

Morris Campus

Chemistry B.A.

Division of Science & Mathematics - Adm

Division of Science and Mathematics

- Program Type: Baccalaureate
- Requirements for this program are current for Spring 2022
- Required credits to graduate with this degree: 120
- Required credits within the major: 60 to 74
- Degree: Bachelor of Arts

Coursework in chemistry is increasingly interdisciplinary and spans analytical, inorganic, organic, and physical chemistry. Students may also pursue a degree in chemistry with a biochemistry subfield or design an interdisciplinary area of concentration encompassing chemistry and related fields. All majors must study beginning physics and calculus. Beginning chemistry courses satisfy the physical sciences component of the general education requirements.

The UMM chemistry program is approved to offer American Chemical Society (ACS) certified degrees. Students who wish to have their degree certified by the ACS may need to complete additional courses or work beyond the program requirements listed below. A complete description of how to complete the ACS requirements at UMM can be found on the discipline web page: <https://academics.morris.umn.edu/chemistry-biochemistry>

Chemistry and biochemistry majors do hands-on work with chemical instrumentation and use computers in both software and hardware applications. The faculty prides itself on working closely with its students on undergraduate research projects, directed studies, and undergraduate teaching assistantships. In addition, chemistry/biochemistry majors are encouraged to complete summer research internships at university and industrial labs or at other research facilities, locally and nationally.

Degrees in chemistry/biochemistry, in addition to being an excellent preparation for industrial employment, government service, or secondary teaching, also prepare students for postgraduate work (more than 60% of majors pursue postgraduate work).

Objectives--the chemistry discipline is designed to:

- Serve students from other disciplines requiring knowledge of chemistry;
 - Advance student learning in contemporary chemistry/biochemistry at a level appropriate to undergraduates;
 - Advance student competence in research in chemistry/biochemistry;
 - Advance student proficiency in green chemistry competencies.
- Prepare students for postgraduate work in a variety of fields and/or for careers in industrial or clinical settings or for careers in secondary education.
- Prepare students for professional programs such as medicine, pharmacy, veterinary medicine, dentistry, and physician assistant.

Learning Outcomes -- The curriculum is designed to ensure that students are able to:

- Demonstrate an understanding of fundamental concepts of chemistry, including the principles of green chemistry.
- Solve problems using critical thinking and analytical reasoning skills including the integration of knowledge from other disciplines.
- Identify the objective of an experiment, conduct experiments using appropriate techniques and equipment, interpret the results, discuss the data, and draw conclusions.
- Communicate concepts and results effectively (oral and written), including interpersonal communication.
- Locate and understand literature (especially primary literature) in chemistry and scientific publications.
- Recognize hazards, conduct experiments in a safe, ethical, and sustainable manner, consider greener laboratory alternatives, and manage chemicals, inc.

Program Delivery

This program is available:

- via classroom (the majority of instruction is face-to-face)

Admission Requirements

For information about University of Minnesota admission requirements, visit the [Office of Admissions website](#).

General Requirements

All students are required to complete general University and college requirements. For more information, see the [general education requirements](#).

Program Requirements

Students are required to take 2 semester(s) of any second language.

Courses may not be taken S/N. Up to 2 courses with a grade of D or D+ may be used to meet the major requirements if offset by an equivalent number of credits of A or B. A minimum GPA of 2.00 is required in the major to graduate. The GPA includes all, and only, University of Minnesota coursework. Grades of "F" are included in GPA calculation until they are replaced. Students should consult members of the chemistry faculty to plan programs of study appropriate to their interests and postgraduate goals.

Students may complete a major in chemistry through one of three tracks--the standard chemistry major or the chemistry major with a biochemistry subfield or with a green and sustainable subfield.

Required Courses

Stat 1601 or Stat 2601 are not required but are strongly recommended.

