

CHEMISTRY AND BIOCHEMISTRY

B.S., M.S., B.S./M.S., Ph.D. Degrees, Minors

Our programs prepare students for employment as research chemists in federal, state, municipal, academic or industrial laboratories, and in premedicine as laboratory technicians, industry supervisors and technical sales personnel. Our programs also provide a technical base for chemistry teachers. Graduates also find positions in the environmental sciences, oceanography and related interdisciplinary fields. Many chemistry graduates elect to pursue advanced M.S., Ph.D., pharmacology or M.D. degrees.

College of Natural Science and Mathematics

Department of Chemistry and Biochemistry (<https://www.uaf.edu/chem/>) 907-474-5510

B.S., CHEMISTRY

The chemistry curriculum meets the American Chemical Society standards covering the basics of general, organic, inorganic, physical and analytical chemistry, and biochemistry. Undergraduate research leading to publications is strongly encouraged, and many of the laboratory-based courses have a research component built into them. The B.S. program may be completed without an optional concentration, or students can opt for an additional focus in biochemistry, environmental chemistry or forensic chemistry. The B.S. program generally prepares students for a career in chemistry or biochemistry, or for professional school. The B.S. in chemistry is an ACS-approved degree program. The environmental chemistry concentration provides courses that help students study the chemistry of the natural environment by adding geology, biology or atmospheric courses, and it prepares students for graduate studies and/or careers in the environmental industry. The biochemistry concentration provides an enhanced curriculum in biological chemistry for students seeking advanced careers in biochemistry, medicine or health sciences. Limited teaching assistantships are often available for upper-division students, which strengthen leadership and communication skills.

The bachelor's degrees in chemistry and concentrations in biochemistry and environmental chemistry provide excellent research opportunities and background for undergraduate students through connection to corresponding graduate programs.

The Chemistry and Biochemistry Department is housed in the Reichardt Building, where laboratories are equipped with research-grade instrumentation, providing hands-on experience to students for entry into graduate school or industry. Visit the Chemistry Department (<https://www.uaf.edu/chem/>) for more information.

Minimum Requirements for Chemistry Bachelor's Degree: 120 credits

Learn more about the bachelor's degree in chemistry (<https://uaf.edu/academics/programs/bachelors/chemistry.php>), including an overview of the program, career opportunities and more.

ACCELERATED B.S./M.S., CHEMISTRY

The Chemistry B.S./M.S. program with thesis or project prepares students for employment as research chemists in federal, state,

municipal, academic or industrial laboratories, and in pre-medicine as laboratory technicians, industry supervisors and technical sales personnel. Graduates also find positions in the environmental sciences, oceanography and related interdisciplinary fields. Many chemistry graduates elect to pursue advanced Ph.D., pharmacology or M.D. degrees. The B.S./M.S. program will assist students in successfully preparing for post-graduate programs by helping students follow a curriculum specifically needed for developing successful licensing school applications or scientific careers while enhancing their critical thinking skill sets, scientific knowledge, writing and presentation skill, and to be overall well-rounded professionals.

The Chemistry B.S./M.S. program is designed to assist students in earning both B.S. and M.S. degrees quicker and with less cost than earning the degrees individually. This is accomplished by having 12 credits of F400- and F600-level courses count as electives in both degrees. Additionally, in the program, students begin to conduct research in a research laboratory at the beginning of their third year. This early research start will allow students to develop technical laboratory skills and to become familiar with their potential M.S. project early on in their program.

To complete the M.S. portion of this program, students will complete a research thesis or a project, in addition to the coursework. This will allow students to tailor their graduate studies to meet their interests and prospective career needs. Students pursuing an M.S. with a research thesis will conduct laboratory research and produce a thesis generally equivalent to a manuscript for a peer-reviewed journal. Students pursuing an M.S. with a project will conduct a research project that may be based solely or partly on literature review/synthesis. This can include writing a review article or a different activity as decided by the student's committee. To ensure students' success in this program, students will need to be advised very carefully by their faculty advisor and committee.

Minimum Requirements for Accelerated Mathematics B.S./M.S. Degrees: 138 credits

Learn more about the bachelor's degree in chemistry (<https://uaf.edu/academics/programs/bachelors/chemistry.php>), including an overview of the program, career opportunities and more.

M.S., CHEMISTRY

Graduates in chemistry qualify for employment in many fields as teachers of chemistry; supervisors in industry; technical sales personnel; research chemists in federal, state, municipal, academic or industrial laboratories; in pre-medicine; and as laboratory technicians. The rapid introduction of chemical techniques in all branches of commerce and the creation of many synthetic products have caused substantial growth in the profession. In addition to the traditional employment opportunities in chemistry, well-qualified graduates find positions in the fields of environmental sciences, oceanography, biochemistry, neuroscience, and related interdisciplinary fields. Many recipients of chemistry master's degrees continue their education to obtain Ph.D. degrees at UAF or other universities. The M.S. program also has concentrations in the departmental focal areas of biochemistry and neuroscience and environmental chemistry. The department also offers Ph.D. degrees in each of these areas.

