

BACHELOR OF SCIENCE IN BIOCHEMISTRY - QUANTITATIVE REASONING CATEGORY III/IV AND STRETCH ENGLISH

120 Total Units Required

Minimum Number of Units in the Major: 72

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)	5
CHEM 115	General Chemistry I: Essential Concepts of Chemistry (Major Lower-Division)	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)	5

MATH 226	Calculus I (Major Lower-Division, B4) ^{2,3}	4
GE Area A		3
GE Area E		3
		Units
		15
Fourth Semester		
CHEM 233 & CHEM 234	Organic Chemistry I and Organic Chemistry I Laboratory (Major Lower-Division)	5
MATH 227	Calculus II (Major Lower-Division)	4
Select One Set of Courses (Major Lower-Division): ⁵		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 C		3
		Units
		16
Fifth Semester		
Select One Set of Courses (Major Lower-Division): ⁵		4
PHYS 121 & PHYS 122	General Physics II and General Physics II Laboratory	
PHYS 240 & PHYS 242	General Physics with Calculus III and General Physics with Calculus III Laboratory	
GE Area C		3
GE Area D - Take Two		6
		Units
		13
Sixth Semester		
CHEM 321	Quantitative Chemical Analysis (Major Upper-Division)	3
CHEM 335	Organic Chemistry II (Major Upper-Division)	3
Major Electives (15 Units Total) - Take One ⁶		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
		Units
		15
Seventh Semester		
CHEM 300	General Physical Chemistry I (Major Upper-Division)	3

CHEM 340	Biochemistry I (Major Upper-Division)	3
CHEM 343	Biochemistry I Laboratory (Major Upper-Division)	3
Major Electives (15 Units Total) - Take One ⁶		3
GWAR Elective ^{6,7}		3
	Units	15
Eighth Semester		
CHEM 301	General Physical Chemistry II (Major Upper-Division)	3
CHEM 341	Biochemistry II	3
Major Electives (15 Units Total) - Take Two ⁶		6
GE Area UD-B: Upper-Division Physical and/or Life Sciences (Consider SF State Studies Course)		3
	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 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/>).

³ QR Category III students with a grade of B or higher in high school pre-calculus in the past year may be able to enroll in MATH 226. Please see a department advisor.

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

⁵ PHYS 111 and PHYS 112 are prerequisites for PHYS 121 and PHYS 122. PHYS 220 and PHYS 222 are prerequisites for PHYS 240 and PHYS 242.

⁶ Upper-Division Electives (15 units)

- Students must complete at least 15 units of upper-division Chemistry and Biology electives selected from the lists below. Courses from community colleges cannot be substituted for the courses on the list below.
- Electives must include at least:
 - a. one course with a CHEM prefix,
 - b. one GWAR (GW) course (See Footnote 7), and
 - c. three laboratory courses.
- Note that many Biology electives have a BIOL 240 prerequisite.
- Students wishing to enroll in BIOL 350, BIOL 355, and BIOL 612 without completing the BIOL 240 prerequisite should contact an advisor before registration.
- Students should consult an advisor regarding selection of elective courses and check course co- and pre-requisites before enrolling.
- Graduate level courses in chemistry or appropriate courses in biology, physics, geosciences, and computer science may be substituted upon prior approval of advisor.

Upper-Division Electives in Chemistry

- CHEM 322 Quantitative Chemical Analysis Laboratory (2 units)
- CHEM 325 Inorganic Chemistry (3 units)
- CHEM 336 Organic Chemistry II Laboratory (2 units)
- CHEM 370 Computer Applications in Chemistry and Biochemistry (3 units)
- CHEM 420 Environmental Analysis (3 units)
- CHEM 422 Instrumental Analysis (4 units)
- CHEM 426 Advanced Inorganic Chemistry Laboratory (2 units)
- CHEM 433 Advanced Organic Chemistry (3 units)
- CHEM 443 Biophysical Chemistry Laboratory (4 units)
- CHEM 451 Experimental Physical Chemistry Laboratory (2 units)
- CHEM 645GW Research Trends in Chemistry and Biochemistry - GWAR (3 units)
- CHEM 680 Chemical Oceanography (3 units)
- CHEM 699 Independent Study (1-6 units)

Upper-Division Electives in Biology

- BIOL 350 Cell Biology (3 units)
- BIOL 351GW Experiments in Cell and Molecular Biology - GWAR (4 units)
- BIOL 355 Genetics (3 units)
- BIOL 357 Molecular Genetics (3 units)
- BIOL 401 General Microbiology (3 units)
- BIOL 402GW General Microbiology Laboratory - GWAR (3 units)
- BIOL 420 General Virology (3 units)
- BIOL 435 Immunology (3 units)
- BIOL 436 Immunology Laboratory (2 units)
- BIOL 612 Human Physiology (3 units)
- BIOL 613GW Human Physiology Laboratory - GWAR (3 units)
- BIOL 638 Bioinformatics and Genome Annotation (4 units)
- BIOL 640 Cellular Neurosciences (3 units)

⁷ GWAR Elective (3-4 units of the 15 total Elective units)

- BIOL 351GW Experiments in Cell and Molecular Biology - GWAR (4 units)
- BIOL 402GW General Microbiology Laboratory - GWAR (3 units)
- BIOL 613GW Human Physiology Laboratory - GWAR (3 units)
- CHEM 390GW Contemporary Chemistry and Biochemistry Research - GWAR (3 units)