CHEMISTRY

College of Natural Science and Mathematics
Department of Chemistry and Biochemistry
907-474-5510
www.uaf.edu/chem/

B.A., B.S. Degrees

Minimum Requirements for Degrees: 120 credits

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 MD degrees.

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. and B.A. programs 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. programs generally prepare 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. The B.A. degree provides breadth in the curriculum for study of a minor subject and requires more humanities courses. The B.A. best prepares students for careers in chemistry-related fields like environmental law, forensic science, science education, anthropology, etc. 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. See graduate programs in chemistry, biochemistry and molecular biology, and environmental chemistry.

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. See the departmental website for more information, **www.uaf.edu/chem/**.

Major — B.A. Degree

1. Complete the general university requirements. (See page 145. As part of the core curriculum requirements, complete: MATH F251X; PHYS F103X and PHYS F104X, or PHYS F211X and PHYS F212X.)
2. Complete the B.A. degree requirements. (See page 145. As part of the B.A. degree requirements, complete: MATH F252X.)
3. Complete the following program (major) requirements:*
   CHEM F105X—General Chemistry I 4
   CHEM F106X—General Chemistry II 4
   CHEM F202—Basic Inorganic Chemistry 3
   CHEM F212—Chemical Equilibrium and Analysis 4
   CHEM F321—Organic Chemistry I 4
   CHEM F325—Organic Chemistry II (4)
   or CHEM F351—General Biochemistry- Metabolism(3) 3-4
   CHEM F314W—Analytical Instrumental Laboratory (3) 3
   CHEM F331—Physical Chemistry I 4
   CHEM F481—Seminar 1
   CHEM F482O—Seminar 2
4. Ensure that you have satisfied the university requirement of 39 upper-division credits and two writing-intensive (W) courses, which will typically require either taking more upper-division chemistry courses or a significant number of upper-division courses in other disciplines, likely your minor.
5. Minimum credits required 120

* *Students must earn a C- grade or better in each course.*

Note: This degree does not encompass the depth required to be an American Chemistry Society-approved chemistry degree. Students taking this degree will not receive a certificate from ACS. Students intending to continue in chemistry or biochemistry careers or graduate studies should select a B.S. degree program.

Optional Concentration: Forensic Chemistry

1. Complete the general university requirements. (See page 145. As part of the core curriculum requirements, complete: MATH F251X; PHYS F103X and PHYS F104X, or PHYS F211X and PHYS F212X.)
2. Complete the B.A. degree requirements. (See page 145. As part of the B.A. degree requirements, complete: MATH F252X.)
3. Complete the program (major) requirements as listed under chemistry B.A. degree, including:
   CHEM F314W—Analytical Instrumental Laboratory 3
4. Complete the following:*
   CHEM F332—Physical Chemistry II 4
5. Earn a minor in justice using the following courses to complete the requirements:*
   JUST F110—Introduction to Justice 3
   JUST F222—Research Methods 3
   JUST F251—Criminology 3
   JUST F300X—Ethics and Justice** 3
   JUST F354—Procedural Law 3
   JUST F454W—Advanced Problems in Procedural Law 3
6. Minimum credits required 120

* *Students must earn a C- grade or better in each course.*

** *JUST F300X may not be used to fulfill core ethics requirement.*

Note: This degree does not encompass the depth required to be an American Chemistry Society-approved chemistry degree. Students taking this track will not receive a certificate from ACS. Students intending to continue in chemistry or biochemistry careers or graduate studies should select a B.S. degree program.

Major — B.S. Degree (American Chemistry Society-approved)

1. Complete the general university requirements. (See page 145. As part of the core curriculum requirements, complete: MATH F251X; PHYS F103X and PHYS F104X, or PHYS F211X and PHYS F212X.)

2. Complete the B.S. degree requirements. (See page 145. As part of the B.S. degree, complete: MATH F252X. Chemistry foundation courses may be used toward partial fulfillment of the natural science requirement.)

