Bachelor of Science in Biology: Concentration in Cell and Molecular Biology Roadmap

120 Total Units Required
Minimum Number of Units in Major: 68

Course | Title | Units
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**First Semester**
CHEM 115 | General Chemistry I: Essential Concepts of Chemistry | 5
MATH 226 | Calculus I | 4
GE Area A: Oral Communication (A1) or Critical Thinking (A3) | 3
GE Area A: Written English Communication (A2) | 3
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Units | 15

**Second Semester**
PHYS 111 & PHYS 112 | General Physics I and General Physics I Laboratory | 4
BIOL 230 | Introductory Biology I | 5
GE Area A: Oral Communication (A1) or Critical Thinking (A3) | 3
GE Area A: Written English Communication II (A4) | 3
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Units | 15

**Third Semester**
CHEM 215 & CHEM 216 | General Chemistry II: Quantitative Applications of Chemistry Concepts and General Chemistry II Laboratory: Quantitative Applications of Chemistry Concepts | 5
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Select One:
MATH 227 | Calculus II | 3-4
CSC 210 | Introduction to Computer Programming | 3
BIOL 358 | Forensic Genetics: Math Matters | 3
BIOL 458 | Biometry | 3
GE Area C: Arts (C1) | 3
GE Area C: Arts (C1) or Humanities (C2) | 3
GE Area D: U.S. History (D2) or U.S. and California Government (D3) | 3
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Units | 17-18

**Fourth Semester**
BIOL 240 | Introductory Biology II | 5
CHEM 233 | Organic Chemistry I | 3
PHYS 121 & PHYS 122 | General Physics II and General Physics II Laboratory | 4
GE Area D: U.S. History (D2) or U.S. and California Government (D3) | 3
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Units | 15

**Fifth Semester**
BIOL 355 | Genetics | 3
CHEM 335 | Organic Chemistry II | 3
GE Area C: Humanities: Literature (C3) | 3
GE Area D: Social Sciences (D1) | 3
SF State Studies or University Elective | 3
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Units | 15

**Sixth Semester**
BIOL 350 | Cell Biology | 3
BIOL 357 | Molecular Genetics | 3
CHEM 349 | General Biochemistry | 3
GE Area UD–C: Upper Division Arts and/or Humanities (Consider SF State Studies Course) | 3
GE Area UD–D: Upper Division Social Sciences (Consider SF State Studies Course) | 3
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Units | 15

**Seventh Semester**
BIOL 351GW | Experiments in Cell and Molecular Biology · GWAR | 4
Select Major Electives Requirement (11 Units Total) – Take Two | 6-7
SF State Studies or University Elective | 3-6
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Units | 15-16

**Eighth Semester**
Select Major Electives Requirement (11 Units Total) | 4-6
SF State Studies or University Elective – Take Three | 9
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Units | 13-15

Total Units: 120-124

1 Depending on courses completed through Early Start and in high school, students in Pathway/Category 3 or 4 may be required to enroll in additional courses before they can take MATH 199 or MATH 226. Most students in Pathway/Category 3 or 4 will need to take a stretch format for MATH 199 (MATH 197 in Fall 2018 and MATH 198 in Spring 2019). Before enrolling in a B4 course, students should verify their MATH Pathway/Category in their Student Center (http://cms.sfsu.edu/content/student-center). Information regarding the courses that correspond with your MATH Pathway/Category can be found on the Developmental Studies Office Website (http://developmentalstudies.sfsu.edu).

2 To avoid taking additional units, it is recommended that you meet LLD and SF State Studies requirements (AERM, GP, ES, SJ) within your GE.

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ENG 114 can only be taken if you complete Directed Self-Placement (DSP) and select ENG 114; if you choose ENG 104/ENG 105 through DSP you will satisfy A2 upon successful completion of ENG 105 in the second semester; multilingual students may be advised into alternative English courses.

Major Electives
Chose 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)
- BIOL 337 Evolution (3 units)
- BIOL 344GW Research Skills - GWAR (3 units)
- BIOL 349 Bioethics (3 units)
- 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)