

# CHEMISTRY (BA) - BIOCHEMISTRY TRACK

## Program Overview

The Biochemistry degree track is designed for students interested in going to medical, dental, or pharmacy school. In addition to the general degree requirements, the track requires satisfactory completion of courses in chemistry, mathematics, physics, and biology. This track has fewer required chemistry and math courses and less laboratory time than the B.S. program. These courses provide a broad foundation in the field and permit flexibility for evolving and changing student interests. A broad range of upper-level elective courses exists to expose students to modern fields within the chemical sciences, and to help students broaden their college experience.

## Career Opportunities

Students majoring in chemistry may pursue careers as teachers, entry level chemist, and medicine.

## Program of Study

Click on the Program Map tab to view a term-by-term guide for completing the program requirements.

## Core Requirements

Code	Title	Credit Hours
<b>Area A Essential Skills</b>		
ENGL 1101	English Composition I (minimum grade of C)	3
ENGL 1102	English Composition II (minimum grade of C)	3
MATH 1113	Pre-Calculus	4
Area A Total		9
<b>Area B Institutional Options <sup>1</sup></b>		
B1: Select 3 hours of following courses:		3
COMM 1110	Public Speaking	
Any Foreign Language 1001, 1002, 2001, 2002		
B2: Select 1 hour of the following courses:		1
ITDS 1779	Scholarship Across the Disciplines	
LEAD 1705	Introduction to Servant Leadership	
PERS 1506	Perspectives 1-hour	
PERS 1507	Perspectives 2-hour	
Area B Total		4
<b>Area C Humanities/Fine Arts/Ethics</b>		
Select one of the following humanities courses:		3
ENGL 2111	World Literature I	
ENGL 2112	World Literature II	
ITDS 1145	Comparative Arts <sup>2</sup>	
ITDS 1155	The Western Intellectual Tradition	
ITDS 2125	Historical Perspectives on the Philosophy of Science and Mathematics	
PHIL 2010	Introduction to Philosophy	
Select one of the following fine arts courses:		3
ARTH 1100	Art Appreciation	
ITDS 1145	Comparative Arts <sup>2</sup>	

MUSC 1100	Music Appreciation	
THEA 1100	Theatre Appreciation	
ARTH 2125	Introduction to the History of Art I– Prehistoric through Gothic	
ARTH 2126	Introduction to the History of Art II– Renaissance through Modern	
Area C Total		6
<b>Area D Science/Math/Technology <sup>1</sup></b>		
D1: Take the following science courses with lab		8
CHEM 1211	Principles of Chemistry I	
CHEM 1211L	Principles of Chemistry I Lab	
CHEM 1212	Principles of Chemistry II	
CHEM 1212L	Principles of Chemistry II Lab	
D2: Take the following Course		3
MATH 1131	Calculus with Analytic Geometry I	
Area D Total		11
<b>Area E Social Sciences</b>		
HIST 2111	U. S. History to 1865	3
or HIST 2112	U. S. History since 1865	
POLS 1101	American Government	3
Select one of the following behavioral science courses:		3
ECON 2105	Principles of Macroeconomics	
ECON 2106	Principles of Microeconomics	
PHIL 2030	Moral Philosophy	
PSYC 1101	Introduction to General Psychology	
SOCI 1101	Introduction to Sociology	
Select one of the following world culture courses:		3
ANTH 1105	Cultural Anthropology	
ANTH 1107	Discovering Archaeology	
ANTH 2105	Ancient World Civilizations	
ANTH/ENGL 2136	Language and Culture	
GEOG 1101	World Regional Geography	
HIST 1111	World History to 1500	
HIST 1112	World History since 1500	
INTS 2105	Introduction to International Studies and Cross-Cultural Learning	
ITDS 1156	Understanding Non-Western Cultures	
Area E Total		12
<b>Wellness Requirement</b>		
Select one of the following:		3
KINS 1106	Lifetime Wellness	
or PHED 1206	Concepts of Fitness	
Select one PEDS course ( <a href="https://catalog.columbusstate.edu/course-descriptions/peds/#peds">https://catalog.columbusstate.edu/course-descriptions/peds/#peds</a> )		
Wellness Total		3
<b>Total Credit Hours</b>		<b>45</b>

<sup>1</sup> Note: Students whose majors require 2 lab science courses in Area D complete Area B and Area D with a combined total of 15 credit hours. Any additional hours may be applied to Area F or beyond, depending on the program of study. Students should consult their advisors.

