

Department of Chemistry and Biochemistry

(College of Humanities, Arts and Sciences)

www.chem.uni.edu/

The Department of Chemistry and Biochemistry offers the following undergraduate and graduate programs. Specific requirements for these programs are listed within this Department of Chemistry and Biochemistry section in the following order:

Undergraduate Majors (B.S.)

- Biochemistry (p. 1)
- Chemistry (p. 2)

Undergraduate Majors (B.A.)

- Biochemistry (p. 3)
- Chemistry (p. 3)
- Chemistry-Teaching (p. 3)

Minors

- Chemistry (p. 4)

Major programs are offered by the Department of Chemistry and Biochemistry in two baccalaureate degree areas:

- the Bachelor of Science and
- the Bachelor of Arts

1. Students considering a baccalaureate chemistry major should complete two semesters of general chemistry, CHEM 1110 (860:044) and CHEM 1120 (860:048), in the freshman year. Well-prepared students may be permitted to take CHEM 1130 (860:070), an accelerated course in general chemistry, during their first semester. It is strongly recommended that chemistry majors complete requirements in mathematics and physics within the first two years.

2. Prior to enrollment in a chemistry course, all pre-requisite courses must be completed with a grade of C- or higher.

3. A student enrolled in a chemistry course during fall or spring semester and who wishes to enroll in the same course in the subsequent spring or fall semester should contact the department. The student will be allowed to register only if space remains after all advance registrations are completed.

4. A student cannot declare a Chemistry minor if they are pursuing any B.A. or B.S. major in the Department of Chemistry and Biochemistry. Two majors cannot be earned within the department except for the combination of the B.A. Chemistry Teaching major and either the B.S. Chemistry or the B.S. Biochemistry major.

Bachelor of Science Degree Programs

Biochemistry Major

The B.S. Biochemistry major requires a minimum of 126 total hours to graduate. This total includes Liberal Arts Core requirements and the following specified major requirements, plus electives to complete the minimum of 126 hours.

The Bachelor of Science Biochemistry major is accredited by the American Chemical Society. This major prepares students for careers and/or advanced study in biochemistry. It also provides partial preparation appropriate for medical school and other health-related programs.

Required

Mathematics:		
MATH 1420 (800:060)	Calculus I *	4
MATH 1421 (800:061)	Calculus II	4
Biology:		
BIOL 2052 (840:052)	General Biology: Cell Structure and Function	4
BIOL 3140 (840:140)	Genetics ***	4
Chemistry and Biochemistry:		
CHEM 1110 (860:044) & CHEM 1120 (860:048) or CHEM 1130 (860:070)	General Chemistry I and General Chemistry II (*) General Chemistry I-II	5-8
CHEM 2010	Chemical Safety Seminar	1
CHEM 2110 (860:110)	Descriptive Inorganic Chemistry	4
CHEM 2210 (860:120)	Organic Chemistry I	3
CHEM 2220 (860:123)	Organic Chemistry II	3
CHEM 2230 (860:121)	Organic Chemistry Laboratory	2
CHEM 2310 (860:132)	Chromatography and Quantitative Analysis	4
CHEM 3600 (860:180)	Undergraduate Research in Chemistry	2
CHEM 4220/5220 (860:161g) or CHEM 4310/5310 (860:137g)	Organic Structure Analysis Instrumental Analysis	3-4
CHEM 4420/5420 (860:140g)	Physical Chemistry I	3
CHEM 4430/5430 (860:141g)	Physical Chemistry II	3
CHEM 4440/5440 (860:143g)	Physical Chemistry Laboratory	2
CHEM 4510/5510 (860:154g)	Biochemistry I	3
CHEM 4520/5520 (860:155g)	Biochemistry II	3
CHEM 4530/5530 (860:156g)	Biochemistry Laboratory	2
Physics:		
Select one of the following:		8

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PHYSICS 1511 (880:054) & PHYSICS 1512 (880:056)	General Physics I and General Physics II	
OR		
PHYSICS 1701 (880:130) & PHYSICS 1702 (880:131)	Physics I for Science and Engineering and Physics II for Science and Engineering	
Electives **		3-4
One 3000-level or higher content course in biology, biochemistry, or chemistry (with the exception of CHEM 4630/5630 which will not count as an elective option)		
Total hours		71-74

