

# BACHELOR OF SCIENCE IN BIOLOGY: CONCENTRATION IN MARINE SCIENCE ROADMAP – QUANTITATIVE REASONING CATEGORY I/II AND STRETCH ENGLISH

120 Total Units Required

Minimum Number of Units in the Major: 57

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
<b>First Semester</b>		
CHEM 115	General Chemistry I: Essential Concepts of Chemistry (Major Lower-Division Core)	5
ENG 104	Writing the First Year: Finding Your Voice Stretch I <sup>1</sup>	3
MATH 226	Calculus I (Major Lower-Division Core, B4) <sup>2</sup>	4
GE Area A <sup>3</sup>		3
		<b>Units 15</b>
<b>Second Semester</b>		
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 130	General Organic Chemistry (Major Lower-Division Core)	3
ENG 105	Writing the First Year: Finding Your Voice Stretch II (A2) <sup>1</sup>	3
GE Area A		3
		<b>Units 15</b>
<b>Third Semester</b>		
BIOL 240	Introductory Biology II <sup>4</sup>	5
Select One (Major Lower-Division Core): <sup>5</sup>		4-5

CHEM 215 & CHEM 216	General Chemistry II: Quantitative Applications of Chemistry Concepts and General Chemistry II Laboratory: Quantitative Applications of Chemistry Concepts	
MATH 227	Calculus II	
Select One (Major Lower-Division Core): <sup>5</sup>		4
PHYS 111 & PHYS 112	General Physics I and General Physics I Laboratory (B1, B3)	
PHYS 220 & PHYS 222	General Physics with Calculus I and General Physics with Calculus I Laboratory (B1, B3)	
GE Area E		3
		<b>Units 16-17</b>
<b>Fourth Semester</b>		
Select One Set of Courses Not already Taken (Major Lower-Division Core):		4-5
CHEM 215 & CHEM 216	General Chemistry II: Quantitative Applications of Chemistry Concepts and General Chemistry II Laboratory: Quantitative Applications of Chemistry Concepts	
MATH 227	Calculus II	
PHYS 121 & PHYS 122	General Physics II and General Physics II Laboratory <sup>6</sup>	
PHYS 230 & PHYS 232	General Physics with Calculus II and General Physics with Calculus II Laboratory <sup>6</sup>	
GE Area C		3
GE Area D - Take Two		6
		<b>Units 13-14</b>
<b>Fifth Semester</b>		
BIOL 355	Genetics <sup>7</sup>	3
BIOL 458	Biometry	4
GE Area C - Take Two		6
GE Area F		3
		<b>Units 16</b>
<b>Sixth Semester</b>		
BIOL 337	Evolution (Major Upper-Division Core)	3
Oceanography Elective - Select One <sup>8</sup>		3-4

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
U.S. and California Government ( <a href="http://bulletin.sfsu.edu/undergraduate-education/american-institutions/#usg">http://bulletin.sfsu.edu/undergraduate-education/american-institutions/#usg</a> )	3

**Units 15-16**

**Seventh Semester**

GWAR Option - Select One <sup>9</sup>	3-4
Major Upper-Division Electives (6-7 units) - Take One <sup>10</sup>	3-4
SF State Studies or University Elective - Take Three	9

**Units 15-17**

**Eighth Semester**

Major Upper-Division Electives (6-7 units) - Take One <sup>10</sup>	3-4
SF State Studies or University Elective - Take Four	12

**Units 15-16**

**Total Units 120-126**

<sup>1</sup> 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.

<sup>2</sup> 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/>).

<sup>3</sup> 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.

<sup>4</sup> GE Areas B2 (Life Science) and B3 (Laboratory Science) are satisfied upon completion of BIOL 240.

<sup>5</sup> Students are encouraged to take MATH 227 if they are taking PHYS 220/PHYS 222.

<sup>6</sup> PHYS 111/PHYS 112 are prerequisites for PHYS 121/PHYS 122. PHYS 220/PHYS 222 are prerequisites for PHYS 230/PHYS 232.

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

<sup>8</sup> **Oceanography Elective - Select One**

- BIOL 582 Biological Oceanography & Limnology (4 units)
- CHEM 680 Chemical Oceanography (3 units)
- ERTH 400 Earth Systems I (3 units)
- ERTH 434 Coastal Processes (3 units)
- ERTH 470 Physical Oceanography (4 units)

<sup>9</sup> **GWAR Option - Select One**

- BIOL 344GW Research Skills - GWAR (3 units)
- BIOL 475GW Herpetology - GWAR (3 units)
- BIOL 478GW Ornithology - GWAR (4 units)
- BIOL 570GW Biology of Fishes - GWAR (4 units)
- BIOL 670GW Ecology and Evolution of Marine Systems I - GWAR (6 units)

<sup>10</sup> **Upper-Division Electives (6-7 units)**

- BIOL 315 Field Methods in Ecology and Evolution (1 unit)
- BIOL 349 Bioethics (3 units) (UD-B, SJ)
- BIOL 350 Cell Biology (3 units)
- BIOL 356 Honors Genetics (2 units)
- BIOL 357 Molecular Genetics (3 units)
- BIOL 380 Evolutionary Developmental Biology (3 units)
- BIOL 382 Developmental Biology (3 units)
- BIOL 391 Microscopy and Photomicrography (2 units)
- BIOL 401 General Microbiology (3 units)
- BIOL 411 Environmental Microbiology (3 units)
- BIOL 460 General Entomology (4 units)
- BIOL 470 Natural History of Vertebrates (4 units)
- BIOL 482 Ecology (4 units)
- BIOL 502 Biology of the Algae (3 units)
- BIOL 525 Plant Physiology (3 units)
- BIOL 526 Plant Molecular Physiology Laboratory (2 units)
- BIOL 530 Conservation Biology (3 units)
- BIOL 532 Restoration Ecology (3 units)
- BIOL 534 Wetland Ecology (4 units)
- BIOL 555 Marine Invertebrate Zoology (4 units)
- BIOL 556 Natural History of Marine Invertebrates (4 units)
- BIOL 572 Colloquium in Ecology, Evolution, and Conservation (2 units)
- BIOL 580 Limnology (3 units)
- BIOL 582 Biological Oceanography & Limnology (4 units)
- BIOL 585 Marine Ecology (3 units)
- BIOL 586GW Marine Ecology Laboratory - GWAR (4 units)
- BIOL 600 Animal Behavior (3 units)
- BIOL 607 Conservation and Management of Marine Mammals (3 units)
- BIOL 617 Environmental Physiology (3 units)
- BIOL 630 Animal Physiology (3 units)
- BIOL 631GW Animal Physiology Laboratory - GWAR (4 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 670GW Ecology and Evolution of Marine Systems I - GWAR (6 units)
- BIOL 671 Ecology and Evolution of Marine Systems II (6 units)
- BIOL 699 Independent Study in Biology (1-3 units)
- GEOG 629 Coastal and Marine Applications of GIS (3 units)
- MSCI 306 Marine Science Diving and Boating (2 units)