

CHEMISTRY

DEPARTMENT OFFICE

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Programs Offered

Bachelor of Science in Chemistry
(certified by the American Chemical Society)

Bachelor of Arts in Chemistry

Bachelor of Science in Biochemistry

Minor in Chemistry

Teaching Credential Preparation

Chemistry is the study of matter, its properties, and how it changes. An understanding of chemical principles is required to fully understand most scientific disciplines such as biology, medicine, physics, environmental science, geology, materials science, pharmaceuticals, agriculture, forensic science, most branches of engineering, and even studio art. Chemists not only study molecules that nature provides but also synthesize new molecules to be used in many of these fields.

The department offers both bachelor of arts and bachelor of science degrees. Both degrees provide students with a solid chemical foundation to prepare them for graduate school, professional school, or the workforce. The B.S. degree requires more science coursework, while the B.A. allows more flexibility for other academic interests. The B.S. in biochemistry is designed for students with an interest in the biological aspects of chemistry and the pre-health professions.

Careers in Chemistry

Sonoma State University is fortunate to be situated within the greater Bay Area, which is rapidly becoming a leading area for research in disciplines such as biotechnology, pharmaceuticals, materials science, and proteomics. Sonoma State graduates have a high success

rate for acceptance into advanced degree programs in chemistry and biochemistry; medical, dental, and veterinary schools; cell and molecular biology; and materials science. They have also entered the job market in a variety of careers, including government agencies (FBI, forensics), technical writing, chemical and biochemical research, cosmetics and perfumes, space chemistry, teaching at all levels, medical technology, pharmaceuticals, patent law, materials research, consulting, and applications of chemistry in business.

Students seeking teaching credentials may elect chemistry as their major within the teaching credential program in science.

The small size and educational philosophy of the department encourage students to develop close relationships with other students, faculty, and staff. Coursework and individual research projects place an emphasis on laboratory experiences in which students are expected to become familiar with a variety of techniques and instruments. In their junior year, students participate in the "Senior Experience" to further prepare themselves for entry into industry or graduate education. In 2006, the department returned to the newly remodeled Darwin Hall, equipped with new lower-division teaching laboratories and facilities for advanced laboratory courses and undergraduate research. Our laboratories are equipped with many modern, computerized instruments that include ultraviolet, visible, infrared, atomic absorption, and fluorescence spectrophotometers; a nuclear magnetic resonance spectrometer; high-pressure liquid, gas, and ion exchange chromatographs; and a gas chromatograph with mass spectrometer detector.

Bachelor of Science in Chemistry (Certified by the American Chemical Society)

The B.S. degree provides thorough preparation for students who wish to pursue advanced degrees in the chemical sciences, go to professional school, or work as chemists in industry. All courses in the major core, major electives, and supporting courses must be taken in the traditional grading mode (A-F). Transcripts will be noted as approved by the American Chemical Society.

Please see the current approved curriculum on the SSU official catalog web page.

Degree Requirements	Units
General education	51
Major requirements	41
Supporting courses	19
Electives	9
Total units needed for graduation	120

Major Core Requirements

CHEM 115AB or CHEM 125AB* General Chemistry (10 units, 4 in the major core, 6 in general education (GE B1 & B3))	4
CHEM 255 Quantitative Analysis*	4
CHEM 310AB Physical Chemistry	6
CHEM 316 Physical Chemistry Laboratory	2

CHEM 325 Inorganic Chemistry	3
CHEM 335AB Organic Chemistry	8
CHEM 336 Organic Chemistry Laboratory	2
CHEM 401 Chemical Synthesis and Characterization I	3
CHEM 402 Chemical Synthesis and Characterization II	3
CHEM 445, 446, or 340 Biochemistry	3
CHEM 494 Undergraduate Research	2
CHEM 497 Research Seminar	1