- * Has prerequisite of satisfactory score on ALEKS exam or subsequent remediation.
- ** Students taking the 3 hour course CHEM 4220/5220 (860:161g) Organic Structure Analysis as an alternative to the 4 hour course CHEM 4310/5310 (860:137g) Instrumental Analysis are required to take a 4 hour elective that includes a lab component.
- *** BIOL 3140 (840:140) has a prerequisite of BIOL 2051 (840:051). BIOL 2051 (840:051) is waived as a prerequisite for Biochemistry majors.

Notes:

- The elective course should be chosen with the help of the major advisor. This is particularly important for students wishing to earn a certified degree, to assure consistency with the certification guidelines of the American Chemical Society. An appropriate advanced course in another science may be substituted with department head approval.
- To satisfy American Chemical Society guidelines for certification of the Biochemistry major, the two hours of CHEM 3600 (860:180) Undergraduate Research required for this program must include completion of a final written report.

Chemistry Major

The B.S. Chemistry major requires a minimum of 126 total hours to graduate. This total includes Liberal Arts Core requirements and the following specified major requirements, plus electives to complete the minimum of 126 hours.

The Bachelor of Science Chemistry major is accredited by the American Chemical Society. This program is recommended for students who wish to prepare for careers as professional chemists. It also provides the most complete preparation for post-graduate study in the field of chemistry.

Required

Mathematics:		
MATH 1420 (800:060)	Calculus I *	4
MATH 1421 (800:061)	Calculus II	4
Chemistry and Biochemistry:		
CHEM 1110 (860:044) & CHEM 1120 (860:048) or CHEM 1130 (860:070)	General Chemistry I and General Chemistry II (*) General Chemistry I-II	5-8
CHEM 2010	Chemical Safety Seminar	1

CHEM 2110 (860:110)	Descriptive Inorganic Chemistry	4
CHEM 2210 (860:120)	Organic Chemistry I	3
CHEM 2220 (860:123)	Organic Chemistry II	3
CHEM 2230 (860:121)	Organic Chemistry Laboratory	2
CHEM 2310 (860:132)	Chromatography and Quantitative Analysis	4
CHEM 3600 (860:180)	Undergraduate Research in Chemistry	2
CHEM 4110/5110 (860:145g)	Inorganic Chemistry	3
CHEM 4310/5310 (860:137g)	Instrumental Analysis	4
CHEM 4420/5420 (860:140g)	Physical Chemistry I	3
CHEM 4430/5430 (860:141g)	Physical Chemistry II	3
CHEM 4440/5440 (860:143g)	Physical Chemistry Laboratory	2
CHEM 4510/5510 (860:154g)	Biochemistry I	3
CHEM 4610/5610 (860:149g)	Advanced Synthesis Laboratory	2

Physics: 8

PHYSICS 1701 (880:130) & PHYSICS 1702 (880:131)	Physics I for Science and Engineering and Physics II for Science and Engineering
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or

PHYSICS 1512 (880:056) & PHYSICS 1511 (880:054)	General Physics II and General Physics I
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Elective 3

A 4000-level chemistry content course.

Total Hours 63-66

- * Has prerequisite of satisfactory score on ALEKS exam or subsequent remediation.

Notes:

- To satisfy American Chemical Society guidelines for certification of the Chemistry major, the two hours of CHEM 3600 (860:180) Undergraduate Research required for this program must include completion of a final written report.
- The elective course should be chosen with the help of the major advisor. This is particularly important for students wishing to earn a certified degree, to assure consistency with the certification guidelines of the American Chemical Society. An appropriate advanced course in another science may be substituted with department head approval.
- Students wishing to earn a non-certified Bachelor of Science degree may omit CHEM 4110/5110 (860:145g), CHEM 4610/5610 (860:149g), and CHEM 4510/5510 (860:154g), but must include six additional elective hours in chemistry at the 4000-level or higher.

Emphasis-Honors Research

This emphasis is available to qualified students pursuing the Bachelor of Science program by invitation at the beginning of their junior year. Completion of Honors Research requires 5 credit hours in CHEM 3600 (860:180) Undergraduate Research and the writing of

a senior research thesis. The research credit may be applied to the elective hours of the B.S. degree.

