

# BACHELOR OF SCIENCE IN BIOCHEMISTRY

The Bachelor of Science degree in Biochemistry is recommended for those students interested in integrating the subjects of biology and chemistry. The cross-disciplinary nature of the degree provides students with a good foundation for careers in research and development in the private sector and in academia. Many will continue their education in graduate schools or in health related fields such as medicine, dentistry, or pharmacy.

For further information, please see the Chemical Sciences (<https://catalog.ysu.edu/undergraduate/colleges-programs/college-science-technology-engineering-mathematics/department-chemistry/#text>) overview page.

COURSE	TITLE	S.H.
<b>FIRST YEAR REQUIREMENT - STUDENT SUCCESS</b>		
YSU 1500	Success Seminar	1-2
or YSU 1500S	Youngstown State University Success Seminar	
or HONR 1500	Intro to Honors	
<b>General Education Requirements</b>		
ENGL 1550	Writing 1	3-4
or ENGL 1549	Writing 1 with Support	
ENGL 1551	Writing 2	3
Mathematics requirement (met with MATH in major)		
Arts and Humanities (6 s.h.)		
Natural Sciences (2 courses, 1 with lab) <small>This requirement met with CHEM 1515, BIOL 2601 or PHYS 2610 in the major</small>		
Social Science (6 s.h.)		
<b>General Education Electives (9 s.h.)</b>		
CMST 1545	Communication Foundations	3
Any 2 Gen Ed Courses (6 s.h.)		
<b>The following CHEM core courses are required:</b>		
CHEM 1515	General Chemistry 1	3
CHEM 1515L	General Chemistry 1 Laboratory	1
CHEM 1515R	Recitation for General Chemistry 1	1
CHEM 1516	General Chemistry 2	3
CHEM 1516L	General Chemistry 2 Laboratory	1
CHEM 1516R	Recitation for General Chemistry 2	1
CHEM 2604 & 2604L	Quantitative Analysis and Quantitative Analysis Laboratory	5
CHEM 3719	Organic Chemistry 1	3
CHEM 3719L	Organic Chemistry 1 Laboratory	1
CHEM 3719R	Organic Chemistry Recitation 1	1
CHEM 3720	Organic Chemistry 2	3
CHEM 3720L	Organic Chemistry 2 Laboratory	1
CHEM 3720R	Organic Chemistry Recitation 2	1
CHEM 3739	Physical Chemistry 1	3
CHEM 3739L	Physical Chemistry 1 Laboratory	1
CHEM 3785	Biochemistry 1	3
CHEM 3785L	Biochemistry Laboratory	1
CHEM 3786	Biochemistry 2	3
CHEM 4850	Chemistry Research	1
CHEM 4851	Chemistry Research Project	2
CHEM 5876	Enzyme Analysis	2
<b>Select 10 s.h. in upper-level CHEM electives from the list below. At least one elective must be a laboratory course or include a laboratory component:</b>		<b>10</b>

CHEM 3729	Inorganic Chemistry	
CHEM 3764	Chemical Toxicology	
CHEM 4851	Chemistry Research Project	
CHEM 4891	Special Topics	
CHEM 5804 & 5804L	Chemical Instrumentation and Chemical Instrumentation Laboratory	
CHEM 5821	Intermediate Organic Chemistry	
CHEM 5822 & 5822L	Advanced Organic Laboratory and Advanced Organic Laboratory	
CHEM 5832 & 5832L	Solid State Structural Methods and Solid State Structural Methods Laboratory	

## The following BIOL core courses are required (14 s.h.):

BIOL 2601	General Biology 1: Molecules and Cells	3
BIOL 2601L	General Biology I: Molecules and Cells Laboratory	1
BIOL 3702	Microbiology	3
BIOL 3702L	Microbiology Laboratory	1
BIOL 3711	Cell Biology: Fine Structure	3
BIOL 3721	Genetics	3

**At least 3 s.h. in upper-level BIOL courses required from the list below; 5 s.h. recommended if needed to attain 120 s.h. required for graduation.**

BIOL 4800 & 4800L	Bioinformatics and Bioinformatics Laboratory	
BIOL 4801 & 4801L	Environmental Microbiology and Environmental Microbiology Laboratory	
BIOL 4829	Microbial Physiology	
BIOL 4890	Molecular Genetics	
BIOL 4890L	Molecular Genetics Laboratory	
BIOL 5840	Advanced Microbiology	

