# Biology, Part 1
# 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: The Study of Life
1.1 What is Biology?
1.2 Science is for Everyone
1.3 Scientific Inquiry
1.4 The Experiment!
1.5 Characteristics of Life
1.6 Prelab: Exploring the Study of Life

#### Lab Activity
Photosynthesis Virtual Lab (Plant Growth)
Experimental Design with Radish Seeds

### Unit 2: Chemistry of Life
2.1 Chemistry Meets Biology
2.2 Why Water Makes Life Flow
2.3 Molecules that Matter: The Foundation of Life
2.4 Enzymes: Speeding Up Life's Chemistry
2.5 Prelab: Exploring the Chemistry of Life

#### Lab Activity
Properties of Water
Enzyme Experiments: Catalase in Action

### Unit 3: The Basic Unit of Life
3.1 From Microscopes to Modern Biology
3.2 Eukaryotic Cell Structure
3.3 Cellular Transport: Keeping the Balance of LIfe
3.4 Cell Growth and Reproduction
3.5 Photosynthesis: Turning Light into Life
3.6 Cellular Respiration: How Your Cells Power Your Life
3.7 Prelab: Exploring Cellular Processes

#### Lab Activity
Photosynthesis Lab: Spinach Leaf Disk Assay
Osmosis in Action: Egg-sploring Cellular Water Balance

## Next Generation Science Standards

In Unit 1, students will explore the study of life and its connections to health, technology, and the environment. They will learn what biology is and why it matters, and practice scientific inquiry by asking questions, forming hypotheses, designing experiments, and analyzing results. Students will identify independent, dependent, and controlled variables, investigate the characteristics of life, and use data and graphs to show how science applies to real-world problems.
**[ HS-LS1-3 ]**

In Unit 2, students will explore how chemistry supports all living systems. They will study the role of atoms, especially carbon, in building biological molecules, and examine the unique properties of water. Students will learn about the four major macromolecules and how they support cell function, and investigate how enzymes speed up chemical reactions. In labs, they will test water's properties and observe enzyme activity.
**[ HS-LS1-6, HS-LS1-7 ]**

In Unit 3, students will investigate cells as the basic unit of life. They will use microscopes to study cell structures and examine how organelles like the nucleus, mitochondria, and chloroplasts support life functions. Students will analyze how cells maintain balance through transport, grow and divide by mitosis, and process energy through photosynthesis and cellular respiration. In labs, they will observe osmosis and measure photosynthesis.
**[ HS-LS1-2, HS-LS1-4, HS-LS1-5, HS-LS1-7, HS-LS2-3, HS-LS2-5 ]**

## Course Outline

### Unit 4: DNA and Genes

4.1 DNA: The Molecule of Heredity
4.2 DNA Replication: Copying Life's Instructions
4.3 Protein Synthesis: DNA to RNA to Protein!
4.4 Genetic Changes
4.5 Biotechnology: Science that Shapes Our Future
4.6 Prelab: Exploring the Blueprint of Life

#### Lab Activity

Replication Revolution: A Hands-On Activity
Genes in a Jar: DNA Extraction

## Next Generation Science Standards

In Unit 4, students will explore DNA as the blueprint of life. They will study how DNA stores and copies genetic information, and how protein synthesis determines traits. Students will examine how mutations affect health, evolution, and diversity, and consider biotechnology's role in medicine, agriculture, and forensics. In labs, they will model DNA replication and extract DNA from real cells.
**[ HS-LS1-1, HS-LS3-1, HS-LS3-2 ]**

### Unit 5: Heredity

5.1 Mendelian Genetics: The Foundations of Heredity
5.2 Meiosis: The Key to Genetic Diversity and Reproduction
5.3 Predicting Traits: The Math and Patterns of Heredity
5.4 When Heredity Follows Different Rules
5.5 Inherited Human Traits
5.6 Prelab: Exploring the Odds of Inheritance

#### Lab Activity

Coin Flip Genetics: Create Your Character
Punnett Prediction Toss

In Unit 5, students will study heredity and how traits pass from one generation to the next. They will learn Mendel's role in genetics, explore how meiosis creates gametes and diversity, and use Punnett squares to predict traits. Students will also examine exceptions like incomplete dominance and human inheritance patterns. In labs, they will simulate genetic crosses and test predictions.
**[ HS-LS1-4, HS-LS3-1, HS-LS3-2, HS-LS3-3 ]**

### Unit 6: The Human Body

6.1 The Human Body and Homeostasis
6.2 Protection, Support, and Locomotion
6.3 The Digestive and Excretory System
6.4 The Nervous System
6.5 Respiration and Circulation
6.6 Endocrine, Reproduction and Development
6.7 Immunity from Disease
6.8 Prelab: Exploring Human Responses

#### Lab Activity

The Beat Goes On: Heart Rate Lab
Think Fast… or Not: Reflex Test

In Unit 6, students will study how the human body functions as an interconnected system. They will learn how homeostasis maintains balance, and explore how body systems support movement, process nutrients, sense the environment, and deliver energy. Students will also examine growth, reproduction, and immunity. In labs, they will measure heart rate and test reflexes to see body responses in action.
**[ HS-LS1-2, HS-LS1-3 ]**