Bachelor of Arts Degree Programs

Biochemistry Major

The B.A. Biochemistry major requires a minimum of 120 total hours to graduate. This total includes Liberal Arts Core requirements and the following specified major requirements, plus electives to complete the minimum of 120 hours.

This program provides experience in most basic areas of chemistry, with a focus on biochemistry. With appropriate choice of university electives, the B.A. Biochemistry major meets the needs of pre-medical students and students preparing for additional study in related areas such as pharmacology, medicinal chemistry, clinical chemistry, and toxicology. It is also suitable for students who wish to combine a chemistry major with a major in another discipline.

Required

Mathematics:			
MATH 1420 (800:060)	Calculus I *		4
Biology:			
BIOL 2052 (840:052)	General Biology: Cell Structure and Function		4
BIOL 3140 (840:140)	Genetics **		4
Chemistry and Biochemistry:			
CHEM 1110 (860:044) & CHEM 1120 (860:048) or CHEM 1130 (860:070)	General Chemistry I and General Chemistry II (*) General Chemistry I-II	5-8	
CHEM 2010	Chemical Safety Seminar		1
CHEM 2110 (860:110) or CHEM 2310 (860:132)	Descriptive Inorganic Chemistry Chromatography and Quantitative Analysis		4
CHEM 2210 (860:120)	Organic Chemistry I		3
CHEM 2220 (860:123)	Organic Chemistry II		3
CHEM 2230 (860:121)	Organic Chemistry Laboratory		2
CHEM 4420/5420 (860:140g)	Physical Chemistry I		3
CHEM 4510/5510 (860:154g)	Biochemistry I		3
CHEM 4520/5520 (860:155g)	Biochemistry II		3
CHEM 4530/5530 (860:156g)	Biochemistry Laboratory		2
Physics:			
PHYSICS 1511 (880:054) & PHYSICS 1512 (880:056) or PHYSICS 1701 (880:130) & PHYSICS 1702 (880:131)	General Physics I and General Physics II Physics I for Science and Engineering and Physics II for Science and Engineering		8
Electives			3-4
One 3000-level or higher content course in biology, biochemistry, or chemistry			
Total Hours			52-56

* Has prerequisite of satisfactory score on ALEKS exam or subsequent remediation.

** BIOL 3140 (840:140) has a prerequisite of BIOL 2051 (840:051). BIOL 2051 (840:051) is waived as a prerequisite for Biochemistry majors.

Chemistry Major

The B.A. Chemistry major requires a minimum of 120 total hours to graduate. This total includes Liberal Arts Core requirements and the following specified major requirements, plus electives to complete the minimum of 120 hours.

This program provides experience in all basic areas of chemistry. With appropriate choice of university electives, the B.A. Chemistry major meets the needs of pre-medical students and students preparing for additional study in related areas such as biochemistry, industrial hygiene, pharmacology and medicinal chemistry, clinical chemistry, and toxicology. It is also suitable for students who wish to combine a chemistry major with a major in another discipline.

Required

Mathematics:			
MATH 1420 (800:060)	Calculus I *		4
MATH 1421 (800:061)	Calculus II		4
Chemistry and Biochemistry:			
CHEM 1110 (860:044) & CHEM 1120 (860:048) or CHEM 1130 (860:070)	General Chemistry I and General Chemistry II (*) General Chemistry I-II	5-8	
CHEM 2010	Chemical Safety Seminar		1
CHEM 2110 (860:110)	Descriptive Inorganic Chemistry		4
CHEM 2210 (860:120)	Organic Chemistry I		3
CHEM 2220 (860:123)	Organic Chemistry II		3
CHEM 2230 (860:121)	Organic Chemistry Laboratory		2
CHEM 2310 (860:132)	Chromatography and Quantitative Analysis		4
CHEM 4310/5310 (860:137g)	Instrumental Analysis		4
CHEM 4420/5420 (860:140g)	Physical Chemistry I		3
CHEM 4430/5430 (860:141g)	Physical Chemistry II		3
Physics:			
Select one of the following:			8
PHYSICS 1511 (880:054) & PHYSICS 1512 (880:056) or PHYSICS 1701 (880:130) & PHYSICS 1702 (880:131)	General Physics I and General Physics II Physics I for Science and Engineering and Physics II for Science and Engineering		
Total Hours			48-51

* Has prerequisite of satisfactory score on ALEKS exam or subsequent remediation.

