

# Biochemistry, B.S.

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The Bachelor of Science degree in Biochemistry prepares students for excellence in graduate or medical school, and employment in the chemical, biotechnological, or pharmaceutical industries. Students learn a wide array of topics in Biology, Chemistry, Mathematics, and Physics. In upper division studies, Biochemistry majors learn to apply biochemical principles to real-life situations via problem-based approaches in their courses. Laboratory courses give students the tools they will need as biochemists to pursue research. Accomplished majors are encouraged to pursue independent research with a professor, and to present their work internally and at national meetings.

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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	Genetics (S)	4
BIOL 3096	Cell Structure and Function (F)	4
CHEM 4196	Techniques of Chemical Measurement II	5

- 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 (78-81 s.h.)

At least 10 courses required for the major must be completed at Temple. At least 4 Biology and 4 Chemistry courses must be completed at Temple.

**Chemistry**

Select one of the following: 4

CHEM 1031                      General Chemistry I  
& CHEM 1033                      and General Chemistry Laboratory I

CHEM 1951                      Honors General Chemical Science I  
& CHEM 1953                      and Honors Chemical Science Laboratory I (F)

Select one of the following: 4

CHEM 1032                      General Chemistry II  
& CHEM 1034                      and General Chemistry Laboratory II

CHEM 1952                      Honors General Chemical Science II  
& CHEM 1954                      and Honors Chemical Science Laboratory II (S)

Select one of the following: 4

CHEM 2201                      Organic Chemistry I  
& CHEM 2203                      and Organic Chemistry Laboratory I

CHEM 2211                      Organic Chemistry for Majors I  
& CHEM 2213                      and Organic Majors Laboratory I (F)

CHEM 2921                      Organic Chemistry for Honors I  
& CHEM 2923                      and Organic Honors Laboratory I (F)

Select one of the following: 4

CHEM 2202                      Organic Chemistry II  
& CHEM 2204                      and Organic Chemistry Laboratory II

CHEM 2212                      Organic Chemistry for Majors II  
& CHEM 2214                      and Organic Majors Laboratory II (S)

CHEM 2922                      Organic Chemistry for Honors II  
& CHEM 2924                      and Organic Honors Laboratory II (S)

CHEM 3103                      Techniques of Chemical Measurement I                      4  
& CHEM 3105                      and Introduction to Chemical Research Techniques

CHEM 3301                      Physical Chemistry Lecture I                      3  
or CHEM 3405                      Physical Chemistry of Biomolecules

CHEM 4401                      Biochemistry I                      3

**Biology**

BIOL 1111                      Introduction to Biology I                      4  
or BIOL 1911                      Honors Introduction to Biology I

BIOL 2112                      Introduction to Biology II                      4  
or BIOL 2912                      Honors Introduction to Biology II

BIOL 2296                      Genetics (S)                      4

BIOL 3096                      Cell Structure and Function (F)                      4

BIOL 3324                      Molecular Biology (F)                      3

BIOL 4344                      Research Techniques in Biochemistry (S)                      4

BIOL 4376                      General Biochemistry II (F)                      3

**Biochemistry Electives**

Select two of the following: <sup>1</sup> 6-9

BIOL 3201                      Human Genetics (F)

BIOL 3265                      Developmental Biology (F)

BIOL 3301                      Advanced Cell Biology (Not offered every year)

BIOL 3317                      General Microbiology (S)

BIOL 3325                      Research Techniques in Molecular Biology (S)

BIOL 3327                      Immunology (S)

BIOL 3328                      Virology (F)

BIOL 3334                      Mammalian Physiology (S)

BIOL 3352                      Systems Neuroscience

BIOL 3363                      Mammalian Development (Not offered every year)

