Impacted Program

The chemistry major is an impacted program. To be admitted to the chemistry major, students must meet the following criteria:

a. Complete preparation for the major;

b. Complete a minimum of 60 transferable semester units;

c. Have a minimum cumulative GPA of 2.0.

To complete the major, students must fulfill the degree requirements for the major described in the catalog in effect at the time they are accepted into the premajors at SDSU (assuming continuous enrollment).

Major Academic Plans (MAPs)

Visit http://www.sdsu.edu/chemmaps for the recommended courses needed to fulfill your major requirements. The MAPs Web site was created to help students navigate the course requirements for their majors and to identify which General Education course will also fulfill a major preparation course requirement.

Chemistry Major

With the B.S. Degree in Applied Arts and Sciences

(Major Code: 19051) (SIMS Code: 772601)

and Certificate of the American Chemical Society

All candidates for a degree in applied arts and sciences must complete the graduation requirements listed in the section of this catalog on “Graduation Requirements.” A minor is not required with this major.

Preparation for the Major

Chemistry 200, 201, 232, 232L, 251; Mathematics 150, 151, 252; and Physics 195, 195L, 196, 196L. (39 units) Recommended: Physics 197 and 197L.

Graduation Writing Assessment Requirement

Passing the Writing Placement Assessment with a score of 10 or completing one of the approved upper division writing courses (W) with a grade of C (2.0) or better. See “Graduation Requirements” section for a complete listing of requirements.

Major

A minimum of 36 upper division units to include Chemistry 410A, 410B, 417, 427, 432, 432L, 457, 520A-520B, 550, 560, one unit of 498, and eight units of upper division electives in chemistry. Six of the eight units may be in related subjects with the approval of the department.

Emphasis in Biochemistry

(SIMS Code: 772609)

Preparation for the Major

Chemistry 200, 201, 232, 232L, 251; Biology 204, 204L; Mathematics 150, 151, 252; Physics 195, 195L, 196, 196L. (43 units) Recommended: Physics 197 and 197L.

Graduation Writing Assessment Requirement

Passing the Writing Placement Assessment with a score of 10 or completing one of the approved upper division writing courses (W) with a grade of C (2.0) or better. See “Graduation Requirements” section for a complete listing of requirements.

Major

A minimum of 36 upper division units to include Chemistry 410A, 410B, 432, 432L, 457, 550, 560, 567, four units selected from Chemistry 562, 563, 564, one unit of Chemistry 498, and the remaining units selected from Chemistry 496, 497, 498, and any 500-level chemistry course; Biology 350, 352, 485, 549, 570, 590. The addition of Chemistry 417, 427, and 520A qualifies this program for ACS certification.
Chemistry Major
With the B.A. Degree in Liberal Arts and Sciences
(Major Code: 19051) (SIMS Code: 772602)
All candidates for a degree in liberal arts and sciences must complete the graduation requirements listed in the section of this catalog on “Graduation Requirements.” No more than 48 units in chemistry courses can apply to the degree. A minor is not required with this major.

Preparation for the Major.
Chemistry 200, 201, 232, 232L, 251; Mathematics 150, 151, 252; Physics 195, 195L, 196, 196L. (39 units)
Recommended: Physics 197 and 197L.

Language Requirement. Competency (successfully completing the third college semester or fifth college quarter) is required in one foreign language to fulfill the graduation requirement. Refer to section of this catalog on “Graduation Requirements.”

Graduation Writing Assessment Requirement. Passing the Writing Placement Assessment with a score of 10 or completing one of the approved upper division writing courses (W) with a grade of C (2.0) or better. See “Graduation Requirements” section for a complete listing of requirements.

Major. A minimum of 30 upper division units in chemistry to include Chemistry 410A, 410B, 417, 432, 432L, 457, 520A, 550, 560; one unit of Chemistry 498, and five units of electives selected from Chemistry 496, 498, or any 500-level course in chemistry.

Chemistry Major
With the B.A. Degree in Liberal Arts and Sciences
(Major Code: 19051) (SIMS Code: 772602)
All candidates for a degree in liberal arts and sciences must complete the graduation requirements listed in the section of this catalog on “Graduation Requirements.” No more than 48 units in chemistry courses can apply to the degree.

Preparation for the Major.
Chemistry 200, 201, 232, 232L, 251; Biology 203, 203L, 204, 204L; Mathematics 150, 151, 252; Physics 195, 195L, 196, 196L. (47 units) Recommended: Physics 197 and 197L.

Language Requirement. Competency (successfully completing the third college semester or fifth college quarter) is required in one foreign language to fulfill the graduation requirement. Refer to section of this catalog on “Graduation Requirements.”