Total units in the major core 41

Supporting Courses

MATH 161 Calculus I (3 units, counted as GE B4)	1
MATH 211 Calculus II	4
MATH 261 Calculus (IV)	4
PHYS 114 Introduction to Physics I	4
PHYS 116 Introduction to Physics Laboratory I	1
PHYS 214 Introduction to Physics II	4
PHYS 216 Introduction to Physics Laboratory II	1

Total units in supporting courses 19

GE Courses

CHEM 115AB	6
MATH 161	3
Others	42

Total units in GE courses 51

Electives 9

Total units to graduate 120

Sample Four-Year Program for Bachelor of Science in Chemistry

FRESHMAN YEAR:: 32 Units

<i>Fall Semester (15 Units)</i>	<i>Spring Semester (17 Units)</i>
CHEM 115A or CHEM 125A (5)	CHEM 115B or CHEM 125B (5)
MATH 161 (4)	MATH 211 (4)
GE (3)	PHYS 114 (4)
GE (3)	PHYS 116 (1)
	GE (3)

SOPHOMORE YEAR:: 29 Units

<i>Fall Semester (14 Units)</i>	<i>Spring Semester (15 Units)</i>
CHEM 335A (5)	CHEM 335B (3)
MATH 261 (4)	CHEM 336 (2)
PHYS 214 (4)	CHEM 255 (4) *
PHYS 216 (1)	GE (3)
	GE (3)

JUNIOR YEAR:: 30 Units

<i>Fall Semester (15 Units)</i>	<i>Spring Semester (15 Units)</i>
CHEM 445 (3)	CHEM 310B (3)
CHEM 310A (3)	CHEM 316 (2)
GE (3)	CHEM 494 (1)
GE (3)	GE (3)
GE (3)	GE (3)
	Elective (3)

SENIOR YEAR:: 29 Units

<i>Fall Semester (13 Units)</i>	<i>Spring Semester (16 Units)</i>
CHEM 401 (3)	CHEM 402 (3)
CHEM 494 (1)	CHEM 497 (1)
GE (3)	CHEM 325 (3)
GE (3)	GE (3)
GE (3)	Elective (3)
	Elective (3)

TOTAL SEMESTER UNITS:: 120

* Students must place into the Chemistry 125 AB series by receiving an appropriate score on the chemistry placement exam. Quantitative Analysis (CHEM 255) is not required for students who have completed CHEM 125 A & B. Students should replace these four units by completing the challenge by exam form upon completion of the series.

Bachelor of Science in Biochemistry

The B.S. degree in biochemistry is appropriate for students interested in the medical fields, graduate study in chemistry or biochemistry, or employment in the biochemical, pharmaceutical or biotechnology industries. All courses in the major core, major electives and supporting courses must be taken in the traditional grading mode (A-F). Undergraduate research is required for the B.S. degree in biochemistry.

Please see the current approved curriculum on the SSU official catalog web page.

Degree Requirements	Units
General education	51
Major requirements	40
Biology courses	9
Supporting courses	13-15
Electives	5 or 7
Total units needed for graduation	120

Major Core Requirements

CHEM 115 AB or CHEM 125 AB* General Chemistry (10 units, 4 in the major core, 6 in general education (GE B1 & B3))	4
CHEM 255 Quantitative Analysis*	4
CHEM 310 AB Physical Chemistry	6
CHEM 325 Inorganic Chemistry	3
CHEM 335 AB Organic Chemistry	8
CHEM 401 Instrumental Analysis and Chemical Synthesis	3
CHEM 441 Biochemical Methods	3
CHEM 445 Structural Biochemistry	3
CHEM 446 Metabolic Biochemistry	3
CHEM 494 Undergraduate Research	2
CHEM 497 Research Seminar	1
Total units in the major core	40

Biology Courses

BIOL 123 Molecular and Cell Biology (4 units, 1 in major core, 3 in general education B2)	1
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Choose 2 from the following:

BIOL 320 Molecular Genetics	4
BIOL 321 Molecular Microbiology	4
BIOL 324 Animal Physiology	4
BIOL 325 Cell Biology	4
BIOL 334 Plant Physiology	4
BIOL 340 General Bacteriology	4
BIOL 382 Parasitology	4
BIOL 383 Virology	4
BIOL 480 Immunology	4
BIOL 544 Advanced Cell Biology	4

or other courses approved by the Chemistry Department

Total units in Biology Courses 9

Supporting Courses

MATH 161 Calculus I (4 units, 1 in major core, 3 in GE B4)	1
MATH 211 Calculus II	4
PHYS 114 or 210A Physics I	3-4
PHYS 116 or 209A Physics Laboratory I	1
PHYS 214 or 210B Physics II	3-4
PHYS 216 or 209B Physics Laboratory II	1

Total units in Supporting Courses 13-15

Strongly recommended:

Additional units in CHEM 494 Undergraduate Research	1-6
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GE Courses

CHEM 115 AB	6
MATH 161	3
BIOL 123	3
Others	39

Total units in GE courses 51

Total units to graduate 120

Sample Four-Year Program for Bachelor of Science in Biochemistry

FRESHMAN YEAR:: 28-29 Units

Fall Semester (15 Units)	Spring Semester (13 or 14 Units)
CHEM 115A or CHEM 125A (5)	CHEM 115B or CHEM 125B (5)
MATH 161 (4)	MATH 211 (4)
GE (3)	PHYS 210A (3) or PHYS 114 (4)
GE (3)	PHYS 209A (1) or PHYS 116 (1)

SOPHOMORE YEAR:: 31-32 Units

Fall Semester (15 or 16 Units)	Spring Semester (16 Units)
CHEM 335A (5)	CHEM 335B (3)
PHYS 210B (3) or PHYS 214 (4)	CHEM 255 (4) *
PHYS 209B (1) or PHYS 216 (1)	GE (3)
GE (3)	GE (3)
Elective (2 or 4) Recommended: MATH 261 (4)	GE (3)

JUNIOR YEAR:: 31 Units

Fall Semester (16 Units)	Spring Semester (15 Units)
CHEM 310A (3)	CHEM 310B (3)
CHEM 445 (4)	CHEM 446 (3)
BIOL 123 (4)	GE (3)
GE (3)	GE (3)
GE (3)	Elective (3)

SENIOR YEAR:: 29 Units

Fall Semester (15 Units)	Spring Semester (14 Units)
CHEM 401 (3)	CHEM 497 (1)
CHEM 494 (2)	CHEM 325 (3)
BIOL elective upper-division (4)	CHEM 441 (3)
GE (3)	BIOL elective upper-division (4)
GE (3)	GE (3)

TOTAL SEMESTER UNITS:: 120

* Students must place into the Chemistry 125 AB series by receiving an appropriate score on the chemistry placement exam. Quantitative Analysis (CHEM 255) is not required for students who have completed CHEM 125 A & B. Students should replace these four units by completing the challenge by exam form upon completion of the series.

Bachelor of Arts in Chemistry

The B.A. degree provides a solid foundation in chemistry so students have the same career options as those with the B.S. degree, while allowing students the flexibility to pursue other academic interests. All courses in the major core, major electives, and supporting courses must be taken in the traditional grading mode (A-F). It is highly recommended that students perform undergraduate research with a faculty member.

Please see the current approved curriculum on the SSU official catalog web page.