BIOL 3367	Endocrinology (F)	
BIOL 3368	Biology of Cancer (S)	
BIOL 3371	Cell Proliferation (S)	
BIOL 3374	Physical Biochemistry (S)	
BIOL 3380	Contemporary Biology	
CHEM 3001	Inorganic Chemistry	
CHEM 3302	Physical Chemistry Lecture II	
CHEM 4196 or CHEM 3397 & CHEM 3398	Techniques of Chemical Measurement II Physical Chemistry Laboratory I and Physical Chemistry Laboratory II	
CHEM 4201	Organic Structure and Mechanisms (F)	
<b>Mathematics</b>		
MATH 1041 or MATH 1941	Calculus I Honors Calculus I	4
MATH 1042 or MATH 1942	Calculus II Honors Calculus II	4
MATH 2043 or MATH 2943	Calculus III Honors Calculus III	4
<b>Physics</b>		
Select one of the following:		4
PHYS 1061	Elementary Classical Physics I	
PHYS 1961	Honors Elementary Classical Physics I (F)	
PHYS 2021	General Physics I	
PHYS 2921	Honors General Physics I (F)	
Select one of the following:		4
PHYS 1062	Elementary Classical Physics II	
PHYS 1962	Honors Elementary Classical Physics II (S)	
PHYS 2022	General Physics II	
PHYS 2922	Honors General Physics II (S)	
Total Credit Hours		78-81

(F) - Fall only course

(S) - Spring only course

<sup>1</sup> With approval from the faculty advisor, two semesters of Undergraduate Research (BIOL 4391/BIOL 4491 or CHEM 3881/CHEM 3891/CHEM 4881/CHEM 4891) for a minimum of 6 credits can be used to fulfill one of the Biochemistry electives.

**Note:** A grade of C or higher in CHEM 1031 or its Honors alternate is required to take BIOL 1111. Grades of C or higher in both CHEM 1031 and CHEM 1032 or their Honors alternates are required to take BIOL 2112. Grades of C or higher in BIOL 1111 and BIOL 2112 or their Honors alternates are 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. Most research and Independent Study courses are not available for major credit, such as:

BIOL 3091	Research Methods	3
BIOL 3681	Cooperative Studies	2 to 4
BIOL 4291	Extrdepartmental Research	1 to 4
BIOL 4483	Accelerated Research in Biochemistry	3
BIOL 4491	Research in Biochemistry	3
BIOL 4591	Research in Neuroscience	1 to 4

## 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.

## Distinction in Major

To graduate with Distinction in Major, students are required to achieve a 3.33 GPA or higher in all the Biology and Chemistry courses in their major.

## Suggested Academic Plan

All prospective majors should schedule an appointment with one of the departmental advisors (names of current Faculty Advisors are available in the About section) to plan a program of study. The recommended order of courses for the major is listed below; a different order is acceptable as long as the student adheres to prerequisite requirements.

## Bachelor of Science in Biochemistry

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

Year 1		Credit Hours
<b>Fall</b>		
Select one of the following:		4
CHEM 1031 & CHEM 1033	General Chemistry I	
CHEM 1951 & CHEM 1953	Honors General Chemical Science I (F)	
MATH 1041 or 1941	Calculus I	4
General Education/Elective Credits		7
Term Credit Hours		15
<b>Spring</b>		
BIOL 1111 or 1911	Introduction to Biology I	4
Select one of the following:		4
CHEM 1032 & CHEM 1034	General Chemistry II	
CHEM 1952 & CHEM 1954	Honors General Chemical Science II (S)	
MATH 1042 or 1942	Calculus II	4
General Education/Elective Credits		3
Term Credit Hours		15
<b>Year 2</b>		
<b>Fall</b>		
BIOL 2112 or 2912	Introduction to Biology II	4
Select one of the following:		4
CHEM 2201 & CHEM 2203	Organic Chemistry I	
CHEM 2211 & CHEM 2213	Organic Chemistry for Majors I (F)	
CHEM 2921 & CHEM 2923	Organic Chemistry for Honors I (F)	
Select one of the following:		4
PHYS 1061	Elementary Classical Physics I	
PHYS 1961	Honors Elementary Classical Physics I (F)	
PHYS 2021	General Physics I	
PHYS 2921	Honors General Physics I (F)	
General Education/Elective Credits		3
Term Credit Hours		15
<b>Spring</b>		
BIOL 2296	Genetics [WI] (S)	4
Select one of the following:		4
CHEM 2202 & CHEM 2204	Organic Chemistry II	