3. Complete the program (major) requirements:*
   CHEM F105X—General Chemistry I....4
   CHEM F106X—General Chemistry II....4
   CHEM F202—Basic Inorganic Chemistry....3
   CHEM F212—Chemical Equilibrium and Analysis....4
   CHEM F321—Organic Chemistry I....4
   CHEM F325—Organic Chemistry II....4
   CHEM F331—Physical Chemistry I....4
   CHEM F332—Physical Chemistry II....4
   CHEM F351—General Biochemistry — Metabolism....3
   CHEM F434W—Chemistry Capstone Laboratory....3
   CHEM F481—Seminar....1
   CHEM F482O—Seminar....2
   CHEM F488—Undergraduate Chemistry and Biochemistry Research....3
   MATH F253X—Calculus III....4

4. Complete two of the following:*
   CHEM F402—Inorganic Chemistry....3
   CHEM F450—General Biochemistry — Macromolecules....3
   CHEM F314W—Analytical Instrumental Laboratory....3

5. Minimum credits required....120

* *Students must earn a C- grade or better in each course.*

Note: Upon completing the required curriculum and fulfilling all general university requirements, students will receive a certificate from the American Chemical Society indicating approval of their degree program.

Optional Concentrations: Biochemistry, Environmental Chemistry

Biochemistry

1. Complete the general university requirements. (See page 146. As part of the core curriculum requirements, complete: MATH F251X; PHYS F103X and PHYS F104X, or PHYS F211X and PHYS F212X.)

2. Complete the B.S. degree requirements. (See page 146. As part of the B.S. degree requirements, complete: MATH F252X. Chemistry foundation courses may be used toward partial fulfillment of the natural science requirement.)

3. Complete the following program (major) requirements:*
   CHEM F105X—General Chemistry I....4
   CHEM F106X—General Chemistry II....4
   BIOL F115X—Fundamentals of Biology I....4
   BIOL F116X—Fundamentals of Biology II....4
   CHEM F202—Basic Inorganic Chemistry....3
   CHEM F212—Chemical Equilibrium and Analysis....4
   CHEM F321—Organic Chemistry I....4
   CHEM F325—Organic Chemistry II....4
   CHEM F331—Physical Chemistry I....3
   CHEM F351—General Biochemistry — Metabolism....3
   CHEM F450—General Biochemistry — Macromolecules....3
   CHEM F481—Seminar....1
   CHEM F482O—Seminar....2
   CHEM F488—Undergraduate Chemistry and Biochemistry Research....6

4. Complete four of the following advanced chemistry/math courses:* **
   CHEM F332—Physical Chemistry II....4
   CHEM F434W—Chemistry Capstone Laboratory....3
   CHEM F314W—Analytical Instrumental Laboratory....3
   CHEM F402—Advanced Inorganic Chemistry....3
   CHEM F420—Applications of NMR Spectroscopy....3
   MATH F253X—Calculus III....4

5. Complete 10 credits of the following biology/biochemistry courses:* **
   CHEM F360—Cell and Molecular Biology....4
   CHEM F455O—Environmental Toxicology....3
   CHEM F470—Cellular and Molecular Neuroscience....3
   CHEM F474—Neurochemistry....3
   BIOL F240—Beginnings in Microbiology....4
   BIOL F260—Principles of Genetics....4
   BIOL F310—Animal Physiology....4
   BIOL F342—Microbiology....4
   BIOL F402W—Biomedical and Research Ethics....3
   BIOL F417O—Neurobiology....3
   BIOL F462O—Concepts in Infectious Disease....3
   BIOL F465—Immunology....3

6. Minimum credits required....120

* *Students must earn a C- grade or better in each course.*

** *Courses selected under numbers 4 and 5 above must meet baccalaureate degree requirements for 39 upper-division credits and two writing-intensive courses.*

Note: This degree is intended for students interested in careers in biochemistry or pre-professional students, providing extra depth in biological sciences. The selection of optional courses will determine if the curriculum conforms to the American Chemistry Society-approved chemistry degree. Students desiring an ACS-approved chemistry degree should consult with their advisor about optional courses that will meet ACS requirements.

Environmental Chemistry

1. Complete the general university requirements. (See page 146. As part of the core curriculum requirements, complete: MATH F251X; PHYS F103X and PHYS F104X, or PHYS F211X and PHYS F212X.)

2. Complete the B.S. degree requirements. (See page 146. As part of the B.S. degree, complete: MATH F252X. Chemistry foundation courses may be used toward partial fulfillment of the natural science requirement.)

