Biology

The Biology concentration invites students to study, in depth and in breadth, the science of life and living matter. Whether pursuing the Bachelor of Arts (A.B.) or Science (Sc.B.) in biology, students can expect to learn broadly in the discipline through a selection of courses in three areas: cell and molecular biology, structure and function, and organismal biology. In addition, students pursuing the Sc.B. complete a thematic track through which they gain an in-depth understanding of a particular subfield (such as, Immunopathology; Ecology and Evolutionary Biology; Physiology/Biotechnology; Cell and Molecular Biology; Physical Sciences. The concentration also emphasizes practical skills and experimental design. Concentrators are required to take at least 3 courses with a laboratory or fieldwork component. Within all of these requirements, students have a high degree of flexibility and choice. Broad research opportunities are also available across several departments within the basic sciences as well.

Standard program for the A.B. Biology

The concentration program for the A.B. in Biology consists of four prerequisite courses in math, chemistry, and a statistics course as well as thirteen courses in biological sciences, including at least one course in each of the following three areas: Area 1: Cell/Molecular Biology, Area 2: Structure/Function, and Area 3: Organismal Biology.

Prerequisites:

- CHEM 0330 Equilibrium, Rate, and Structure
- CHEM 0350 Organic Chemistry
- MATH 0090 Introductory Calculus, Part I (or placement, MATH 0050/MATH 0060 may be substituted for MATH 0090.)

One of the following:

- MATH 0100 Introductory Calculus, Part II (or placement)
- MATH 0170 Advanced Placement Calculus (or equivalent placement)

Or a statistics course, to be approved by the concentration advisor.

Ten Core Courses:

- BIOL 0200 The Foundation of Living Systems (Required course; AP credit or similar IB or A-levels accepted, placement test available.)

The Area requirement must be fulfilled by taking at least one course in each of these groups: ¹

Area 1 (Cell/Molecular Biology)

- BIOL 0280 Biochemistry
- BIOL 0470 Genetics
- BIOL 0500 Cell and Molecular Biology
- BIOL 0510 Introductory Microbiology
- BIOL 0530 Principles of Immunology
- BIOL 0810 Applied Cell and Molecular Biology
- BIOL 1050 Biology of the Eukaryotic Cell
- BIOL 1310 Developmental Biology
- BIOL 1515 Conservation in the Genomics Age
- NEUR 1020 Principles of Neurobiology

Area 2 (Structure/Function)

- BIOL 0400 Biological Design: Structural Architecture of Organisms
- BIOL 0410 Invertebrate Zoology
- BIOL 0440 Inquiry in Plant Biology: Analysis of Plant Growth, Reproduction and Adaptive Responses
- BIOL 0800 Principles of Physiology

Area 3 (Organismal Biology)

- BIOL 1120 Biomaterials
- BIOL 1310 Developmental Biology
- BIOL 1330 Biology of Reproduction
- BIOL 1800 Animal Locomotion
- BIOL 1880 Comparative Biology of the Vertebrates
- NEUR 0010 The Brain: An Introduction to Neuroscience

Area 4

- BIOL 1210 Diversity of Life
- BIOL 0350 The Fossil Record: Life through Time on Earth
- BIOL 0380 The Ecology and Evolution of Infectious Disease
- BIOL 0410 Invertebrate Zoology
- BIOL 0420 Principles of Ecology
- BIOL 0430 The Evolution of Plant Diversity
- BIOL 0480 Evolutionary Biology
- BIOL 1480 Terrestrial Biogeochemistry and the Functioning of Ecosystems
- BIOL 1515 Conservation in the Genomics Age
- BIOL 1800 Animal Locomotion
- BIOL 1880 Comparative Biology of the Vertebrates
- ENVS 0490 Environmental Science in a Changing World

Six additional courses chosen from BIOL and/or NEUR offerings for concentrators. The Core may include up to two related sciences, with advisor approval. The Core must also include a Senior Capstone.

