

# BACHELOR OF SCIENCE IN BIOCHEMISTRY – CHEM ASSOCIATE DEGREE FOR TRANSFER (ADT) ROADMAP

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This is a sample pathway for students who transfer to San Francisco State University in the current Bulletin year with an AS-T in Chemistry. Thirty-four units in the major (CHEM 115/CHEM 215, CHEM 233/CHEM 234, CHEM 335, MATH 226/MATH 227, required PHYS sequence) and 33 units of lower-division GE have been satisfied. Check with a major advisor about the most appropriate course sequence for you. **Degree completion guaranteed in 60 units; see the Associate Degree for Transfer (ADT) section for more information (<http://bulletin.sfsu.edu/undergraduate-admissions/transfer-students/>).**

## To Do at SF State:

Enough total units to reach 120 minimum for graduation; 30 units minimum at the upper-division level; to include the following:

### University-Wide Requirements: 15–21 Units

- American Institutions (0–6 units): US History, US Government, California State and Local Government requirements if not taken before transfer. See the next two bullets.
- Lower-Division GE (6 units) – Area C (3 units in any subarea) and Area D (3 units). D2 courses satisfy US History; D3 courses satisfy US/CA Government requirements.
- Upper-Division GE, Areas B, C, and D (9 units) – Courses may satisfy the US History or US/CA Government requirements, and UD-C or UD-D at the same time, if approved for multiple areas.
- Students entering the major with the AS-T in Chemistry are not required to fulfill SF State Studies or Complementary Studies requirements.

### Biochemistry B.S.: 38 Units

Completed: CHEM 115/CHEM 215/CHEM 216, CHEM 233/CHEM 234, CHEM 335/CHEM 336, MATH 226/MATH 227, required PHYS sequence.

- Major Lower-Division Requirements (5 units) – BIOL 230
- Major Upper-Division Requirements (18 units)
- Major Upper-Division Electives (15 units) - including
- at least one course with a CHEM prefix
- at least one course with GW suffix (fulfills University GVAR requirement)
- at least three laboratory courses

Note that many BIOL electives require BIOL 240 as a prerequisite; enrollment without this prereq in BIOL 350, BIOL 355, and BIOL 612 may be permitted, but students must consult with a department advisor prior to registering for these courses.

### University Electives: 4 or More Units

Depends on course choices made at the community college, how transferred units are applied to the requirements above, and course choices at SF State. Some courses may meet more than one requirement, e.g., UD GE and the major.

Course	Title	Units
<b>First Semester</b>		
BIOL 230	Introductory Biology I (Major Lower-Division)	5
CHEM 321	Quantitative Chemical Analysis (Major Upper-Division)	3
GE Area C		3
GE Area D		3
		<b>Units</b>
		<b>14</b>
<b>Second Semester</b>		
CHEM 340	Biochemistry I (Major Upper-Division)	3
CHEM 343	Biochemistry I Laboratory (Major Upper-Division)	3
GWAR Elective <sup>1,2</sup>		3

Major Upper-Division Electives (15 units) - Take One <sup>2</sup>	3
GE Area UD-B: Upper-Division Physical and/or Life Sciences	3
<b>Units</b>	<b>15</b>
<b>Third Semester</b>	
Select One (Major Upper-Division):	3
CHEM 300	Physical Chemistry for Life Sciences I
CHEM 351	Physical Chemistry I: Thermodynamics and Kinetics
CHEM 341	Biochemistry II (Major Upper-Division)
Major Upper-Division Electives (15 units) - Take One <sup>2</sup>	3
US History ( <a href="http://bulletin.sfsu.edu/undergraduate-education/american-institutions/#USHaGR">http://bulletin.sfsu.edu/undergraduate-education/american-institutions/#USHaGR</a> )	3
or University Elective if US History met before transfer	
GE Area UD-C: Upper-Division Arts and/or Humanities	3
<b>Units</b>	<b>15</b>
<b>Fourth Semester</b>	
Select One (Major Upper-Division):	3
CHEM 301	Physical Chemistry for Life Sciences II
CHEM 353	Physical Chemistry II: Quantum Chemistry and Spectroscopy
Major Upper-Division Electives (15 units) - Take Two <sup>2</sup>	6
GE Area UD-D: Upper-Division Social Sciences	3
University Elective	4
<b>Units</b>	<b>16</b>
<b>Total Units</b>	<b>60</b>

- <sup>1</sup> **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)  
 CHEM 645GW Research Trends in Chemistry and Biochemistry - GWAR (3 units)

- <sup>2</sup> **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:
    - one course with a CHEM prefix,
    - one GWAR (GW) course (See Footnote 7), and
    - 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 - GVAR (3 units)  
CHEM 667/BIOL 667 Optical Engineering for the Biological Sciences (3 units)  
CHEM 680 Chemical Oceanography (3 units)  
CHEM 685 Projects in the Teaching of Chemistry and Biochemistry (1 unit)  
CHEM 686 Experiences in Teaching Chemistry and Biochemistry (1 unit)<sup>3</sup>  
CHEM 699 Independent Study (1-6 units)\*<sup>4</sup>

*Upper-Division Electives in Biology and Computer Science*

BIOL 350 Cell Biology (3 units)  
BIOL 351GW Experiments in Cell and Molecular Biology - GVAR (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 - GVAR (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 - GVAR (3 units)\*  
BIOL 638 Bioinformatics and Sequence Analysis (4 units)\*  
BIOL 640 Cellular Neurosciences (3 units)

Select a maximum of one:

CSC 306 An Interdisciplinary Approach to Computer Programming (3 units)  
CSC 408 Machine Learning and Data Science for Personalized Medicine (3 units)  
CSC 509 Data Science and Machine Learning for Medical Image Analysis (3 units)

- <sup>3</sup> May be repeated and up to 2 units used towards Elective requirement.  
<sup>4</sup> By petition only. Units must be taken in the same semester to be used as an upper-division elective.  
\* Can be used to fulfill the laboratory requirement.