- CHEM 1101 - General Chemistry I [SCI-L] (5.0 cr)
- CHEM 1102 - General Chemistry II [SCI-L] (5.0 cr)
- CHEM 2301 - Organic Chemistry I [SCI] (4.0 cr)
- CHEM 2311 - Organic Chemistry Lab I (1.0 cr)
- CHEM 2321 - Introduction to Research I (1.0 cr)
- CHEM 2322 - Introduction to Research II (1.0 cr)
- CHEM 3101 - Analytical Chemistry [SCI-L] (4.0 cr)
- CHEM 3501 - Physical Chemistry: Thermodynamics [SCI] (4.0 cr)
- CHEM 3901 - Chemistry Seminar I (0.5 cr)
- CHEM 4901 - Chemistry Seminar II (0.5 cr)
- MATH 1101 - Calculus I [M/SR] (5.0 cr)
- MATH 1102 - Calculus II [M/SR] (5.0 cr)
- CHEM 2302 - Organic Chemistry II [SCI] (4.0 cr)
or CHEM 2304 - Organic Chemistry II with a Biological Emphasis [SCI] (4.0 cr)

Program Sub-plans

Students are required to complete one of the following sub-plans.

Standard

Standard Chemistry Required Courses

- CHEM 3502 - Physical Chemistry: Quantum Mechanics [SCI] (4.0 cr)
- CHEM 3511 - Physical Chemistry Lab (1.0 cr)
- PHYS 1101 - General Physics I [SCI-L] (5.0 cr)
- PHYS 1102 - General Physics II [SCI-L] (5.0 cr)

Standard Chemistry Elective Courses

Take 6 or more credit(s) from the following:

- BIOL 4211 - Biochemistry (4.0 cr)
- CHEM 3201 - Sustainable Synthetic and Solid State Methods (2.0 cr)
- CHEM 3406 - Polymer Properties and Characterization (2.0 cr)
- CHEM 3407 - Polymer Synthesis (3.0 cr)
- CHEM 3503 - Quantum Chemical Models and Visualizations (2.0 cr)
- CHEM 4111 - Instrumental Analysis (5.0 cr)
- CHEM 4201 - Chemistry and Sustainable Applications to Global Problems (4.0 cr)
- CHEM 4352 - Synthesis (4.0 cr)
- CHEM 4551 - Theoretical Chemistry (4.0 cr)
- CHEM 4552 - Molecular Spectroscopy (3.0 cr)
- CHEM 4701 - Inorganic Chemistry (4.0 cr)
- CHEM 4751 - Advanced Inorganic Chemistry (2.0 cr)
- CHEM 4351 *{Inactive}*(2.0 cr)
or CHEM 4355 - Biochemistry of Carbohydrates and Glycoconjugates (4.0 cr)
or CHEM 4357 *{Inactive}*(2.0 cr)

Biochemistry

Biochemistry Required Courses

- BIOL 1111 - Fundamentals of Genetics, Evolution, and Development [SCI] (3.0 cr)
- BIOL 2111 - Cell Biology [SCI-L] (4.0 cr)
- BIOL 3121 - Molecular Biology [SCI-L] (4.0 cr)
- BIOL 4211 - Biochemistry (4.0 cr)

BIOL 4611 - Biochemistry Lab (1.0 cr)
PHYS 1091 - Principles of Physics I [SCI-L] (5.0 cr)
PHYS 1092 - Principles of Physics II [SCI-L] (5.0 cr)
or PHYS 1101 - General Physics I [SCI-L] (5.0 cr)
PHYS 1102 - General Physics II [SCI-L] (5.0 cr)

Advanced Biochemistry-based Elective

Take 4 or more credit(s) from the following:

- CHEM 4351 *{Inactive}*(2.0 cr)
- CHEM 4355 - Biochemistry of Carbohydrates and Glycoconjugates (4.0 cr)
- CHEM 4357 *{Inactive}*(2.0 cr)

Biochemistry Electives

For students planning to go to graduate school in biochemistry, it is recommended that they also take BIOL 4111 - Microbiology and BIOL 4312 - Genetics.

