Neuroscience - Cellular & Molecular, B.S.

The Bachelor of Science degree in Neuroscience - Cellular & Molecular is designed to provide rigorous preparation in scientific knowledge at the molecular and cellular level to those students interested in pursuing advanced studies and professional development in neuroscience, medicine or a related field in life sciences. In addition to neuroscience, graduates in the major will be well prepared for graduate or professional studies in cell or molecular biology, biochemistry, biophysics, biomedical sciences, medicine, pharmacy, dentistry, and many allied health fields. Neuroscience graduates who do not pursue graduate studies will be prepared to accept technical positions in industry (pharmaceutical, biotech) or government and university laboratories. Graduates will be ready to conduct research on a range of neuroscience and related topics at the level of cells or molecules, including nervous system function, development, disease or injury.

Undergraduate Contact Information:
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Bachelor of Science

Summary of Requirements for the Degree

1. University Requirements (123 total s.h.)
   - MATH 0701 (4 s.h.) and/or ENG 0701 (4 s.h.), if required by placement testing.
   - All Temple students must take a minimum of two writing-intensive courses at Temple as part of their major. Following is a list of courses that can be used to satisfy the writing-intensive requirement: BIOL 2296 and BIOL 3096.
   - Students must complete the General Education (GenEd) requirements.
     - See the General Education (http://bulletin.temple.edu/undergraduate/general-education) section of the Undergraduate Bulletin for the GenEd curriculum.
     - Students who complete CST majors typically receive a waiver for 2 Science & Technology (GS) and 1 Quantitative Literacy (GQ) GenEd courses.
   - Students must satisfy general Temple University residency requirements (http://bulletin.temple.edu/undergraduate/academic-policies/academic-residency-requirements).

2. College Requirements
   - 45 Upper Level (2000+) credits within the College of Science & Technology (CST) or the College of Liberal Arts (CLA).
   - 90 credits within the College of Science & Technology (CST) or the College of Liberal Arts (CLA).

3. Major Requirements for Bachelor of Science (75-82 s.h.)
   At least 9 courses required for the major must be completed at Temple. At least 4 Biology courses must be completed at Temple.

   **Biology**
   - BIOL 1111 or BIOL 1911: Introduction to Biology I or Honors Introduction to Biology I
   - BIOL 2112 or BIOL 2912: Introduction to Biology II or Honors Introduction to Biology II
   - BIOL 2296: Genetics (S)
   - BIOL 3096: Cell Structure and Function (F)
   - BIOL 3352: Systems Neuroscience
   - BIOL 3358: Cellular and Molecular Neuroscience (S)

   **Chemistry**
   - CHEM 1031: General Chemistry I
   - CHEM 1033: and General Chemistry Laboratory I
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>CHEM 1951 &amp; CHEM 1953</td>
<td>Honors General Chemical Science I and Honors Chemical Science Laboratory I</td>
<td></td>
</tr>
<tr>
<td>CHEM 1032 &amp; CHEM 1034</td>
<td>General Chemistry II and General Chemistry Laboratory II</td>
<td>4</td>
</tr>
<tr>
<td>or CHEM 1952 &amp; CHEM 1954</td>
<td>Honors General Chemical Science II and Honors Chemical Science Laboratory II</td>
<td></td>
</tr>
<tr>
<td>CHEM 2201 &amp; CHEM 2203</td>
<td>Organic Chemistry I and Organic Chemistry Laboratory I</td>
<td>4</td>
</tr>
<tr>
<td>or CHEM 2211 &amp; CHEM 2213</td>
<td>Organic Chemistry for Majors I and Organic Majors Laboratory I</td>
<td></td>
</tr>
<tr>
<td>or CHEM 2921 &amp; CHEM 2923</td>
<td>Organic Chemistry for Honors I and Organic Honors Laboratory I</td>
<td></td>
</tr>
<tr>
<td>CHEM 2202 &amp; CHEM 2204</td>
<td>Organic Chemistry II and Organic Chemistry Laboratory II</td>
<td>4</td>
</tr>
<tr>
<td>or CHEM 2212 &amp; CHEM 2214</td>
<td>Organic Chemistry for Majors II and Organic Majors Laboratory II</td>
<td></td>
</tr>
<tr>
<td>or CHEM 2922 &amp; CHEM 2924</td>
<td>Organic Chemistry for Honors II and Organic Honors Laboratory II</td>
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**Mathematics**

