CHEMISTRY
Natural and Applied Sciences Division
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http://www.cabrillo.edu/programs

Chemistry A.A. Degree
Chemistry is the study of the properties, composition and transformations of all material substances. It is often called the "central science" since it draws from mathematics and physics and forms a necessary background to the study of the earth sciences and all the biological disciplines, including the various medical professions. A chemistry major is considered excellent preparation for medical school.

As pure scientists, chemists seek to understand ever more complex substances in greater detail. As applied scientists, chemists contribute to the creation and development of thousands of the products that support our complex society. Chemistry is a profoundly experimental science and much of a student's time will be spent in the laboratory.

A chemistry major usually transfers to a four-year institution to complete a bachelor's degree. Many also go on to earn Masters or Ph.D.s, since advanced degrees generally lead to more rewarding careers. Cabrillo's chemistry program is articulated with those of the UC and CSU systems and includes the standard courses needed to complete the first two years of the major.

Verification of prerequisites will be required. Prerequisites for courses in this department are computer enforced. Students should be sure their records have been entered into the Cabrillo computer system before attempting to enroll.

Learning Outcomes
The Cabrillo College Core Competencies (with an emphasis in the study of Chemistry):
1. Communication: Reading, Writing, Listening, Speaking and/or Conversing
2. Critical Thinking and Information Competency: Analysis, Computation, Research, Problem Solving

Model Program for Chemistry
These Associate Degrees require 60 units appropriate to your educational goal, to include general education and at least 30 units in a major. Courses should be selected to meet the lower-division major preparation requirements at your intended transfer university - these specific requirements can be found at www.assist.org for 4-year public institutions in California. Please see a counselor for advisement concerning the necessity or appropriateness of these courses. The department presents the following suggested Model Programs for this major. The courses listed below may or may not be appropriate depending on your specific goal. Please see a counselor for advisement for transfer to any 4-year institution.

A.A. General Education

Core Courses (20-24 Units)

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 1A</td>
<td>General Chemistry I</td>
<td>5</td>
</tr>
<tr>
<td>CHEM 1B</td>
<td>General Chemistry II</td>
<td>5</td>
</tr>
<tr>
<td>CHEM 5</td>
<td>+ Quantitative Analysis</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 12A</td>
<td>Organic Chemistry I</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 12AL</td>
<td>Organic Chemistry Laboratory I</td>
<td>2</td>
</tr>
<tr>
<td>CHEM 12B</td>
<td>Organic Chemistry II</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 12BL</td>
<td>Organic Chemistry Laboratory II</td>
<td>2</td>
</tr>
</tbody>
</table>

Foreign Language* | Units | 8 - 12

Electives: Units | Any Course Number 1-99 | 6 - 10 |

Total Units | 60

*The student should consult the Catalog of the intended transfer institution concerning the necessity or appropriateness of these courses.

+Spring, odd years only; ++Fall only; +++Spring only; ++++Fall, even years only

Chemistry A.S. Degree

A.S. General Education

Core Courses (39 Units)

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 1A</td>
<td>General Chemistry I</td>
<td>5</td>
</tr>
<tr>
<td>CHEM 1B</td>
<td>General Chemistry II</td>
<td>5</td>
</tr>
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<td>Organic Chemistry Laboratory I</td>
<td>2</td>
</tr>
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<td>Organic Chemistry II</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 12BL</td>
<td>Organic Chemistry Laboratory II</td>
<td>2</td>
</tr>
<tr>
<td>Foreign Language*</td>
<td>Units</td>
<td>8 - 12</td>
</tr>
<tr>
<td>MATH 5A</td>
<td>Analytic Geometry and Calculus I</td>
<td>5</td>
</tr>
<tr>
<td>MATH 5B</td>
<td>Analytic Geometry and Calculus II</td>
<td>5</td>
</tr>
<tr>
<td>MATH 5C</td>
<td>Analytic Geometry and Calculus III</td>
<td>5</td>
</tr>
<tr>
<td>MATH 6</td>
<td>Introduction to Linear Algebra</td>
<td>3</td>
</tr>
<tr>
<td>MATH 7</td>
<td>Introduction to Differential Equations</td>
<td>3</td>
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<tr>
<td>PHYS 4A</td>
<td>Physics for Scientists and Engineers I</td>
<td>5</td>
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<tr>
<td>PHYS 4B</td>
<td>++ Physics for Scientists and Engineers II</td>
<td>5</td>
</tr>
<tr>
<td>PHYS 4C</td>
<td>+++ Physics for Scientists and Engineers III</td>
<td>5</td>
</tr>
<tr>
<td>PHYS 4D</td>
<td>++++ Modern Physics for Scientists and Engineers</td>
<td>5</td>
</tr>
</tbody>
</table>