Take 1 or more course(s) from the following:

- CHEM 3201 - Sustainable Synthetic and Solid State Methods (2.0 cr)
- CHEM 3406 - Polymer Properties and Characterization (2.0 cr)
- CHEM 3407 - Polymer Synthesis (3.0 cr)
- CHEM 3502 - Physical Chemistry: Quantum Mechanics [SCI] (4.0 cr)
- CHEM 3503 - Quantum Chemical Models and Visualizations (2.0 cr)
- CHEM 4111 - Instrumental Analysis (5.0 cr)
- CHEM 4201 - Chemistry and Sustainable Applications to Global Problems (4.0 cr)
- CHEM 4352 - Synthesis (4.0 cr)
- CHEM 4551 - Theoretical Chemistry (4.0 cr)
- CHEM 4552 - Molecular Spectroscopy (3.0 cr)
- CHEM 4701 - Inorganic Chemistry (4.0 cr)
- CHEM 4751 - Advanced Inorganic Chemistry (2.0 cr)

Chemistry, Green and Sustainable

Required

CHEM 2201 - Introduction to Environmental Chemistry (2.0 cr)
or CHEM 2202 - Introduction to Green Chemistry (2.0 cr)
BIOL 1111 - Fundamentals of Genetics, Evolution, and Development [SCI] (3.0 cr)
ENST 1101 - Environmental Problems and Policy [ENVT] (4.0 cr)
PHYS 1091 - Principles of Physics I [SCI-L] (5.0 cr)
PHYS 1092 - Principles of Physics II [SCI-L] (5.0 cr)
or PHYS 1101 - General Physics I [SCI-L] (5.0 cr)
PHYS 1102 - General Physics II [SCI-L] (5.0 cr)

Interdisciplinary Elective

Take 1 or more course(s) from the following:

- BIOL 2101 - Evolution of Biodiversity [SCI-L] (4.0 cr)
- BIOL 2111 - Cell Biology [SCI-L] (4.0 cr)
- BIOL 3131 - Ecology [ENVT] (4.0 cr)
- ENST 3101 - Industrial Ecology (4.0 cr)
- GEOL 3501 - Hydrology [SCI] (4.0 cr)
- GEOL 3502 - Groundwater [ENVT] (4.0 cr)
- GEOL 3601 - Introduction to Geochemistry [SCI] (4.0 cr)
- PHYS 3004 - Atmospheric Physics [ENVT] (4.0 cr)
- STAT 1601 - Introduction to Statistics [M/SR] (4.0 cr)
or STAT 2601 - Statistical Methods [M/SR] (4.0 cr)

Green and Sustainability Electives

Take 6 or more credit(s) from the following:

- CHEM 3201 - Sustainable Synthetic and Solid State Methods (2.0 cr)
- CHEM 3406 - Polymer Properties and Characterization (2.0 cr)
- CHEM 4201 - Chemistry and Sustainable Applications to Global Problems (4.0 cr)
- CHEM 4352 - Synthesis (4.0 cr)

Chemistry Electives

Take 4 or more credit(s) from the following:

- BIOL 4211 - Biochemistry (4.0 cr)
- CHEM 3407 - Polymer Synthesis (3.0 cr)
- CHEM 3411 - Polymer Chemistry Lab (1.0 cr)
- CHEM 3502 - Physical Chemistry: Quantum Mechanics [SCI] (4.0 cr)
- CHEM 3503 - Quantum Chemical Models and Visualizations (2.0 cr)
- CHEM 4111 - Instrumental Analysis (5.0 cr)
- CHEM 4351 *{Inactive}*(2.0 cr)
- CHEM 4355 - Biochemistry of Carbohydrates and Glycoconjugates (4.0 cr)
- CHEM 4357 *{Inactive}*(2.0 cr)

- CHEM 4551 - Theoretical Chemistry (4.0 cr)
- CHEM 4701 - Inorganic Chemistry (4.0 cr)
- CHEM 4711 - Inorganic Chemistry Lab (1.0 cr)
- CHEM 4751 - Advanced Inorganic Chemistry (2.0 cr)