BIOLOGY, B.S. (BERKS)

Begin Campus: Any Penn State Campus
End Campus: Berks

Degree Requirements
For the Bachelor of Science degree in Biology, a minimum of 124 credits is required:

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Education</td>
<td>45</td>
</tr>
<tr>
<td>Requirements for the Major</td>
<td>94</td>
</tr>
</tbody>
</table>

15 of the 45 credits for General Education are included in the Requirements for the Major. This includes: 9 credits of GN courses; 6 credits of GQ courses.

Requirements for the Major
To graduate, a student enrolled in the major must earn a grade of C or better in each course designated by the major as a C-required course, as specified by Senate Policy 82-44 (http://senate.psu.edu/policies-and-rules-for-undergraduate-students/82-00-and-83-00-degree-requirements/#82-44).

Common Requirements for the Major (All Options)

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>CHEM 111</td>
<td>Experimental Chemistry I</td>
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<tr>
<td>CHEM 113</td>
<td>Experimental Chemistry II</td>
<td>1</td>
</tr>
<tr>
<td>MATH 141</td>
<td>Calculus with Analytic Geometry II</td>
<td>4</td>
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</tbody>
</table>

Prescribed Courses: Require a grade of C or better

Select one of the following:

- BIOL 110  Biology: Basic Concepts and Biodiversity  4
- BIOL 220W  Biology: Populations and Communities  4
- BIOL 230W  Biology: Molecules and Cells  4
- BIOL 240W  Biology: Function and Development of Organisms  4
- CHEM 110  Chemical Principles I  3
- CHEM 112  Chemical Principles II  3
- MATH 140  Calculus With Analytic Geometry I  4

Additional Courses

Select one of the following:  8-12

- PHYS 211  General Physics: Mechanics and General Physics: Electricity and Magnetism
- PHYS 213  and General Physics: Fluids and Thermal Physics
- PHYS 214  and General Physics: Wave Motion and Quantum Physics
- PHYS 250  Introductory Physics I
- PHYS 251  and Introductory Physics II

Select one of the following:  3-4

- STAT 200  Elementary Statistics
- STAT 240  Introduction to Biometry
- STAT 250  Introduction to Biostatistics

Requirements for the Option
Ecology Option (46-51 credits)
Available at the following campuses: Altoona, Schuylkill, University Park

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL 463</td>
<td>General Ecology</td>
<td>3</td>
</tr>
</tbody>
</table>

Additional Courses

Select one of the following:  3

- STAT 462  Applied Regression Analysis
- or STAT 464  Applied Nonparametric Statistics

Select one of the following:  6-8

- CHEM 202  Fundamentals of Organic Chemistry I
- CHEM 203  and Fundamentals of Organic Chemistry II
- CHEM 210  Organic Chemistry I
- CHEM 212  and Organic Chemistry II
- CHEM 213  and Laboratory in Organic Chemistry

Groups
Select a minimum of 15 credits of 400-level biology courses, with at least 6 credits from the Ecology group, 3 credits from the Evolution group, and 3 credits from the Practicum group. A maximum of 3 credits of BIOL 400, 494, 495, 496, and SC 295, 395, 495 may be used to fulfill 15 credits minimum in the 400-level biology course requirements.

Ecology Group:

- BIOL 406  Symbiosis
- BIOL 412  Ecology of Infectious Diseases
- BIOL 415  Ecotoxicology
- BIOL 417  Invertebrate Zoology
- BIOL 419  Ecological and Environmental Problem Solving
- BIOL/PPEM 425  Biology of Fungi
- BIOL 429  Animal Behavior
- BIOL 435  Ecology of Lakes and Streams
- BIOL 436  Population Ecology and Global Climate Change
- BIOL 438  Theoretical Population Ecology
- BIOL 444  Field Ecology
- BIOL 446  Physiological Ecology
- BIOL 450W  Experimental Field Biology
- BIOL 464  Sociobiology
- BIOL 474  Astrobiology
- BIOL 482  Coastal Biology
- BIOL 499A  Tropical Field Ecology

Evolution Group:

- BIOL 405  Molecular Evolution
- BIOL 406  Symbiosis
- BIOL 411  Medical Embryology
- BIOL 414  Taxonomy of Seed Plants
- BIOL 417  Invertebrate Zoology
- BIOL 420  Paleobotany
- BIOL 421  Comparative Anatomy of Vertebrates
- BIOL 422  Advanced Genetics
- BIOL/PPEM 425  Biology of Fungi
- BIOL 427  Evolution
- BIOL 428  Population Genetics
<table>
<thead>
<tr>
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<th>Credits</th>
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<tbody>
<tr>
<td>BIOL 429</td>
<td>Animal Behavior</td>
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<tr>
<td>BIOL 432</td>
<td>Developmental Genetics</td>
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<tr>
<td>BIOL 433</td>
<td>Evolution of Vertebrates</td>
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<tr>
<td>BIOL 434</td>
<td>Pathobiology of Emerging Infectious Disease</td>
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<td>BIOL 436</td>
<td>Population Ecology and Global Climate Change</td>
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<td>BIOL 438</td>
<td>Theoretical Population Ecology</td>
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<td>BIOL 439</td>
<td>Practical Bioinformatics</td>
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<tr>
<td>BIOL 443</td>
<td>Evo-devo: Evolution of Developmental Mechanisms</td>
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<tr>
<td>BIOL 446</td>
<td>Physiological Ecology</td>
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<tr>
<td>BIOL 451</td>
<td>Biology of RNA</td>
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<tr>
<td>BIOL 460</td>
<td>Human Genetics</td>
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<td>BIOL 463</td>
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<td>BIOL 464</td>
<td>Sociobiology</td>
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<td>BIOL 474</td>
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<td>BIOL 478</td>
<td>COMPARATIVE NEUROANATOMY</td>
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<tr>
<td>BIOL 400</td>
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<td>BIOL 402W</td>
<td>Biological Experimental Design</td>
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<td>BIOL 407</td>
<td>Plant Developmental Anatomy</td>
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<tr>
<td>BIOL 419</td>
<td>Ecological and Environmental Problem Solving</td>
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<td>BIOL 421</td>
<td>Comparative Anatomy of Vertebrates</td>
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<td>BIOL/PPEM425</td>
<td>Biology of Fungi</td>
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<td>BIOL 433</td>
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<td>BIOL 437</td>
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<td>BIOL 450W</td>
<td>Experimental Field Biology</td>
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<tr>
<td>BIOL 461</td>
<td>Contemporary Issues in Science and Medicine</td>
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<td>BIOL 473</td>
<td>Laboratory in Mammalian Physiology</td>
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<td>BIOL 478</td>
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<td>BIOL 494</td>
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<td>BIOL 495</td>
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<td>BIOL 496</td>
<td>Independent Studies</td>
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<td>BIOL 499A</td>
<td>Tropical Field Ecology</td>
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<td>BIOTC 459</td>
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<tr>
<td>SC 295</td>
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<td>SC 395</td>
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<tr>
<td>SC 495</td>
<td>Science Co-op Work Experience III</td>
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</tbody>
</table>

**Supporting Courses and Related Areas**

Select 17-24 credits from department list

**Code** | **Title**
--- | ---
BIOL 400 | Teaching in Biology
BIOL 402W | Biological Experimental Design
BIOL 407 | Plant Developmental Anatomy
BIOL 414 | Taxonomy of Seed Plants
BIOL 417 | Invertebrate Zoology
BIOL 419 | Ecological and Environmental Problem Solving
BIOL 421 | Comparative Anatomy of Vertebrates
BIOL 422 | Advanced Genetics
BIOL/PPEM 425 | Biology of Fungi
BIOL 433 | Evolution of Vertebrates
BIOL 437 | Histology
BIOL 439 | Practical Bioinformatics
BIOL 444 | Field Ecology
BIOL 450W | Experimental Field Biology
BIOL 461 | Contemporary Issues in Science and Medicine
BIOL 473 | Laboratory in Mammalian Physiology
BIOL 475N | COMPARATIVE NEUROANATOMY
BIOL 478 | COMPARATIVE NEUROANATOMY
BIOL 482 | Coastal Biology
BIOL 494 | Research Project
BIOL 495 | Internship in Biology
BIOL 496 | Independent Studies
BIOL 499A | Tropical Field Ecology
BIOTC 459 | 
SC 295 | Science Co-op Work Experience I
SC 395 | Science Co-op Work Experience II
SC 495 | Science Co-op Work Experience III

**General Biology Option (46-51 credits)**

Available at the following campuses: Abington, Altoona, Beaver, Berks, Brandywine, Harrisburg, Schuylkill, Scranton, University Park, York

**Select one of the following:**


**Groups**

Select a minimum of 18 credits of 400-level biology courses, with at least 3 credits from each of the following groups (each course may be used to satisfy a requirement in only one group). Moreover, a maximum of 3 credits of BIOL 400, 494, 495, 496 and SC 295, 395, 495 may be used to fulfill the 18 credit minimum in the 400-level biology course requirements.