Chemistry Major-Teaching

The B.A. Chemistry-Teaching major requires a minimum of 120 total hours to graduate. This total includes Liberal Arts Core requirements, the Professional Education Requirements, and the following specified

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major requirements, plus electives to complete the minimum of 120 hours.

This program provides preparation for chemistry teachers with successful completion leading to recommendation for State of Iowa licensure in 5-12 Chemistry. Coursework that leads to additional endorsements is recommended and should be selected in consultation with your advisor.

Required

Mathematics:		
MATH 1420 (800:060)	Calculus I *	4
Chemistry and Biochemistry:		
CHEM 1110 (860:044) & CHEM 1120 (860:048)	General Chemistry I and General Chemistry II (*)	8
CHEM 2010	Chemical Safety Seminar	1
CHEM 2040	Applied Organic and Biochemistry	4
CHEM 2110 (860:110)	Descriptive Inorganic Chemistry	4
CHEM 2310 (860:132)	Chromatography and Quantitative Analysis	4
CHEM 4420/5420 (860:140g)	Physical Chemistry I	3
Physics: 8		
Select one of the following:		
PHYSICS 1511 (880:054) & PHYSICS 1512 (880:056)	General Physics I and General Physics II	
or		
PHYSICS 1701 (880:130) & PHYSICS 1702 (880:131)	Physics I for Science and Engineering and Physics II for Science and Engineering	
Science and Science Education:		
SCI ED 3300/5300 (820:190g)	Orientation to Science Teaching	4
SCI ED 4800/5800	Methods for Teaching Secondary Science or MTSS	3
Teaching:		
TEACHING 3129	Secondary and Special-Area Classroom Management	1
Total Hours		44

* Has prerequisite of satisfactory score on ALEKS exam or subsequent remediation.

Notes:

1. Well-prepared students may substitute *CHEM 1130 (860:070)* for CHEM 1110 (860:044) and CHEM 1120 (860:048); these students must also substitute CHEM 2210 (860:120) and CHEM 2230 (860:121) and CHEM 2220 (860:123) for CHEM 2040.

Minors

Chemistry Minor

A student cannot declare a Chemistry minor if they are pursuing any B.A. or B.S. major in the Department of Chemistry and Biochemistry.

Required

Chemistry and Biochemistry:		
CHEM 1110 (860:044) & CHEM 1120 (860:048) or CHEM 1130 (860:070)	General Chemistry I and General Chemistry II (*) General Chemistry I-II	5-8
Electives 14		
Total Hours		19-22

* Has prerequisite of satisfactory score on ALEKS exam or subsequent remediation.

Note: Courses numbered 2000 and above may be used as electives for the Chemistry Minor, with the following exceptions: CHEM 2010, CHEM 4630/5630, and any Cooperative Education, Independent Study, Readings, Research, and Seminar courses.

Following are some suggested elective courses to complete the Chemistry Minor:

CHEM 2040	Applied Organic and Biochemistry
CHEM 2110 (860:110)	Descriptive Inorganic Chemistry
CHEM 2210 (860:120)	Organic Chemistry I
CHEM 2220 (860:123)	Organic Chemistry II
CHEM 2230 (860:121)	Organic Chemistry Laboratory
CHEM 2310 (860:132)	Chromatography and Quantitative Analysis
CHEM 4200/5200 (860:144g)	Nanoscience
CHEM 4210/5210 (860:148g)	Nanotechnology
CHEM 4310/5310 (860:137g)	Instrumental Analysis
CHEM 4420/5420 (860:140g)	Physical Chemistry I
CHEM 4430/5430 (860:141g)	Physical Chemistry II
CHEM 4510/5510 (860:154g)	Biochemistry I
CHEM 4520/5520 (860:155g)	Biochemistry II
CHEM 4505/5505	Drugs, Poisons, and Venoms

Biochemistry, B.S.

