

BACHELOR OF SCIENCE IN BIOLOGY: CONCENTRATION IN CELL AND MOLECULAR BIOLOGY - QUANTITATIVE REASONING CATEGORY III/IV AND STRETCH ENGLISH

120 Total Units Required

Minimum Number of Units in Major: 68

This roadmap is a suggested plan of study and does not replace meeting with an advisor. Please note that students may need to adjust the actual sequence of courses based on course availability. Please consult an advisor in your major program for further guidance.

Course	Title	Units
First Semester		
ENG 104	Writing the First Year: Finding Your Voice Stretch I ¹	3
MATH 197	Prelude to Calculus I (Prerequisite for MATH 226) ^{2,3}	3
GE Area A ⁴		3
GE Area C		3
GE Area D		3
		Units 15
Second Semester		
BIOL 230	Introductory Biology I (Major Lower-Division Core)	5
CHEM 115	General Chemistry I: Essential Concepts of Chemistry (Major Lower-Division Core)	5
ENG 105	Writing the First Year: Finding Your Voice Stretch II (A2) ¹	3
MATH 198	Prelude to Calculus II (Prerequisite for MATH 226, B4) ^{2,3}	3
		Units 16

Third Semester		
CHEM 215 & CHEM 216	General Chemistry II: Quantitative Applications of Chemistry Concepts and General Chemistry II Laboratory: Quantitative Applications of Chemistry Concepts (Major Lower-Division Core)	5
MATH 226	Calculus I (Major Lower-Division Core, B4) ^{2,3}	4
PHYS 111 & PHYS 112	General Physics I and General Physics I Laboratory (Major Lower-Division Core, B1, B3)	4
GE Area E		3
		Units 16

Fourth Semester		
BIOL 240	Introductory Biology II (Major Lower-Division Core) ⁵	5
CHEM 233	Organic Chemistry I (Major Lower-Division Core)	3
PHYS 121 & PHYS 122	General Physics II and General Physics II Laboratory (Major Lower-Division Core)	4
Select One (Major Lower-Division Core):		3-4
BIOL 358	Forensic Genetics: Math Matters	
BIOL 458	Biometry	
CSC 210	Introduction to Computer Programming	
MATH 227	Calculus II ⁶	
		Units 15-16

Fifth Semester		
CHEM 335	Organic Chemistry II (Major Upper-Division Core)	3
GE Area A		3
GE Area C		3
GE Area D - Take Two		6
		Units 15

Sixth Semester		
BIOL 355	Genetics (Major Upper-Division Core) ⁷	3
BIOL 350	Cell Biology (Major Upper-Division Core)	3

CHEM 349	General Biochemistry (Major Upper-Division Core) ⁸	3
GE Area C		3
SF State Studies or University Elective		3
Units		15
Seventh Semester		
BIOL 351GW	Experiments in Cell and Molecular Biology - GVAR (Major Upper-Division Core)	4
BIOL 357	Molecular Genetics (Major Upper-Division Core)	3
Select Major Electives Requirement (11 Units Total) - Take Two ⁹		6-7
SF State Studies or University Elective		3
Units		16-17
Eighth Semester		
Select Major Electives Requirement (11 Units Total) - Take Two ⁹		4-6
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
SF State Studies or University Elective		2
Units		12-14
Total Units		120-124

¹ 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.

² Depending on courses completed through Early Start, students in Pathway/Category III or IV may be required to enroll in a support course to complement their Quantitative Reasoning/B4 requirement. There are multiple course options for this pathway. 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/>).

⁴ To avoid taking additional units, it is recommended that you meet SF State Studies requirements (AERM, GP, ES, SJ) within your GE.

⁵ GE Areas B2 (Life Science) and B3 (Laboratory Science) are satisfied upon completion of BIOL 240.

⁶ Students who plan to pursue a Ph.D. should complete at least two semesters of calculus and one semester of physical chemistry.

⁷ Upper-Division General Education, Physical, and Life Sciences (UD-B) is satisfied upon completion of BIOL 355.

⁸ Students may take CHEM 340 and CHEM 341 in lieu of CHEM 349 upon advisement. In this case, CHEM 341 counts towards the upper-division elective unit requirement.

⁹ **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 - GVAR (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 - GVAR (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 - GVAR (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.