

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](http://www.csusm.edu/academicadvising) 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.
- With the exception of BIOL 101, 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 395 (up to 3 units), BIOL 488 (4 units only), BIOL 489 (4 units only), BIOL 495 (up to 4 units), BIOL 496A or B (2 units only), BIOL 498 (2 units only), and BIOL 499 (2 units only) may be applied toward the major.

PREPARATION FOR THE MAJOR (42 UNITS)

Lower-division Biology Courses (18 units):

✓	Course	Units
<input type="checkbox"/>	BIOL 101: Welcome to Biological Sciences	1
<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 and Population Biology	4
<input type="checkbox"/>	BIOL 211A: Organismal and Population Biology Tutorial (*BIOL 211)	1
<input type="checkbox"/>	BIOL 212: Evolution (*BIOL 210 or 211)	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 (*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, 150 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 150~: Calculus for the Life Sciences (*MATH 105, 115, 125 or pass Calculus Readiness Diagnostic)	3

Complete one pair 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, 150 or 160)	4
<input type="checkbox"/>	PHYS 206: Physics for the Biological Sciences II (*PHYS 201 or 205 and MATH 132, 150 or 160)	4

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

~Students may choose to take MATH 160 as an alternative to MATH 150;

^only one seminar course may count in Area A: Concentration Requirements.

BIOLOGICAL SCIENCES

UPPER-DIVISION CORE REQUIREMENTS (20 UNITS)

✓	Course	Units
<input type="checkbox"/>	BIOL 351: Molecular Cell Biology (*CHEM 150, BIOL 210, 211, 215)	5
<input type="checkbox"/>	BIOL 352: Genetics (*BIOL 210, 211, 212, 215)	5
<input type="checkbox"/>	BIOL 353: Comparative Animal Physiology (*BIOL 210, 211, 215)	5
<input type="checkbox"/>	BIOL 354: Principles of Ecology (*BIOL 210, 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

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. Select 3 lectures and 1 lab. Only one seminar course (BIOL 560-567) may be used in the Area A: Concentration Requirements.

- 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.

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

Area B: Science Electives

Select from any Biology courses numbered **355-599**. In addition, may include one course from the following list which will count for both the BB and a Science Elective: CHEM 308*, 341*, 351*, 404*; CS 320*; MATH 448*; PHYS 440*.

✓	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

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

~Students may choose to take MATH 160 as an alternative to MATH 150;

^only one seminar course may count in Area A: Concentration Requirements.

BIOLOGICAL SCIENCES

BIOLOGICAL SCIENCE 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 Lab/Field Methods (1) (*BIOL 215 for lab)
BIOL 381A: Plant Diversity Lecture (3) **or** **381B:** Plant Diversity Lecture and Lab (5)
BIOL 384: Natural History of Southern California (4)
BIOL 386A: Terrestrial Ecology Lecture (3) **or** **386B:** Terrestrial Ecology Lecture and Lab (5)
BIOL 387: Ecological Processes in Aquatic Systems (3) + **BIOL 387L:** Aquatic Ecology Laboratory (1)
BIOL 389: Freshwater Biology (3)
BIOL 390A: Terrestrial Plant Ecology Lecture (3) **or** **390B:** Terrestrial Plant Ecology Lecture and Lab (5)
BIOL 400A: Vertebrate Biology Lecture (3) **or** **400B:** Vertebrate Biology Lecture and Lab (5)
BIOL 401: Comparative Vertebrate Anatomy (5) (*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 506A: Avian Biology Lecture (3) **or** **506B:** Avian Biology Lecture and Lab (5) (*BIOL 353 or 354)
BIOL 522: Biological Oceanography (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 542: Communicating Ocean Science to General Audiences (3) (*BIOL 354)
BIOL 565^s: Seminar in Ecology (3) (*BIOL 354)
BIOL 567^s: Current Topics in Biological Research (3) (*at least 2 of: BIOL 351-354)

MOLECULAR AND CELLULAR BIOLOGY COURSES:

- BIOL 367:** Biology of Microorganisms (5)
BIOL 368: Developmental Biology (3) + **BIOL 368L:** Developmental Biology Laboratory (1)
BIOL 370A: Plant Physiology Lecture (3) **or** **370B:** Plant Physiology Lecture and Lab (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: Immunology Lecture (3) **or** **477B:** Immunology Lecture and Lab (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: Molec Biol/Genomics Lecture (3) **or** **503B:** Molec Biol/Genomics Lecture/Lab (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 560^s: Seminar in Molecular Cellular Biology (3) (*BIOL 351 or BIOT 355)
BIOL 567^s: Current Topics in Biological Research (3) (*at least 2 of: BIOL 351-354)
BIOT 356: Cellular Biotechnology (5) (offered Spring semester only)
BIOT 420: Plant Biotechnology (3) (*BIOL 351 or BIOT 355)

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

~Students may choose to take MATH 160 as an alternative to MATH 150;

^sonly one seminar course may count in Area A: Concentration Requirements.

BIOLOGICAL SCIENCES

BIOT 450: Medical Biotechnology (3) (*BIOL 351 or BIOT 355)

PHYSIOLOGY COURSES:

BIOL 368: Developmental Biology (3) + **BIOL 368L:** Developmental Biology Laboratory (1) (*BIOL 215 for lab)
BIOL 370A: Plant Physiology Lecture (3) **or** **370B:** Plant Physiology Lecture and Lab (5)
BIOL 374: Exercise Physiology and Bioenergetics (3)
BIOL 375: Endocrinology (3) (*CHEM 201)
BIOL 380: Comparative Animal Behavior (3) + **BIOL 380L:** Animal Behavior Lab & Field Methods (1) (*BIOL 215 for lab)
BIOL 401: Comparative Vertebrate Anatomy (5) (*BIOL 212)
BIOL 404A: Developmental Physiology Lecture (3) **or** **404B:** Developmental Physiology Lecture/Lab (5) (*BIOL 353)
BIOL 411: Animal Reproductive Physiology (3) (*BIOL 212 and 353) + **BIOL 411L:** Animal Reproductive Physiology Lab (1)
BIOL 423A: Fish Physiology Lecture (3) **or** **423B:** Fish Physiology Lecture and Lab (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 563[§]: Seminar in Physiology (3) (*BIOL 353)
BIOL 567[§]: Current Topics in Biological Research (3) (*at least 2 of: BIOL 351-354)
BIOL 576[^]: Laboratory Experience in Neurobiology (2) (+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)

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

~Students may choose to take MATH 160 as an alternative to MATH 150;

§only one seminar course may count in Area A: Concentration Requirements.