The department offers well-equipped laboratories housing instrumentation for nuclear magnetic resonance spectrometry, infrared, ultraviolet/visible and atomic absorption spectrophotometry, mass spectrometry, gas chromatography, amino acid analysis and HPLC.

Additional equipment for gas chromatography/mass spectrometry, X-ray diffractometry, electron microscopy and liquid scintillating counters is available in cooperation with other UAF departments and institutes.

Minimum Requirements for Chemistry Master's Degree: 30 credits

PH.D., BIOCHEMISTRY AND NEUROSCIENCE

Biochemistry and neuroscience is an interdepartmental program administered by the Department of Chemistry and Biochemistry with research support through the Institute of Arctic Biology. A broad range of biomedical research experiences is available, including molecular and cellular neuroscience, proteomics, protein structure-function and molecular toxicology. The Arctic environment provides additional research opportunities in environmental biochemistry, adaptations and molecular genetics. Students seeking an M.S. degree in these research areas should see the M.S. chemistry with a concentration in biochemistry and neuroscience degree.

UAF faculty and affiliate faculty at collaborating institutions provide a rich academic environment encompassing both research and comprehensive course offerings. Students with career interests in biotechnology, pharmaceutical sciences, environmental health, genetics and biomedicine are encouraged to apply. Students are normally accepted with financial support (fellowships, research assistantships and/or teaching assistantships) along with tuition waivers.

Minimum Requirements for Biochemistry and Neuroscience Doctoral Degree: 18 thesis credits

PH.D., ENVIRONMENTAL CHEMISTRY

Environmental chemistry focuses on the chemical processes influencing the composition and chemical speciation of natural systems (air, water and soils), the chemical fate and mobility of contaminants in the environment, chemical processes that affect the toxicity and bioavailability of contaminants, and chemical aspects of contaminant remediation and pollution prevention. The common link is a focus on the underlying chemical structure, reactivity and mechanisms that dictate the extent and rates of environmentally important chemical reactions. Environmental chemistry is a challenging field, requiring core training in physical, analytical, organic and inorganic chemistry, and an understanding of how these disciplines can be applied to complex environmental systems. It also provides a quantitative and fundamental approach to understanding the processes that influence the quality of the environment.

The Department of Chemistry and Biochemistry offers B.S. and M.S. via concentrations under the chemistry degree. The program provides education and research opportunities focused on the molecular scale aspects of environmental science. The program defines three tracks to meet a wide range of student interests:

1. atmospheric chemistry,
2. aqueous/environmental geochemistry, and
3. environmental toxicology and contaminant fate.

Students may also design a custom focus area, subject to approval by their advisory committee.

Our faculty are involved in a wide range of projects from field studies of chemical transformation and transport to laboratory and modeling studies of the basic mechanisms of environmental reactions, to the

development of novel chemistry useful in contaminant remediation. The program is centered in the Reichardt Building on the Fairbanks campus which houses state-of-the-art classrooms, laboratories and computer facilities to support education and research activities. Located in Interior Alaska, UAF is home to numerous research institutes and centers that focus on Arctic science and engineering and provide great opportunities for collaboration and cross-disciplinary studies focused on the chemistry of polar and sub-Arctic systems.

The Ph.D. program in environmental chemistry provides advanced training in the concepts and methods of molecular environmental sciences with the expectation that Ph.D. recipients will be acknowledged as experts in their particular topic of study. This is accomplished primarily through the Ph.D. dissertation, which is a body of independent research that presents new findings on forefront topics related to molecular processes in the environment. The Ph.D. in environmental chemistry prepares students for careers in academia or the public and private research sectors. Graduate students in the environmental chemistry program are typically supported through teaching and research assistantships or fellowships. Students interested in an M.S. degree focusing on environmental chemical problems should see the M.S. chemistry with a concentration in environmental chemistry program.

Minimum Requirements for Environmental Chemistry Doctoral Degree: 32 credits

Programs Degrees

- B.S., Chemistry (<https://catalog.uaf.edu/bachelors/chemistry-bs/>)
- B.S./M.S., Chemistry (<https://catalog.uaf.edu/accelerated-programs/chemistry-bs-ms/>)
- M.S., Chemistry (<https://catalog.uaf.edu/masters/chemistry/>)
- Ph.D., Biochemistry and Neuroscience with Biochemistry Concentration (<https://catalog.uaf.edu/phd/biochemistry-neuroscience-bio/>)
- Ph.D., Biochemistry and Neuroscience with Neuroscience Concentration (<https://catalog.uaf.edu/phd/biochemistry-neuroscience-neuro/>)
- Ph.D., Environmental Chemistry (<https://catalog.uaf.edu/phd/environmental-chemistry/>)

Minors

- Minor, Biochemistry (<https://catalog.uaf.edu/minors/biochemistry/>)
- Minor, Chemistry (<https://catalog.uaf.edu/minors/chemistry/>)