

## PROGRAM OVERVIEW

Biochemistry is the chemistry of life – the molecules, reactions, and energy transformations that underlie structure and function in all living organisms. The study of biochemistry combines knowledge from chemistry, biology, physics, and mathematics (and sometimes other disciplines) to understand how life works at the molecular level. This integrated scientific knowledge will be essential for understanding the future of human health, sustainable energy, and the environment.

The B.S. Biochemistry program at CU Denver strongly emphasizes connections between basic science and human health. Required coursework covers much of the foundational knowledge and skills for graduate and health professions entrance exams. Several courses explore connections between cutting-edge biochemical research and different diseases. Students are encouraged to take advantage of undergraduate research opportunities in biochemistry and related fields either at CU-Denver or on the nearby Anschutz Medical campus. Graduates learn skills in critical thinking, problem solving, and scientific communication for careers in the health and natural sciences. A B.S. in Biochemistry stands out as a premiere accomplishment in applications for professional degree programs, including pharmacy, medicine, nursing, dentistry, medical technology, and many others.

## ACADEMIC ADVISING

The College of Liberal Arts and Sciences (CLAS) supports students to graduation using a dual-advising system. CLAS students have two academic advisors with whom they should meet regularly to discuss academic and degree progress: a CLAS Academic Advisor and a major advisor.

*For questions related to CU Denver Core Curriculum, CLAS, general graduation requirements, university/college academic policies, or campus resources contact:*

### CLAS Academic Advising

[clas\\_advising@ucdenver.edu](mailto:clas_advising@ucdenver.edu)

Visit the CLAS Advising website [here](#)

North Classroom (NC) 1030

303-315-7100

*For questions related to major requirements, major course prerequisites, or evaluation of transfer coursework in your major contact:*

### Biochemistry Major Advising

[CLAS Major Advisor Contact Information](#)

Visit the department website [here](#)

Science Building (SI) 3071

303-315-7650

## GENERAL GRADUATION REQUIREMENTS & POLICIES

*All CU Denver CLAS students are required to complete the following minimum general graduation requirements to be eligible to apply for graduation:*

1. Complete a minimum of 120 credit hours
2. Achieve a minimum 2.0 CU cumulative grade point average (GPA)
3. Complete a minimum of 45 upper-division (3000- to 4000-level) credit hours
4. Complete all CU Denver Core, CLAS, and major requirements
5. Complete a minimum of 30 CLAS credit hours with letter grades at CU Denver

*The following are **maximum** credit hours that can apply toward the minimum 120 credit hours required for graduation:*

- 16 credit hours Pass/Fail
- 12 credit hours of Independent Study/Directed Research
- 12 credit hours of internship credit
- 8 credit hours of physical education credit

## PROGRAM REQUIREMENTS & POLICIES

**Students are responsible for meeting with the major advisor to confirm major requirements.** Students completing the Biochemistry B.S. Degree are required to complete the following minimum program requirements:

1. Students must complete a minimum of 74 credit hours, including a minimum of 33 CHEM credit hours.
2. Students must complete a minimum of 16 upper-division (3000-level and above) CHEM credit hours.
3. Students must earn a minimum grade of C- (1.7) in all courses that apply to the major and must achieve a minimum cumulative major GPA of 2.0. All graded attempts in required and elective courses are calculated in the major GPA. Courses taken using P+/P/F or S/U grading cannot apply to major requirements.
4. Students must complete a minimum of 14 credits hours with CU Denver faculty including CHEM 4518 Physical Chemistry Laboratory: Reaction Analysis or CHEM 4538 Physical Chemistry Laboratory: Molecular Structure or CHEM 4548 Physical Biochemistry Laboratory.
5. A student who has declared a Biochemistry major at CU Denver may not take additional chemistry courses outside of the department for the purpose of applying those credits toward meeting the requirements of the major without prior written approval of the undergraduate Biochemistry major advisor. No more than 3 additional credit hours of such pre-approved transfer credits will be allowed.
6. All courses applied to the biochemistry major need to be taken within ten years of the graduation date with the exception of General Chemistry I Lecture (CHEM 2031 General Chemistry I or CHEM 2081 Honors General Chemistry I) and Laboratory (CHEM 2038 General Chemistry Laboratory I or CHEM 2088 Honors General Chemistry 1 Laboratory) and General Chemistry II Lecture (CHEM 2061 General Chemistry II or CHEM 2091 Honors General Chemistry II Lecture) and Laboratory (CHEM 2068 General Chemistry Laboratory II or CHEM 2098 Honors General Chemistry II Laboratory). In the event that the student would like to apply for expired credit for Organic I Lecture CHEM 3481 Majors Organic Chemistry I, the student will need to test at the 50th percentile on the ACS Standardized Exam for Organic Chemistry I.
7. PHYS 2321 Intro Experimental Phys Lab I and PHYS 2341 Intro Experimental Phys Lab II are specifically designed for students in non-Physics majors and can be paired with either PHYS 2010 College Physics I and PHYS 2020 College Physics II or PHYS 2311 General Physics I: Calculus-Based and PHYS 2331 General Physics II: Calculus-Based lectures. Students pursuing a second major in Physics should complete PHYS 2311 General Physics I: Calculus-Based and PHYS 2331 General Physics II: Calculus-Based and PHYS 2351 Applied Physics Lab I and PHYS 2361 Applied Physics Lab II.
8. Students may double major in Biochemistry and Chemistry. Students can apply the requirements for both majors, if the respective courses are a major requirement for both the Chemistry and Biochemistry major. Students must select unique Chemistry or Biochemistry elective courses to satisfy elective course credit requirements for both majors. A course cannot fulfill more than two requirement / elective areas in a student's degree.