**Plant and Fungi Group:**

- BIOL 406 | Symbiosis
- BIOL 407 | Plant Developmental Anatomy
- BIOL 414 | Taxonomy of Seed Plants
- BIOL 420 | Paleobotany
- BIOL 424 | Seeds of Change: The Uses of Plants
- BIOL/PPEM 425 | Biology of Fungi

**Evolution Group:**

- BIOL 405 | Molecular Evolution
- BIOL 406 | Symbiosis
- BIOL 411 | Medical Embryology
- BIOL 414 | Taxonomy of Seed Plants
- BIOL 417 | Invertebrate Zoology
- BIOL 420 | Paleobotany
- BIOL 421 | Comparative Anatomy of Vertebrates
- BIOL 422 | Advanced Genetics
- BIOL/PPEM 425 | Biology of Fungi

**Additional Courses**

Select one of the following: 6-8 credits

- BIOL 427 | Evolution
- BIOL 428 | Population Genetics
- BIOL 429 | Animal Behavior
- BIOL 432 | Developmental Genetics
- BIOL 433 | Evolution of Vertebrates
- BIOL 434 | Pathobiology of Emerging Infectious Disease
- BIOL 436 | Population Ecology and Global Climate Change
- BIOL 438 | Theoretical Population Ecology
- BIOL 439 | Practical Bioinformatics
- BIOL 443 | Evo-devo: Evolution of Developmental Mechanisms
- BIOL 446 | Physiological Ecology
- BIOL 451 | Biology of RNA
- BIOL 460 | Human Genetics
Biology, B.S. (Berks)

BIOL 463  General Ecology
BIOL 464  Sociobiology
BIOL 474  Astrobiology
BIOL 478  COMPARATIVE NEUROANATOMY

Genetics and Developmental Biology Group:
BIOL 404  Cellular Mechanisms in Vertebrate Physiology
BIOL 405  Molecular Evolution
BIOL 407  Plant Developmental Anatomy
BIOL 411  Medical Embryology
BIOL 413  Cell Signaling and Regulation
BIOL 416  Biology of Cancer
BIOL 422  Advanced Genetics
BIOL 426  Developmental Neurobiology
BIOL 428  Population Genetics
BIOL 430  Developmental Biology
BIOL 431  Developmental Genetics
BIOL 439  Practical Bioinformatics
BIOL 443  Evo-devo: Evolution of Developmental Mechanisms
BIOL 448  Ecology of Plant Reproduction
BIOL 451  Biology of RNA
BIOL 460  Human Genetics
BIOL 467  Molecular Basis of Neurological Diseases
BIOL 469  Neurobiology
MICRB 410  Principles of Immunology

Ecology Group:
BIOL 406  Symbiosis
BIOL 412  Ecology of Infectious Diseases
BIOL 415  Ecotoxicology
BIOL 417  Invertebrate Zoology
BIOL 419  Ecological and Environmental Problem Solving
BIOL/PPEM 425  Biology of Fungi
BIOL 429  Animal Behavior
BIOL 435  Ecology of Lakes and Streams
BIOL 436  Population Ecology and Global Climate Change
BIOL 438  Theoretical Population Ecology
BIOL 444  Field Ecology
BIOL 446  Physiological Ecology
BIOL 450W  Experimental Field Biology
BIOL 463  General Ecology
BIOL 464  Sociobiology
BIOL 474  Astrobiology
BIOL 482  Coastal Biology
BIOL 499A  Tropical Field Ecology

Physiology Group:
BIOL 404  Cellular Mechanisms in Vertebrate Physiology
BIOL 406  Symbiosis
BIOL 409  Biology of Aging
BIOL 411  Medical Embryology
BIOL 412  Ecology of Infectious Diseases
BIOL 413  Cell Signaling and Regulation

Supporting Courses and Related Areas
Select 20-27 credits from department list  20-27
**Genetics and Developmental Biology Option (46-51 credits)**