- Area B1, 3 hours;
- Area B2, 1 hour;

- Area D1, 8 hours;
- Area D2, 3 hours.

<sup>2</sup> ITDS 1145 Comparative Arts, though listed under both humanities and fine arts, may be taken only once.

## Major Requirements

Code	Title	Credit Hours
<b>Core Requirements</b>		
Complete the core requirements for this program		45
<b>Area F Courses Related to Major</b>		
Students must have a grade of C or better in the course used to satisfy the major.		
Apply one hour from Area A (MATH 1113)		1
Apply one hour from Area D (MATH 1131)		1
BIOL 1231K	General Biology I	4
BIOL 1232K	General Biology II	4
PHYS 1111	Introductory Physics I	3
PHYS 1112	Introductory Physics II	3
PHYS 1311	Introductory Physics I Lab	1
PHYS 1312	Introductory Physics II Lab	1
Area F Total		18
<b>Area G Program Requirements</b>		
Students must have a grade of C or better in the course used to satisfy the major.		
STAT 1401	Elementary Statistics	3
BIOL 3215K	Cell Biology	4
CHEM 2115	Quantitative Chemical Analysis	3
CHEM 2315	Quantitative Chemical Analysis Lab	1
CHEM 3111	Organic Chemistry I	3
CHEM 3112	Organic Chemistry II	3
CHEM 3135	Inorganic Chemistry	3
CHEM 3141	Biochemistry I	3
CHEM 3142	Biochemistry II	3
CHEM 3311	Organic Chemistry I Lab	1
CHEM 3312	Organic Chemistry II Lab	1
CHEM 3335	Inorganic Chemistry Lab	1
CHEM 3345	Biochemistry Lab I	1
CHEM 4115	Foundations of Physical Chemistry	3
CHEM 4175	Instrumental Methods of Chemical Analysis	3
CHEM 4315	Foundations of Physical Chemistry Lab	1
CHEM 4375	Instrumental Methods of Chemical Analysis Lab	1
Select any Elementary-Intermediate foreign language sequence (FL 1002 and FL 2001):		6
Area G Total		44
<b>Area H Program Electives</b>		
Choose 4 chemistry elective credits (CHEM 1715 for 1 hour is strongly encouraged). Students will need a total of 8 credit hours of coursework at the 3000 level or above in Area H or Area I to satisfy the major.		4
Area H Total		4
<b>Area I General Electives</b>		

Choose 12 general elective credits. Students will need a total of 8 credit hours of coursework at the 3000 level or above in Area I or Area H to satisfy the major.

**Total Credit Hours** **123**

## Program Map

Course	Title	Credit Hours
<b>First Year</b>		
<b>Fall</b>		
CHEM 1211	Principles of Chemistry I (minimum grade of C) <sup>1</sup>	3
CHEM 1211L	Principles of Chemistry I Lab (minimum grade of C) <sup>1</sup>	1
MATH 1113	Pre-Calculus (minimum grade of C)	4
ENGL 1101	English Composition I (minimum grade of C)	3
CHEM 1715	Introductory Chemistry Seminar (Area H; minimum grade of C) <sup>2</sup>	1
POLS 1101	American Government	3
KINS 1106 or PHED 1205	Lifetime Wellness or Concepts of Fitness	2
<b>Credit Hours</b>		<b>17</b>
<b>Spring</b>		
CHEM 1212	Principles of Chemistry II (minimum grade of C)	3
CHEM 1212L	Principles of Chemistry II Lab (minimum grade of C)	1
MATH 1131	Calculus with Analytic Geometry I	4
ENGL 1102	English Composition II (minimum grade of C)	3
AREA E	World Culture Elective	3
Area B2	ITDS 1779 (2), LEAD 1705 (2), PERS 1506 (1; may be repeated with different topic), PERS 1507 (2)	1
<b>Credit Hours</b>		<b>15</b>
<b>Second Year</b>		
<b>Fall</b>		
CHEM 3111	Organic Chemistry I (minimum grade of C) <sup>3</sup>	3
CHEM 3311	Organic Chemistry I Lab (minimum grade of C) <sup>3</sup>	1
PHYS 1111	Introductory Physics I (minimum grade of C)	3
PHYS 1311	Introductory Physics I Lab (minimum grade of C)	1
BIOL 1231K	General Biology I	4
AREA C	Humanities Elective	3
<b>Credit Hours</b>		<b>15</b>
<b>Spring</b>		
CHEM 3112	Organic Chemistry II (minimum grade of C) <sup>4</sup>	3
CHEM 3312	Organic Chemistry II Lab (minimum grade of C) <sup>4</sup>	1
PHYS 1112	Introductory Physics II (minimum grade of C)	3

