Biology, Part 2
Course Outline & Objectives

Course Description
In Biology, students will be introduced to the living world by studying structure, function, and processes at both the macro-level and the micro-level. Students will begin their study at the micro-level, learning about biological chemistry, cell biology, and genetics. By the end of the course students will focus their learning on explaining the diversity of life as a result of evolution and how those living organisms interact within ecosystems. Laboratory investigations incorporate procedures and develop students' ability to synthesize and analyze information. Students will continue to develop their skills in reading and writing through lab reports and research projects. Technology is utilized throughout the course through virtual labs, videos, activities, and readings about each area of study.

Credits - One Semester (0.5 Carnegie unit / CA: 5 credits)

Course Outline

Unit 1: Change Through Time

1.1 The Record of Life
1.2 Origins: The Early Ideas
1.3 Natural Selection and the Scientific Evidence for Evolution
1.4 Mechanisms and Speculation
1.5 Classification: Exploring Life's Family Tree
1.6 Prelab: Evolution and Adaptations

Lab Activity

DNA Doesn't Lie: Charting Evolution with Cladograms
Feeding for Fitness: Exploring Beak Adaptations

Next Generation Science Standards

In Unit 1, students will explore the evidence scientists use to understand the history of life on Earth, including fossils and other records of change over time. They will examine early ideas about life's origins and how new discoveries have shaped scientific thinking. Students will learn how natural selection drives evolution, review the evidence that supports this theory, and investigate the processes that lead to speciation. They will also study how scientists classify living things and use cladograms to illustrate evolutionary relationships. Through hands-on labs, students will analyze evolutionary traits and explore how physical adaptations—such as variations in bird beaks—support survival.
[HS-LS4-1, HS-LS4-2, HS-LS4-3, HS-LS4-4, HS-LS4-5, HS-LS4-6]

Unit 2: Viruses, Bacteria, Protists, and Fungi

2.1 Viral Mysteries: Origins, Outbreaks, and Defenses
2.2 Bacteria: Ancient Origins, Modern Impact
2.3 The World of Protists
2.4 What is a Fungus?
2.5 Slime Molds, Water Molds, and Downy Mildews
2.6 Prelab: Fungi and Protists

Lab Activity

Fungi: Structure and Spore Dispersal
Investigating Protists

In Unit 2, students will investigate viruses to understand what they are, how they spread, and the ways both the body and science defend against them. They will explore the structure and function of bacteria, their importance in ecosystems, and their effects on human health. Students will learn about the diversity of protists and how they combine traits of animals, plants, and fungi, as well as study the characteristics of fungi, including how they grow, feed, and reproduce through spores. They will also examine lesser-known groups such as slime molds, water molds, and downy mildews that challenge traditional classification. Through hands-on labs, students will observe fungal structures and analyze the movement and behavior of protists.
[HS-LS1-1, HS-LS1-2, HS-LS1-3, HS-LS2-6, HS-LS2-7]

Course Outline

Unit 3: Plants

3.1 Plant Kingdom 101: Exploring Nature's Variety
3.2 The Originals: Nonvascular Plants and the First Steps on Land
3.3 The Conquest of Land: Evolution of Vascular Plants
3.4 From Cells to Growth: Understanding Plant Structure and Behavior
3.5 Plant Anatomy and Survival Strategies
3.6 The Evolution of Plant Reproduction: From Spores to Flowers
3.7 Prelab: Parts and Pigments in Plants

Lab Activity

Anatomy of a Flowering Plant: Dissection and Analysis
Biology in Color: Investigating Pigments and Their Roles in Plants

Next Generation Science Standards

In Unit 3, students will explore the diversity of the plant kingdom and learn how plants are classified. They will study how nonvascular plants first made the transition from water to land and how vascular tissues like xylem and phloem allowed plants to grow tall and thrive in dry environments. Students will examine how plant cells and tissues contribute to growth, transport, and survival, and discover how roots, stems, leaves, and flowers support photosynthesis, reproduction, and adaptation. They will trace the evolution of plant reproduction from simple spores to complex flowers and seeds. Through hands-on labs, students will dissect a flowering plant and investigate pigments that play a key role in photosynthesis.