CHEM 2212 & CHEM 2214	Organic Chemistry for Majors II (S)	
CHEM 2922 & CHEM 2924	Organic Chemistry for Honors II (S)	
Select one of the following:		4
PHYS 1062	Elementary Classical Physics II	
PHYS 1962	Honors Elementary Classical Physics II (S)	
PHYS 2022	General Physics II	
PHYS 2922	Honors General Physics II (S)	
General Education/Elective Credits		3
Term Credit Hours		15
<b>Year 3</b>		
<b>Fall</b>		
BIOL 3096	Cell Structure and Function [WI] (F)	4
CHEM 3103	Techniques of Chemical Measurement I <sup>1</sup>	3
CHEM 3105	Introduction to Chemical Research Techniques <sup>1</sup>	1
MATH 2043 or 2943	Calculus III	4
General Education/Elective Credits		3
Term Credit Hours		15
<b>Spring</b>		
CHEM 4401	Biochemistry I	3
Select one of the following:		3
CHEM 3301	Physical Chemistry Lecture I	
CHEM 3405	Physical Chemistry of Biomolecules <sup>2</sup>	
General Education/Elective Credits		10
Term Credit Hours		16
<b>Year 4</b>		
<b>Fall</b>		
BIOL 3324	Molecular Biology (F)	3
BIOL 4376	General Biochemistry II (F)	3
Biochemistry Elective <sup>2</sup>		3-4
General Education/Elective Credits		7-6
Term Credit Hours		16
<b>Spring</b>		
BIOL 4344	Research Techniques in Biochemistry (S)	4
Biochemistry Elective <sup>2</sup>		3-5
General Education/Elective Credits		9-7
Term Credit Hours		16
Total Credit Hours:		123

<sup>1</sup> It is strongly encouraged that CHEM 3103/CHEM 3105 be taken prior to any laboratory courses numbered above CHEM 3105.

<sup>2</sup> Biochemistry majors taking CHEM 3405 instead of CHEM 3301 cannot also receive Biochemistry elective credit for it. Biochemistry majors who want to take CHEM 4196 or the combination of CHEM 3397 & CHEM 3398 as a Biochemistry elective **must** take the CHEM 3301-CHEM 3302 sequence as CHEM 3405 does not serve as a prerequisite for these courses or any other course that has CHEM 3301 as a prerequisite or co-requisite.

(F) - Fall only course

(S) - Spring only course

## Biochemistry Electives

Students are required to take two advanced biochemistry electives from the following list:

Select two of the following:		6-8
BIOL 3201	Human Genetics (F)	

BIOL 3265	Developmental Biology (F)
BIOL 3301	Advanced Cell Biology (S)
BIOL 3317	General Microbiology (S)
BIOL 3325	Research Techniques in Molecular Biology (S)
BIOL 3327	Immunology (S)
BIOL 3328	Virology (F)
BIOL 3334	Mammalian Physiology (S)
BIOL 3352	Systems Neuroscience
BIOL 3363	Mammalian Development
BIOL 3367	Endocrinology (F)
BIOL 3368	Biology of Cancer (S)
BIOL 3371	Cell Proliferation (S)
BIOL 3374	Physical Biochemistry (S)
BIOL 3380	Contemporary Biology (F)
CHEM 3001	Inorganic Chemistry (F)
CHEM 3302	Physical Chemistry Lecture II
CHEM 4196	Techniques of Chemical Measurement II
or CHEM 3397 & CHEM 3398	Physical Chemistry Laboratory I and Physical Chemistry Laboratory II
CHEM 4201	Organic Structure and Mechanisms (F)

**Notes:**

1. Other courses may be acceptable with the permission of one of the biochemistry faculty advisors.
2. With approval from the faculty advisor, two semesters of Undergraduate Research (BIOL 4391/BIOL 4491 or CHEM 3881/CHEM 3891/CHEM 4881/CHEM 4891) for a minimum of 6 credits can be used to fulfill one of the Biochemistry electives.