

# BACHELOR OF SCIENCE IN BIOLOGY: CONCENTRATION IN CELL AND MOLECULAR BIOLOGY – BIOL 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 Biology. Thirty-two units in the major (BIOL 230/BIOL 240, CHEM 115, CHEM 215, CHEM 216, MATH 226, required PHYS sequence) and 33 units of lower-division GE requirements have been satisfied. Check with a major advisor about the most appropriate course sequence. **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: 12–18 Units

- American Institutions (0-6 units): US History, US Government, CA Government. If not met in transfer, see next bullets.
- Lower-Division GE (6 units) – Area C (3 units in any subarea) and Area D (3 units).
- Upper-Division GE (9 units): See Note 1. Also, 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 this major with the AS-T in Biology are not required to fulfill SF State Studies or Complementary Studies requirements.

### Biology – Cell and Molecular Biology Major: 32-35 Units

Completed: BIOL 230/BIOL 240, MATH 226, all PHYS, and CHEM 115/CHEM 215/CHEM 216.

- Lower-Division Requirements (4-7 units): Organic Chemistry sequence; BIOL 231
- Major Upper-Division Requirements/GWAR (19 units)
- Major Upper-Division Electives (9 units) – upon advisement; includes lab component. See list above.

### University Electives: 13 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 231	Advising for Success as a Biology Major (Major Lower-Division Core)	1
Select One (Major Lower-Division Core): <sup>1</sup>		3
CHEM 130	General Organic Chemistry	
CHEM 233	Organic Chemistry I	
US History ( <a href="http://bulletin.sfsu.edu/undergraduate-education/american-institutions/#USHaGR">http://bulletin.sfsu.edu/undergraduate-education/american-institutions/#USHaGR</a> ) or University Elective if US History met before transfer		3
GE Area C		3
University Elective - Take Two		6
	<b>Units</b>	<b>16</b>
<b>Second Semester</b>		
BIOL 350	Cell Biology (Major Upper-Division Core)	3
BIOL 355	Genetics (Major Upper-Division Core) <sup>2</sup>	3
Select One (Major Lower-Division Core): <sup>1</sup>		3

CHEM 335	Organic Chemistry II	
SF State Studies or University Elective (if CHEM 130 taken)		
GE Area D		3
GE Area UD-C: Upper-Division Arts and/or Humanities		3
		<b>Units</b>
		<b>15</b>
<b>Third Semester</b>		
BIOL 337	Evolution (Major Upper-Division Core)	3
BIOL 351GW	Experiments in Cell and Molecular Biology - GWAR (Major Upper-Division)	4
BIOL 357	Molecular Genetics (Major Upper-Division Core)	3
Select One (Major Upper-Division Core):		
CHEM 340	Biochemistry I	
CHEM 349	General Biochemistry	
GE Area UD-D: Upper-Division Social Sciences		3
		<b>Units</b>
		<b>13</b>
<b>Fourth Semester</b>		
Major Upper-Division Electives (9 units) <sup>3</sup>		9
University Elective - Take Two		7
		<b>Units</b>
		<b>16</b>
		<b>Total Units</b>
		<b>60</b>

<sup>1</sup> CHEM 233 is a prerequisite for CHEM 335. If students plan to take CHEM 335, they must take CHEM 233.

<sup>2</sup> BIOL 355 satisfies GE Area UD-B: Upper-Division Physical and/or Life Sciences.

<sup>3</sup> **Major Electives (9 units)**

Select 9 units upon advisement. At least one elective course must have an upper-division laboratory component. Graduate level courses may be used upon advisement.

BIOL 328 Human Anatomy (4 units)\*

BIOL 332 Health Disparities in Cancer (3 units) (AERM, GP, SJ)

BIOL 349 Bioethics (3 units) (UD-B, SJ)

BIOL 356 Honors Genetics (2 units)

BIOL 358 Forensic Genetics: Math Matters (4 units)

BIOL 380 Evolutionary Developmental Biology (3 units)

BIOL 382 Developmental Biology (3 units)

BIOL 401 General Microbiology (3 units)

BIOL 420 General Virology (3 units)

BIOL 425 Emerging Diseases (3 units)

BIOL 430 Medical Microbiology (3 units)

BIOL 431 Medical Microbiology Laboratory (2 units)\*

BIOL 435 Immunology (3 units)

BIOL 436 Immunology Laboratory (2 units)\*

BIOL 442 Microbial Physiology (3 units)

BIOL 443 Microbial Physiology Laboratory (2 units)\*

BIOL 446 Microbial Genomics (4 units)

BIOL 453 General Parasitology (3 units)

BIOL 454 Parasitology Laboratory (1 units)\*

BIOL 458 Biometry (4 units)

BIOL 482 Ecology (4 units)\*

BIOL 490 Ecology of Infectious Diseases (4 units)

BIOL 525 Plant Physiology (3 units)

BIOL 526 Plant Molecular Physiology Laboratory (2 units)\*

BIOL 612 Human Physiology (3 units)

BIOL 615 Molecular Pathophysiology (3 units)

BIOL 619 Pathophysiology (3 units)

BIOL 620 Endocrinology (3 units)

BIOL 621 Reproductive Physiology (3 units)

BIOL 622 Hormones and Behavior (3 units)

BIOL 627 Biophysics (3 units)

- BIOL 630 Animal Physiology (3 units)
  - BIOL 638 Bioinformatics and Genome Annotation (4 units)\*
  - BIOL 640 Cellular Neurosciences (3 units)
  - BIOL 642 Neural Systems Physiology (3 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 667/CHEM 667 Optical Engineering for the Biological Sciences (3 units)\*
  - BIOL 699 Independent Study in Biology (1-3 units)
  - CSC 306 An Interdisciplinary Approach to Computer Programming (3 units)\*
- \* Course fulfills the upper-division laboratory elective requirement.