

Biochemistry, B.S.

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: ¹ 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) | |
| Mathematics | | |
| 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 |
| Physics | | |
| 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

¹ 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 |
|------------------------------------|---|--------------|
| Fall | | |
| 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 |
| Spring | | |
| 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 |
| Year 2 | | |
| Fall | | |
| 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 |
| Spring | | |
| 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 |
| Year 3 | | |
| Fall | | |
| BIOL 3096 | Cell Structure and Function [WI] (F) | 4 |
| CHEM 3103 | Techniques of Chemical Measurement I ¹ | 3 |
| CHEM 3105 | Introduction to Chemical Research Techniques ¹ | 1 |
| MATH 2043 or 2943 | Calculus III | 4 |
| General Education/Elective Credits | | 3 |
| Term Credit Hours | | 15 |
| Spring | | |
| CHEM 4401 | Biochemistry I | 3 |
| Select one of the following: | | 3 |
| CHEM 3301 | Physical Chemistry Lecture I | |
| CHEM 3405 | Physical Chemistry of Biomolecules ² | |
| General Education/Elective Credits | | 10 |
| Term Credit Hours | | 16 |
| Year 4 | | |
| Fall | | |
| BIOL 3324 | Molecular Biology (F) | 3 |
| BIOL 4376 | General Biochemistry II (F) | 3 |
| Biochemistry Elective ² | | 3-4 |
| General Education/Elective Credits | | 7-6 |
| Term Credit Hours | | 16 |
| Spring | | |
| BIOL 4344 | Research Techniques in Biochemistry (S) | 4 |
| Biochemistry Elective ² | | 3-5 |
| General Education/Elective Credits | | 9-7 |
| Term Credit Hours | | 16 |
| Total Credit Hours: | | 123 |

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

² 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.