3. Complete the following program (major) requirements:*
   CHEM F105X—General Chemistry I....4
   CHEM F106X—General Chemistry II....4
   CHEM F202—Basic Inorganic Chemistry....3
   CHEM F212—Chemical Equilibrium and Analysis....4
   CHEM F314W—Analytical Instrumental Laboratory....3
   CHEM F321—Organic Chemistry I....4
   CHEM F325—Organic Chemistry II....4
   CHEM F331—Physical Chemistry I....4
   CHEM F332—Physical Chemistry II....4
   CHEM F434W—Chemistry Capstone Laboratory....3
   CHEM F481—Seminar....1
   CHEM F482O—Seminar....2
   CHEM F488—Undergraduate Chemistry and Biochemistry Research....3
   MATH F253X—Calculus III....3

4. Complete two of the following:*
   ATM F101X—Weather and Climate of Alaska....4
   BIOL F115X—Fundamentals of Biology I....4
   BIOL F116X—Fundamentals of Biology II....4
   GEOS F101X—The Dynamic Earth....4
   GEOS F262—Rocks and Minerals....3

5. Complete two of the following:*
   ATM F401—Introduction to Atmospheric Science....3
   BIOL F342—Microbiology....4
   CHEM F406—Atmospheric Chemistry....3
   CHEM F455O—Environmental Toxicology....3
   GEOS F417—Introduction to Geochemistry....3
   NRM F380W—Soils and the Environment....3

6. Minimum credits required....120

* *Students must earn a C- grade or better in each course.*

Note: A course in statistics (e.g. STAT F200X, STAT F300, or GEOS F430) is suggested. The selection of optional courses will determine if the curriculum conforms to the American Chemistry Society-approved chemistry degree. Students desiring an ACS-approved chemistry degree should consult with their advisor about optional courses that will meet ACS requirements.

Requirements for Chemistry Teachers (grades 7-12)

1. Complete all the requirements of the chemistry B.A. or B.S. degree.
2. All prospective science teachers must complete the following:
   PHIL F481—Philosophy of Science.....3

Note: We strongly recommend that prospective secondary science teachers seek advising from the UAF School of Education early in your undergraduate degree program so that you can be appropriately advised of the State of Alaska requirements for teacher licensure.

Minors

Chemistry

1. Complete the following:
   CHEM F105X—General Chemistry I.....4
   CHEM F106X—General Chemistry II.....4
2. Complete the following:
   CHEM F212—Chemical Equilibrium and Analysis* 4
   CHEM F321—Organic Chemistry I 4
   CHEM F325—Organic Chemistry II 4
   CHEM F331—Physical Chemistry I 4
3. Complete one of the following additional chemistry lab courses:
   CHEM F202—Basic Inorganic Chemistry 3
   CHEM F332—Physical Chemistry II 4
4. Minimum credits required 27

Biochemistry

1. Complete the following:
   CHEM F105X—General Chemistry I.....4
   CHEM F106X—General Chemistry II.....4
2. Complete the following:
   CHEM F321—Organic Chemistry I 4
   CHEM F325—Organic Chemistry II 4
   CHEM F331—Physical Chemistry I 4
   CHEM F351—General Biochemistry — Metabolism 3
3. Complete one of the following chemistry lab courses:
   CHEM F202—Basic Inorganic Chemistry 3
   CHEM F212—Chemical Equilibrium and Analysis 4
4. Minimum credits required 26

Baccalaureate Core Requirements

Communication . . . . . 9 Credits

- ENGL F111X—Introduction to Academic Writing.....(3)

Complete one of the following:
- ENGL F211X—Academic Writing about Literature.....(3)
- ENGL F213X—Academic Writing about the Social and Natural Sciences.....(3)

Complete one of the following:
- COMM F121X—Introduction to Interpersonal Communication .....(3)
- COMM F131X—Fundamentals of Oral Communication: Group Context .....(3)
- COMM F141X—Fundamentals of Oral Communication: Public Context.....(3)

Perspectives on the Human Condition . . . . . 18 Credits

Complete all of the following four courses:
- ANTH F100X/SOC F100X—Individual, Society and Culture.....(3)
- ECON F100X or PS F100X—Political Economy .....(3)
- HIST F100X—Modern World History.....(3)
- ENGL/FL F200X—World Literature .....(3)

