BACHELOR OF SCIENCE IN BIOLOGY: CONCENTRATION IN CELL AND MOLECULAR BIOLOGY – BIOL ASSOCIATE DEGREE FOR TRANSFER ROADMAP

This is a sample pathway for students who transfer to San Francisco State University in the current Bulletin year with an AS-T in Biology. Thirty-two units in the major (BIOL 230/BIOL 240, CHEM 115, CHEM 215, CHEM 216, MATH 226, required PHYS sequence) and 33 units of lower-division GE requirements have been satisfied. Check with a major advisor about the most appropriate course sequence. Degree completion guaranteed in 60 units; see the Associate Degree for Transfer (ADT) section for more information (http://bulletin.sfsu.edu/undergraduate-admissions/transfer-students).

Course | Title | Units
--- | --- | ---
**First Semester**
Select One (Major Lower-Division): | 3-4
BIOL 358 | Forensic Genetics: Math Matters | 3
BIOL 458 | Biometry | 3
CSC 210 | Introduction to Computer Programming | 3
MATH 227 | Calculus II | 3
CHEM 233 | Organic Chemistry I (Major Lower-Division) | 3
US History (bulletin.sfsu.edu/undergraduate-education/graduation-requirements/#USHaGR) | 3
- or University Elective if US History met before transfer | 3
GE Area C | | 3
University Elective | | 3
| Units | 16
**Second Semester**
BIOL 350 | Cell Biology (Major Upper-Division) | 3
BIOL 355 | Genetics (Major Upper-Division) | 3
CHEM 335 | Organic Chemistry II (Major Upper-Division) | 3
GE Area D | | 3
GE Area UD-C: Upper-Division Arts and/or Humanities | | 3
| Units | 15

**Third Semester**

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<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
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<tbody>
<tr>
<td>BIOL 351GW</td>
<td>Experiments in Cell and Molecular Biology - GWAR (Major Upper-Division)</td>
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<tr>
<td>BIOL 357</td>
<td>Molecular Genetics (Major Upper-Division)</td>
<td>3</td>
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<tr>
<td>CHEM 349</td>
<td>General Biochemistry (Major Upper-Division)</td>
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<tr>
<td>GE Area UD-D: Upper-Division Social Sciences</td>
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| University Elective | | 2
| **Units** | **15** |

**Fourth Semester**

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<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
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<tr>
<td>Major Upper-Division Electives (11 units)</td>
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| University Elective | | 3
| **Units** | **14** |
| **Total Units** | **60** |

1 BIOL 355 satisfies GE Area UD-B: Upper-Division Physical and/or Life Sciences.
Major Electives (11 units)
Select 11 units upon advisement. At least one elective course must have an upper-division laboratory component. Graduate-level courses may be used upon advisement.

- BIOL 332 Health Disparities in Cancer (3 units) (AERM, GP, SJ)
- BIOL 337 Evolution (3 units)
- BIOL 344GW Research Skills - GWAR (3 units)
- BIOL 349 Bioethics (3 units) (UD-B, SJ)
- BIOL 356 Honors Genetics (2 units)
- BIOL 358 Forensic Genetics: Math Matters (4 units)
- BIOL 380 Evolutionary Developmental Biology (3 units)
- BIOL 382 Developmental Biology (3 units)
- BIOL 401 General Microbiology (3 units)
- BIOL 402GW General Microbiology Laboratory - GWAR (3 units)*
- BIOL 411 Environmental Microbiology (3 units)
- BIOL 420 General Virology (3 units)
- BIOL 425 Emerging Diseases (3 units)
- BIOL 435 Immunology (3 units)
- BIOL 436 Immunology Laboratory (2 units)*
- BIOL 442 Microbial Physiology (3 units)
- BIOL 443 Microbial Physiology Laboratory (2 units)*
- BIOL 446 Microbial Genomics (4 units)
- BIOL 453 General Parasitology (3 units)
- BIOL 454 Parasitology Laboratory (1 units)*
- BIOL 458 Biometry (4 units)
- BIOL 490 Ecology of Infectious Diseases (4 units)
- BIOL 525 Plant Physiology (3 units)
- BIOL 526 Plant Molecular Physiology Laboratory (2 units)*
- BIOL 615 Molecular Pathophysiology (3 units)
- BIOL 618 Biology of Aging (3 units)
- BIOL 623 Pharmacology (3 units)
- BIOL 630 Animal Physiology (3 units)
- BIOL 631GW Animal Physiology Laboratory - GWAR (4 units)*
- BIOL 638 Bioinformatics and Genome Annotation (4 units)*
- BIOL 640 Cellular Neurosciences (3 units)
- BIOL 652 Science Education Partners in Biology (4 units)
- BIOL 699 Independent Study in Biology (1-3 units)*
- CHEM 343 Biochemistry I Laboratory (3 units)*

* Course fulfills the upper-division laboratory elective requirement.

To Do at SF State:
Enough total units to reach 120 minimum for graduation; 30 units minimum at the upper-division level; to include the following:

University-Wide Requirements: 12–18 Units
- Lower-Division GE (6 units) – Area C (3 units in any subarea) and Area D (3 units). D2 courses satisfy US History; D3 courses satisfy US/CA Government requirements.
- Upper-Division GE (9 units): See Note 1. Also, courses may satisfy the US History or US/CA Government requirements, and UD-C or UD-D at the same time, if approved for multiple areas.
- Students entering this major with the AS-T in Biology are not required to fulfill SF State Studies or Complementary Studies requirements.

Biology – Cell and Molecular Biology Major: 37 Units
Completed: BIOL 230/BIOL 240, MATH 226, all PHYS, and CHEM 115/CHEM 215/CHEM 216.

- Lower-Division Requirements (7 units): CHEM 233; CSC 210 or MATH 227. BIOL 358 or BIOL 458 can be substituted for CSC 210 or MATH 227.
- Major Upper-Division Requirements/GWAR (19 units)
- Major Upper-Division Electives (11 units) – upon advisement; includes lab component. See list above.

University Electives: 5 or More Units
Depends on course choices made at the community college, how transferred units are applied to the requirements above, and course choices at SF State. Some courses may meet more than one requirement, e.g., UD GE and the major.