SENIOR CAPSTONE: "Only applies to students who have declared in Fall 2019 or later." To be fulfilled via ONE of the following:

1. One of the following approved courses: BIOL 1100, 1250, 1515, 1555, 1565, 1575, 1600, 1820, 1970.
2. One semester of independent research/independent study (BIOL 1950 or BIOL 1960).
3. A senior Honors thesis in Biology; Students can register for BIOL 1950 or BIOL 1960 or both.

Please visit the BUE webpage for more information.

Total Credits 10

¹ AP scores of 4 or 5 may substitute Math courses.
² Biology courses for concentration credit include those numbered between 0100 - 2999. Exclusions: BIOL 1920 series courses can only be used as related sciences and do not fulfill advanced course requirements.
³ At least two biology and/or neuroscience courses must be at the advanced level (between 1000-2999). Senior Capstone can be used towards one advanced requirement. At least three of the Biology and/or Neuroscience courses must include laboratory or fieldwork. BIOL 1950/BIOL 1960, (Directed Research) may be included, but is not required. If a lab project, this can count for one of the three lab course requirements, and one advanced course.
⁴ No substitutions per above Area list. If a course is listed in more than one area, it may be used to fulfill one area only; the other area must be fulfilled by a different course.

Honors: Honors in biology requires a thesis and presentation based on a research project (conducted via BIOL 1950/BIOL 1960), and quality grades in the concentration. Guidelines and information on faculty research are available in the Office of Biology Undergraduate Education or found at http://www.brown.edu/academics/biology/undergraduate-education.

Standard Program for the Sc.B. Biology

The concentration program for the Sc.B. in Biology consists of seven prerequisite courses in math, chemistry, and physics as well as thirteen
to fourteen courses in biological sciences, including courses in each of the following three areas: Area 1: Cell/Molecular Biology; Area 2: Structure/Function; and Area 3: Organismal Biology, and the three-course Track. The biological sciences requirement also requires research (BIOL 1950/BIOL 1960), which should reflect the advanced cluster.

Students pursuing a ScB in Biology have the option to substitute a course for CHEM 0360 (Organic Chemistry) in their background core. For students pursuing the Marine Biology track, an upper level course in Geological Sciences may replace CHEM 0360. For students pursuing all other tracks, BIOL 0280 (Introductory Biochemistry) may serve as the replacement course. Please note that approval from the concentration advisor is required for these background course substitutions. If the student has already declared, then a revised concentration plan must be submitted and approved via the ASK system. If BIOL 0280 is used as a substitute for CHEM 0360, it cannot be counted as a core course, as a laboratory course, or as an Area 1 course. Students planning to apply to medical or graduate school should seek additional advising (such as from the Health Careers Office) in crafting their course plan.

Prerequisites: 1

<table>
<thead>
<tr>
<th>Course</th>
<th>Description</th>
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<tbody>
<tr>
<td>BIOL 0200</td>
<td>The Foundation of Living Systems (or placement)</td>
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One of the following:

<table>
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<tr>
<td>BIOL 0210</td>
<td>The Structure of the Cell (or equivalent)</td>
</tr>
<tr>
<td>BIOL 0220</td>
<td>Advanced Placement Calculus (or equivalent placement)</td>
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Or a statistics course, to be approved by the concentration advisor.

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<tr>
<td>CHEM 0330</td>
<td>Organic Chemistry</td>
</tr>
<tr>
<td>CHEM 0350</td>
<td>Organic Chemistry</td>
</tr>
<tr>
<td>CHEM 0360</td>
<td>Organic Chemistry</td>
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<tr>
<td>PHYS 0030</td>
<td>Basic Physics A (or equivalent. PHYS 0050 or ENGR 0030 may be substituted for PHYS 0030.)</td>
</tr>
<tr>
<td>PHYS 0040</td>
<td>Basic Physics B (or equivalent. PHYS 0060 or ENGR 0040 may be substituted for PHYS 0040.)</td>
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Core Courses: 2,3,4

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<td>BIOL 0200</td>
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The Area requirement must be fulfilled by taking at least one course in each of these groups:

**Area 1 (Cell/Molecular Biology)**

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<tr>
<td>BIOL 0280</td>
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<tr>
<td>BIOL 0470</td>
<td>Genetics</td>
</tr>
<tr>
<td>BIOL 0500</td>
<td>Cell and Molecular Biology</td>
</tr>
<tr>
<td>BIOL 0510</td>
<td>Introductory Microbiology</td>
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<tr>
<td>BIOL 0530</td>
<td>Principles of Immunology</td>
</tr>
<tr>
<td>BIOL 0810</td>
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<tr>
<td>BIOL 1050</td>
<td>Biology of the Eukaryotic Cell</td>
</tr>
<tr>
<td>BIOL 1310</td>
<td>Developmental Biology</td>
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<tr>
<td>BIOL 1515</td>
<td>Conservation in the Genomics Age</td>
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<td>NEUR 1020</td>
<td>Principles of Neurobiology</td>
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**Area 2 (Structure/Function)**

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<tr>
<td>BIOL 0400</td>
<td>Biological Design: Structural Architecture of Organisms</td>
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<td>BIOL 0410</td>
<td>Invertebrate Zoology</td>
</tr>
<tr>
<td>BIOL 0440</td>
<td>Inquiry in Plant Biology: Analysis of Plant Growth, Reproduction and Adaptive Responses</td>
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<tr>
<td>BIOL 0800</td>
<td>Principles of Physiology</td>
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**Area 3 (Organismal Biology)**

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<tbody>
<tr>
<td>BIOL 0140</td>
<td>Conservation Medicine</td>
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<tr>
<td>BIOL 0210</td>
<td>Diversity of Life</td>
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<td>BIOL 0350</td>
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<tr>
<td>ENV 0490</td>
<td>Environmental Science in a Changing World</td>
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</tbody>
</table>

Six additional courses chosen from BIOL and/or NEUR offerings for concentrators. The Core may include up to two related sciences, with advisor approval. The Core must also include research. 5

**RESEARCH:** 5

Typically, two courses in Core are advanced level research (BIOL 1950,1960).

**TRACK:**

The Track consists of three additional biological sciences courses (not including BIOL 1950/1960 research) that form a Track. Tracks include: Immuno/Pathobiology; Ecology and Evolutionary Biology; Physiology and Biotechnology; Neurobiology: Physical Sciences; Marine Biology; Cell and Molecular Biology. At least two track courses, and preferably all three, must be above 1000-level. Track courses should form a cohesive grouping approved by an advisor and/or Associate Dean of Biology, Katherine Smith.

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### Total Credits

1

1 AP scores of 4 or 5 may substitute Math courses.

2 Biology courses for concentration credit include those numbered between 0100-2999. Exclusions: BIOL 1920 series courses can only be used as related sciences and do not fulfill advanced course requirements.

3 At least two biology and/or neuroscience courses must be at the advanced level (between 1000-2999). At least three of the biology and/or neuroscience courses must include laboratory or fieldwork. BIOL 1950/ BIOL 1960 can count for one of the three lab course requirements and one advanced course.

4 No substitutions per above Area list. If a course is listed in more than one area, it may be used to fulfill one area only; the other area must be fulfilled by a different course.

5 If substantial research is carried out away from Brown, it must be approved by an appropriate Brown BioMed faculty member but does not carry course credit toward the Core program.

**HONORS:** Honors in biology requires a thesis and presentation based on a research project (usually conducted via BIOL 1950/BIOL 1960), and quality grades in the concentration. Guidelines and information on faculty
research are available in the Office of Biology Undergraduate Education or at http://www.brown.edu/academics/biology/undergraduate-education/.

Stipulations for Biology Programs:

1. For double concentrations, no more than two courses may overlap (i.e., be used to meet requirements of both programs).
2. No more than two semesters of directed research may be used as concentration credits. Each does count as an individual core towards the program, but only carry one lab credit towards the three required.
3. A limited number of transfer or study abroad courses may be used within the program, subject to approval of advisor, and Associate Dean of Biology, Katherine Smith.
Font Notice

This document should contain certain fonts with restrictive licenses. For this draft, substitutions were made using less legally restrictive fonts.
Specifically:
Helvetica was used instead of Arial.
The editor may contact Leepfrog for a draft with the correct fonts in place.