*Available at the following campuses: Abington, Berks, Harrisburg, Schuylkill, University Park, York*

<table>
<thead>
<tr>
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<th>Credits</th>
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<tr>
<td>BIOL 322</td>
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<td>BIOL 430</td>
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<tr>
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<tr>
<td>BMB 402</td>
<td>General Biochemistry</td>
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<tr>
<td>CHEM 210</td>
<td>Organic Chemistry I</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 212</td>
<td>Organic Chemistry II</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 213</td>
<td>Laboratory in Organic Chemistry</td>
<td>2</td>
</tr>
</tbody>
</table>

**Prescribed Courses**

**Additional Courses**

Select 2-5 credits from the following:

- MATH 220: Matrices
- MATH 231: Calculus of Several Variables
- MICRB 201: Introductory Microbiology
- MICRB 202: Introductory Microbiology Laboratory

**Groups**

Select a minimum of 12 credits of 400-level courses, with at least 6 credits from the Genetics and Developmental Biology group, 3 credits from Evolution, and 3 credits from the Practicum group. A maximum of 3 credits of BIOL 400, 494, 495, 496 and SC 295, 395, 495 may be used to fulfill the 12 credit minimum in the 400-level biology course requirements.

**Genetics and Developmental Biology Group:**

- BIOL 404: Cellular Mechanisms in Vertebrate Physiology
- BIOL 405: Molecular Evolution
- BIOL 407: Plant Developmental Anatomy
- BIOL 411: Medical Embryology
- BIOL 413: Cell Signaling and Regulation
- BIOL 416: Biology of Cancer
- BIOL 422: Advanced Genetics
- BIOL 426: Developmental Neurobiology
- BIOL 428: Population Genetics
- BIOL 431: Developmental Genetics
- BIOL 432: Practical Bioinformatics
- BIOL 443: Evo-devo: Evolution of Developmental Mechanisms
- BIOL 448: Ecology of Plant Reproduction
- BIOL 451: Biology of RNA
- BIOL 460: Human Genetics
- BIOL 467: Molecular Basis of Neurological Diseases
- BIOL 469: Neurobiology
- BMB 400: Molecular Biology of the Gene
- or BMB 450: Microbial/Molecular Genetics
- or BMB 464: Molecular Medicine
- or BMB 484: Functional Genomics
- or HORT 407: Plant Breeding
- or MICRB 41: Principles of Immunology

**Evolution Group:**

- BIOL 405: Molecular Evolution
- BIOL 406: Symbiosis
- BIOL 411: Medical Embryology
- BIOL 414: Taxonomy of Seed Plants
- BIOL 417: Invertebrate Zoology
- BIOL 420: Paleobotany
- BIOL 421: Comparative Anatomy of Vertebrates
- BIOL 422: Advanced Genetics
- BIOL/PPEM 425: Biology of Fungi
- BIOL 427: Evolution
- BIOL 428: Population Genetics
- BIOL 429: Animal Behavior
- BIOL 432: Developmental Genetics
- BIOL 433: Evolution of Vertebrates
- BIOL 434: Pathobiology of Emerging Infectious Disease
- BIOL 436: Population Ecology and Global Climate Change
- BIOL 438: Theoretical Population Ecology
- BIOL 439: Practical Bioinformatics
- BIOL 443: Evo-devo: Evolution of Developmental Mechanisms
- BIOL 446: Physiological Ecology
- BIOL 451: Biology of RNA
- BIOL 460: Human Genetics
- BIOL 463: General Ecology
- BIOL 464: Sociobiology
- BIOL 474: Astrobiology
- BIOL 478: COMPARATIVE NEUROANATOMY

**Practicum Group:**

- BIOL 400: Teaching in Biology
- BIOL 402W: Biological Experimental Design
- BIOL 407: Plant Developmental Anatomy
- BIOL 414: Taxonomy of Seed Plants
- BIOL 417: Invertebrate Zoology
- BIOL 419: Ecological and Environmental Problem Solving
- BIOL 421: Comparative Anatomy of Vertebrates
- BIOL 422: Advanced Genetics
- BIOL/PPEM 425: Biology of Fungi
- BIOL 433: Evolution of Vertebrates
- BIOL 437: Histology
- BIOL 439: Practical Bioinformatics
- BIOL 444: Field Ecology
- BIOL 450W: Experimental Field Biology
- BIOL 461: Contemporary Issues in Science and Medicine
- BIOL 473: Laboratory in Mammalian Physiology
- BIOL 475N
- BIOL 478: COMPARATIVE NEUROANATOMY
- BIOL 482: Coastal Biology
- BIOL 494: Research Project
- BIOL 495: Internship in Biology
- BIOL 496: Independent Studies
- BIOL 499A: Tropical Field Ecology
- SC 295: Science Co-op Work Experience I
- SC 395: Science Co-op Work Experience II
### Neuroscience Option (46-51 credits)

