Biology (AS-T)

**CAREER PATHS:**
- Biological Technician
- Biologist
- Molecular and Cellular Biologist
- Geneticists
- Life Scientist

Additional Career Paths and related data, including state-by-state wage info and growth in the field, can be found at www.onetonline.org.

This program map represents one possible pathway. See a counselor to create a customized education plan. Map is for the 2019-2020 catalog year.

GET STARTED NOW!

- Get started on your Pathway now with these recommended courses!
  - Then – See a counselor to create a CUSTOMIZED education plan personalized to your career and transfer goals!
- Required courses may change depending on a student's career and transfer goals, including requirements for cross-cultural and foreign language courses, and/or specific requirements for an individual CSU or UC.
- Unique transfer requirements for a specific institution can be found at www.assist.org.

LET US HELP YOU!

**How to Apply:** solano.edu/ar/apply.php

- **Questions? Talk to a Counselor Now!**
  - Main Campus, Fairfield: (707) 864-7101
  - Vacaville Center: (707) 863-7836
  - Vallejo Center: (707) 642-8188
  - Travis AFB: (707) 863-7878
  - Visit online at solano.edu/counseling

- **Contact Our Career Center to Learn Your Career Options!**
  - Call 707-864-7124, or email at CareerCenter@solano.edu
  - Visit online at solano.edu/career

- **You Can Afford College! Learn more about Financial Aid!**
  - Call 707-864-7103, or email at FinancialAid@solano.edu
  - Visit online at solano.edu/financial_aid

- **College is Accessible! Contact our Disability Services Program (DSP)**
  - at 707-864-7136.

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**FIRST SEMESTER**

Total Recommended Units: 15

- **CHEM 001** 5 units
  - General Chemistry I (IGETC 5A/5C)
- **MATH 020** 5 units
  - Analytic Geometry & Calculus I (IGETC 2)
- **ENGL 001** 4 units
  - College Composition (IGETC 1A)
- **LR 010** 1 unit
  - Introduction to Library Research and Information Competency

**SECOND SEMESTER**

Total Recommended Units: 17

- **CHEM 002** 5 units
  - General Chemistry II (IGETC 5B)
- **BIO 002** 5 units
  - Cell & Molecular Biology
- **IGETC 1B** 4 units
  - Suggested: ENGL 002 or 004
- **IGETC 3A** 3 units
  - Suggested: ART 001 or 002 or MUSC 005 or 008

**THIRD SEMESTER**

Total Recommended Units: 16

- **PHYS 002 or 006** 5 units
  - General Physics I OR Physics for Science & Engineering
- **BIO 003** 5 units
  - Evolution, Ecology and Biodiversity
- **IGETC 3B/Am Inst Grp 2** 3 units
  - Suggested: HIST 017 or 018
- **IGETC 1C** 3 units
  - Suggested: COMM 001 or 002 or 006

**FOURTH SEMESTER**

Total Recommended Units: 17

- **PHYS 004 or 007** 5 units
  - General Physics II OR Physics for Science & Engineering
- **IGETC 4** 3 units
  - Suggested: PSYC 001
- **IGETC 3A or 3B** 3 units
- **IGETC 4/Am Inst Grp 1** 3 units
  - Suggested: PLSC 001 for Am Inst requirement
- **IGETC 4** 3 units
  - Suggested: SOC 001 or ANTH 002 or ECON 001

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*The University of California transfer pathway for Biology also requires MATH 021, CHEM 003, and CHEM 004, but does NOT require courses in Physics. See a counselor for a personalized education plan.*

- **Required Courses/Courses in Discipline**
- **GE Courses/Categories**
Biology

Associate in Science in Biology for Transfer (ADT: A.S.-T.)

Program Description
The Associate in Science in Biology for Transfer Degree program prepares students to transfer to the California State University system as a biology major.

