CATALOG TERM: 2024-2027 **TOTAL UNITS REQUIRED = 120**

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.
- Your Degree Planner will display the following requirements in the University's recommended sequence.
- With the exception of BIOL 101 and 355, 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 395A (up to 3 units), BIOL 488 (4 units only), BIOL 489 (6 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
	BIOL 101: Welcome to Biological Sciences	1
	BIOL 210: Introduction to Cellular and Molecular Biology (⁺CHEM 150)	4
	BIOL 210A: Cellular and Molecular Biology Tutorial (⁺BIOL 210, ⁺CHEM 150)	1
	BIOL 211: Introduction to Organismal & Population Biology	4
	BIOL 211A: Organismal and Population Biology Tutorial (⁺BIOL 211)	1
	BIOL 212: Evolution (*BIOL 210 or 211)	3
	BIOL 215: Experimental Design & Statistical Analysis	4

Non-Biology Supporting Courses (24 units):

✓	Course	Units
	CHEM 150: General Chemistry (*MATH 101, 103, 105 or MATH Category 1 or 2)	4
	CHEM 150L: General Chemistry Lab (⁺CHEM 150)	1
	CHEM 160: General Chemistry II (*CHEM 150/150L; MATH 125, 126, 150, or 160)	3
	CHEM 201: Organic Chemistry I (*CHEM 160 or 162)	3
	CHEM 201L: Organic Chemistry I Laboratory (⁺CHEM 201)	2
	MATH 150˜: Calculus for the Life Sciences (*MATH 105, 115, 125 or pass CRD)	3

Complete <u>one</u> pair of Physics courses:

✓	Course	Units
	PHYS 101: Introduction to Physics I (*GE Area 2)	4
	PHYS 102: Introduction to Physics II (*PHYS 101)	4

OR

✓	Course	Units
	PHYS 205: Physics for the Biological Sciences I (⁺MATH 132, 150 or 160)	4
	PHYS 206: Physics for the Biological Sciences II (*PHYS 201 or 205 and MATH 132, 150 or 160)	4

UPPER-DIVISION CORE REQUIREMENTS (20 UNITS)

**prerequisite; ⁺pre-/co-requisite; ^instructor consent required; ˜Students may choose to take MATH 160 as an alternative to MATH 150.*

BIOLOGICAL SCIENCES

✓	Course	Units
	BIOL 351: Molecular Cell Biology (*CHEM 150, BIOL 210, 211, 215)	5
	BIOL 352: Genetics (*BIOL 210, 211, 212, 215)	5
	BIOL 353: Comparative Animal Physiology (*BIOL 210, 211, 215)	5
	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.

☐ **Ecology Concentration:**
Select 3 lecture courses and 1 lab course within Ecology.

☐ **General Concentration:**
Select 1 course each from Ecology, Molecular and Cellular Biology, and Physiology. Select 1 lab course from any area.

☐ **Molecular and Cellular Biology Concentration:**
Select 3 lecture courses and 1 lab course within Molecular and Cellular Biology.

☐ **Physiology Concentration:**
Select 3 lecture courses and 1 lab course within Physiology.

✓	Course	Units
	Lecture Course:	
	Lecture Course:	
	Lecture Course:	
	Lab Course:	

Area B: Science Electives

Select from any Biology courses numbered **355-599.** In addition, one course from the following list may be used for both the GE UD25 and a Science Elective: CHEM 308*, 341*, 351*, 404*; CS 320*; MATH 448*; PHYS 440*.

✓	Course	Units

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.*

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 or 381B: Plant Diversity (3 or 5)
BIOL 384: Natural History of Southern California (4)
BIOL 386A or 386B: Terrestrial Ecology (3 or 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 or 5)
BIOL 400A or 400B: Vertebrate Biology (3 or 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 or 506B: Avian Biology (3 or 5) (*BIOL 353 or 354)
BIOL 516: Research Methods in Molecular Ecology **+ BIOL 516L:** Molecular Methods in Ecology Lab (*BIOL 351 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: Seminar in Ecology (3) (*BIOL 354) **or**
BIOL 567: Current Topics in Biological Research (3) (*at least 2 of: BIOL 351-354; may only count once as Concentration Elective)

MOLECULAR AND CELLULAR BIOLOGY COURSES:

BIOL 367: Biology of Microorganisms (5)
BIOL 368: Developmental Biology (3) **+ BIOL 368L:** Developmental Biology Laboratory (1)
BIOL 370A or 370B: Plant Physiology (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 or 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 or 5) (*BIOL 351 or BIOT 355)
BIOL 504^: Virology (3) (*BIOL 351 or BIOT 355)
BIOL 516: Research Methods in Molecular Ecology **+ BIOL 516L:** Molecular Methods in Ecology Lab (*BIOL 351 or 354)
BIOL 520^: Advanced Molecular Cell Biology (3) (*BIOL 351, 352)
BIOL 537^: Microbial Physiology (4) (*BIOL 351 or 367)
BIOL 560: Seminar in Molecular Cellular Biology (3) (*BIOL 351 or BIOT 355) **or**
BIOL 567: Current Topics in Biological Research (3) (*at least 2 of: BIOL 351-354; may only count once as Concentration Elective)
BIOT 356: Cellular Biotechnology (5) (*BIOL 355; offered Spring semester only)

**prerequisite; +pre-/co-requisite; ^instructor consent required; ~Students may choose to take MATH 160 as an alternative to MATH 150.*

BIOLOGICAL SCIENCES

BIOT 420: Plant Biotechnology (3) (*BIOL 351 or BIOT 355)
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 or 370B: Plant Physiology (3 or 5)
BIOL 374: Exercise Physiology and Bioenergetics (3)
BIOL 375: Endocrinology (3) (*CHEM 201)
BIOL 376: Medical Parasitology (3) (*BIOL 212)
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 or 404B: Developmental Physiology (3 or 5) (*BIOL 353)
BIOL 411: Animal Reproductive Physiology (3) (*BIOL 212 and 353) **+ BIOL 411L:** Animal Reproductive Physiology Lab (1)
BIOL 423A or 423B: Fish Physiology (3 or 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) **or**
BIOL 567: Current Topics in Biological Research (3) (*at least 2 of: BIOL 351-354; may only count once as Concentration Elective)
BIOL 576^: Laboratory Experience in Neurobiology (2) (+BIOL 476)
BIOL 579: Insect Physiology (3) (*BIOL 353)

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 with a grade of B or higher or instructor permission)
BIOL 532: Biological Data Analysis II-Multivariate (3) (*BIOL 215 with a grade of B or higher or instructor permission)

**prerequisite; +pre-/co-requisite; ^instructor consent required; ~Students may choose to take MATH 160 as an alternative to MATH 150.*