

BIOLOGICAL SCIENCES

- This worksheet is intended for supplemental use only. The University will use your Academic Requirements Report (ARR) to track your graduation requirements, including those for your major. Please continue to check your ARR for accuracy.
- If your ARR requires a correction, please submit an ARR Correction Form at www.csusm.edu/academicadvising.
- Your [Degree Planner](http://mycsusm.edu) (in mycsusm.edu) will display the following requirements in the University's recommended sequence.
- All courses used for the major and preparation for the major must be completed with a grade of C (2.0) or higher.
- All non-articulated courses MUST be reviewed and approved by a faculty advisor.
- A minimum of 18 units must be completed at CSUSM.
- No more than a total of 8 units of any combination of BIOL 488 (4 units only), BIOL 489 (4 units only), BIOL 495 (3 units only), BIOL 496 (2 units only), BIOL 498 (2 units only), and BIOL 499 (2 units only) may be applied toward the major.

PREPARATION FOR THE MAJOR

Lower-division Biology Courses (17 units):

✓	Course	Units
<input type="checkbox"/>	BIOL 210: Introduction to Cellular and Molecular Biology (*CHEM 150)	4
<input type="checkbox"/>	BIOL 210A: Cellular and Molecular Biology Tutorial (*BIOL 210, *CHEM 150)	1
<input type="checkbox"/>	BIOL 211: Introduction to Organismal & Population Biology (*BIOL 210)	4
<input type="checkbox"/>	BIOL 211A: Organismal and Population Biology Tutorial (*BIOL 210, *BIOL 211)	1
<input type="checkbox"/>	BIOL 212: Evolution (*BIOL 210)	3
<input type="checkbox"/>	BIOL 215: Experimental Design & Statistical Analysis	4

Non-Biology Supporting Courses (24 units):

✓	Course	Units
<input type="checkbox"/>	CHEM 150: General Chemistry (*CPE ^c , CHEM 101 or 105 and MATH 101, 105 or MATH Category 1 or 2)	4
<input type="checkbox"/>	CHEM 150L: General Chemistry Lab (*CHEM 150)	1
<input type="checkbox"/>	CHEM 160: General Chemistry II (*CHEM 150/150L, *MATH 125, 126 or 160)	3
<input type="checkbox"/>	CHEM 201: Organic Chemistry I (*CHEM 160 or 162)	3
<input type="checkbox"/>	CHEM 201L: Organic Chemistry I Laboratory (*CHEM 201)	2
<input type="checkbox"/>	MATH 132 [~] : Survey of Calculus (*MATH 105 or MATH Category I or II)	3

Complete one sequence of Physics courses:

✓	Course	Units
<input type="checkbox"/>	PHYS 101: Introduction to Physics I (*B4)	4
<input type="checkbox"/>	PHYS 102: Introduction to Physics II (*PHYS 101)	4

OR

✓	Course	Units
<input type="checkbox"/>	PHYS 205: Physics for the Biological Sciences I (*MATH 132 or 160)	4
<input type="checkbox"/>	PHYS 206: Physics for the Biological Sciences II (*PHYS 205)	4

*prerequisite; +pre-/co-requisite; ^instructor consent required

^cScore above 50% on the Chemistry Placement Exam;

[~]Students may choose to take MATH 160 as an alternative to MATH 132.

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UPPER-DIVISION CORE REQUIREMENTS (20 UNITS)

✓ <input type="checkbox"/>	Course	Units
<input type="checkbox"/>	BIOL 351: Molecular Cell Biology (*CHEM 150, BIOL 211, 215)	5
<input type="checkbox"/>	BIOL 352: Genetics (*BIOL 211, 212, 215)	5
<input type="checkbox"/>	BIOL 353: Comparative Animal Physiology (*BIOL 211, 215)	5
<input type="checkbox"/>	BIOL 354: Principles of Ecology (*BIOL 211, 212, 215)	5

UPPER-DIVISION CONCENTRATION AND SCIENCE ELECTIVES (19 UNITS TOTAL)

Courses taken for **Area A** (Concentration Requirements) and **Area B** (Science Electives) MUST total a minimum of **19 units**.

Area A: Concentration Requirements (10-15 units)

Select a concentration for course requirements. Course options for each concentration are located on the *Biological Sciences Concentration Courses* on page 3 of this document.

- Ecology Concentration:**
Select 3 Ecology courses. One course must have a lecture + lab.
- General Concentration:**
Select 1 course each from Ecology, Molecular and Cellular Biology, and Physiology.
One course must have a lecture + lab.
- Molecular and Cellular Biology Concentration:**
Select 3 Molecular and Cellular Biology courses. One course must have a lecture + lab.
- Physiology Concentration:**
Select 3 Physiology courses. One course must have a lecture + lab.

✓ <input type="checkbox"/>	Course	Units
<input type="checkbox"/>		
<input type="checkbox"/>		
<input type="checkbox"/>	Course: Lecture + Lab	

Area B: Science Electives (4-9 units)

Select from any Biology courses numbered **355-599**. In addition, with consent of advisor, 1 course from the following list: CS 305, 311; CHEM 341, 351, 401, 402, 404; PHYS 440; PSYC 461; MATH 362, 374, 441, 448, 464. Other courses may be approved with faculty consent.

✓ <input type="checkbox"/>	Course	Units
<input type="checkbox"/>		
<input type="checkbox"/>		
<input type="checkbox"/>		
<input type="checkbox"/>		

Units from Area A (Concentration Requirements) + Area B (Science Electives) must total a minimum of 19 units:	/19 units
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*prerequisite; *pre-/co-requisite; ^instructor consent required

^Score above 50% on the Chemistry Placement Exam;

^Students may choose to take MATH 160 as an alternative to MATH 132.

