Next Generation Science Standards:
Biology
10th Grade

SCI 401, 402 Biology

1 credit
5 days a week; 2 semesters
Taught in English

Biology - The Study of Life! This is a ***required course for all 10th grade students*** in both the Mexican and/or U.S. diploma program The first semester is devoted to learning how life is the same. Living things use similar biochemical, cellular structure and genetic processes. The second semester is devoted to how living things differ. Living things evolve, change and produce huge diversity on our planet.

Textbook: Biology, Miller and Levine, Pearson (2010)
Prerequisite: None

Strand 1 = Structure and Function
Strand 2 = Inheritance and Variation of Traits
Strand 3 = Matter and Energy in Organisms and Ecosystems
Strand 4 = Interdependent Relationships in Ecosystems
Strand 5 = Natural Selection and Adaptation
Strand 6 = History of Earth
Strand 7 = Earth's Systems
Strand 8 = Human Sustainability
Strand 9 = Engineering Design

Strand 1: Structure and Function

Standard 1: Structure and Function	
Benchmark Code	Benchmark
HS-LS1-1	The student will construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells.
HS-LS1-2	The student will develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.
HS-LS1-3	The student will plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.

Strand 2: Inheritance and Variation of Traits

Standard 1: Growth and Development of Organisms	
Benchmark Code	Benchmark
HS-LS1-4	The student will use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.

Standard 2: Inheritance of Traits	
Benchmark Code	Benchmark
HS-LS3-1	The student will ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents of offspring.
Standard 2: Variation of Traits	
Benchmark Code	Benchmark
HS-LS3-2	The student will make and defend a claim based on evidence that inheritable genetic variations may result from: (new genetic combinations through meiosis, (2) viable errors occurring dung replication, and / or (3) mutations caused by environmental factors.
HS-LS3-3	The student will apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.
Strand 3: Matter and Energy in Organisms and Ecosystems	
Standard 1: Organization for Matter and Energy Flow in Organisms	
Benchmark Code	Benchmark
HS-LS1-5	The student will use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.
HS-LS1-6	The student will construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and /or other large carbon-based molecules.
HS-LS1-7	The student will use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food-molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy.
Standard 2: Cycles of Matter and Energy Transfer to Ecosystems	
Benchmark Code	Benchmark
HS-LS2-3	The student will construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions.
HS-LS2-4	The student will construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions.
HS-LS2-5	The student will construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions.

Strand 4: Interdependent Relationships in Ecosystems	
Standard 1: Interdependent Relationships in Ecosystems	
Benchmark Code	Benchmark
HS-LS2-1	The student will use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.
HS-LS2-2	The student will use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems off different scales.
Standard 2: Ecosystem Dynamics, Functioning, and Resilience	
Benchmark Code	Benchmark
HS-LS2-6	The student will evaluate the claims evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.
HS-LS2-7	The student will design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.
Standard 3: Social Interactions and Group Behavior	
Benchmark Code	Benchmark
HS-LS2-8	The student will evaluate the evidence for the role of group behavior on individual and species 'chances to survive and reproduce.
Standard 4: Adaptation	
Benchmark Code	Benchmark
HS-LS4-6	The student will create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity.
Strand 5: Natural Selection and Adaptation	
Standard 1: Evidence of Common Ancestry and Diversity	
Benchmark Code	Benchmark
HS-LS4-1	The student will communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence.
Standard 2: Natural Selection/Adaptation	
Benchmark Code	Benchmark
HS-LS4-2	The student will construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment.

HS-LS4-3	The student will apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait.
HS-LS4-4	The student will construct an explanation based on evidence for how natural selection leads to adaptation of populations.
HS-LS4-5	The student will evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species.
Strand 6: History of Earth	
Standard 1: The History of Planet Earth	
Benchmark Code	Benchmark
HS-ESS1-5	The student will evaluate evidence of the past and current movements of continental and oceanic crust and the theory of plate tectonics to explain the ages of crustal rocks.
HS-ESS1-6	The student will apply scientific reasoning and evidence from ancient Earth materials, meteorites, and other planetary surfaces to construct an account of Earth's formation and early history.
HS-LS3-3	The student will apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.
Strand 7: Earth's Systems	
Standard 1: Weather and Climate	
Benchmark Code	Benchmark
HS-ESS2-7	The student will construct an argument based on evidence about the simultaneous coevolution of Earth systems and life on Earth.
Strand 8: Human Sustainability	
Standard 1: Natural Resources/Natural Hazards	
Benchmark Code	Benchmark
HS-ESS3-1	The student will construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.
Standard 2: Human Impacts on Earth Systems	
Benchmark Code	Benchmark
HS-ESS3-3	The student will create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity.

HS-ESS3-4	The student will evaluate or refine a technological solution that reduces impacts of human activities on natural systems.

Strand 9: Engineering Design	
Benchmark Code	Benchmark
HS-ETS1-1	The student will analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.
HS-ETS1-2	The student will design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.
HS-ETS1-3	The student will evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.
HS-ETS1-4	The student will use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.