B.S. IN BIOCHEMISTRY AND M.S. CHEMISTRY: BIOCHEMISTRY SF STATE SCHOLARS ROADMAP

The San Francisco State Scholars program provides undergraduate students with an accelerated pathway to a graduate degree. Students in this program pursue a bachelor's and master's degree simultaneously. This program allows students to earn graduate credit while in their junior and/or senior year, reducing the number of semesters required for completion of a master's degree.

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 Year		
Fall Semester		
CHEM 115	General Chemistry I (Major Lower-Division)	5
ENG 114	Writing the First Year: Finding Your Voice (A2) [1]	3
MATH 226	Calculus I (Major Lower-Division, B4) [2]	4
GE Area A [3]		3
	Units	**15**
Spring 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 227	Calculus II (Major Lower-Division)	4
GE Area A		3
GE Area E		3
	Units	**15**
Second Year		
Fall Semester		
CHEM 233 & CHEM 234	Organic Chemistry I and Organic Chemistry I Laboratory (Major Lower-Division)	5
CHEM 321	Quantitative Chemical Analysis (Major Upper-Division)	3
Select One Set of Courses (Major Lower-Divison): [4]		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	**15**
Spring Semester		
BIOL 230	Introductory Biology I (Major Lower-Division)	5
CHEM 335	Organic Chemistry II (Major Upper-Division)	3
Select One Set of Courses (Major Lower-Division): [4]		4
PHYS 121 & PHYS 122	General Physics II and General Physics II Laboratory	
PHYS 230 & PHYS 232	General Physics with Calculus II and General Physics with Calculus II Laboratory	
PHYS 240 & PHYS 242	General Physics with Calculus III and General Physics with Calculus III Laboratory	
GE Area D		3
	Units	**15**
Third Year		
Summer Semester		
SF State Studies or University Elective - Take Two		6
	Units	**6**
Fall Semester		
CHEM 300	Physical Chemistry for Life Sciences I (Major Upper-Division) [5]	3
CHEM 340	Biochemistry I (Major Upper-Division)	3
GWAR Elective [6,7]		3-4
Major Electives (15 Units Total) - Take One [6]		3
GE Area D		3
	Units	**15-16**

Spring Semester		
CHEM 341	Biochemistry II (Major Upper-Division)	3
CHEM 343	Biochemistry I Laboratory (Major Upper-Division)	3
Major Electives (15 Units Total) - Take One [6]		3
GE Area C - Take Two		6
	Units	**15**
Fourth Year		
Fall Semester		
CHEM 301	Physical Chemistry for Life Sciences II (Major Upper-Division) [5]	3
Major Electives (15 Units Total) - Take One [6]		3
GE Area F [±]		3
GE Area UD-B: Upper-Division Physical and/or Life Sciences		3
GE Area UD-C: Upper-Division Arts and/or Humanities		3
	Units	**15**
Spring Semester		
CHEM 879	Research Methods I (Graduate Core)	3
Major Electives (15 Units Total) - Take One [6]		3
Related Study - Take One [8]		3
GE Area UD-D: Upper-Division Social Sciences		3
U.S. and California Government (http://bulletin.sfsu.edu/undergraduate-education/american-institutions/#usg)		3
	Units	**15**
Fifth Year		
Fall Semester		
CHEM 897	Research (Graduate Requirement - Take 3 units)	3
Related Study - Take Three [8]		9
	Units	**12**
Spring Semester		
CHEM 880	Research Methods II (Graduate Core)	3
CHEM 897	Research (Graduate Requirement - Take 6 units)	6
Culminating Experience - Select One [9]		3
CHEM 895	Research Project	
CHEM 898	Master's Thesis	
	Units	**12**
	Total Units	**150-151**

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 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.

5 CHEM 351 may be substituted for CHEM 300 and CHEM 353 may be substituted for CHEM 301 if prerequisites for CHEM 351 and CHEM 353 are met.

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:
  i. one course with a CHEM prefix,
  ii. one GWAR (GW) course (See Footnote 7), and
  iii. 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 the instructor of record before registration.
- Students should consult an advisor regarding the 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 an advisor.

Upper-Division Electives in Chemistry

Students should keep in mind that non-Biochemistry courses may require additional prerequisites that are not met in the Biochemistry degree or permission of the instructor.

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 390GW Contemporary Chemistry and Biochemistry Research - GWAR (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 667/BIOL 667 Optical Engineering for the Biological Sciences (3 units)
CHEM 680 Chemical Oceanography (3 units)
CHEM 699 Independent Study (1-6 units)*

Upper-Division Electives in Biology and Computer Science

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 358 Forensic Genetics: Math Matters (4 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)
Select a maximum of one:
CSC 306 An Interdisciplinary Approach to Computer Programming (3 units)
CSC 508 Machine Learning and Data Science for Personalized Medicine (3 units)
CSC 509 Data Science and Machine Learning for Medical Image Analysis (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)

[8] **Related Study (9-12 units)**
Graduate courses in biochemistry, chemistry, physics, mathematics, or biology on advisement of a graduate major advisor. Upper-division courses may be used with permission of a graduate major advisor.
Analytical/Environmental/Methods (AEM)
CHEM 741/BIOL 741/ERTH 741 Electron Microscopy (4 units)
CHEM 800 Special Topics in Chemistry (3 units)
CHEM 820 (units)
CHEM 821 Mass Spectrometry - Principles and Practice (3 units)
Biochemistry (BIO)
CHEM 800 Special Topics in Chemistry (3 units)
CHEM 841 Enzymology (3 units)
CHEM 851 Biochemical Spectroscopy (3 units)
Organic/Medicinal (OM)
CHEM 800 Special Topics in Chemistry (3 units)
CHEM 832 Organic Synthesis (3 units)
CHEM 834 Organic Spectroscopic Methods (3 units)
CHEM 842 Bioorganic and Medicinal Chemistry (3 units)
Physical/Inorganic/Computational (PIC)
CHEM 800 Special Topics in Chemistry (3 units)
CHEM 851 Biochemical Spectroscopy (3 units)
CHEM 852 (units)
CHEM 870 Computational Methods in Chemistry (3 units)
Chemical Education
CHEM 885 (units)

[9] Both options also require an oral defense.

[10] CHEM 699 - By petition only. To be used as an upper-division elective in Chemistry, a minimum of 3-units must be taken in a single semester.

* Can be used to fulfill the laboratory requirement.

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