

**Description of Course:**

A study of the natural world centers on cellular structure and the processes of life. First semester topics include: lab safety, history of biology, cell structure and function, biogeochemical properties, ecology, taxonomy and evolution. Second semester topics include genetics, structure and function of organisms, and botany.

**Prerequisites:**

Students must have achieved at least an (A-) or equivalent in a prior science course prior to taking this course.

**Goals:**

Students will gain the:

1. Ability to identify the basic principles of inheritance and the role it plays in the natural selection and the orderly development of life.
2. Ability to classify matter and analyze basic chemical and physical reactions of energy.
3. Ability to recognize the basic cycles of an ecosystem and their effects on physical and chemical activity.
4. Ability to evaluate limitations in amount and use of energy and other natural resources and importance of conservation and recycling.
5. Ability to analyze using scientific knowledge, the role of the individual, local governments, and nations in preservation and conservation.
6. Ability to analyze the current practices of individuals and industries that may have long-term and global effects on Earth systems.
7. Ability to perform basic scientific experiments using proper techniques, instruments, and report skills and write a lab report using the scientific method.

**Course Outline:****UNIT ONE: From Molecules to Organisms: Structures and Processes.**

- I. Orientation and introduction
  - A. Familiarization with 1) Attendance, conduct, text features, and evaluation scheme.
  - B. Nature and magnitude of topics in Biology
  - C. Laboratory Skills Assessment
- II. Chapter 1: The Science of Biology
  - A. 1.1 What is Science
  - B. 1.2 How Scientists Work
  - C. 1.3 Studying Life
  - D. 1.4 Tools and Procedures
  - E. Lab 1: Using a Compound Microscope
  - F. Chapter 1 Test
- III. Summary of Scientific Concepts
  - A. Scientific Fundamentals and Methods
  - B. Anatomical & Physiological Terminology
  - C. Selected Latin/Greek prefixes/suffixes
- IV. Chapter 2: The Chemistry of Life
  - A. 2.1 The Nature of Matter
  - B. 2.2 Properties of Water
  - C. 2.3 Carbon Compounds
  - D. 2.4 Chemical Reactions and Enzymes
  - E. Lab 2: Investigating the Effect of Temperature on Enzyme Activity
  - F. Chapter 2 Test
- V. Chapter 7: Cell Structure and Function

- A. 7.1 Life is Cellular
- B. 7.2 Eukaryotic Cell Structure
- C. 7.3 Cell Boundaries
- D. 7.4 The Diversity of Cellular Life
- E. Lab 7: Investigating Cell Structures and Processes
- F. Chapter 7 Test

## **UNIT TWO: Biological Evolution: Unity and Diversity**

### I. Chapter 18: Classification

- A. 18.1 Finding Order in Diversity
- B. 18.2 Modern Evolutionary Classification
- C. 18.3 Kingdoms and Domains
- D. Lab 18: Classifying Organisms Using Dichotomous Keys

### II. Plant Diversity

- A. 22.1 Introduction to Plants
- B. 22.2 Bryophytes
- C. 22.3 Seedless Vascular Plants
- D. 22.4 Seed Plants
- E. 22.5 Angiosperms – Flowering Plants
- F. Lab 22: Comparing Adaptations of Mosses and Ferns
- G. Chapter 22 Test

### III. Roots, Stems, and Leaves

- A. 23.1 Specialized Tissues in Plants
- B. 23.2 Roots
- C. 23.3 Stems
- D. 23.4 Leaves
- E. 23.5 Transport in Plants
- F. Lab 23: Identifying the Growth Zones in a Plant
- G. Chapter 23 Test

### IV. Reproduction of Seed Plants

- A. 24.1 Reproduction with Cones and Flowers
- B. 24.2 Seed Development and Germination
- C. 24.3 Plant Propagation and Agriculture
- D. Lab 24: Investigating Pollen Tube Growth
- E. Chapter 24 Test

### V. Plant Responses and Adaptations

- A. 25.1 Hormones and Plant Growth
- B. 25.2 Plant Responses
- C. 25.3 Plant Adaptations
- D. Lab 25: Using Hormones to Control Plant Development
- E. Chapter 25 Test