University Goal: Communication

Program Goal 1: Students will be able to effectively communicate chemical information to colleagues and the public.

Outcome 1: Students will be able to prepare and produce scientific written communications using standard chemistry style and format.

Outcome 2: Students will be able to prepare and deliver an oral presentation on chemical topics.

University Goal: Content Knowledge

Program Goal 2: Students will apply chemical knowledge.

Outcome 3: Students will demonstrate proficient knowledge and application of chemistry content.

University Goal: Critical Thinking

Program Goal 3: Students will be able to think critically about chemistry.

Outcome 4: Students will be able to plan the collection of the data needed to test a hypothesis in chemistry.

Program Goal 4: Students will demonstrate the skills needed to successfully conduct experiments and analyze data.

Outcome 5: Students will produce data to create a calibration curve and use it to analyze unknown samples.

Biochemistry, B.A.

University Goal: Communication

Program Goal 1: Students will be able to effectively communicate chemical information to colleagues and the public.

Outcome 1: Students will be able to prepare and produce scientific written communications using standard chemistry style and format.

Outcome 2: Students will be able to prepare and deliver an oral presentation on chemical topics.

University Goal: Content Knowledge

Program Goal 2: Students will apply chemical knowledge.

Outcome 3: Students will demonstrate proficient knowledge and application of chemistry content.

University Goal: Critical Thinking

Program Goal 3: Students will be able to think critically about chemistry.

Outcome 4: Students will be able to plan the collection of the data needed to test a hypothesis in chemistry.

Program Goal 4: Students will demonstrate the skills needed to successfully conduct experiments and analyze data.

Outcome 5: Students will produce data to create a calibration curve and use it to analyze unknown samples.

Chemistry, B.S.

University Goal: Communication

Program Goal 1: Students will be able to effectively communicate chemical information to colleagues and the public.

Outcome 1: Students will be able to prepare and produce scientific written communications using standard chemistry style and format.

Outcome 2: Students will be able to prepare and deliver an oral presentation on chemical topics.

University Goal: Content Knowledge

Program Goal 2: Students will apply chemical knowledge.

Outcome 3: Students will demonstrate proficient knowledge and application of chemistry content.

University Goal: Critical Thinking

Program Goal 3: Students will be able to think critically about chemistry.

Outcome 4: Students will be able to plan the collection of the data needed to test a hypothesis in chemistry.

Program Goal 4: Students will demonstrate the skills needed to successfully conduct experiments and analyze data.

Outcome 5: Students will produce data to create a calibration curve and use it to analyze unknown samples.

Chemistry, B.A.

University Goal: Communication

Program Goal 1: Students will be able to effectively communicate chemical information to colleagues and the public.

Outcome 1: Students will be able to prepare and produce scientific written communications using standard chemistry style and format.

Outcome 2: Students will be able to prepare and deliver an oral presentation on chemical topics.

University Goal: Content Knowledge

Program Goal 2: Students will apply chemical knowledge.

Outcome 3: Students will demonstrate proficient knowledge and application of chemistry content.

University Goal: Critical Thinking

Program Goal 3: Students will be able to think critically about chemistry.

Outcome 4: Students will be able to plan the collection of the data needed to test a hypothesis in chemistry.

Program Goal 4: Students will demonstrate the skills needed to successfully conduct experiments and analyze data.

Outcome 5: Students will produce data to create a calibration curve and use it to analyze unknown samples.

Chemistry Teaching, B.A.

University Goal: Communication

Program Goal 1: Students will be able to effectively communicate chemical information to colleagues and the public.

Outcome 1: Students will be able to prepare and produce scientific written communications using standard chemistry style and format.

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Outcome 2: Students will be able to prepare and deliver an oral presentation on chemical topics.

University Goal: Content Knowledge

Program Goal 2: Students will apply chemical knowledge.

Outcome 3: Students will demonstrate proficient knowledge and application of chemistry content.

University Goal: Critical Thinking

Program Goal 3: Students will demonstrate the skills needed to successfully conduct experiments and analyze data.

Outcome 4: Students will produce data to create a calibration curve and use it to analyze unknown samples.