Associate in Science Degree
The Associate in Science in Biology for Transfer degree prepares students to seamlessly transfer to the California State University system as a Biology major. This degree gives Biology majors the Biology, Mathematics, Chemistry, and Physics knowledge that allows them to succeed in upper division courses after transfer. In the major, students gain knowledge of biological molecules, cell structure and function, bioenergetics, Mendelian and molecular genetics, microbiology, plant biology, evolution, ecology, biodiversity, and biotechnology. In the laboratory students learn experimental design including data collection and analysis, keeping a legal laboratory notebook, and reporting the results in a standard scientific journal format. The Biology courses give students an extensive laboratory experience where they gain essential skills required to study and manipulate macromolecules, aseptically transfer cells, work with the common model organisms used in Biology research, and carry out a field study.

Associate in Science in Biology for Transfer
Students who complete this 35 unit major will be guaranteed admission with junior status to the California State University system, though not to a particular campus.

The Associate in Science in Biology for Transfer degree requires:
1. Completion of 60 semester units that are eligible for transfer to the California State University, including both of the following:
   a. The Intersegmental General Education Transfer Curriculum (IGETC) or the California State University General Education – Breadth Requirements.
   b. Completion of the 35 units of courses in the major.
2. Obtainment of a minimum grade point average of 2.0. Students must earn a C or better in all courses required for the major. A “P” (Pass) grade is not an acceptable grade for courses in the major.

Program Outcomes
Students who complete the Biology Associate Degree will be able to:
1. Design and/or interpret an investigation, including data collection and/or analysis.
2. Describe the molecular basis of genetics and energetics.
3. Explain the principles and mechanisms of microevolution and macroevolution.

REQUIRED COURSES .............................................................. Units
BIO 002 Cell and Molecular Biology ........................................ 5
BIO 003 Evolution, Ecology & Biodiversity ............................ 5
CHEM 001 General Chemistry I ............................................. 5
CHEM 002 General Chemistry II ........................................... 5
MATH 020 Analytic Geometry and Calculus I ....................... 5
Select List A or List B ......................................................... 10
Required Major Total Units .................................................. 35

CSU General Education or IGETC for Stem Units. 31-33
CSU Transferable Electives (as needed to reach 60 Transferable units)* ......................................................... 1-4
Total Degree Units ............................................................... 60

*9-10 units may be double counted toward both the major area of emphasis and CSU General Education or IGETC Pattern. Consult with a counselor for more information on completing this degree.
Biology

Program Description
This degree has been designed for students planning on transferring to a campus of the University of California as a Biology, Cell Biology, Molecular Biology, or Biochemistry majors. The program incorporates a study of the mathematics, chemistry, and biology required to understand and research biological processes including cell biology, molecular biology, bioenergetics, genetics, population genetics, microbiology, evolution, developmental biology, ecology, biodiversity, and biotechnology.

Associate in Science Degree
The Associate in Science Degree can be obtained by completing the 40-unit major, and general education requirements. All courses in the major must be completed with a minimum grade of C or a P if the course is taken on a Pass/No Pass basis.

Program Outcomes
Students who complete the Biology Associate Degree will be able to:
1. Design and/or interpret an investigation, including data collection and/or analysis.
2. Describe the molecular basis of genetics and energetics.
3. Explain the principles and mechanisms of microevolution and macroevolution.

Required Courses

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>BIO 002</td>
<td>Cell and Molecular Biology</td>
<td>5</td>
</tr>
<tr>
<td>BIO 003</td>
<td>Evolution, Ecology &amp; Biodiversity</td>
<td>5</td>
</tr>
<tr>
<td>CHEM 001</td>
<td>General Chemistry I</td>
<td>5</td>
</tr>
<tr>
<td>CHEM 002</td>
<td>General Chemistry II</td>
<td>5</td>
</tr>
<tr>
<td>CHEM 003</td>
<td>Organic Chemistry I</td>
<td>5</td>
</tr>
<tr>
<td>CHEM 004</td>
<td>Organic Chemistry II</td>
<td>5</td>
</tr>
<tr>
<td>MATH 020</td>
<td>Analytic Geometry and Calculus I</td>
<td>5</td>
</tr>
<tr>
<td>MATH 021</td>
<td>Analytic Geometry and Calculus II</td>
<td>5</td>
</tr>
</tbody>
</table>

Total Degree Units Solano GE: 61

CSU General Education or IGETC for STEM units: 31-33
Total Degree Units CSU GE or IGETC: 62-64

Required Major Total Units: 40

Electives (as needed to reach 60 units): 21

* 9 units may be double counted toward both the major area of emphasis and CSU General Education or IGETC Pattern. Consult with a counselor for more information on completing this degree.