## LYNXCONNECT RESOURCES

Are you interested in learning about internship, study abroad, career, and research opportunities for this major? Visit the CU Denver LynxConnect, located in Tivoli Student Union (TV) Suite 339, and browse the LynxConnect [website](#) for more information.

Degree Requirements	Credits	Notes
<b>* Course prerequisites change regularly. Students are responsible for consulting advisors and the class schedule in the student portal for prerequisite information. *</b>		
<b>CU Denver Core Curriculum Requirements</b>	<b>34 - 40</b>	<a href="#">CU Denver Core Curriculum Requirements</a>
<b>CLAS Graduation Requirements</b>	<b>15 - 29</b>	<a href="#">CLAS Graduation Requirements</a>
<b>BICM Major Requirements</b>	<b>74</b>	At least 16 CHEM credit hours must be upper-division
<b>CHEM Required Courses</b>		
CHEM 2031 General Chemistry I <b>or</b> CHEM 2081 Honors General Chemistry I <sup>FA</sup>	3	*Prerequisite: Placement. If AP and IB credit for General Chemistry see Chemistry Advisor before registering for first chemistry class. See BICM advisor for CHEM 2081.
CHEM 2038 General Chemistry I Lab <b>or</b> CHEM 2039 Majors General Chemistry I Lab <b>or</b> CHEM 2088 Honors General Chemistry I Lab <sup>FA</sup>	1	*Prerequisite/Corequisite: CHEM 2031 or 2081 See BICM advisor for CHEM 2088.
CHEM 2061 General Chemistry II <b>or</b> CHEM 2091 Honors General Chemistry II <sup>SP</sup>	3	*Prerequisite: C- or higher in CHEM 2031 or 2081. See BICM advisor for CHEM 2091.
CHEM 2068 General Chemistry II Lab <b>or</b> CHEM 2069 Majors General Chemistry II Lab <b>or</b> CHEM 2098 Honors General Chemistry II Lab <sup>SP</sup>	2	*Prerequisite: C- or higher in CHEM 2038 or 2088. *Prerequisite/Corequisite: CHEM 2061 or CHEM 2091 See BICM advisor for CHEM 2098.
CHEM 3481 Majors Organic Chemistry I <sup>FA</sup> For CHEM-BS or BICM-BS students only	4	*Prerequisite: C- or higher in CHEM 2061 or 2091. *Corequisite: CHEM 3418 or 3488
CHEM 3488 Majors Organic Chemistry I Lab <sup>FA</sup> For CHEM-BS or BICM-BS students only	1	*Prerequisite: C- or higher in CHEM 2068 or 2098. *Prerequisite/Corequisite: CHEM 3411 or 3481
CHEM 3491 Majors Organic Chemistry II <sup>SP</sup> For CHEM-BS or BICM-BS students only	4	*Prerequisite: C- or higher in CHEM 3411 or 3481 and 3418 or 3488
CHEM 3498 Majors Organic Chemistry II Lab <sup>FA, SP</sup> For CHEM-BS or BICM-BS students only	2	*Prerequisite: C- or higher in CHEM 3411 or 3481 and 3418 or 3488 *Prerequisite/Corequisite: CHEM 3421 or 3491
CHEM 4810 General Biochemistry I <sup>FA</sup> <b>or</b> CHEM 5810 Graduate Biochemistry I <sup>FA</sup>	3	*Prerequisite/Corequisite: C- or higher in CHEM 3421 or 3491 (for 4810)
CHEM 4828 Biochemistry Lab <sup>SP</sup>	2	*Prerequisite: C- or higher in CHEM 3810 or 4810 or 5810
CHEM 4500 Foundations of Physical Chemistry	3	*Prerequisite: C- or higher in MATH 2411 and PHYS 2020 *Prerequisite/Corequisite: PHYS 2331 and CHEM 3421 or 3491
CHEM 4511 Physical Chemistry: Thermodynamics and Kinetics <sup>SP</sup> <b>or</b> CHEM 4521 Physical Chemistry: Quantum Mechanics & Spectroscopy <sup>FA</sup>	3	*Prerequisite: C- or higher in PHYS 2331 or 2020 and either: *Prerequisite: C- or higher in MATH 2421 or CHEM 4500 or *Corequisite/Prerequisite: C- or higher in MATH 3511