PHYS 1312	Introductory Physics II Lab (minimum grade of C)	1
BIOL 1232K	General Biology II	4
AREA E	Behavioral Science Elective	3
<b>Credit Hours</b>		<b>15</b>

**Third Year****Fall**

CHEM 2115	Quantitative Chemical Analysis (minimum grade of C) <sup>5</sup>	3
CHEM 2315	Quantitative Chemical Analysis Lab (minimum grade of C) <sup>5</sup>	1
CHEM 3141	Biochemistry I (minimum grade of C)	3
CHEM 3345	Biochemistry Lab I (minimum grade of C)	1
Area B1	COMM 1110 Public Speaking or foreign language 1001, 1002, 2001, 2002	3
AREA I	Electives	4
<b>Credit Hours</b>		<b>15</b>

**Spring**

CHEM 4175	Instrumental Methods of Chemical Analysis (minimum grade of C) <sup>6</sup>	3
CHEM 4375	Instrumental Methods of Chemical Analysis Lab (minimum grade of C) <sup>6</sup>	1
CHEM 3142	Biochemistry II (minimum grade of C)	3
STAT 1401	Elementary Statistics	3
HIST 2111 or HIST 2112	U. S. History to 1865 or U. S. History since 1865	3
AREA G	Foreign Language (1002)	3
<b>Credit Hours</b>		<b>16</b>

**Fourth Year****Fall**

CHEM 4115	Foundations of Physical Chemistry (minimum grade of C)	3
CHEM 4315	Foundations of Physical Chemistry Lab (minimum grade of C)	1
BIOL 3215K	Cell Biology	4
AREA G	Foreign Language (2001)	3
AREA I	Electives	4
<b>Credit Hours</b>		<b>15</b>

**Spring**

CHEM 3135	Inorganic Chemistry (minimum grade of C)	3
CHEM 3335	Inorganic Chemistry Lab (minimum grade of C)	1
AREA C	Fine Arts Elective	3
AREA H	Program Elective <sup>7</sup>	3
AREA I	Electives	4
Select one PEDS course ( <a href="https://catalog.columbusstate.edu/course-descriptions/peds/#peds">https://catalog.columbusstate.edu/course-descriptions/peds/#peds</a> )		1
EST Major Field Test		
<b>Credit Hours</b>		<b>15</b>
<b>Total Credit Hours</b>		<b>123</b>

<sup>1</sup> The Principles of Chemistry sequence are offered each semester and summer. These must be completed by the summer.

<sup>2</sup> Introductory Chemistry Seminar is only offered in the fall semester.

<sup>3</sup> Organic Chemistry 1 and the co-requisite lab are only offered in the fall semester.

<sup>4</sup> Organic Chemistry 2 and the co-requisite lab are only offered in the spring semester.

<sup>5</sup> Quantitative Chemical Analysis and the co-requisite lab are only offered in the fall semester.

<sup>6</sup> Instrumental Analysis and the co-requisite lab are only offered in the spring semester.

<sup>7</sup> Program electives may include additional 3000 level courses in biology, physics, engineering,...etc.

## Additional Notes

This program map illustrates appropriate coursework for completing a degree within four years, provided that course grades allow for earned credit. Please consult with your advisor to determine when courses can be switched out with others and taken in a different semester or sequence than illustrated since not all courses are taught every semester.