BIO 002  Cell and Molecular Biology  5.0 Units
Prerequisite: CHEM 001.
General Education: Option A: Area A; Option B: Area SB, Area SC;
Option C: Area B2, Area B3
Transferable to UC/CSU
Hours: 48-54 lecture, 96-108 lab.
This course, intended for biology majors, covers the structure and function of prokaryotic and eukaryotic cells, biological molecules, cell reproduction and its controls. Mendelian and molecular genetics, cell physiology and the metabolism including cellular respiration and photosynthesis, cellular communication, and homeostasis. An extensive laboratory component teaches the techniques used in biotechnology to manipulate DNA and to study proteins. (C-ID BIOL 190)

BIO 003  Evolution, Ecology & Biodiversity  5.0 Units
Prerequisite: BIO 002 with a minimum grade of C.
General Education: Option A: Area A; Option B: Area SB, Area SC;
Option C: Area B2, Area B3
Transferable to UC/CSU
Hours: 48-54 lecture, 96-108 lab.
This course, intended for biology majors, covers evolution, ecology, and the diversity of life. Laboratory includes invertebrate and vertebrate dissection and several weekend and all day field trips. Students must successfully complete both the lecture and the laboratory portions of the course. Field trips may be required with some involving a fee. (C-ID BIOL 140)
Biology

**BIO 004  Human Anatomy  5.0 Units**
Course Advisory: BIO 016 and BIO 016L strongly recommended; Eligibility for ENGL 001; and SCC minimum Math standard.
General Education: Option A: Area A; Option B: Area 5B, Area 5C; Option C: Area B2, Area B3
Transferable to UC/CSU
Hours: 48-54 lecture, 96-108 lab.
A study of the structural organization of the human body, from cellular to organismal level. Throughout the course, various types of instruction are used, including microscopic investigation of prepared slides of tissues and organs, gross (macroscopic) anatomical dissection, and examination of prospected human material. (C-ID BIOL 110B)

**BIO 005  Human Physiology  5.0 Units**
Prerequisite: A minimum grade of C in BIO 004 and CHEM 001, CHEM 010 or CHEM 012 (formerly CHEM 051).
General Education: Option A: Area A; Option B: Area 5B, Area 5C; Option C: Area B2, Area B3
Transferable to UC/CSU
Hours: 48-54 lecture, 96-108 lab.
A description of physiological and homeostatic mechanisms of the body systems in health and disease. The laboratory relates structure to function, uses instrumentation to measure physiological variables, and enables students to critically evaluate functional status. (C-ID BIOL 120)

**BIO 012L  Environmental Science Laboratory  1.5 Units**
Prerequisite: BIO 012 (may enroll concurrently)
General Education: Option B: Area 5C; Option C: Area B3
Transferable to UC/CSU
Hours: 8-9 lecture, 48-54 lab.
Examine the ecological roles of organisms, resource use, and pollution/waste by using laboratory and mandatory field trip techniques. Field trips may be required.

**BIO 012  Environmental Science  3.0 Units**
Course Advisory: Eligibility for ENGL 001 and SCC minimum Math standard.
General Education: Option A: Area A; Option B: Area 5B, Area 5C; Option C: Area B2
Transferable to UC/CSU
Hours: 48-54 lecture.
Examines environmental issues from a scientific perspective by using an understanding of the physical, chemical, and biological processes of the Earth system to examine the interaction between humans and these processes. Topics include ecological principles, biodiversity, human population growth, climate change, air and water pollution, solid waste management, and the management of renewable and non-renewable energy, water, land, soil, and mineral resources. The course utilizes knowledge of these subject to find solutions to environmental challenges. Field trips may be required.