Select one of the following: 4

- MATH 1041 Calculus I
- MATH 1941 Honors Calculus I

Select one of the following: 4

- MATH 1044 Introduction to Probability and Statistics for the Life Sciences
- MATH 1042 Calculus II
- MATH 1942 Honors Calculus II

**Neuroscience**

Neuroscience electives - select five of the following: 15-20

- BIOL 3232 Behavioral Genetics (F)
- BIOL 3312 Biostatistics (F)
- BIOL 3324 Molecular Biology
- BIOL 3325 Research Techniques in Molecular Biology (S)
- BIOL 3333 Advanced Techniques in Microscopy (S)
- BIOL 3334 Mammalian Physiology (S)
- BIOL 3337 Comparative Biomechanics
- BIOL 3354 Neural Basis of Animal Behavior (F - odd years)
- BIOL 3356 Organization and Development of the Nervous System (F - even years)
- BIOL 3361 Synaptic Neuropharmacology: From Poppies to People
- BIOL 3365 The New Neuroimmunology
- BIOL 4375 General Biochemistry I
- CIS 1166 Mathematical Concepts in Computing I
- or CIS 1966 Honors Mathematical Concepts in Computing I
- NSCI 3087 Techniques in Neuroscience (non-CST course)
- PSY 2501 Foundations of Behavioral Neuroscience (non-CST course)
- PSY 2502 Foundations of Cognitive Neuroscience (non-CST course)

**Neuroscience Research/Independent Study courses** 3

Take the following for a total of 6-8 credits:

- BIOL 4591 Research in Neuroscience (or Neuroscience Independent Study)
- BIOL 4591 Research in Neuroscience (or Neuroscience Independent Study)

**Physics**

<table>
<thead>
<tr>
<th>Course Code</th>
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<tbody>
<tr>
<td>PHYS 2021</td>
<td>General Physics I</td>
<td>4</td>
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<tr>
<td>or PHYS 2921</td>
<td>Honors General Physics I</td>
<td></td>
</tr>
<tr>
<td>PHYS 2022</td>
<td>General Physics II</td>
<td>4</td>
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</tbody>
</table>
Three of the five electives must be within the College of Science & Technology.

CIS 1166 or CIS 1966 may be replaced with CIS 1053.

Neuroscience Research/Independent Study courses should be determined in consultation with the Neuroscience faculty advisor. Students are required to have BOTH a B- or above in BIOL 3352 AND a Science GPA of 3.2 to take Neuroscience Research, BIOL 4591. Students are required to have BOTH a B- or above in BIOL 3352 AND a Science GPA of 3.0 to take Independent Study in Neuroscience. The Science GPA is to consist of all Biology courses, Chemistry through Organic Chemistry, Calculus, and Physics.

Note: A grade of C or higher in CHEM 1031 and CHEM 1032 is required to take BIOL 1111 and BIOL 2112. A grade of C or higher in BIOL 1111 and BIOL 2112 is required to take upper-level Biology courses, and a C- or higher is required unless otherwise specified in all other courses for the major, including course prerequisites.

Calculation of Major GPA

Courses listed under the major requirements for the degree will be included in the calculation of the major GPA. Courses that could not apply toward the major as an elective or required course would not be counted in the calculation of the major GPA. This would include BIOL 1011, for example.

A total of up to 3 s.h. of Biology research courses numbered lower than 4000 from the list below may be taken for a letter grade. Any additional credits in research courses in this category can be taken only on a Credit/No Credit (CR/NC) basis. No research courses numbered lower than 4000 may be used for Biology elective credit.

BIOL 2082 Independent Research I (not repeatable) 1 to 4
BIOL 3082 Independent Research II 1 to 4
BIOL 3181 Cooperative Research in Biochemistry 3
BIOL 3281 Cooperative Research in Biochemistry 3
BIOL 3681 Cooperative Studies 2 to 4

Distinction in the Major

Distinction in Neuroscience is awarded based upon the completion of two semesters of BIOL 4591, submission of a paper, a poster presentation, AND maintaining a GPA of 3.2.