Graduation Writing Assessment Requirement. Passing the Writing Placement Assessment with a score of 10 or completing one of the approved upper division writing courses (W) with a grade of C (2.0) or better. See “Graduation Requirements” section for a complete listing of requirements.

Major. A minimum of 24 upper division units in chemistry to include Chemistry 410A, 410B, 417, 432, 432L, 457, 550, and seven units of electives selected from Chemistry 496, 498, or any 500-level course in chemistry.

Minor. A minor in biology is expected for preprofessional students.

Chemistry Major (Teaching Credential Only)
In preparation for the Single Subject Teaching Credential in Science/Chemistry
With the B.A. Degree in Applied Arts and Sciences
(Major Code: 19051) (SIMS Code: 772607)
One of the requirements for acceptance into the College of Education’s post-baccalaureate credential program is to either pass the appropriate CSET examinations or complete an approved academic program. The single subject teaching credential in science preparation program described below satisfies the academic requirements for a student planning to teach integrated science and chemistry at the secondary level. Entrance into the post-baccalaureate credentialing program in part requires certification of subject matter competency by this department. This certification requires completion of the academic program with the required grades, submission of a satisfactory portfolio, and the recommendation of the department. Contact the subject matter preparation program adviser. In addition, all candidates for a Single Subject Teaching credential at San Diego State University must complete the requirements outlined in the catalog under Teacher Education or Policy Studies. Contact the School of Teacher Education or the Policy Studies in Language and Cross-Cultural Education Department for up-to-date information on prerequisites.

All candidates for a degree in applied arts and sciences must complete the graduation requirements listed in the section of this catalog on “Graduation Requirements.” Candidates who wish to graduate with 122 units must complete one of two American Institutions courses at the upper division level or satisfy the California state and local government portion of American Institutions by passing the California Government examination available through the Student Testing, Assessment and Research Office.

A minor is not required for this major.

Preparation for the Major.
Astronomy 109, 201; Biology 203, 203L, 204, 204L; Chemistry 200, 201, 232, 232L, 251; Communication 103; Mathematics 150, 151; Physics 180A, 180B, 182A, 182B; Mathematics 252 OR Physics 195, 195L, 196, 196L, 197, 197L; Teacher Education 211B. (55 units)

Graduation Writing Assessment Requirement. Passing the Writing Placement Assessment with a score of 10 or completing one of the approved upper division writing courses (W) with a grade of C (2.0) or better. See “Graduation Requirements” section for a complete listing of requirements.

Major. A minimum of 31 upper division units to include Chemistry 410A, 410B, 417, 432, 432L, 457, 497 (1 unit), 520A, 550, 560; Geological Sciences 412; Natural Science 315.

Additional Requirements for Subject Matter Preparation Certification
Satisfactory Grades. At most one course with a C- or lower among the courses listed under Preparation for the Major, and at most one course with a C- or lower among the courses listed under the Major. If a course is repeated, the highest grade will count.

Summative Assessment. Completion of a satisfactory, preliminary portfolio two semesters prior to graduation. Contact the subject matter preparation adviser for information.

Chemical Physics Major
With the B.S. Degree in Applied Arts and Sciences
(Major Code: 19081) (SIMS Code: 772801)
All candidates for a degree in applied arts and sciences must complete the graduation requirements listed in the section of this catalog on “Graduation Requirements.” Individual master plans for each student are filed with the chemistry and physics undergraduate advisers and the Office of Advising and Evaluations. A minor is not required with this major.

Preparation for the Major.
Chemistry 200, 201, 232, 232L, 251; Mathematics 150, 151, 252; Physics 195, 195L, 196, 196L, 197, 197L. (43 units)
Recommended: A course in computer programming.

Graduation Writing Assessment Requirement. Passing the Writing Placement Assessment with a score of 10 or completing one of the approved upper division writing courses (W) with a grade of C (2.0) or better. See “Graduation Requirements” section for a complete listing of requirements.

Major. A minimum of 36 upper division units to include Chemistry 410A, 410B, 417, 550; Mathematics 342A, 342B; Physics 311, 350, 400A, 410; three units selected from Chemistry 432, 432L, 457, 510, Physics 357, 360, 400B, Chemistry 538 or Physics 538; and Research Project: Chemistry 497 (3 units) or Chemistry 498 (3 units) or Physics 498A and 498B (3 units).

Chemistry Minor
(Major Code: 19051) (SIMS Code: 772601)
The following courses are prerequisite to the chemistry minor and do not count toward the 15 units required for the minor: Chemistry 200, 201. (10 units.)