- This map is for illustrative purposes only and does not constitute a legal contract on the part of CSU since degree requirements or course offerings could change. As always, check with your advisor.
- Students must complete "Area A" (ENGL 1101 English Composition I, ENGL 1102 English Composition II, and MATH 1001 Quantitative Skills and Reasoning or higher) prior to reaching 30 hours and earn a "C" or higher in ENGL 1101 and 1102.
- As of Fall 2013, all undergraduate students are required each semester to meet the 2.0 institutional GPA standard for satisfactory academic progress.
- To graduate, a student must have 39 credits of upper-division courses (3000 level or higher). These courses may be in any discipline.
- A grade of "C" or higher is required for all chemistry courses.
- The prerequisite for Principles of Chemistry 1 (CHEM 1211 Principles of Chemistry I) and its co-requisite lab is College Algebra (MATH 1111 College Algebra) with a grade of "C" or higher or placement in MATH 1113 Pre-Calculus or higher.
- Introductory Physics 1 and 2 with the co-requisite labs are required for completion of the B.A. in chemistry.
- The prerequisite for Introductory Physics 1 (PHYS 1111 Introductory Physics I) and its lab is pre-calculus (MATH 1113 Pre-Calculus) or higher.
- The prerequisite for Organic Chemistry 2 (CHEM 3112 Organic Chemistry II) and its co-requisite lab (CHEM 3312 Organic Chemistry II Lab) are Organic Chemistry 1 (CHEM 3111 Organic Chemistry I) and its co-requisite lab (CHEM 3311) with a "C" or higher in each.
- The prerequisite for Biochemistry 1 (CHEM 3141 Biochemistry I) and its co-requisite lab (CHEM 3345 Biochemistry Lab I) are Organic Chemistry 1 (CHEM 3111 Organic Chemistry I) and its co-requisite lab (CHEM 3311 Organic Chemistry I Lab) with a "C" or higher in each.
- The prerequisite for Inorganic Chemistry (CHEM 3135 Inorganic Chemistry) and its co-requisite lab (CHEM 3335 Inorganic Chemistry Lab) are Organic Chemistry 2 (CHEM 3112 Organic Chemistry II) and its co-requisite lab (CHEM 3312 Organic Chemistry II Lab) with a "C" or higher.
- The prerequisite for Foundations of Physical Chemistry (CHEM 4115 Foundations of Physical Chemistry and its co-requisite lab (CHEM 4315 Foundations of Physical Chemistry Lab are Calculus 1 (MATH 1131 Calculus with Analytic Geometry I) and Introductory

Physics 2 (PHYS 1112 Introductory Physics II) and its lab with a "C" or higher.

- Foundations of Physical Chemistry lecture and lab may be offered at night, i.e. 4:30 - 5:45 for the lecture and 6:00 - 8:50 for lab.
- The prerequisite for Instrumental Methods of Chemical Analysis (CHEM 4175 Instrumental Methods of Chemical Analysis and its co-requisite lab (CHEM 4375 Instrumental Methods of Chemical Analysis Lab are Quantitative Chemical Analysis (CHEM 2115 Quantitative Chemical Analysis) and its co-requisite lab (CHEM 2315 Quantitative Chemical Analysis Lab), Organic Chemistry 2 and its co-requisite Lab (CHEM 3312 Organic Chemistry II Lab), and Calculus 1 (MATH 1131 Calculus with Analytic Geometry I). A minimum grade of "C" or higher is required to satisfy the prerequisite requirement.
- Inorganic Chemistry and its co-requisite lab (CHEM 3135 Inorganic Chemistry and CHEM 3335 Inorganic Chemistry Lab) may be offered in the fall or spring semester.
- Organic Chemistry 1 and its co-requisite lab (CHEM 3111 Organic Chemistry I and CHEM 3311 Organic Chemistry I Lab) are only offered in the fall semester and Organic Chemistry 2 with its co-requisite lab (CHEM 3112 Organic Chemistry II and CHEM 3312 Organic Chemistry II Lab) are only offered in the spring semester.
- Quantitative Analysis and its co-requisite lab (CHEM 2115 Quantitative Chemical Analysis and CHEM 2315 Quantitative Chemical Analysis Lab) are only offered in the fall semester.
- Instrumental Methods of Chemical Analysis (CHEM 4175 Instrumental Methods of Chemical Analysis) and its co-requisite lab (CHEM 4375 Instrumental Methods of Chemical Analysis Lab) are only offered in the spring semester.
- Supervised Undergraduate Research (CHEM 4899 Supervised Undergraduate Research) is offered as a 1, 2, or 3 credit hour course. The course may be repeated with a different topic up to 9 credits.
- Additional courses in astronomy, biology, chemistry, computer science, engineering, geology, or mathematics courses may be selected as program electives (area H) as approved by advisor and the department chair. At least 6 hours must be chemistry courses.

## Admission Requirements

There are no program specific admission requirements.

## Additional Program Requirements

There are no program specific academic regulations.

## Program Learning Outcomes

- Students will apply both the theoretical and practical principles of the analytical, inorganic, organic and physical divisions of chemistry.
- Students will conduct experiments, analyze data, and interpret results, while using safe and ethical lab practices.
- Students will demonstrate the correct operation of chemical instrumentation.
- Students will apply both the theoretical and practical principles of cellular biology.