

BACHELOR OF SCIENCE IN CHEMISTRY ROADMAP – QUANTITATIVE REASONING CATEGORY I/II 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		Units
First Semester				
CHEM 115	General Chemistry I: Essential Concepts of Chemistry (Major Lower-Division)	5	CHEM 321 & CHEM 322	Quantitative Chemical Analysis and Quantitative Chemical Analysis Laboratory (Major Upper-Division) 5
ENG 104	Writing the First Year: Finding Your Voice Stretch I ¹	3	Select One (Major Lower-Division, B1, B3): 4	
MATH 226	Calculus I (Major Lower-Division, B4) ²	4	PHYS 111 & PHYS 112	General Physics I and General Physics I Laboratory
GE Area A ³		3	PHYS 220 & PHYS 222	General Physics with Calculus I and General Physics with Calculus I Laboratory
		Units		15
Second 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	GE Area E	3
MATH 227	Calculus II (Major Lower-Division)	4	Units 17	
ENG 105	Writing the First Year: Finding Your Voice Stretch II (A2) ¹	3	Fourth Semester	
GE Area A		3	CHEM 335 & CHEM 336	Organic Chemistry II and Organic Chemistry II Laboratory (Major Upper-Division) ⁵ 5
		Units		4
Third Semester				
CHEM 233 & CHEM 234	Organic Chemistry I and Organic Chemistry I Laboratory (Major Lower-Division) ⁴	5	Select One (Major Lower-Division):	
		Units		4
Fourth Semester				
CHEM 251	Mathematics and Physics for Chemistry (Major Lower-Division)	3	PHYS 121 & PHYS 122	General Physics II and General Physics II Laboratory
		Units		3
Fifth Semester				
		Units		3
		Units		3
		Units		15

CHEM 325	Inorganic Chemistry (Major Upper-Division)	3
CHEM 351	Physical Chemistry I: Thermodynamics and Kinetics (Major Upper-Division)	3
GE Area C		3
GE Area D		3
Units		15
Sixth Semester		
CHEM 353	Physical Chemistry II: Quantum Chemistry and Spectroscopy (Major Upper-Division)	3
CHEM 390GW	Contemporary Chemistry and Biochemistry Research - GEAR (Major Upper- Division)	3
CHEM 426	Advanced Inorganic Chemistry Laboratory (Major Upper-Division) ⁶	2
GE Area C		3
GE Area F [±]		3
Units		14
Seventh Semester		
CHEM 340	Biochemistry I (Major Upper-Division)	3
CHEM 451	Experimental Physical Chemistry Laboratory (Major Upper-Division) ⁶	2
Upper-Division Major Elective (9 Units) - Take One ⁷		3-4
GE Area D		3
GE Area UD-B: Upper-Division Physical and/or Life Sciences (Consider SF State Studies Course)		3
GE Area UD-C: Upper-Division Arts and/or Humanities (Consider SF State Studies Course)		3
Units		17-18
Eighth Semester		
Upper-Division Major Elective (9 Units) – Take Two ⁷		6-8
GE Area UD-D: Upper-Division Social Sciences (Consider SF State Studies Course)		3
U.S. and California Government (http://bulletin.sfsu.edu/ undergraduate-education/american-institutions/#usg)		3
Units		12-14
Total Units		120-123

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 Area B1 (Physical Science) is satisfied upon completion of CHEM 233.

Area B3 (Laboratory Science) is satisfied upon completion of CHEM 234.

⁵ CHEM 338 may be substituted for CHEM 336.

⁶ Students may substitute CHEM 343 for CHEM 426 or CHEM 451 upon prior approval of advisor. If CHEM 343 is used as a substitute, it can not also be used as an elective.

⁷ **Major Electives**

A minimum of 9 units of electives must be selected from the following list of courses. Courses from community colleges cannot be substituted for the courses on the list below.

CHEM 341 Biochemistry II (3 units)

CHEM 343 Biochemistry I Laboratory (3 units)

CHEM 370 Computer Applications in Chemistry and Biochemistry (3 units)

CHEM 420 Environmental Analysis (3 units)

CHEM 422 Instrumental Analysis (4 units)

CHEM 433 Advanced Organic Chemistry (3 units)

CHEM 443 Biophysical Chemistry Laboratory (4 units)

CHEM 645GW Research Trends in Chemistry and Biochemistry - GEAR (3 units)

CHEM 680 Chemical Oceanography (3 units)

CHEM 699 Independent Study (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)

[±] Given catalog rights, fall 2022 transfer students do not need to complete an Area F course.

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.