The minor in chemistry consists of 15 units in chemistry to include Chemistry 232, 232L, 251; and six units of upper division electives. Strongly recommended: Chemistry 410A, 410B. 
Courses in the minor may not be counted toward the major, but may be used to satisfy preparation for the major and general education requirements, if applicable. A minimum of six upper division units must be completed in residence at San Diego State University.

* Additional prerequisites in mathematics and physics required for these courses.

**Courses (CHEM)**

Refer to Courses and Curricula and University Policies sections of this catalog for explanation of the course numbering system, unit or credit hour; prerequisites, and related information.

**LOWER DIVISION COURSES**

**CHEM 100. Introduction to General Chemistry with Laboratory (4) [GE]**

Three lectures and three hours of laboratory. Elementary principles of chemistry used to illustrate nature and development of modern scientific thought. Not open to students with credit in Chemistry 105 or 200.

**CHEM 102. Introduction to General, Organic, and Biological Chemistry (5) [GE]**

Four lectures and three hours of laboratory. Prerequisite: High school chemistry or Chemistry 100. Concepts of general, organic, and biological chemistry necessary to understanding human biochemistry and pharmacology, including chemical bonding, stereochemistry, acidity, thermodynamics, carbohydrates, lipids, enzymes, proteins, and nucleic acids. Open only to students applying for entrance to the nursing major.

**CHEM 130. Elementary Organic Chemistry (3)**

Prerequisite: Chemistry 100 or 200. Introduction to compounds of carbon including both aliphatic and aromatic substances. Not open to students with credit in Chemistry 231 or 232.

**CHEM 160. Introductory Biochemistry (3)**

Prerequisite: Chemistry 130. Fundamental principles of the chemistry of life. This course is intended primarily for majors in nutrition and related fields. Not applicable for admission to the School of Nursing.

**CHEM 200. General Chemistry (5)**

Three lectures, one hour of discussion, and three hours of laboratory. Prerequisites: Knowledge of introductory chemistry as demonstrated by completion of Chemistry 100 with a grade of C or better; or satisfaction of the Entry-Level Mathematics requirement and qualification on the Chemistry Department Placement Examination. General principles of chemistry with emphasis on inorganic materials.

**CHEM 201. General Chemistry (5)**

Three lectures, one hour of discussion, and three hours of laboratory. Prerequisite: Chemistry 200 or 202 with a grade of C or better. Continuation of Chemistry 200. General principles of chemistry with emphasis on fundamentals of chemical reactions.

**CHEM 202. General Chemistry for Engineers (4)**

Three lectures and three hours of laboratory. Prerequisite: Knowledge of introductory chemistry as demonstrated by completion of Chemistry 100 with a grade of C or better; or satisfaction of the Entry-Level Mathematics requirement and qualification on the Chemistry Department Placement Examination. General principles of chemistry with emphasis on inorganic and physical chemistry and chemistry basics for engineers. Not open to students with credit in Chemistry 200. Restricted to engineering majors.

**CHEM 232. Organic Chemistry (3)**

Prerequisites: Chemistry 201 with a grade of C or better and credit or concurrent registration in Chemistry 232L. Properties and synthesis of organic compounds including reaction mechanisms. Same course as lecture portion of Chemistry 231. Not open to students with credit in Chemistry 231.

**CHEM 232L. Organic Chemistry Laboratory (1)**

Three hours of laboratory. Prerequisites: Chemistry 201 with a grade of C or better and credit or concurrent registration in Chemistry 232L. Properties and synthesis of organic compounds including methods of separation and purification techniques. Same course as laboratory portion of Chemistry 231. Not open to students with credit in Chemistry 231.

**CHEM 251. Analytical Chemistry (5)**

Three lectures and six hours of laboratory. Prerequisites: Chemistry 201 and credit or concurrent registration in Mathematics 122 or 150. Introduction to the theory and practice of analytical chemistry including gravimetric, volumetric, and instrumental methods.

**CHEM 296. Experimental Topics (1-4)**

Selected topics. May be repeated with new content. See Class Schedule for specific content. Limit of nine units of any combination of 296, 496, 596 courses applicable to a bachelor’s degree.

**CHEM 299. Special Study (1-4)**

Prerequisite: Consent of instructor. Individual study. Maximum credit six units.

