BIOCHEMISTRY, CHEMISTRY (BS)

Degree: Bachelor of Science
Major: Chemistry
Concentration: Biochemistry
Program Code: 3476

About This Major . . .

Biochemistry students build a strong foundation in chemistry and apply their knowledge to problems in chemistry and biology. Students learn to critically analyze chemical structures and chemical and biochemical reactions, skills which are necessary for success in fields of biochemistry, medicinal chemistry, medicine, pharmacy and chemical biology. By taking upper division courses in chemistry and biology, biochemistry majors develop a strong understanding of both subjects. Through research under a chemistry or biology faculty member, students can enhance their laboratory and critical thinking skills.

The program culminates in two courses designed to bridge students’ coursework with their entry into the workforce, a medical degree program, or graduate school. The Advanced Laboratory course helps students to synthesize knowledge from various chemical disciplines and apply it to solving chemical problems in a practical manner. This is similar to the type of process that they are likely to experience after graduation. Our Communicating in the World of Chemistry course couples with our Advanced Laboratory course to help students express themselves in a professional manner while applying for and entering their new positions.

Colorado Mesa University graduates have been successful in finding jobs in the pharmaceutical industry and in secondary education, as well as being placed in graduate, pharmacy and medical schools.

For more information on what you can do with this major, visit Career Services’ What to Do with a Major? resource.

All CMU baccalaureate graduates are expected to demonstrate proficiency in specialized knowledge/applied learning, quantitative fluency, communication fluency, critical thinking, personal and social responsibility, and information literacy. In addition to these campus-wide student learning outcomes, graduates of this major will be able to:

1. Demonstrate fluency in the concepts from major fields of chemistry (organic, physical, analytical, and biochemistry.) (Specialized Knowledge)
2. Utilize mathematics to solve chemical and biological problems. (Quantitative Fluency)
3. Employ proper experimental techniques. (Applied Learning)
4. Interpret chemical and biological information from peer-reviewed publications. (Critical Thinking)
5. Communicate chemical and biological topics effectively, both verbally and in writing. (Communication Fluency)
6. Demonstrate a solid understanding of genetics, cellular, and molecular biology. (Specialized Knowledge)

Requirements

Each section below contains details about the requirements for this program. Select a header to expand the information/requirements for that particular section of the program’s requirements.

To print or save an overview of this program’s information, including the program description, learning outcomes, requirements, suggested course sequencing (if applicable), and advising and graduation information, scroll to the bottom of the left-hand navigation menu and select “Print Options.” This will give you the options to either “Send Page to Printer” or “Download PDF of This Page.” The “Download PDF of This Page” option prepares a much more concise presentation of all program information. The PDF is also printable and may be preferable due to its brevity.

Institutional Degree Requirements

The following institutional degree requirements apply to all CMU baccalaureate degrees. Specific programs may have different requirements that must be met in addition to institutional requirements.

- 120 semester hours minimum.
- Students must complete a minimum of 30 of the last 60 hours of credit at CMU, with at least 15 semester hours in major discipline courses numbered 300 or higher.
- 40 upper-division credits (an alternative credit limit applies to the Bachelor of Applied Science degree).
- 2.00 cumulative GPA or higher in all CMU coursework.
- A course may only be used to fulfill one requirement for each degree/certificate.
- No more than six semester hours of independent study courses can be used toward the degree.
- Non-traditional credit, such as advanced placement, credit by examination, credit for prior learning, cooperative education and internships, cannot exceed 30 semester credit hours for a baccalaureate degree. A maximum of 15 of the 30 credits may be for cooperative education, internships, and practica.
- Pre-collegiate courses (usually numbered below 100) cannot be used for graduation.
- Capstone exit assessment/projects (e.g., Major Field Achievement Test) requirements are identified under Program-Specific Degree Requirements.
- The Catalog Year determines which program sheet and degree requirements a student must fulfill in order to graduate. Visit with your advisor or academic department to determine which catalog year and program requirements you should follow.
- See “Requirements for Undergraduate Degrees and Certificates” in the catalog for a complete list of graduation requirements.

Essential Learning Requirements

(31 semester hours)

See the current catalog for a list of courses that fulfill the requirements below. If a course is an Essential Learning option and a requirement for your major, you must use it to fulfill the major requirement and make a different selection for the Essential Learning requirement.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Semester Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGL 111</td>
<td>English Composition I-GTCO1</td>
<td>3</td>
</tr>
<tr>
<td>ENGL 112</td>
<td>English Composition II-GTCO2</td>
<td>3</td>
</tr>
<tr>
<td>Mathematics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MATH 151</td>
<td>Calculus I-GT-MA1</td>
<td>3</td>
</tr>
</tbody>
</table>

1. Institutional requirements
2. Mathematics courses numbered 300 or higher
### History
Select one History course 3

### Humanities
Select one Humanities course 3

### Social and Behavioral Sciences
Select one Social and Behavioral Sciences course 3
Select one Social and Behavioral Sciences course 3

### Fine Arts
Select one Fine Arts course 3

### Natural Sciences
Select one Natural Sciences course with a lab 4
Select one Natural Sciences course 3

### Total Semester Credit Hours
31

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1. Must receive a grade of "C" or better and must be complete by the time the student has 60 semester hours.

