# CHEMISTRY/BIOLOGY DOUBLE MAJOR, BACHELOR OF SCIENCE

## Student Learning Outcomes

1. Understand the concept of and be able to apply the scientific method to problem solution.
2. Understand classifications of chemical compounds, general reaction types and quantitative aspects of stoichiometry as applied to chemical reactions.
3. Apply basic knowledge of related fields such as mathematics and physics to problem solving, methods of analysis and use of numerical data in the chemical sciences.
4. Demonstrate a knowledge of basic laboratory skills, methods and equipment used in chemistry for observation and analysis of chemical systems.
5. Read, think and write critically and review current literature in the chemical sciences.
6. Exhibit a comprehensive knowledge of the fundamental theories, concepts and skills necessary in the chemical sciences.

## Outcomes Assessment Activities

- Assessment of chemistry majors occurs through examination of GPA in required courses. Majors are required to maintain a 2.000 GPA in major and minor courses as well as in other required courses.
- Students are required to complete American Chemical Society national standard exams when given during the course of the chemistry degree curriculum. Scores are compared to national averages to determine if students exhibit a comprehensive knowledge of the fundamental theories and concepts necessary in the chemical sciences disciplinary areas.
- Students are required to take an exit examination during the senior year. The ETS Major Field Achievement Test (MFAT) covers the undergraduate chemistry curriculum. Scores are compared to national averages to determine if students exhibit a comprehensive knowledge of the fundamental theories and concepts necessary in the chemical sciences overall.

## Specific Program Requirements

### Program Overview

| Requirement | Credits |
|---|---|
| General Education | 24 |
| Core Requirements | 42 |
| Concentration Requirements | 20 |
| Biology as Second Major Minimum | 39 |
| **Total Credits** | **125** |

- Students majoring or minoring in chemistry are required to have a cumulative GPA of 2.000 or better in their chemistry courses. In addition, students majoring or minoring in chemistry must receive a grade of “C” or better in all core chemistry courses. Students minoring in chemistry are required to earn a grade of “C” or better in all of the chemistry courses applying to the minor.
- Proficiency in physics, math and computer science is essential for understanding and applying chemical principles; therefore, graduates must complete approved math and physics courses with an overall GPA of 2.000 or better.
- Transfer students are required to earn a minimum of 20 semester credit hours in approved chemistry courses from CSU-Pueblo for graduation with a BS degree in chemistry. Transfer students wishing to minor in chemistry must earn a minimum of 10 of the 20 credit hours required at CSU-Pueblo.
- Students will be required to take an exit examination during the senior year, covering the undergraduate chemistry curriculum.

### Specific Core Requirements

| Course | Title | Credits |
|---|---|---|
| CHEM 121 & 121L | General Chemistry I (GT-SC2) and General Chemistry Lab I (GT-SC1) | 5 |
| CHEM 122 & 122L | General Chemistry II (GT-SC2) and General Chemistry Lab II (GT-SC1) | 5 |
| CHEM 170 | Academic Orientation | 0.5 |
| CHEM 301 & 301L | Organic Chemistry I and Organic Chemistry Lab I | 5 |
| CHEM 302 & 302L | Organic Chemistry II and Organic Chemistry Lab II | 5 |
| CHEM 317 & 317L | Quantitative Analysis and Quantitative Analysis Lab | 5 |
| CHEM 321 | Physical Chemistry I | 3 |
| CHEM 322 | Physical Chemistry II | 3 |
| CHEM 370 | Academic Enrichment | 0.5 |
| CHEM 419 & 419L | Instrumental Analysis and Instrumental Analysis Lab | 5 |
| CHEM 420 & 420L | Inorganic Chemistry and Inorganic Chemistry Lab | 4 |
| CHEM 493 | Seminar | 1 |
| **Total Credits** | | **42** |

### Specific Concentration Requirements

| Course | Title | Credits |
|---|---|---|
| **Required Chemistry Core** | | |
| Chemistry Core (including **either** major seminar course) | | 42 |
| **Other Required Courses** | | |
| MATH 126 | Calculus & Analytic Geometry I (GT-MA1) | 5 |
| MATH 224 | Calculus and Analytic Geometry II | 5 |
| Select one of the following: | | 4-5 |
| PHYS 201 & 201L | Principles of Physics I (GT-SC2) and Principles of Physics Lab I (GT-SC1) | 4 |
| PHYS 221 & 221L | General Physics I and General Physics I Lab (GT-SC1) | 5 |
| Select one of the following: | | 4-5 |
| PHYS 202 & 202L | Principles Of Physics II (GT-SC2) and Principles Of Physics II Lab (GT-SC1) | 4 |
| PHYS 222 & 222L | General Physics II and General Physics II Lab (GT-SC1) | 5 |
| **Institutional and General Education** | | |
| Select 24 credits | | 24 |
| **Biology Second Major Minimum** | | |

| | |
|---|---|
| Biology as Second Major | 39 |
| **Total Credits** | **123-125** |

# Planning Sheet

Disclaimer: The Planning Sheet is designed as a guide for students planning their course selections. The information on this page provides only a suggested schedule. Actual course selections should be made with the advice and consent of an academic advisor. While accurately portraying the information contained in the college catalog, this form is not considered a legal substitute for that document. Students should become familiar with the catalog in effect at the time in which they entered the institution.