## The following support courses are required (22 s.h.):

MATH 1571	Calculus 1	4
MATH 1572	Calculus 2	4
STAT 3717	Statistical Methods	4
or STAT 3743	Probability and Statistics	
PHYS 2610	General Physics 1	4
PHYS 2610L	General Physics Laboratory 1	1
PHYS 2611	General Physics 2	4
PHYS 2611L	General Physics laboratory 2	1

**Total Semester Hours 120-122**

## Year 1

Fall		S.H.
YSU 1500	Success Seminar	1-2
or YSU 1500S	or Youngstown State University Success Seminar	
or HONR 1500	or Intro to Honors	
CHEM 1515	General Chemistry 1	3
CHEM 1515L	General Chemistry 1 Laboratory	1
CHEM 1515R	Recitation for General Chemistry 1	1
MATH 1571	Calculus 1	4
ENGL 1550	Writing 1	3-4
or ENGL 1549	or Writing 1 with Support	

**Semester Hours 13-15**

## Spring

CHEM 1516	General Chemistry 2	3
CHEM 1516L	General Chemistry 2 Laboratory	1
CHEM 1516R	Recitation for General Chemistry 2	1
MATH 1572	Calculus 2	4
ENGL 1551	Writing 2	3

BIOL 2601	General Biology 1: Molecules and Cells	3
BIOL 2601L	General Biology I: Molecules and Cells Laboratory	1
<b>Semester Hours</b>		<b>16</b>

**Year 2****Fall**

CHEM 3719	Organic Chemistry 1	3
CHEM 3719L	Organic Chemistry 1 Laboratory	1
CHEM 3719R	Organic Chemistry Recitation 1	1
CHEM 2604 & 2604L	Quantitative Analysis and Quantitative Analysis Laboratory	5
PHYS 2610	General Physics 1	4
PHYS 2610L	General Physics Laboratory 1	1
<b>Semester Hours</b>		<b>15</b>

**Spring**

CHEM 3720	Organic Chemistry 2	3
CHEM 3720L	Organic Chemistry 2 Laboratory	1
CHEM 3720R	Organic Chemistry Recitation 2	1
PHYS 2611	General Physics 2	4
PHYS 2611L	General Physics laboratory 2	1
STAT 3717 or STAT 3743	Statistical Methods or Probability and Statistics	4
<b>Semester Hours</b>		<b>14</b>

**Year 3****Fall**

CHEM 3785	Biochemistry 1	3
CHEM 3785L	Biochemistry Laboratory	1
CHEM 3739	Physical Chemistry 1	3
CHEM 3739L	Physical Chemistry 1 Laboratory	1
BIOL 3721	Genetics	3
GER		6
<b>Semester Hours</b>		<b>17</b>

**Spring**

CHEM 3786	Biochemistry 2	3
CHEM 5876	Enzyme Analysis	2
BIOL 3711	Cell Biology: Fine Structure	3
BIOL 3702	Microbiology	3
BIOL 3702L	Microbiology Laboratory	1
GER		3
<b>Semester Hours</b>		<b>15</b>

**Year 4****Fall**

CHEM 4850	Chemistry Research	1
CHEM Upper-Level Elective		6
CHEM 4851	Chemistry Research Project	2
CMST 1545	Communication Foundations	3
GER		3
<b>Semester Hours</b>		<b>15</b>

**Spring**

CHEM Upper-Level Elective		4
BIOL Upper-Level Elective		5
GER		6
<b>Semester Hours</b>		<b>15</b>

<b>Total Semester Hours</b>	<b>120-122</b>
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## Learning Outcomes

The undergraduate student learning outcomes for the major in biochemistry are as follows:

- Undergraduate students will demonstrate an understanding of the fundamentals of chemistry and biochemistry.
- Undergraduate students will demonstrate independent and critical thinking.
- Undergraduate students will demonstrate an understanding of the fundamentals of modern chemical instrumentation.
- Undergraduate students will be able to interpret experimental data.
- Undergraduate students will effectively communicate their ideas both orally and in writing.