CHEM 4518 Physical Chemistry Lab: Reaction Analysis <sup>SP</sup> <b>or</b> CHEM 4538 Physical Chemistry Lab: Molecular Structure <sup>FA</sup> <b>or</b> CHEM 4548 Physical Biochemistry Lab <sup>SP</sup> (recommended)	2	*Prerequisite/Corequisite: C- or higher in CHEM 4511 (for 4518) *Prerequisite/Corequisite: C- or higher in CHEM 4511 or 4521 (for 4538) *Prerequisite/Corequisite: C- or higher in CHEM 3498 or 4528 (for 4548)
<b>Advanced Biochemistry Electives</b> Complete nine credits from three advanced biochemistry elective courses	9	*Check individual courses for prerequisites and availability. See BICM advisor for approved list of electives.
<b>Molecular Science Electives</b> Complete six credits of molecular science elective courses, not already completed	6	*Check individual courses for prerequisites and availability. See BICM advisor for approved list of electives.
<b>Ancillary Coursework</b>		
BIOL 2010 & 2011 Organisms to Ecosystems (Gen Bio) with lab <b>or</b> BIOL 2030 & 2031 Honors Organisms to Ecosystems (Gen Bio) with lab <sup>FA</sup>	4	*Prerequisite: High School chemistry or CHEM 1000 recommended
BIOL 2020 & 2021 Molecules to Cells (Gen Bio) with lab <b>or</b> BIOL 2040 & 2041 Honors Molecules with Cells (Gen Bio) with lab <sup>SP</sup>	4	*Prerequisite: C- or higher in BIOL 2010 & 2011 or 2030 & 2031
PHYS 2311 & 2321 General Physics I & Intro to Experimental Phys Lab I <i>and</i> PHYS 2331 & 2341 General Physics II & Intro Experimental Phys Lab II <b>or</b> PHYS 2010 & 2321 College Physics I & Intro to Experimental Phys Lab I <i>and</i> PHYS 2020 & 2341 College Physics II & Intro to Experimental Phys Lab II	10	*Prerequisite: MATH 1401 for PHYS 2311 *Prerequisite: C- or higher in PHYS 2311 and MATH 2411 for 2331 *Prerequisite: C- or higher in PHYS 2010 or 2311 for 2020 *Prerequisite: C- or higher in PHYS 2030 or 2321 for 2341
MATH 1401 Calculus I	4	*Prerequisite: C- or higher in MATH 1109, 1070, or 1110 and MATH 1120; or C- or higher in MATH 1130; or C- or higher in MATH 1401; or entry into the MA01 Student Group OR ALEKS PPL score 76-100. Course can fulfill CU Denver Core Mathematics
MATH 2411 Calculus II	4	*Prerequisite: C- or higher in MATH 1401
<b>Estimated General Electives</b>	<b>0</b>	General Elective credit hours vary based on Core & CLAS Requirements. Consult with CLAS Advisor.
<b>Total Minimum Credit Hours:</b>	<b>120</b>	45 credit hours must be upper-division

## SUGGESTED ACADEMIC PLAN OF STUDY

The following academic plan is a *suggested* pathway to completing degree requirements for this major. Students should tailor this plan based on previously completed college coursework (e.g., AP, IB, CLEP, dual/concurrent enrollment, and transfer credit) and individual preferences related to course load, schedules, or add-on programs such as minors or double-majors.

**Note:** Students should be aware that certain graduate programs do not accept AP, IB and CLEP credits. Students must create and have an academic plan of study on file with the Chemistry Major Advisor.