Total Units | 60

*The student should consult the Catalog of the intended transfer institution concerning the necessity or appropriateness of these courses.

+Spring, odd years only; ++Fall only; +++Spring only; ++++Fall, even years only.
Chemistry Courses

**CHEM 1A  General Chemistry I**
5 units; 3 hours Lecture, 6 hours Laboratory
Prerequisite: CHEM 2 or CHEM 3 and CHEM 3L or equivalent, or high school chemistry with grade of "B" or better and MATH 152 or equivalent.
Repeatability: May be taken a total of 1 time.
Covers general chemical principles including structure of matter, chemical equations and bonding, gases, solutions, periodic law, acids and bases, and chemical equilibrium.
Transfer Credit: Transfers to CSU; UC. C-ID: CHEM 110. CHEM 1A + CHEM 1B = C-ID 120S

**CHEM 1B  General Chemistry II**
5 units; 3 hours Lecture, 6 hours Laboratory
Prerequisite: CHEM 1A.
Repeatability: May be taken a total of 1 time.
Covers general chemical principles including organic chemistry, chemical kinetics, equilibrium, acid/base chemistry, thermochemistry, thermodynamics, electrochemistry, structure, properties of transition metals, and nuclear chemistry.
Transfer Credit: Transfers to CSU; UC. C-ID: CHEM 1A + CHEM 1B = C-ID 120S

**CHEM 3  Introductory Inorganic Chemistry**
3 units; 3 hours Lecture
Prerequisite: MATH 152.
Repeatability: May be taken a total of 1 time.
Covers fundamental principles of inorganic chemistry. Lecture topics include chemical calculations, classification of matter, the atomic and kinetic theories of matter and the mole concept. CHEM 3L is an additional requirement in preparation for CHEM 1A at Cabrillo. May be offered in a Distance-Learning Format.
Transfer Credit: Transfers to CSU; UC, with conditions: No credit if taken after CHEM 1A. CHEM 3 + 3L = C-ID CHEM 101

**CHEM 5  Quantitative Analysis**
4 units; 2 hours Lecture, 6 hours Laboratory
Prerequisite: CHEM 1B.
Presents quantitative chemical determinations using classical (gravimetric, volumetric) and instrumental (electrochemical, spectrochemical, polarimetric, chromatographic) methods; data obtained from these experiments will then be analyzed utilizing statistical methods. Designed for any scientific discipline that requires the knowledge and skills necessary to perform quantitative chemical determinations.
Spring semester odd years only.
Transfer Credit: Transfers to CSU; UC.

**CHEM 12A  Organic Chemistry I**
3 units; 3 hours Lecture
Prerequisite: CHEM 1B.
Repeatability: May be taken a total of 1 time.
Presents the lecture portion of the first semester of the year-long organic chemistry course designed for chemistry majors and pre-professional medical and biology majors. Covers stereochemistry, mechanisms, reactions and spectroscopic studies of aliphatic compounds. Students enrolled in the Honors Transfer Program may count this course towards the Honors Scholar designation with an Honors Contract.
Transfer Credit: Transfers to CSU; UC. CHEM 12A + AL = C-ID CHEM 150. CHEM 12A+ CHEM 12AL + CHEM 12B + CHEM 12BL = C-ID CHEM 160S

