

## Biology – Credit Recovery

**COURSE DESCRIPTION:** This course is an introduction to general biology. It will include the fundamental principles of living organisms including physical and chemical properties of life, cellular organization and function, the transfer of energy through metabolic systems, cellular reproduction, the classification of living things, and the six kingdoms of life. The main focus is to present biological information in an understandable and straight forward way that will capture the student's interest dealing with up-to-date principles and concepts.

### COURSE OBJECTIVES:

- Explain the unifying themes in biology.
  - Describe the differences between atoms and elements.
  - Identify the structure and function of different types of carbon compounds.
  - Define the roles of enzymes in chemical reactions.
  - List the two major processes of photosynthesis and state what occurs in those sets of reactions.
  - Describe the nature of light and how it is associated with the release of electrons from a photosystem.
  - Explain the role of the two energy-carrying molecules produced in the light dependent reactions (ATP and NADPH) and in the light independent reactions.
  - State the role of oxygen in aerobic respiration.
  - Describe how humans use fermentation, what products are made, and how they impact society.
  - Define magnification and resolution in the use of a microscope.
  - State why cells must be relatively small.
  - Compare the structures of prokaryotic cells and eukaryotic cells.
  - Identify the structures of cell membranes.
  - Describe the role of the nucleus in cell activities and the internal membranes play in protein production.
  - Describe the importance of mitochondria in eukaryotic cells.
  - Match the organelles of an animal cell and a plant cell.
  - Describe the four stages of Mitosis and the stages of Meiosis
  - Identify Mendel's contribution to science in its historical perspective.
  - Discuss how genes influence human health.
  - Outline the role of DNA in heredity.
  - Compare RNA and DNA.
  - Identify the major steps in translation and the four basic steps of genetic engineering.
  - Outline the main points of Darwin's theory.
  - Describe how fossil record supports evolution.
  - List the five conditions that must exist before conditions for the Hardy-Weinberg principle are met.
  - Distinguish between stabilizing, directional, and disruptive selection.
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- Identify two groups of prokaryotes and describe the evolution of eukaryotes.
  - Identify the first multicellular organisms to live on land.
  - Name the first animals to live on land and the first vertebrates to leave the ocean.
  - Define the term mass extinction.
  - Identify the characteristics used to classify organisms in each of the domains and kingdoms.
  - Identify the levels of cellular organization that occur in plants and animals (tissues, organs, and organ systems).
  - Recognize the characteristics of the three domains and identify organisms based on assigned names (taxonomy).
  - Describe how phylogenetic reconstruction is used to identify the evolutionary patterns that unite different organisms.
  - Explain why outward appearance alone does not provide enough information to assign an organism to a particular species.
  - Explain the purpose of applying a genus name and a species name to an organism.
  - Give reasons why using common names alone for organisms is often very unsatisfactory.
  - Compare and contrast the concepts of evolutionary systematics, phenetics, and cladistics with respect to their methods of grouping organisms.
  - Comprehend that a monophyletic lineage evolves independently with organisms that share a common ancestry.
  - Explain the construction of a cladogram and the information it represents.

- Interpret a simple cladogram to define derived trait and out-group.
- Arrange in proper order: kingdom, phylum (or division), class, order, family, genus, and species.
- Name and define the tissues and organ systems that extend throughout the plant body.
- Discuss and identify parts of the plant root and root tip, and distinguish the taproot system and fibrous root system.
- Identify the various parts of a typical flower and give their functions.
- Relate the sequence of events that give rise to microspores and megaspores.
- List the five types of hormones found in most flowering plants.
- Describe the Cohesion-Tension Theory, explaining how water moves upward in an unbroken column through xylem to the tops of tall trees.
- Generally describe the internal structure of a leaf as well as give the function of stomata.
- Know the function, location, and features of the basic tissue types in animals.
- Explain homeostasis and how it is maintained in an animal's body, including the idea of feedback.
- Interpret the functions of systems in organisms including circulatory, digestive, nervous, endocrine, reproductive, integumentary, skeletal, respiratory, muscular, excretory, and immune.
- Describe the organs and other important components that make up the main animal organ systems (circulatory, digestive, nervous, endocrine, reproductive, integumentary, skeletal, respiratory, muscular, excretory, and immune).  
Identify how an animal's body responds to various stimuli in both the internal and external environments.
- Compare the interrelationships of organ systems to each other and to the body as a whole (such as the respiratory/circulatory or skeletal/muscular).
- Define population density and describe the relationship between resources and population growth.
- Define ecosystem.
- Differentiate primary succession from secondary succession.
- Describe the differences between producers and consumers.
- Outline elements and key players in the Earth's ecosystem, such as food webs, food chains, herbivores, carnivores, omnivores, detritivores, and decomposers. Describe the major steps of the carbon cycle.