**BIO 014  Principles of Microbiology  4.0 Units**
Prerequisite: A minimum grade of C in CHEM 001, CHEM 010, or CHEM 012.
General Education: Option A: Area A; Option B: Area 5B, Area 5C; Option C: Area B2, Area B3
Transferable to UC/CSU
Hours: 48-54 lecture, 48-54 lab.
The study of the morphology, physiology, genetics, taxonomy, and ecology of microorganisms. The course also includes principles of immunology, the control of microbes, and their relationship to disease. Laboratory exercises cover microscopy, staining, aseptic techniques, identification, and microbial growth among others.

**BIO 015  Introduction to Biology  4.0 Units**
Course Advisory: Eligibility for ENGL 001; SCC minimum Math standard.
General Education: Option A: Area A; Option B: Area 5B, Area 5C; Option C: Area B2, Area B3
Transferable to UC/CSU
Hours: 48-54 lecture.
Intended for non-science majors, a survey of biology including biological chemistry, cell structure and function, genetics, evolution, and ecology. The laboratory component emphasizes the scientific method to reinforce lecture concepts. Off-campus field trips may be scheduled. NOTE: Not open for credit to students who have completed BIO 003.

**BIO 016  Introduction to Human Biology  3.0 Units**
Course Advisory: SCC minimum English and Math standards.
General Education: Option A: Area A; Option B: Area 5B; Option C: Area B2
Transferable to UC/CSU
Hours: 48-54 lecture.
An introduction to general biology with emphasis on the human model. Topics include cell structure and function, human evolution, anatomy and physiology, genetics, and the human impact on the environment. This is a course for non-majors. NOTE: Not open for credit to students who have completed BIO 001, 002, 004, 005, 010 or 015.
**Biology**

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<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
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<tbody>
<tr>
<td>BIO 016L</td>
<td>Human Biology Laboratory</td>
<td>1.5</td>
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<td><em>Prerequisite:</em> BIO 016 with a minimum grade of C (may enroll concurrently).</td>
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<td><em>Course Advisory:</em> Eligibility for ENGL 001</td>
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<td><em>General Education:</em> Option B: Area SC; Option C: Area B3</td>
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<td><em>Transferable to UC/CSU</em></td>
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<td><em>Hours:</em> 8-9 lecture, 48-54 lab.</td>
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<td></td>
<td>An introduction to general biology with an emphasis on the human model. Topics include microscopy, cell structure and function, human anatomy and physiology, genetics and the human impact on the environment. Off-campus field trips may be required and may involve a fee. This course is for non-majors. Note: Not open for credit to students who have completed BIO 002, 003, 004, 005 or 015.</td>
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| BIO 018    | Biology Of Sex                                   | 3.0   |
|           | *Course Advisory:* Eligibility for ENGL 001 and SCC minimum Math standard. |       |
|           | *Transferable to UC/CSU*                         |       |
|           | *Hours:* 48-54 lecture.                          |       |
|           | The biological bases of human sex and sexuality will be discussed. Emphasis will be placed on the normal and diseased state of the male and female reproductive system. Essay and objective exams as well as written assignments will be used for student evaluations; the final exam will be comprehensive. |       |

| BIO 019    | Marine Biology                                   | 4.0   |
|           | *Course Advisory:* Eligibility for ENGL 001 and SCC minimum Math standard. |       |
|           | *General Education:* Option A: Area A; Option B: Area 5B, Area 5C; Option C: Area B2 |       |
|           | *Transferable to UC/CSU*                         |       |
|           | *Hours:* 48-54 lecture, 48-54 lab.               |       |
|           | The study of the diversity and natural history of life in the marine environment with an emphasis on the adaptations of organisms to their environment. Students must successfully complete both the lecture and laboratory portions of the course. Field trips may be required. Some field trips may involve a fee. This course is for non-majors. NOTE: This course is not open for credit to students who have completed BIO 001 or 002. |       |