### VI. Chapter 19: Bacteria and Viruses

- A. 19.1 Bacteria
- B. 19.2 Viruses
- C. 19.3 Diseases Caused by Bacteria and Viruses
- D. Lab 19: Identifying Limits to the Growth of Bacteria
- E. Chapter 19 Test

### VII. Chapter 20: Protists

- A. 20.1 The Kingdom Protista
- B. 20.2 Animal-like Protists: Protozoans
- C. 20.3 Plant-like Protists: Unicellular Algae
- D. 20.4 Plantlike Protists: Red, Brown, and Green Algae
- E. 20.5 Fungus-like Protists
- F. Lab 20: Investigating Contractile Vacuoles
- G. Chapter 20 Test

#### VIII. Chapter 21: Fungi

- A. 21.1 The Kingdom Fungi
- B. 21.2 Classification of Fungi
- C. 21.3 Ecology of Fungi
- D. Lab 21: Examining Seeds for Fungi
- E. Chapter 21 Test

#### IX. Sponges and Cnidarians

- A. 26.1 Introduction to the Animal Kingdom
- B. 26.2 Sponges
- C. 26.3 Cnidarians
- D. Lab 26: Investigating the Responses of Hydras to External Stimuli
- E. Chapter 26 Test

#### X. Worms and Mollusks

- A. 27.1 Flatworms
- B. 27.2 Roundworms
- C. 27.3 Annelids
- D. 27.4 Mollusks
- E. Lab 27: Investigating Land Snails
- F. Chapter 27 Test

#### XI. Arthropods and Echinoderms

- A. 28.1 Introduction to the Arthropods
- B. 28.2 Groups of Arthropods
- C. 28.3 Insects
- D. 28.4 Echinoderms
- E. Lab 28: Observing Ant Behavior
- F. Chapter 28 Test

#### XII. Comparing Invertebrates

- A. 29.1 Invertebrate Evolution
- B. 29.2 Form and Function in Invertebrates
- C. Lab 29: Investigating Invertebrate Responses to External Stimuli
- D. Chapter 29 Test

#### XIII. Non-vertebrate Chordates, Fishes, and Amphibians

- A. 30.1 The Chordates
- B. 30.2 Fishes
- C. 30.3 Amphibians
- D. Lab 30: Investigating Homeostasis in Fishes and Amphibians
- E. 34.3 Lab: Observing Behavior in Fish
- F. Chapter 30 Test

#### XIV. Reptiles

- A. 31.1 Reptiles
- B. 31.2 Birds
- C. Lab 31: Examining Bird Bones
- D. Chapter 31 Test

## XV. Mammals

- A. 32.1 Introduction to the Mammals
- B. 32.2 Diversity of Mammals
- C. 32.3 Primates and Human Origins
- D. Lab 32: Using Fibers as Forensic Evidence
- E. Chapter 32 Test
- F. 33.1 Chordate Evolution
- G. 33.2 Controlling Body Temperature
- H. 33.3 Form and Function in Chordates
- I. Lab 33: Comparing Chordate Family Trees
- J. Chapter 33 Test

## UNIT THREE: Heredity: Inheritance and Variation of Traits

### I. Chapter 10: Cell Growth and Division

- A. 10.1 Cell Growth
- B. 10.2 Cell Division
- C. 10.3 Regulating the Cell Cycle
- D. Lab 10: Modeling the Phases of the Cell Cycle
- E. Chapter 10 Test

### II. Chapter 11: Introduction to Genetics

- A. 11.1 The Work of Gregor Mendel
- B. 11.2 Probability and Punnett Squares
- C. 11.3 Exploring Mendelian Genetics
- D. 11.4 Meiosis
- E. 11.5 Linkage and Gene Maps
- F. Lab 11: Modeling Meiosis
- G. Chapter 11 Test

### III. Chapter 12: DNA and RNA

- A. 12.1 DNA
- B. 12.2 Chromosomes and DNA Replication
- C. 12.3 RNA and Protein Synthesis
- D. 12.4 Mutations
- E. 12.5 Gene Regulation
- F. Lab 12: Modeling DNA Replication
- G. Chapter 12 Test