BIOLOGICAL SCIENCES CONCENTRATION COURSES

*BIOL 210 and BIOL 211 are prerequisites for each of the courses below. Some courses may have additional prerequisites.

ECOLOGY COURSES:

- BIOL 379: Invertebrate Biology (4)
- BIOL 380: Comparative Animal Behavior (3) + BIOL 380L: Animal Behavior Laboratory and Field Methods (1) (*BIOL 215 for lab)
- BIOL 381A or 381B: Plant Diversity (3-5)
- BIOL 382: Biogeography (3)
- BIOL 383: Tropical Ecology (3) (*BIOL 212)
- BIOL 384: Natural History of Southern California (4)
- BIOL 386A or 386B: Terrestrial Ecology (3-5)
- BIOL 387: Ecological Processes in Aquatic Systems (3) + BIOL 387L: Aquatic Ecology Laboratory (1)
- BIOL 389: Freshwater Biology (3)
- BIOL 390A or 390B: Terrestrial Plant Ecology (3-5)
- BIOL 400A or 400B: Vertebrate Biology (3-5) (*BIOL 212 for 400B)
- BIOL 401: Comparative Vertebrate Anatomy (4) (*BIOL 212)
- BIOL 420: Ecological Monitoring (4) (*BIOL 215, 354)
- BIOL 422: Marine Communities (3) (*BIOL 354)
- BIOL 463: Principles of Conservation Biology (3) (*BIOL 354)
- BIOL 502[^]: Population Genetics (5) (*BIOL 352)
- BIOL 505[^]: Physiological Ecology (3) (*BIOL 353)
- BIOL 513: Ecology of Parasitism (3) (*BIOL 354)
- BIOL 533[^]: Geographic Information Systems Applications in Landscape Ecology (4) (*BIOL 354)
- BIOL 535[^]: Ecological Modeling (3) (*BIOL 354)
- BIOL 536[^]: Biogeochemical Cycles and Global Change (3) (*BIOL 354)
- BIOL 540: Molecular Methods in Ecology and Evolution (3) (*BIOL 352)

MOLECULAR AND CELLULAR BIOLOGY COURSES:

- BIOL 367: Biology of Microorganisms (5) (offered Fall semester only)
- BIOL 368: Developmental Biology (3) + BIOL 368L: Developmental Biology Laboratory (1)
- BIOL 370A or 370B: Plant Physiology (3-5)
- BIOL 452: Medical Genetics (3) (*BIOL 212, 352)
- BIOL 456: Molecular Medicine and Mechanisms of Disease (3) (*BIOL 351, 352, 353, 477, or 504 or BIOT 355 or 356)
- BIOL 477A or 477B: Immunology (3-5) (*BIOL 351 or BIOT 355)
- BIOL 480: Bioinformatics (5) (*BIOL 351, 352 or BIOT 355)
- BIOL 481: Cell and Tissue Biomechanics (4) (*PHYS 205)
- BIOL 502: Population Genetics (5) (*BIOL 352)
- BIOL 503A or 503B: Modern Molecular Biology and Genomics (3-5) (*BIOL 351 or BIOT 355)
- BIOL 504[^]: Virology (3) (*BIOL 351 or BIOT 355)
- BIOL 520[^]: Advanced Molecular Cell Biology (3) (*BIOL 351, 352)
- BIOL 537[^]: Microbial Physiology (4) (*BIOL 351 or 367)
- BIOL 540[^]: Molecular Methods in Ecology and Evolution (3) (*BIOL 352)
- BIOT 356: Cellular Biotechnology (4) (offered Spring semester only)

PHYSIOLOGY COURSES:

- BIOL 368: Developmental Biology (3) + BIOL 368L: Developmental Biology Laboratory (1) (*BIOL 215 for lab)
- BIOL 370A or 370B: Plant Physiology (3-5)
- BIOL 374: Exercise Physiology and Bioenergetics (3)
- BIOL 375: Endocrinology (3) (*CHEM 201)
- BIOL 380: Comparative Animal Behavior (3) + BIOL 380L: Animal Behavior Laboratory and Field Methods (1) (*BIOL 215 for lab)
- BIOL 401: Comparative Vertebrate Anatomy (4) (*BIOL 212)
- BIOL 404A or 404B: Developmental Physiology (3-5) (*BIOL 353)
- BIOL 411: Animal Reproductive Physiology (3) (*BIOL 212 and 353) + BIOL 411L: Animal Reproductive Physiology Laboratory (1)
- BIOL 423A or 423B: Fish Physiology (3-5) (*BIOL 353)
- BIOL 434: Human Cardiovascular Physiology (3) (*BIOL 353)
- BIOL 476: Neurobiology (3) (*BIOL 353)
- BIOL 481: Cell and Tissue Biomechanics (4) (*PHYS 205)
- BIOL 505[^]: Physiological Ecology (3) (*BIOL 353)
- BIOL 512[^]: Physiology of Aging (3) + BIOL 512L[^]: Physiology of Aging Laboratory (1) (*BIOL 353)
- BIOL 514[^]: Physiology of Parasitism (3) + BIOL 514L[^]: Physiology of Parasitism Lab (1) (*BIOL 353)
- BIOL 515[^]: Medical Physiology (3) (*BIOL 353)
- BIOL 537[^]: Microbial Physiology (3) (*BIOL 351 or 367)
- BIOL 576[^]: Laboratory Experience in Neurobiology (1) (*BIOL 476)

ONE OF THE FOLLOWING MAY BE USED TO FULFILL A CONCENTRATION COURSE:

- BIOL 365: Computing Skills for Biologists (3) (*BIOL 215)
- BIOL 531: Biological Data Analysis I-Linear (3) (*BIOL 215)
- BIOL 532: Biological Data Analysis II-Multivariate (3) (*BIOL 215)