Enrollment in CHEM 121 requires successful placement exam score or completion of CHEM 111 with a grade of C or better, and completion of MATH 120 with a grade of C or better, or mathematics placement above MATH 120. The placement exam is administered through the Testing Center - contact them to make arrangements.

| Course | Title | Credits |
|---|---|---|
| **Year 1** | | |
| **Fall** | | |
| CHEM 121 | General Chemistry I (GT-SC2) | 4 |
| CHEM 121L | General Chemistry Lab I (GT-SC1) | 1 |
| CHEM 170 | Academic Orientation | 0.5 |
| BIOL 181 | College Biology I/Organismal Bio (GT-SC2) | 3 |
| BIOL 181L | College Biology I/Organismal Bio Lab (GT-SC1) | 1 |
| ENG 101 | Rhetoric & Writing I (GT-CO1) | 3 |
| CID 103 | Speaking & Listening | 3 |
| | **Credits** | **15.5** |
| **Spring** | | |
| CHEM 122 | General Chemistry II (GT-SC2) | 4 |
| CHEM 122L | General Chemistry Lab II (GT-SC1) | 1 |
| BIOL 182 | College Biology II/Cellular Biology (GT-SC2) | 3 |
| BIOL 182L | College Biology II/Cellular Bio Lab (GT-SC1) | 1 |
| ENG 102 | Rhetoric & Writing II (GT-CO2) | 3 |
| General Education | recommended to select a Social Science course | 3 |
| | **Credits** | **15** |
| **Year 2** | | |
| **Fall** | | |
| CHEM 301 | Organic Chemistry I | 3 |
| CHEM 301L | Organic Chemistry Lab I | 2 |
| BIOL 201<br>or BIOL 202 | Botany (GT-SC2) BIOL 201 is spring-only course - see your advisor<br>or Zoology | 2 |
| BIOL 201L<br>or BIOL 202L | Botany Laboratory (GT-SC1) BIOL 201L is a spring-only course - see your advisor<br>or Zoology Laboratory | 2 |
| MATH 126 | Calculus & Analytic Geometry I (GT-MA1) | 5 |
| General Education | recommended to select a Humanities course | 3 |
| | **Credits** | **17** |
| **Spring** | | |
| CHEM 302 | Organic Chemistry II | 3 |
| CHEM 302L | Organic Chemistry Lab II | 2 |
| MATH 224 | Calculus and Analytic Geometry II | 5 |
| General Education | recommended to select a Social Science course | 3 |
| | **Credits** | **13** |
| **Year 3** | | |
| **Fall** | | |
| CHEM 317 | Quantitative Analysis | 3 |
| CHEM 317L | Quantitative Analysis Lab | 2 |
| CHEM 322 | Physical Chemistry II | 3 |
| BIOL 301 | General Microbiology | 3 |
| BIOL 301L | General Microbiology Lab | 1 |
| General Education | recommended to select a Humanities course | 3 |
| | **Credits** | **15** |
| **Spring** | | |
| BIOL 350 | Mendelian and Population Genetics | 2 |
| CHEM 321 | Physical Chemistry I | 3 |
| CHEM 370 | Academic Enrichment | 0.5 |
| CHEM 419 | Instrumental Analysis | 3 |
| CHEM 419L | Instrumental Analysis Lab | 2 |
| PHYS 201<br>or PHYS 221 | Principles of Physics I (GT-SC2)<br>or General Physics I | 3-4 |
| PHYS 201L<br>or PHYS 221L | Principles of Physics Lab I (GT-SC1)<br>or General Physics I Lab (GT-SC1) | 1 |
| | **Credits** | **14.5-15.5** |
| **Year 4** | | |
| **Fall** | | |
| CHEM 420 | Inorganic Chemistry | 3 |
| CHEM 420L | Inorganic Chemistry Lab | 1 |
| CHEM 493 | Seminar | 1 |
| BIOL 351 | Molecular Biology & Genetics | 3 |
| BIOL Elective | | 3 |
| PHYS 202<br>or PHYS 222 | Principles Of Physics II (GT-SC2)<br>or General Physics II | 3-4 |
| PHYS 202L<br>or PHYS 222L | Principles Of Physics II Lab (GT-SC1)<br>or General Physics II Lab (GT-SC1) | 1 |
| | **Credits** | **15-16** |
| **Spring** | | |
| BIOL 352 | Evolutionary Biology and Ecology | 3 |
| BIOL 412 | Advanced Cellular Biology | 3 |
| BIOL 412L | Advanced Cellular Biology Lab | 1 |
| General Education | recommended to select a History course | 3 |
| BIOL Elective | | 4 |
| BIOL Elective | | 3 |
| | **Credits** | **17** |
| | **Total Credits** | **122-124** |