Degree Requirements	Units
General education	51
Major requirements	32
Supporting courses	13-15
Electives	22-24
Total units needed for graduation	120

Major Core Requirements

CHEM 115AB or CHEM 125AB* General Chemistry (10 units, 4 in the major core, 6 in general education (GE B1 & B3))	4
CHEM 255 Quantitative Analysis*	4
CHEM 310AB Physical Chemistry	6
CHEM 316 Physical Chemistry Laboratory	2
CHEM 325 Inorganic Chemistry	3
CHEM 335AB Organic Chemistry	8
CHEM 401 Chemical Synthesis and Characterization I	3
CHEM 497 Research Seminar	1
Elective (upper-division chemistry)	1
Total units in the major core	32

Supporting Courses

MATH 161 Calculus I (4 units, 1 in major core, 3 in GE B4)	1
MATH 211 Calculus II	4
PHYS 114 or 210A Physics I	3-4
PHYS 116 or 209A Physics Laboratory I	1
PHYS 214 or 210B Physics II	3-4
PHYS 216 or 209B Physics Laboratory II	1
Total units in supporting courses	13-15

GE Courses

CHEM 115 AB	6
MATH 161	3
Others	42
Total units in GE courses	51

Electives 22-24

Total units to graduate 120

Recommended course

CHEM 494 Undergraduate Research

Sample Four-Year Program for Bachelor of Arts in Chemistry

FRESHMAN YEAR:: 31 or 32 Units

<i>Fall Semester (15 Units)</i>	<i>Spring Semester (16 or 17 Units)</i>
CHEM 115A or CHEM 125A (5)	CHEM 115B or CHEM 125B (5)
MATH 161 (4)	MATH 211 (4)
GE (3)	PHYS 210 A (3) or PHYS 114 (4)
GE (3)	PHYS 209A (1) or PHYS 116 (1)
	GE (3)

SOPHOMORE YEAR:: 29-31 Units

<i>Fall Semester (14 or 15 Units)</i>	<i>Spring Semester (15 Units)</i>
CHEM 335A (5)	CHEM 335B (3)
PHYS 210B (3) or PHYS 214 (4)	CHEM 336 (2) (Elective units)
PHYS 209B (1) or PHYS 216 (1)	CHEM 255 (4) *
GE (3)	GE (3)
Elective (1 or 3) Recommended: MATH 261 (4)	GE (3)

JUNIOR YEAR:: 29 Units

<i>Fall Semester (15 Units)</i>	<i>Spring Semester (14 Units)</i>
CHEM 310A (3)	CHEM 310B (3)
GE (3)	CHEM 316 (2)
GE (3)	GE (3)
GE (3)	GE (3)
Elective (3)	GE (3)

SENIOR YEAR:: 30 Units

<i>Fall Semester (14 Units)</i>	<i>Spring Semester (16 Units)</i>
CHEM 401 (3)	CHEM 497 (1)
CHEM 494 (1) (Elective units)	CHEM 325 (3)
GE (3)	Elective (3)
GE (3)	Elective (3)
Chemistry Elective (1)	Elective (3)
Elective (3)	Elective (3)

TOTAL SEMESTER UNITS:: 120

CHEM 336 (2 unit) and CHEM 494 (1 unit) are used as chemistry elective units.

** Students must place into the Chemistry 125 AB series by receiving an appropriate score on the chemistry placement exam. Quantitative Analysis (CHEM 255) is not required for students who have completed CHEM 125 A & B. Students should replace these four units by completing the challenge by exam form upon completion of the series.*

Minor in Chemistry

Completion of the following SSU courses (or their equivalent): General Chemistry 115A and B (10 units), Quantitative Analysis 255 (4 units), Organic Chemistry: either 232 (5 units) or 335A (5 units), plus at least two additional upper-division classes for a total of 6 units. These additional upper-division classes must be taken in residence at SSU. Up to six units in chemistry 115A/B may count toward the General Education requirements in area B including the laboratory requirement.

Secondary Education Teaching Credential Preparation

Chemistry students must demonstrate competence in the natural sciences by passing the subject matter examination required by the California Commission on Teacher Credentialing. One part of the examination will test breadth of knowledge in biology, chemistry, physics, astronomy, and geology. Another part of the examination will test depth of knowledge in a particular area, such as chemistry. The B.A. or B.S. degree in chemistry is recommended to prepare for the part of the examination that tests depth of knowledge in chemistry. For more information, please contact the Chemistry Department office, Darwin Hall 300, (707) 664-2119.