*Available at the following campuses: University Park*

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL 469</td>
<td>Neurobiology</td>
<td>3</td>
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<tr>
<td>BMB 401</td>
<td>General Biochemistry</td>
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<td>BMB 402</td>
<td>General Biochemistry</td>
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<td>CHEM 210</td>
<td>Organic Chemistry I</td>
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<td>CHEM 212</td>
<td>Organic Chemistry II</td>
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</tr>
<tr>
<td>CHEM 213</td>
<td>Laboratory in Organic Chemistry</td>
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</tr>
<tr>
<td>BIOL 426</td>
<td>Developmental Neurobiology</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 470</td>
<td>Functional and Integrative Neuroscience</td>
<td></td>
</tr>
<tr>
<td>BIOL 478</td>
<td>COMPARATIVE NEUROANATOMY</td>
<td></td>
</tr>
</tbody>
</table>

### Groups

**Prescribed Courses**

- Select 9-17 credits from department list

**Additional Courses**

- Select 3 credits from the following:
  - BIOL 426: Developmental Neurobiology
  - BIOL 470: Functional and Integrative Neuroscience
  - BIOL 478: COMPARATIVE NEUROANATOMY

**Groups**

- Select a minimum of 12 credits of 400-level biology courses, with at least 6 credits from the Neuroscience group, 3 credits from the Evolution group, and 3 credits from the Practicum Group. A maximum of 3 credits of BIOL 400, 494, 495, 496 and SC 295, 395, 495 may be used to fulfill the 12 credit minimum in the 400-level biology course requirements.

**Neuroscience Group:**

- BIOL 404: Cellular Mechanisms in Vertebrate Physiology
- BIOL 413: Cell Signaling and Regulation
- BIOL 424: Seeds of Change: The Uses of Plants
- BIOL 426: Developmental Neurobiology
- BIOL 430: Developmental Biology
- BIOL 437: Histology
- BIOL 467: Molecular Basis of Neurological Diseases
- BIOL 470: Functional and Integrative Neuroscience
- BIOL 472: Human Physiology
- BIOL 473: Laboratory in Mammalian Physiology
- BIOL 478: COMPARATIVE NEUROANATOMY
- BIOL 479: General Endocrinology
- BBH 432: Biobehavioral Aspects of Stress
  - or BBH 451: Pharmacological Influences on Health
  - or BBH 468: Neuroanatomical Bases for Disorders of Behavior and Health
  - or HDFS 468: Neuroanatomical Bases for Disorders of Behavior and Health
  - or NUTR 445: Energy and Macronutrient Metabolism
  - or PSYCH 45: Learning and Memory
  - or PSYCH 46: Physiological Psychology
  - or PSYCH 47: Clinical Neuropsychology

**Evolution Group:**

- BIOL 405: Molecular Evolution
- BIOL 406: Symbiosis
- BIOL 411: Medical Embryology
- BIOL 414: Taxonomy of Seed Plants

**Practicum Group:**

- BIOL 400: Teaching in Biology
- BIOL 402W: Biological Experimental Design
- BIOL 407: Plant Developmental Anatomy
- BIOL 414: Taxonomy of Seed Plants
- BIOL 417: Invertebrate Zoology
- BIOL 419: Ecological and Environmental Problem Solving
- BIOL 421: Comparative Anatomy of Vertebrates
- BIOL 422: Advanced Genetics
- BIOL 425: Biology of Fungi
- BIOL 433: Evolution of Vertebrates
- BIOL 437: Histology
- BIOL 439: Practical Bioinformatics
- BIOL 444: Field Ecology
- BIOL 450W: Experimental Field Biology
- BIOL 461: Contemporary Issues in Science and Medicine
- BIOL 473: Laboratory in Mammalian Physiology
- BIOL 475N: Laboratory in Mammalian Physiology
- BIOL 478: COMPARATIVE NEUROANATOMY
- BIOL 482: Coastal Biology
- BIOL 494: Research Project
- BIOL 495: Internship in Biology
- BIOL 496: Independent Studies
- BIOL 499A: Tropical Field Ecology
- BIOTC 459: Marine Biology
- SC 295: Science Co-op Work Experience I
- SC 395: Science Co-op Work Experience II
- SC 495: Science Co-op Work Experience III
### Supporting Courses and Related Areas
Select 14-19 credits from department list  

