

BACHELOR OF SCIENCE IN BIOLOGY: CONCENTRATION IN CELL AND MOLECULAR BIOLOGY ROADMAP

120 Total Units Required
Minimum Number of Units in Major: 60

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		
CHEM 115	General Chemistry I (Major Lower-Division Core)	5
ENG 114	Writing the First Year: Finding Your Voice (A2) ¹	3
MATH 226	Calculus I (Major Lower-Division Core, B4) ²	4
GE Area A ³		3
		Units
		15
Second Semester		
BIOL 230	Introductory Biology I (Major Lower-Division Core)	5
BIOL 231	Advising for Success as a Biology Major (Major Lower-Division Core)	1
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
GE Area E		3
		Units
		14
Third Semester		
BIOL 240	Introductory Biology II (Major Lower-Division Core) ⁴	5
Select One (Major Lower-Division Core): ⁵		3
CHEM 130	General Organic Chemistry	

CHEM 233	Organic Chemistry I	
GE Area A		3
GE Area D		3
		Units
		14
Fourth Semester		
Select One (Major Lower-Division Core): ⁵		3
CHEM 335	Organic Chemistry II	
SF State Studies or University Elective (if CHEM 130 taken)		
PHYS 111 & PHYS 112	General Physics I and General Physics I Laboratory (Major Lower-Division Core, B1, B3)	4
GE Area C - Take Two		6
GE Area D		3
		Units
		16
Fifth Semester		
BIOL 355	Genetics (Major Upper-Division Core) ⁶	3
GE Area C		3
GE Area F [±]		3
U.S. and California Government (http://bulletin.sfsu.edu/undergraduate-education/american-institutions/#usg)		3
SF State Studies or University Elective		3
		Units
		15
Sixth Semester		
BIOL 337	Evolution (Major Upper-Division Core)	3
BIOL 350	Cell Biology (Major Upper-Division Core)	3
BIOL 357	Molecular Genetics (Major Upper-Division Core)	3
Select One (Major Upper-Division Core):		3
CHEM 340	Biochemistry I	
CHEM 349	General Biochemistry	
GE Area UD-D: Upper-Division Social Sciences		3
		Units
		15
Seventh Semester		
BIOL 351GW	Experiments in Cell and Molecular Biology - GEAR (Major Upper-Division Core)	4
Select Major Electives Requirement (9 Units Total) - Take Two ⁷		6
GE Area UD-C: Upper-Division Arts and/or Humanities		3
SF State Studies or University Elective		3
		Units
		16
Eighth Semester		
Select Major Electives Requirement (9 Units Total) - Take One ⁷		3

SF State Studies or University Elective – Take Four	12
Units	15
Total Units	120

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 To determine the best B4 course option, students should complete the online advising activity at mathadvising.sfsu.edu (<https://mathadvising.sfsu.edu/>). Questions? Contact Gator Smart Start. (<https://gatorsmartstart.sfsu.edu/>)

³ To avoid taking additional units, it is recommended that you meet the **SF State Studies** (AERM, GP, ES, SJ) requirements within your GE or major.

⁴ GE Area B2 (Life Science) is satisfied upon completion of BIOL 240.

⁵ CHEM 233 is a prerequisite for CHEM 335. If students plan to take CHEM 335, they must take CHEM 233.

⁶ Upper-Division General Education, Physical, and Life Sciences (UD-B) is satisfied upon completion of BIOL 355.

⁷ **Major Electives (9 units)**

Select 9 units upon advisement. At least one elective course must have an upper-division laboratory component. Graduate level courses may be used upon advisement.

BIOL 328 Human Anatomy (4 units)*

BIOL 332 Health Disparities in Cancer (3 units) (AERM, GP, SJ)

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 420 General Virology (3 units)

BIOL 425 Emerging Diseases (3 units)

BIOL 430 Medical Microbiology (3 units)

BIOL 431 Medical Microbiology Laboratory (2 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 482 Ecology (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 612 Human Physiology (3 units)

BIOL 615 Molecular Pathophysiology (3 units)

BIOL 619 Pathophysiology (3 units)

BIOL 620 Endocrinology (3 units)

BIOL 621 Reproductive Physiology (3 units)

BIOL 622 Hormones and Behavior (3 units)

BIOL 627 Biophysics (3 units)

BIOL 630 Animal Physiology (3 units)

BIOL 638 Bioinformatics and Genome Annotation (4 units)*

BIOL 640 Cellular Neurosciences (3 units)

BIOL 642 Neural Systems Physiology (3 units)

BIOL 644 LEADerS Service Learning Course: Learners Engaged in Advocating for Diversity in Science (4 units)
 or BIOL 654 Peer Assistants for Learning Science (PALS) (4 units)
 BIOL 667/CHEM 667 Optical Engineering for the Biological Sciences (3 units)*

BIOL 699 Independent Study in Biology (1-3 units)

CSC 306 An Interdisciplinary Approach to Computer Programming (3 units)*

* Course fulfills the upper-division laboratory elective requirement.

± Given catalog rights, fall 2023 transfer students do not need to complete an Area F course.