Year One	<b>Fall</b>	CRS	Spring		CRS
	ENGL 1020 – Core Composition I	3		ENGL 2030 – Core Composition II	3
	CHEM 2031 & 2038/2039 <sup>C</sup> or CHEM 2081 & 2088 <sup>C</sup>	4		CHEM 2061 & 2068/2069 <sup>C</sup> or CHEM 2091 & 2098 <sup>PE C</sup>	5
	BIOL 2010 & 2011 <sup>C</sup> or BIOL 2030 & 2031 <sup>C</sup>	4		BIOL 2020 & 2021 <sup>PE C</sup> or BIOL 2040 & 2041 <sup>PE C</sup>	4
	MATH 1401 <sup>PE</sup>	4		CU Denver Core Behavioral Science	3
	UNIV 1110 College Success	1			
	<b>Total Credit Hours</b>	<b>16</b>		<b>Total Credit Hours</b>	<b>15</b>
Year Two	<b>Fall</b>	CRS	Spring		CRS
	CHEM 3481 & 3488 <sup>PE</sup>	5		CHEM 3491 <sup>PE</sup>	4
	PHYS 2010 & 2321 <sup>C</sup> or PHYS 2311 & 2321 <sup>PE C</sup> (see BICM advisor)	5		CHEM 3498 <sup>PE</sup>	2
	MATH 2411 <sup>PE</sup>	4		PHYS 2020 & 2341 <sup>C</sup> or PHYS 2331 & 2341 <sup>PE C</sup> (see BICM advisor)	5
	CU Denver Core Humanities	3		CU Denver Core Arts	3
	<b>Total Credit Hours</b>	<b>17</b>		<b>Total Credit Hours</b>	<b>14</b>
Year Three	<b>Fall</b>	CRS	Spring		CRS
	CHEM 4810 <sup>PE</sup> or 5810 <sup>PE</sup>	3		CHEM 4828 <sup>PE</sup>	2
	Molecular Science Elective <sup>PE</sup>	3		CHEM 4500 <sup>PE</sup>	3
	CLAS Second Language Semester I	5		Advanced Biochemistry Elective <sup>PE</sup>	3
	CLAS Communicative Skills	3		CLAS Second Language Semester II	5
	<b>Total Credit Hours</b>	<b>14</b>		CU Denver Core Social Science	3
				<b>Total Credit Hours</b>	<b>16</b>

<sup>M</sup> Major Course Available   <sup>C</sup> CU Denver Core Course   <sup>PE</sup> Prerequisite Enforced   <sup>PR</sup> Prerequisite Recommended

Biochemistry students have multiple sequencing options for year four depending on the semester in which they complete specific major courses. Students must work with the BICM major advisor to discuss and plan for one of the following year four options:

### Option 1:

Year Four	<b>Fall</b>	CRS	Spring		CRS
	Molecular Science Elective <sup>PE</sup>	3		CHEM 4511 <sup>PE</sup>	3
	Advanced Biochemistry Elective <sup>PE</sup>	3		CHEM 4518 or CHEM 4548 <sup>PE</sup>	2
	CU Denver Core International Perspectives (Upper-Division)	3		Advanced Biochemistry Elective <sup>PE</sup>	3
	CLAS Social Science	3		CU Denver Core Cultural Diversity	3
	CLAS Behavioral Science	3		CLAS Humanities	3
	<b>Total Credit Hours</b>	<b>15</b>		<b>Total Credit Hours</b>	<b>14</b>

<sup>M</sup> Major Course Available   <sup>C</sup> CU Denver Core Course   <sup>PE</sup> Prerequisite Enforced   <sup>PR</sup> Prerequisite Recommended

### Option 2:

Year Four	<b>Fall</b>	CRS	Spring		CRS
	CHEM 4521 <sup>PE</sup>	3		Advanced Biochemistry Elective <sup>PE</sup>	3
	CHEM 4538 <sup>PE</sup>	2		Advanced Biochemistry Elective <sup>PE</sup>	3
	Molecular Science Elective <sup>PE</sup>	3		CU Denver Core Cultural Diversity	3
	CU Denver Core International Perspectives (Upper-Division)	3		CLAS Humanities	3
	CLAS Social Science	3		CLAS Behavioral Science	3
	<b>Total Credit Hours</b>	<b>14</b>		<b>Total Credit Hours</b>	<b>15</b>

<sup>M</sup> Major Course Available   <sup>C</sup> CU Denver Core Course   <sup>PE</sup> Prerequisite Enforced   <sup>PR</sup> Prerequisite Recommended