#### Plant Biology Option (46-51 credits)
*Available at the following campuses: University Park*

<table>
<thead>
<tr>
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<tbody>
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<td>BIOL 407</td>
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<td>BIOL 441</td>
<td>Plant Physiology</td>
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<td>General Biochemistry</td>
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</tbody>
</table>

**Additional Courses**

**Groups**

Select a minimum of 12 credits of 400-level biology courses, with at least 6 credits from the Plant and Fungi group, 3 credits from the Evolution group, and 3 credits from the Practicum group. A maximum of 3 credits of BIOL 400, 494, 495, 496 and SC 295, 395, 495 may be used to fulfill the 12 credit minimum in the 400-level biology course requirements.

**Plant and Fungi Group:**

- BIOL 406  Symbiosis
- BIOL 414  Taxonomy of Seed Plants
- BIOL 420  Paleobotany
- BIOL 424  Seeds of Change: The Uses of Plants
- BIOL/PPEM 425  Biology of Fungi
- BIOL 431
- BIOL 444  Field Ecology
- BIOL 446  Physiological Ecology
- BIOL 448  Ecology of Plant Reproduction
- BIOL 451  Biology of RNA
- BIOL 482  Coastal Biology
- BIOL 499A  Tropical Field Ecology

**Evolution Group:**

- BIOL 405  Molecular Evolution
- BIOL 406  Symbiosis
- BIOL 411  Medical Embryology
- BIOL 414  Taxonomy of Seed Plants
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- BIOL/PPEM 425  Biology of Fungi
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- BIOL 460  Human Genetics
- BIOL 463  General Ecology
- BIOL 464  Sociobiology
- BIOL 474  Astrobiology
- BIOL 478  COMPARATIVE NEUROANATOMY

**Practicum Group:**

- BIOL 400  Teaching in Biology
- BIOL 402W  Biological Experimental Design
- BIOL 407  Plant Developmental Anatomy
- BIOL 414  Taxonomy of Seed Plants
- BIOL 417  Invertebrate Zoology
- BIOL 419  Ecological and Environmental Problem Solving
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- BIOL 450W  Experimental Field Biology
- BIOL 461  Contemporary Issues in Science and Medicine
- BIOL 473  Laboratory in Mammalian Physiology
- BIOL 475N
- BIOL 478  COMPARATIVE NEUROANATOMY
- BIOL 482  Coastal Biology
- BIOL 494  Research Project
- BIOL 495  Internship in Biology
- BIOL 496  Independent Studies
- BIOL 499A  Tropical Field Ecology
- BIOTC 459
- SC 295  Science Co-op Work Experience I
- SC 395  Science Co-op Work Experience II
- SC 495  Science Co-op Work Experience III

### Supporting Courses and Related Areas
Select 14-19 credits from department list  

#### Vertebrate Physiology Option (46-51 credits)
*Available at the following campuses: Abington, Altoona, Brandywine, Schuylkill, University Park*

<table>
<thead>
<tr>
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<td>CHEM 210</td>
<td>Organic Chemistry I</td>
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</table>
Additional Courses

Groups

Select a minimum of 12 credits of 400-level courses, with at least 6 credits from the Physiology group, 3 credits from the Evolution group, and 3 credits from the Practicum group. A maximum of 3 credits of BIOL 400, 494, 495, 496 and SC 295, 395, 495 may be used to fulfill the 12 credit minimum in the 400-level biology course requirements.