**UPPER DIVISION COURSES**

(Intended for Undergraduates)

**CHEM 300. Forensic Science (3) [GE]**

Prerequisite: Chemistry 100 or completion of General Education requirement in Foundations of Learning II.A. Natural Sciences and Quantitative Reasoning. Techniques and case studies of mysteries solved by molecular analysis: chemical and DNA analysis of crime scenes, biochemical explanations of mysterious deaths and accidents, molecular hallmark of forgery, chemical methods in crime deterrence, chemical causes of fires and structure failure. Not applicable to chemistry majors.

**CHEM 308. Chemistry as a Unifying Science (3) [GE]**

Prerequisite: Completion of the General Education requirement in Foundations II.A., Natural Sciences and Quantitative Reasoning. Atomic-molecular theory of matter; use of concepts of chemistry to explain observable phenomena in everyday life, including physical properties and chemical changes; connections between chemistry and biology, earth science, and physical science. Open only to liberal studies majors. Not applicable to chemistry majors.

**CHEM 365. Biochemistry, Cell and Molecular Biology I (3)**

Prerequisites: Biology 203, 203L and Chemistry 232, 232L. Basic concepts of modern integrated biochemistry, cell and molecular biology. Not open to students with credit in Chemistry 560. Applicable to chemistry major or minor only with approval from department.

**CHEM 410A. Physical Chemistry (4)**

Three lectures and three hours of laboratory. Prerequisites: Chemistry 232, 232L, 251; Mathematics 252 (Mathematics 150, 151; 252 or Physics 195, 195L, 196, 196L for chemistry teaching major); Physics 195, 195L and 196, 196L. Recommended: Physics 197 and 197L. Theoretical principles of chemistry with emphasis on mathematical relations. Theory and practice in acquisition and statistical analysis of physical measurements on chemical systems.

**CHEM 410B. Physical Chemistry (3)**

Three lectures. Prerequisites: Chemistry 232, 232L, 251, 410A. Theoretical principles of chemistry with emphasis on mathematical relations. Theory and practice in acquisition and statistical analysis of physical measurements on chemical systems.

**CHEM 417. Advanced Physical Chemistry Laboratory (2)**

Six hours of laboratory. Prerequisites: Chemistry 251, 410A, and credit or concurrent registration in Chemistry 410B. Experimental physical chemistry. Emphasis on interpretation and statistical evaluation of instrument-derived results, record keeping, report writing, and individual initiative in observing results.
CHEM 571. Environmental Chemistry (3)
Fundamentals of chemistry applied to environmental problems. Chemistry of ecosystems; analysis of natural constituents and pollutants; sampling methods; transport of contaminants; regulations and public policy.

CHEM 562. Intermediary Metabolism (2)
Prerequisite: Chemistry 365 or 560.
Catabolic and biosynthetic pathways of carbohydrate, lipid, amino acid, and nucleotide metabolism; TCA cycle, mitochondrial and chloroplast electron transport chains, ATP generation and their interactions and control. Not open to students with credit in Chemistry 361.

CHEM 563. Nucleic Acid Function and Protein Synthesis (2)
Prerequisite: Chemistry 365 or 560.
DNA replication, RNA transcription, RNA processing, and protein translation, including chemical mechanisms of synthesis and cellular mechanisms of regulating gene expression; genomics, recombinant DNA, and DNA topology. Not open to students with credit in Chemistry 361.

CHEM 564. Receptor Biochemistry and Protein Modification (2)
Prerequisite: Chemistry 365 or 560.
Biochemical study of receptors, second messengers, and cellular proteins that participate in extracellular and intracellular communication, with focus on protein structures, post-translational modifications, and biochemical mechanisms that regulate receptors and effector enzymes.

CHEM 567. Biochemistry Laboratory (3)
One lecture and six hours of laboratory.
Prerequisite: Chemistry 560.
Theory and practice of procedures used in study of life at molecular level. Includes purification and characterization of enzymes, isolation of cell components, and use of radioactive tracer techniques.

CHEM 571. Environmental Chemistry (3)
Prerequisite: Chemistry 232, 232L, 251; consent of instructor for all other majors.
Fundamentals of chemistry applied to environmental problems. Chemistry of ecosystems; analysis of natural constituents and pollutants; sampling methods; transport of contaminants; regulations and public policy.

CHEM 596. Advanced Special Topics in Chemistry (1-3)
Prerequisite: Consent of instructor.
Advanced selected topics in modern chemistry. May be repeated with new content. See Class Schedule for specific content. Limit of nine units of any combination of 296, 496, 596 courses applicable to a bachelor's degree. Maximum credit of six units of 596 applicable to a master's degree. Nine units of any combination of 296, 496, 596 courses applicable to a master's degree with approval of the graduate adviser.

GRADUATE COURSES
Refer to the Graduate Bulletin.