12

Complete one of the following three courses:
- ART/MUS/THR F200X—Aesthetic Appreciation: Interrelationship of Art, Drama and Music.....(3)
- HUM F201X—Unity in the Arts.....(3)
- ANS F202X—Aesthetic Appreciation of Alaska Native Performance .....(3)

3

Complete one of the following six courses:
- BA F323X—Business Ethics.....(3)
- COMM F300X—Communicating Ethics.....(3)
- JUST F300X—Ethics and Justice.....(3)
- NRM F303X—Environmental Ethics and Actions .....(3)
- PS F300X—Ethics and Society.....(3)
- PHIL F322X—Ethics.....(3)

3

Or complete 12 credits from the above courses plus one of the following:
- Two semester-length courses in a single Alaska Native language or other non-English language
- Three semester-length courses (9 credits) in American Sign Language taken at the university level.

6-9

Mathematics . . . . . 3 Credits

Complete one of the following:
- MATH F113X—Concepts and Contemporary Applications of Mathematics.....(3)
- MATH F151X—College Algebra for Calculus* .....(4)
- MATH F152X—Trigonometry.....(3)
- MATH F156X—Precalculus .....(4)
- MATH F122X—Algebra for Business and Economics** .....(3)
- STAT F200X—Elementary Probability and Statistics.....(3)

** No credit may be earned for more than one of MATH F151X or F122X.*

Or complete one of the following:*
- MATH F251X—Calculus I** .....(4)
- MATH F252X—Calculus II .....(4)
- MATH F253X—Calculus III.....(4)
- MATH F222X—Calculus for Business and Economics .....(4)
- MATH F232X—Calculus for Life Sciences.....(4)

** Or any math course having one of these as a prerequisite*

*** No credit may be earned for more than one of MATH F251X, F222X or F232X.*

3-4

Natural Sciences . . . . . 8 Credits

Complete any two (4-credit) courses.
- ATM F101X—Weather and Climate of Alaska .....(4)
- BIOL F100X—Human Biology.....(4)
- BIOL F101X—Introduction to Animal Behavior .....(4)
- BIOL F103X—Biology and Society.....(4)
- BIOL F104X—Natural History.....(4)
- BIOL F115X—Fundamentals of Biology I .....(4)
- BIOL F116X—Fundamentals of Biology II.....(4)
- BIOL F120X—Introduction to Human Nutrition .....(4)
- BIOL F213X—Human Anatomy and Physiology I.....(4)
- BIOL F214X—Human Anatomy and Physiology II .....(4)
- CHEM F100X—Chemistry in Complex Systems .....(4)
- CHEM F103X—Basic General Chemistry.....(4)
- CHEM F104X—Beginnings in Biochemistry.....(4)
- CHEM F105X—General Chemistry.....(4)
- CHEM F106X—General Chemistry.....(4)
- GEOG F111X—Earth and Environment: Elements of Physical Geography....(4)
- GEOS F100X—Introduction to Earth Science .....(4)
- GEOS F101X—The Dynamic Earth.....(4)
- GEOS F106X—Life and the Age of Dinosaurs.....(4)
- GEOS F112X—History of Earth and Life .....(4)
- GEOS F120X—Glaciers, Earthquakes and Volcanoes .....(4)
- GEOS F125X—Humans, Earth and Environment.....(4)
- MSL F111X—The Oceans .....(4)
- PHYS F102X—Energy and Society.....(4)
- PHYS F103X—College Physics .....(4)
- PHYS F104X—College Physics .....(4)
- PHYS F115X—Physical Science I.....(4)
- PHYS F175X—Astronomy.....(4)
- PHYS F211X—General Physics.....(4)
- PHYS F212X—General Physics.....(4)
- PHYS F213X—Elementary Modern Physics.....(4)

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Library and Information Research . . . . . 0-1 Credit

- Successful completion of library skills competency test or LS F100X or LS F101X prior to junior standing

0-1

Upper-Division Writing and Oral Communication

Complete the following at the upper-division level:
- Two writing intensive courses designated (W) and one oral communication intensive course designated (O), or two oral communication intensive courses designated (O/2) (see degree and/or major requirements)

Total credits required 38-39

All degrees (e.g. B.A., B.S., etc.) require additional courses. Refer to specific degree and program requirements. Students must earn a C- grade or better in each course used toward the baccalaureate core.