[HS-LS1-5, HS-LS1-6, HS-LS1-7, HS-LS2-5, HS-LS4-1]

Unit 4: Invertebrates

4.1 What Makes You an Animal?
4.2 The Simple Life: Sponges and Cnidarians
4.3 Wiggling Wonders: Flatworms, Roundworms, and Segmented Worms
4.4 Soft Bodies and Mighty Shells: The Mollusks
4.5 Armor and Antennae: The Arthropod Army
4.6 Star Power: Echinoderms and Invertebrate Chordates
4.7 Prelab: Invertebrates

Lab Activity

Overview of Invertebrates Lab
Invertebrate Survey Lab

In Unit 4, students will learn what makes an animal an animal and examine the key differences between invertebrates and vertebrates. They will explore the simplest animals, such as sponges and cnidarians, to see how they survive without complex organs, and discover the diversity of worms—from flatworms to segmented worms—and how their body structures support movement and feeding. Students will study mollusks, including snails, clams, and octopuses, and their unique features, and investigate arthropods like insects, spiders, and crustaceans to understand why they are the most successful animal group on Earth. They will also examine echinoderms, such as sea stars, and invertebrate chordates as evolutionary links to more complex animals. Through hands-on labs, students will observe and classify invertebrate groups and compare their body structures and adaptations.

[HS-LS4-1, HS-LS4-2, HS-LS4-4, HS-LS4-5, HS-LS2-8]

Course Outline

Unit 5: Vertebrates

5.1 Fintastic Evolution: From Slime to Spine
5.2 From Gills to Lungs: Amphibians Take the Leap
5.3 Reptiles: Masters of Dry Land
5.4 Birds: Taking to the Skies
5.5 Mammals: Warm-Blooded Wonders
5.6 Primates and Humans: Our Unique Connection
5.7 The Mind of the Animal: Behavior and Adaptations
5.8 Prelab: Animal Behaviors and Adaptations

Lab Activity

Animal Behavior Lab: Observing and Classifying Behavior
Investigating Fish Body Forms and Environmental Adaptations

Next Generation Science Standards

In Unit 5, students will explore how vertebrates evolved from aquatic ancestors and developed adaptations for life on land. They will learn how amphibians bridge water and land through unique life cycles and examine how reptiles survive in dry environments with scaly skin, eggs, and lungs. Students will discover the adaptations that allow birds to fly and regulate their body temperature, and study mammals to understand what makes them unique—such as hair, live birth, and complex brains. They will also investigate primates and consider what sets humans apart from other vertebrates. Finally, students will observe how animals behave and adapt to their environments to survive and reproduce. Through hands-on labs, students will explore animal behavior and examine how fish body forms align with their habitats.

[HS-LS1-2, HS-LS1-3, HS-LS4-1, HS-LS4-2, HS-LS4-3, HS-LS4-4, HS-LS4-5, HS-LS2-8]

Unit 6: Principles of Ecology

6.1 Ecology: The Web of Life
6.2 Ecosystems in Action: Energy and Matter
6.3 Recycling of Matter
6.4 Nature's Neighborhoods: Communities and Biomes
6.5 Counting Creatures: Population Patterns
6.6 Saving the Planet: Biodiversity and Conservation
6.7 Prelab: Populations and Ecological Processes

Lab Activity

Population Modeling in Action: A Case Study
Trophic Cascades

In Unit 6, students will explore the relationships between organisms and their environments within ecosystems. They will learn how energy flows through food chains, food webs, and trophic levels, and understand how matter cycles through ecosystems through processes like the water, carbon, and nitrogen cycles. Students will compare different biomes to see how communities of organisms interact and adapt to their surroundings, and study how populations grow, shrink, and change in response to resources and environmental conditions. They will also discover the importance of biodiversity, examine how humans impact ecosystems, and consider strategies for conservation. Through hands-on labs, students will model population changes and investigate how predator-prey relationships shape ecosystems.

[HS-LS2-1, HS-LS2-2, HS-LS2-3, HS-LS2-4, HS-LS2-5, HS-LS2-6, HS-LS2-7, HS-LS2-8, HS-LS4-6]