**PREREQUISITES:** None

**COURSE LENGTH:** Two Semesters

**REQUIRED TEXT:** No required textbook for this course.

**MATERIALS LIST:** [Biology Materials List](#) (Click to Download)

### **COURSE OUTLINE:**

#### **Semester 1**

##### **Unit 1: The Nature and Science of Biology**

- Section 1 - Biology: The Study of Life
- Section 2 - Chemistry of Life

##### **Unit 2: Photosynthesis and Cellular Respiration**

- Section 1 - Energy
- Section 2 - Photosynthesis: Food Production
- Section 3 - Cellular Respiration

##### **Unit 3: Cell Structure**

- Section 1 - Cell Structure
- Section 2 - Cell Membrane: Structure and Function
- Section 3 - Chromosomes and Cell Reproduction
- Section 4 - Meiosis and Sexual Reproduction

#### **Unit 4: Genetics**

- Section 1 - Mendel and Heredity
- Section 2 - The Chromosome Theory Of Inheritance
- Section 3 - Human Genetic Traits
- Section 4 - How Proteins Are Made
- Section 5 - Protein Synthesis: From Gene to Protein
- Section 6 - Biotechnology and the Genetics Revolution

#### **Unit 5: Evolution**

- Section 1 - Evolution: Descent With Modification
- Section 2 - Evolution and Genetics

### **Semester 2**

#### **Unit 6: History of Life on Earth**

- Section 1 - Fossils
- Section 2 - The Precambrian: Birth of a Planet and Establishment of Life
- Section 3 - The Paleozoic: The Time of Ancient Life
- Section 4 - The Mesozoic Era: The Age of Dinosaurs
- Section 5 - The Cenozoic: Age of Mammals and Birds

#### **Unit 7: Biological Diversity and Classification**

- Section 1 - Taxonomy
- Section 2 - Prokaryotes: Bacteria and Archaea
- Section 3 - Domain Eukarya: Evolution of Eukaryotes
- Section 4 - The Plant Kingdom
- Section 5 - Kingdom Fungi
- Section 6 - Kingdom Animalia
- Section 7 - Phylum Annelida: Segmented Worms

#### **Unit 8: Plant Structure**

- Section 1 - Plant Organs, Tissues, and Cells
- Section 2 - Flowering Plant Reproduction
- Section 3 - Plant Hormones, Nutrition, and Transport

#### **Unit 9: Animal Organization**

- Section 1 - Animal Cells and Tissues

- Section 2 - Animal Organ Systems and Homeostasis
- Section 3 - The Integumentary System: Protection and Senses
- Section 4 - The Circulatory System: Transport of Materials Within the Body
- Section 5 - The Lymphatic System and Immunity: The Body's Defense
- Section 6 - The Digestive System: Getting Food and Nutrients Into the Body
- Section 7 - Control of the Body Part I: The Nervous System
- Section 8 - Muscular and Skeletal Systems
- Section 9 - The Respiratory System
- Section 10 - The Reproductive System and Human Development

**Unit 10: Ecology**

- Section 1 - Population Growth
- Section 2 - Community and Ecosystem Dynamics
- Section 3 - The Biosphere and Mass Extinctions