| BIO 020    | Infectious Disease, Plagues, and Public Health   | 3.0   |
|           | *Course Advisory:* Eligibility for ENGL 001; SCC minimum Math standard. |       |
|           | *General Education:* Option A: Area A; Option B: Area 5B; Option C: Area B2 |       |
|           | *Transferable to UC/CSU*                         |       |
|           | *Hours:* 48-54 lecture.                          |       |
|           | Examine infectious disease and the changing disease landscape from the molecular to the ecological level. Topics include cell structure and function, microorganisms, immunity, epidemiology, historical plagues, emerging diseases, prevention and treatment, and conditions that promote novel disease emergence. This is a course designed for non-science majors. |       |

| BIO 025    | Human Genetics                                   | 3.0   |
|           | *Course Advisory:* Eligibility for ENGL 001; SCC minimum Math standard. |       |
|           | *General Education:* Option A: Area A; Option B: Area 5B; Option C: Area B2 |       |
|           | *Transferable to UC/CSU*                         |       |
|           | *Hours:* 48-54 lecture.                          |       |
|           | Provides an understanding of basic principles of genetics, current developments in genetics, and the influence of genes and the environment in determining human characteristics. This course is for non-science majors. |       |

| BIO 047    | Independent Study                                | 0.5 to 3.0 |
|           | *Prerequisite:* A minimum grade of C in 12.0 Units of credit, including 4.0 Units from within the discipline. |       |
|           | *Course Advisory:* Eligibility for ENGL 001; statistics may be useful for data analysis. |       |
|           | *Transferable to CSU*                            |       |
|           | *Hours:* 48-162 lab by arrangement.              |       |
|           | Designed for students who intend to major in biological sciences or pre-professional programs. Students may take this course up to the maximum number of units over multiple semesters. |       |

| BIO 049    | Biology Honors                                   | 1.0 to 3.0 |
|           | *Prerequisite:* Eligibility for Honors Program; BIO 001, BIO 002, BIO 005, BIO 014, or BIO 015 (any of these courses may be taken concurrently). |       |
|           | *Course Advisory:* Eligibility for ENGL 001.     |       |
|           | *Transferable to CSU*                            |       |
|           | *Hours:* 24-162 lab by arrangement.              |       |
|           | Requires approval of a faculty member sponsor and the Dean of the School of Science and Mathematics. Requires students to complete an independent student project under the supervision of a member of the faculty. The project may be a laboratory or field study or a library study that leads to a thesis. In all cases, the final written product should show integration and synthesis of ideas. Students may take this course up to the maximum number of units over multiple semesters. |       |
Biology

BIO 099  Biology Honors: Special Dissection  0.5 to 2.0 Units
Prerequisites: Completion of 24.0 units of college credit with a minimum GPA of 3.3; BIO 004 with a minimum grade of B; an ability to work independently; permission of the School Dean based on instructor availability.
Transferable to CSU
Hours: 24-108 lab by arrangement.
An independent study project designed to increase understanding of human anatomy through detailed dissection and other projects assigned by the supervising instructor. The student will be evaluated through oral examination and evaluation of dissections. This course is an Open Entry/Open Exit course. Students may continue BIO 099 over multiple semesters not to exceed 2.0 units.

BIO 101  How to Study Science  0.5 Units
Hours: 8-9 lab.
A step-by-step approach for success in transferable science courses. Topics include: overcoming science anxiety; learning how science courses are organized; how best to learn and retain scientific information; how to use science textbooks, common scientific terms, and symbols; how to analyze figures; how to develop test-taking skills to prepare for lecture and laboratory tests; and more.

BIO 160  Review of Scientific Principles of Pre-Nursing  2.5 Units
Prerequisite: Current acceptance or on the waiting list of an RN Program.
Hours: 40-45 lecture.
A focus on science and mathematics topics that are critical to success for students entering an RN program. Providing a clinically pertinent review of select anatomy, physiology, nutrition, and microbiology topics for students entering nursing school. Especially designed for students that have had an extended time period between finishing their pre-nursing requirements and entering nursing school. This course is taught by a panel of experts in the field. Case studies are extensively used in order to contextualize the material. This is a Pass/No Pass only course.