**CHEM 12AL  Organic Chemistry Laboratory I**
2 units; 6 hours Laboratory
Prerequisite: CHEM 1B.
Hybrid Requisite: Completion of or concurrent enrollment in CHEM 12A.
Repeatability: May be taken a total of 1 time.
Presents an introduction to microscale laboratory and instrumental techniques covering isolation, synthesis and identification of many classes of organic compounds. Students enrolled in the Honors Transfer Program may count this course towards the Honors Scholar designation with an Honors Contract.
Transfer Credit: Transfers to CSU; UC. CHEM 12A + AL = C-ID CHEM 150. CHEM 12A+ CHEM 12AL + CHEM 12B + CHEM 12BL = C-ID CHEM 160S
CHEM 12B  Organic Chemistry II
3 units; 3 hours Lecture
Prerequisite: CHEM 12A.
Repeatability: May be taken a total of 1 time.
Covers mechanisms, synthesis and spectroscopy of aliphatic and aromatic alcohols, amines, carbonyl and carboxyl compounds, carbohydrates and proteins. Students enrolled in the Honors Transfer Program may count this course towards the Honors Scholar designation with an Honors Contract.
Transfer Credit: Transfers to CSU; UC. CHEM 12A + AL + B + BL = C-ID CHEM 160S.

CHEM 12BL  Organic Chemistry Laboratory II
2 units; 6 hours Laboratory
Prerequisite: CHEM 12AL.
Hybrid Requisite: Completion of or concurrent enrollment in CHEM 12B.
Repeatability: May be taken a total of 1 time.
Presents multi-step synthesis and identification of unknown mixtures including chemical, physical and spectroscopic studies of aliphatic and aromatic alcohols, aldehydes, ketones, acids and other classes of organic compounds. Includes GC and IR. Students enrolled in the Honors Transfer Program may count this course towards the Honors Scholar designation with an Honors Contract.
Transfer Credit: Transfers to CSU; UC. CHEM 12A + AL + B + BL = C-ID CHEM 160S.

CHEM 30A  Inorganic Chemistry for Health Occupations
4 units; 3 hours Lecture, 3 hours Laboratory
Prerequisite: MATH 152 or MATH 152A and MATH 152B or MATH 142 or MATH 142A and MATH 142B.
Repeatability: May be taken a total of 1 time.
Covers chemical concepts such as atomic structure, acids and bases, salts, buffers, electrolyte systems and nuclear chemistry. Appropriate for students interested in physiology and paramedical fields.
Transfer Credit: Transfers to CSU.

CHEM 30B  Introductory Organic Chemistry and Biochemistry for Health Occupations
4 units; 3 hours Lecture, 3 hours Laboratory
Prerequisite: CHEM 30A or CHEM 2 or CHEM 3 and CHEM 3L or high school chemistry.
Repeatability: May be taken a total of 1 time.
Presents a survey of the major classes of organic and biochemical compounds as they relate to the chemistry of life processes. Designed for students preparing for the Dental Hygiene program or a four-year nursing degree.
Transfer Credit: Transfers to CSU.

CHEM 32  Chemistry for the Allied Health Major
5 units; 3 hours Lecture, 6 hours Laboratory
Prerequisite: MATH 152 or MATH 152A and MATH 152B or MATH 142 or MATH 142A and MATH 142B.
Repeatability: May be taken a total of 1 time.
Presents a one semester survey of general and organic chemistry as preparation for careers in the allied health sciences. It is not appropriate for premed, dental or veterinary students nor is it intended for allied health students requiring two semesters of chemistry.
Transfer Credit: Transfers to CSU. CHEM 32 is a one-semester alternative that satisfies the CHEM 30A/CHEM 30B two semester sequence required for students transferring to some 4-year Nursing Programs - please see a counselor or check www.assist.org for more information. CHEM 32 also satisfies the Prerequisite requirement for BIO 5 and BIO 6.