2. This is a 5 credit course. 3 credits apply to the Essential Learning requirements and 2 credits apply to Foundation.

### Program Specific Degree Requirements
(54 semester hours, must pass all courses with a grade of "C" or higher)

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Semester Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 131</td>
<td>General Chemistry I-GTSC1</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 131L</td>
<td>General Chemistry Laboratory I-GTSC1</td>
<td>1</td>
</tr>
<tr>
<td>CHEM 132</td>
<td>General Chemistry II-GTSC1</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 132L</td>
<td>General Chemistry Laboratory II-GTSC1</td>
<td>1</td>
</tr>
<tr>
<td>CHEM 301</td>
<td>Analytical Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 301L</td>
<td>Analytical Chemistry Laboratory</td>
<td>1</td>
</tr>
<tr>
<td>CHEM 311</td>
<td>Organic Chemistry I</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 311L</td>
<td>Organic Chemistry I Laboratory</td>
<td>1</td>
</tr>
<tr>
<td>CHEM 312</td>
<td>Organic Chemistry II</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 312L</td>
<td>Organic Chemistry II Laboratory</td>
<td>1</td>
</tr>
<tr>
<td>CHEM 341</td>
<td>Advanced Laboratory I</td>
<td>2</td>
</tr>
<tr>
<td>CHEM 442</td>
<td>Communicating in the World of Chemistry</td>
<td>1</td>
</tr>
</tbody>
</table>

#### Biochemistry Concentration Courses

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Semester Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL 301</td>
<td>Principles of Genetics</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 351</td>
<td>Inorganic Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 352</td>
<td>Inorganic Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 396</td>
<td>Topics</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 397</td>
<td>Structured Research</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 421</td>
<td>Advanced Organic Chemistry I</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 422</td>
<td>Advanced Organic Chemistry II</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 431</td>
<td>Instrumental Analysis Laboratory</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 487</td>
<td>Formal Research</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 494</td>
<td>Seminar</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 496</td>
<td>Topics</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 497</td>
<td>Structured Research</td>
<td>3</td>
</tr>
</tbody>
</table>

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### Foundation Courses
(21 semester hours, must earn a grade of "C" or better in each course)

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Semester Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL 105</td>
<td>Attributes of Living Systems-GTSC1</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 105L</td>
<td>Attributes of Living Systems Laboratory-GTSC1</td>
<td>1</td>
</tr>
<tr>
<td>MATH 151</td>
<td>Calculus I-GT-MA1</td>
<td>2</td>
</tr>
<tr>
<td>MATH 152</td>
<td>Calculus II</td>
<td>5</td>
</tr>
</tbody>
</table>

Select one of the following sets of courses:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Semester Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS 131 &amp; 131L</td>
<td>Fundamental Mechanics-GTSC1 and Fundamental Mechanics Laboratory-GTSC1</td>
<td>5</td>
</tr>
<tr>
<td>PHYS 111 &amp; 111L</td>
<td>General Physics-GTSC1 and General Physics Laboratory-GTSC1</td>
<td>5</td>
</tr>
</tbody>
</table>

Select one of the following sets of courses:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Semester Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS 132 &amp; 132L</td>
<td>Electromagnetism and Optics-GTSC1 and Electromagnetism and Optics Laboratory-GTSC1</td>
<td>5</td>
</tr>
</tbody>
</table>

### Other Lower Division Requirements

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Semester Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>KINE 100</td>
<td>Health and Wellness</td>
<td>1</td>
</tr>
</tbody>
</table>

Select one Activity course 1

**Wellness Requirement**

**Essential Learning Capstone**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Semester Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>ESSL 290</td>
<td>Maverick Milestone</td>
<td>3</td>
</tr>
<tr>
<td>ESSL 200</td>
<td>Essential Speech</td>
<td>1</td>
</tr>
</tbody>
</table>

Total Semester Credit Hours 6

1. Essential Learning Capstone must be taken after completion of the Essential Learning English and Mathematics requirements, and when a student has earned between 45 and 75 hours.