Physiology Group:
- BIOL 404 Cellular Mechanisms in Vertebrate Physiology
- BIOL 406 Symbiosis
- BIOL 409 Biology of Aging
- BIOL 411 Medical Embryology
- BIOL 412 Ecology of Infectious Diseases
- BIOL 413 Cell Signaling and Regulation
- BIOL 415 Ecotoxicology
- BIOL 416 Biology of Cancer
- BIOL 421 Comparative Anatomy of Vertebrates
- BIOL 424 Seeds of Change: The Uses of Plants
- BIOL 426 Developmental Neurobiology
- BIOL 430 Developmental Biology
- BIOL 431
- BIOL 432 Developmental Genetics
- BIOL 437 Histology
- BIOL 443 Evo-devo: Evolution of Developmental Mechanisms
- BIOL 446 Physiological Ecology
- BIOL 460 Human Genetics
- BIOL 469 Neurobiology
- BIOL 470 Functional and Integrative Neuroscience
- BIOL 478 COMPARATIVE NEUROANATOMY
- BIOL 479 General Endocrinology
- BIOL 482 Coastal Biology
- ANSC 431 Physiology of Animal Reproduction
  - or ANTH 466 The Skull
  - or BMB 484 Functional Genomics
  - or ENT 402A Biology of Animal Parasites
  - or MICRB 40 Microbial Physiology and Structure
  - or MICRB 41 Principles of Immunology
  - or MICRB 41 Medical Microbiology
  - or MICRB 43 Viral Pathogenesis
  - or PSYCH 46 Physiological Psychology

Evolution Group:
- BIOL 405 Molecular Evolution
- BIOL 406 Symbiosis
- BIOL 411 Medical Embryology
- BIOL 414 Taxonomy of Seed Plants
- BIOL 417 Invertebrate Zoology
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Supporting Courses and Related Areas
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Select 15-20 credits from department list

Supporting Courses and Related Areas

Select 15-20 credits from department list
General Education

Connecting career and curiosity, the General Education curriculum provides the opportunity for students to acquire transferable skills necessary to be successful in the future and to thrive while living in interconnected contexts. General Education aids students in developing intellectual curiosity, a strengthened ability to think, and a deeper sense of aesthetic appreciation. These are requirements for all baccalaureate students and are often partially incorporated into the requirements of a program. For additional information, see the General Education Requirements (https://bulletins.psu.edu/undergraduate/general-education/baccalaureate-degree-general-education-program/) section of the Bulletin and consult your academic adviser.

The keystone symbol appears next to the title of any course that is designated as a General Education course. Program requirements may also satisfy General Education requirements and vary for each program.

Foundations (grade of C or better is required.)
- Quantification (GQ): 6 credits
- Writing and Speaking (GWS): 9 credits

Knowledge Domains
- Arts (GA): 6 credits
- Health and Wellness (GHW): 3 credits
- Humanities (GH): 6 credits
- Social and Behavioral Sciences (GS): 6 credits
- Natural Sciences (GN): 9 credits

Integrative Studies (may also complete a Knowledge Domain requirement)
- Inter-Domain or Approved Linked Courses: 6 credits

University Degree Requirements

First Year Engagement
All students enrolled in a college or the Division of Undergraduate Studies at University Park, and the World Campus are required to take 1 to 3 credits of the First-Year Seminar, as specified by their college First-Year Engagement Plan.

Other Penn State colleges and campuses may require the First-Year Seminar; colleges and campuses that do not require a First-Year Seminar provide students with a first-year engagement experience.

First-year baccalaureate students entering Penn State should consult their academic adviser for these requirements.

Cultures Requirement
6 credits are required and may satisfy other requirements
- United States Cultures: 3 credits
- International Cultures: 3 credits

Writing Across the Curriculum
3 credits required from the college of graduation and likely prescribed as part of major requirements.

Total Minimum Credits
A minimum of 120 degree credits must be earned for a baccalaureate degree. The requirements for some programs may exceed 120 credits. Students should consult with their college or department adviser for information on specific credit requirements.

Quality of Work
Candidates must complete the degree requirements for their major and earn at least a 2.00 grade-point average for all courses completed within their degree program.

Limitations on Source and Time for Credit Acquisition
The college dean or campus chancellor and program faculty may require up to 24 credits of course work in the major to be taken at the location or in the college or program where the degree is earned. Credit used toward degree programs may need to be earned from a particular source or within time constraints (see Senate Policy 83-80 (http://senate.psu.edu/policies-and-rules-for-undergraduate-students/82-00-and-83-00-degree-requirements/#83-80)). For more information, check the Suggested Academic Plan for your intended program.