Suggested Academic Plan

Bachelor of Science in Neuroscience - Cellular & Molecular

Requirements for New Students starting in the 2017-2018 Academic Year

<table>
<thead>
<tr>
<th>Year 1</th>
<th>Credit Hours</th>
</tr>
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<tbody>
<tr>
<td><strong>Fall</strong></td>
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<tr>
<td>Select one of the following:</td>
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<tr>
<td>CHEM 1031</td>
<td>General Chemistry I</td>
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<td>&amp; CHEM 1033</td>
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<tr>
<td>&amp; CHEM 1953</td>
<td></td>
</tr>
<tr>
<td>MATH 1041 or 1941</td>
<td>Calculus I</td>
</tr>
<tr>
<td>General Education/Elective Credits</td>
<td>7</td>
</tr>
<tr>
<td>Term Credit Hours</td>
<td>15</td>
</tr>
</tbody>
</table>

| **Spring** | |  |
| BIOL 1111 or 1911 | Introduction to Biology I | 4 |
| Select one of the following: | 4 |
| CHEM 1032 | General Chemistry II |
| & CHEM 1034 | |
| CHEM 1952 | Honors General Chemical Science II (S) |
| & CHEM 1954 | |
Select one of the following:  
- MATH 1044: Introduction to Probability and Statistics for the Life Sciences  
- MATH 1042: Calculus II  
- MATH 1942: Honors Calculus II

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<td>Term Credit Hours</td>
<td>15</td>
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**Year 2**

**Fall**

- BIOL 2112 or 2912: Introduction to Biology II  
- Select one of the following:  
  - CHEM 2201: Organic Chemistry I  
  - CHEM 2203  
  - CHEM 2211: Organic Chemistry for Majors I  
  - CHEM 2213  
  - CHEM 2921: Organic Chemistry for Honors I (F)  
  - CHEM 2923

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<thead>
<tr>
<th>General Education/Elective Credits</th>
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</thead>
<tbody>
<tr>
<td>Term Credit Hours</td>
<td>16</td>
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</tbody>
</table>

**Spring**

- BIOL 2296: Genetics [WI] (S)  
- BIOL 3352: Systems Neuroscience  
- Select one of the following:  
  - CHEM 2202: Organic Chemistry II  
  - CHEM 2204  
  - CHEM 2212: Organic Chemistry for Majors II  
  - CHEM 2214  
  - CHEM 2922: Organic Chemistry for Honors II (S)  
  - CHEM 2924

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<tr>
<td>Term Credit Hours</td>
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**Year 3**

**Fall**

- BIOL 3096: Cell Structure and Function [WI] (F)  
- Neuroscience Elective  
- PHYS 2021 or 2921: General Physics I

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<td>Term Credit Hours</td>
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**Spring**

- BIOL 3358: Cellular and Molecular Neuroscience (S)  
- Neuroscience Elective  
- PHYS 2022 or 2922: General Physics II

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<th>General Education/Elective Credits</th>
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<tbody>
<tr>
<td>Term Credit Hours</td>
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**Year 4**

**Fall**

- BIOL 4591: Research in Neuroscience (or Neuroscience Independent Study)  
- Neuroscience Elective  
- Neuroscience Elective  
- Neuroscience Elective

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<tbody>
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<td>Term Credit Hours</td>
<td>16</td>
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**Spring**

- BIOL 4591: Research in Neuroscience (or Neuroscience Independent Study)  
- Neuroscience Elective

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<tbody>
<tr>
<td>Term Credit Hours</td>
<td>16</td>
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</tbody>
</table>
General Education/Elective Credits 10-8

Term Credit Hours 16

Total Credit Hours: 123

(F) - Fall only course

(S) - Spring only course

1 Select from the Neuroscience Electives list under Requirements.
2 Neuroscience Research/Independent Study courses should be determined in consultation with the neuroscience faculty advisor. Students are required to have BOTH a B- or above in BIOL 3352 AND a Science GPA of 3.2 to take Neuroscience Research, BIOL 4591. Students are required to have BOTH a B- or above in BIOL 3352 AND a Science GPA of 3.0 to take Independent Study in Neuroscience. The Science GPA is to consist of all Biology courses, Chemistry through Organic Chemistry, Calculus, and Physics.