### Foundation Courses
(21 semester hours, must earn a grade of "C" or better in each course)
BIOL 310 & 310L Developmental Biology and Developmental Biology Laboratory
BIOL 343 Immunology
BIOL 350 & 350L Microbiology and Microbiology Laboratory
BIOL 352 Human Physiology & Human Physiology Laboratory
BIOL 387 Structured Research
BIOL 403 Evolution
BIOL 425 Molecular Genetics
BIOL 441 Endocrinology
BIOL 442 Pharmacology
BIOL 487 Advanced Research

Total Semester Credit Hours 7

No more than 4 semester hours can come from CHEM 397, CHEM 487, CHEM 497, BIOL 387, or BIOL 487

General Electives
All college level courses appearing on your final transcript, not listed above that will bring your total semester hours to 120 hours. 8 semester hours.

Suggested Course Plan

First Year
Fall Semester

CHEM 131 General Chemistry I-GTSC1 & 131L and General Chemistry Laboratory I-GTSC1 5
Essential Learning - History 3
ENGL 111 English Composition I-GTCO1 3
Essential Learning - Natural Science with Lab 4

Spring Semester

CHEM 132 General Chemistry II-GTSC1 & 132L and General Chemistry Laboratory II-GTSC1 5
ENGL 112 English Composition II-GTCO2 3
BIOL 105 Attributes of Living Systems-GTSC1 & 105L and Attributes of Living Systems Laboratory-GTSC1 4
Essential Learning - Social and Behavioral Sciences 3

Total Semester Credit Hours 15

Second Year
Fall Semester

MATH 151 Calculus I-GTMA1 5
CHEM 311 & 311L Organic Chemistry I and Organic Chemistry I Laboratory 5
Select one of the following: 5
PHYS 131 & 131L Fundamental Mechanics-GTSC1 and Fundamental Mechanics Laboratory-GTSC1
PHYS 111 & 111L General Physics-GTSC1 and General Physics Laboratory-GTSC1

Total Semester Credit Hours 15

Spring Semester

CHEM 312 & 312L Organic Chemistry II and Organic Chemistry II Laboratory 5
Select one of the following: 5
PHYS 132 & 132L Electromagnetism and Optics-GTSC1 and Electromagnetism and Optics Laboratory-GTSC1
PHYS 112 & 112L General Physics-GTSC1 and General Physics Laboratory-GTSC1

Total Semester Credit Hours 15

Third Year
Fall Semester

CHEM 315 Biochemistry I 3
CHEM 317L Biochemistry Laboratory 1
BIOL 302 Cellular Biology 3
Essential Learning - Natural Science 3
ESSL 290 Maverick Milestone 3
ESSL 200 Essential Speech 1

Total Semester Credit Hours 14

Fourth Year
Fall Semester

CHEM 321 Physical Chemistry I 3
BIOL 371L Laboratory Investigations in Cellular and Molecular Biology 3
Restricted Electives 4
Essential Learning - Fine Arts 3
Essential Learning - Social and Behavioral Sciences 3

Total Semester Credit Hours 16

Spring Semester

CHEM 341 Advanced Laboratory I 2
CHEM 442 Communicating in the World of Chemistry 1
Essential Learning - Humanities 3
Restricted Elective 3
General Electives (2 courses) 6

Total Semester Credit Hours 15

Total Semester Credit Hours 120

Advising and Graduation
Advising Process and DegreeWorks

Documentation on the pages related to this program is intended for informational purposes to help determine what courses and associated requirements are needed to earn a degree. The suggested course sequencing outlines how students could finish degree requirements. Some courses are critical to complete in specific semesters, while others may be moved around. Meeting with an academic advisor is essential in planning courses and altering the suggested course sequencing. It is ultimately the student’s responsibility to understand and fulfill the requirements for her/his intended degree(s).

DegreeWorks is an online degree audit tool available in MAVzone. It is the official record used by the Registrar's Office to evaluate progress.
towards a degree and determine eligibility for graduation. Students are responsible for reviewing their DegreeWorks audit on a regular basis and should discuss questions or concerns with their advisor or academic department head. Discrepancies in requirements should be reported to the Registrar’s Office.

Graduation Process
Students must complete the following in the first two months of the semester prior to completing their degree requirements:

- Review their DegreeWorks audit and create a plan that outlines how unmet requirements will be met in the final semester.
- Meet with their advisor and modify their plan as needed. The advisor must approve the final plan.
- Submit the “Intent to Graduate” form to the Registrar’s Office to officially declare the intended graduation date and commencement ceremony plans.
- Register for all needed courses and complete all requirements for each degree sought.

Submission deadlines and commencement details can be found at http://www.coloradomesa.edu/registrar/graduation.html.

If a student’s petition for graduation is denied, it will be her/his responsibility to consult the Registrar’s Office regarding next steps.