### IV. Chapter 13: Genetic Engineering

- A. 13.1 Changing the Living World
- B. 13.2 Manipulating DNA
- C. 13.3 Cell Transformation
- D. 13.4 Applications of Genetic Engineering
- E. Lab 13: Investigating the Effects of Radiation on Seeds
- F. Chapter 13 Test

### V. Chapter 14: The Human Genome

- A. 14.1 Human Heredity
- B. 14.2 Human Chromosomes
- C. 14.3 Human Molecular Genetics
- D. Lab 14: Modeling DNA Probes
- E. Chapter 14 Test

### VI. Chapter 15: Darwin's Theory of Evolution

- A. 15.1 The Puzzle of Life's Diversity
- B. 15.2 Ideas That Shaped Darwin's Thinking
- C. 15.3 Darwin Presents His Case
- D. Lab 15: Modeling Adaptation
- E. Chapter 15 Test

VII. Chapter 16: Evolution of Populations

- A. 16.1 Genes and Variation
- B. 16.2 Evolution as Genetic Change
- C. 16.3 The Process of Speciation
- D. Lab 16: Investigating Genetic Diversity in Bacteria
- E. Chapter 16 Test

VIII. Chapter 17: The History of Life

- A. 17.1 The Fossil Record
- B. 17.2 Earth's Early History
- C. 17.3 Evolution of Multicellular Life
- D. 17.4 Patterns of Evolution
- E. Lab 17: Modeling Co-evolution
- F. Chapter 17 Test

**UNIT FOUR: Ecosystems, Interactions, Energy and Dynamics**

I. Chapter 8: Photosynthesis

- A. 8.1 Energy and Life
- B. 8.2 Photosynthesis: An Overview
- C. 8.3 The Reactions of Photosynthesis
- D. Lab 8a: Investigating Photosynthesis
- E. Lab 8b: Paper Chromatography
- F. Chapter 8 Test

II. Chapter 9: Cellular Respiration

- A. 9.1 Chemical Pathways
- B. 9.2 The Krebs Cycle and Electron Transport
- C. Lab 9: Investigating Fermentation by Making Kimchi
- D. Chapter 9 Test

III. Chapter 3: The Biosphere

- A. 3.1 What is Ecology?
- B. 3.2 Energy Flow
- C. 3.3 Cycles of Matter
- D. Lab 3: Identifying a Limited Nutrient
- E. Chapter 3 Test

IV. Chapter 4: Ecosystems and Communities

- A. 4.1 The Role of Climate
- B. 4.2 What shapes an Ecosystem?
- C. 4.3 Biomes
- D. 4.4 Aquatic Ecosystems
- E. Lab 4: Observing Succession
- F. Chapter 4 Test

V. Chapter 5: Populations

- A. 5.1 How Populations Grow
- B. 5.2 Limits to Growth
- C. 5.3 Human Population Growth
- D. Lab 5: Investigating the Growth of a Population of Bacteria
- E. Chapter 5 Test

VI. Chapter 6: Humans in the Biosphere

- A. 6.1 A Changing Landscape
- B. 6.2 Renewable and Nonrenewable Resources
- C. 6.3 Biodiversity
- D. 6.4 Charting a Course for the Future
- E. Lab 6: Observing the Effects of Acid Rain
- F. Chapter 6 Test

**Course requirements:**

Students must be familiar with and abide by the school handbook rules for student conduct and the lab procedures and safety rules.

Some reading materials will be provided only during class and students must make the most of their time by taking notes from those materials. Other materials are available in the library and students are expected to glean information from those materials in an organized fashion. The student's Biology notebook, textbook, and other necessary materials are the student's responsibility and must accompany the student to class each session.

**Methods of Evaluation:**

**Every Grading Period**

Chapter and Unit Tests	500 - 600 points
Lab Participation and Reports	300 - 400 points
Class Participation, Notebook, & Science Fair	100 - 200 points
Semester Exams (Grade)	100 points *(Weighted 20% of Semester Grade)

Lecture, readings, discussion, audiovisuals, supervised lab investigations.

**Required Text:**

2008. Biology The Living Science. Kenneth R. Miller & Joseph Levine. Pearson. Prentice Hall.