. Optional seminar courses in neuroscience include Biol 171 and Biol 4934. Physics 360 may count either as the advanced laboratory requirement or the outside elective course but not for both requirements.

## Additional Information

### Research

Research opportunities are available during the student's first and second years through Biol 200; such opportunities are available during the third and fourth years through Biol 500. A research emphasis in the major requires at least 6 credits (two semesters) of Biol 500 research and an approved senior thesis on this research, which is presented at the undergraduate symposium. The research emphasis is acknowledged on the degree as a research milestone.

### Senior Honors

Biology majors are encouraged to work for senior honors, which require a 3.30 grade point average in biology, a 3.30 GPA in nonbiological sciences (mathematics, chemistry and physics courses), and a 3.65 overall GPA at the time of graduation. Also required are 6 units of Biol 500 research and an approved thesis from this work, equivalent to the research emphasis described in the preceding paragraph. Students interested in senior honors should begin Biol 500 no later than the spring of their junior year.

The Department of Biology awards the Marian Smith Spector Prize to an undergraduate who has an excellent academic record and who submits an outstanding honors thesis; it also awards the Ralph S. Quatrano Prize to the student whose thesis shows the greatest evidence of creativity in design, research methodology and/or broader scientific implications. The Harrison D. Stalker Prize is awarded to a graduating senior whose college career is distinguished by scholarship, service and breadth of interest.

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