

Biology

COURSE DESCRIPTION: In this course, students focus on the chemistry of living things: the cell, genetics, evolution, the structure and function of living things, and ecology. Students follow a program of online study days alternating with review-and-assessment days. Lessons include extensive animations, hands-on laboratory activities, reference book study, and collaborative activities with virtual classmates.

PREREQUISITES: Middle school Life Science, or equivalent

COURSE LENGTH: Two Semesters

REQUIRED TEXT: Biology: A Reference Guide

MATERIALS LIST: Materials for laboratory experiments, including a compound microscope

COURSE OUTLINE:

Semester 1

Unit 1: The Science of Biology

- Semester Introduction
- Biology and Scientific Methods
- Scientific Processes 1
- Scientific Processes 2
- Review: Scientific Processes
- The Characteristics of Life 1
- The Characteristics of Life 2
- Semester Introduction
- Biology and Scientific Methods
- Scientific Processes 1
- Scientific Processes 2
- Review: Scientific Processes
- The Characteristics of Life 1
- The Characteristics of Life 2

Unit 2: The Chemistry of Life

- Chemistry Review
- Chemical Bonds
- Review: Chemical Bonds
- Carbon and Life
- Review: Carbon and Life
- Water
- Review: Water
- Laboratory: Investigating Biological Compounds 1
- Laboratory: Investigating Biological Compounds 2
- Simple Carbohydrates
- Complex Carbohydrates
- Review: Carbohydrates
- Lipids
- Review: Lipids
- Amino Acids and Proteins
- Proteins as Enzymes
- Review: Proteins
- Nucleic Acids
- Review: Nucleic Acids
- ATP
- Review: ATP

Unit 3: Cell Biology

- The Cell and Life
- Cell Structure
- Cell Organelles
- Review: Cell Life, Structure, and Organelles
- Two Types of Cells
- Review: Two Types of Cells
- Cell Membrane Structure
- Movement Across Membranes
- Review: Cell Structure and Movement
- Laboratory: Determining the Rate of Diffusion 1

- Laboratory: Determining the Rate of Diffusion 2
- Chemical Energy and Life
- Review: Chemical Energy
- Respiration and Photosynthesis
- Review: Respiration and Photosynthesis
- Laboratory: The Rate of Photosynthesis 1
- Laboratory: The Rate of Photosynthesis 2
- Reproduction and Development
- Mitosis
- Review: Reproduction, Development and Mitosis
- Laboratory: Observing Mitosis
- Cell Differentiation
- Review: Cell Differentiation
- Cell Specialization
- Review: Cell Specialization
- Sexual Reproduction
- Meiosis I
- Meiosis II
- Review: Sexual Reproduction and Meiosis

Unit 4: Mendelian Genetics

- The Work of Gregor Mendel
- Mendelian Inheritance
- Review: Mendel and Mendelian Inheritance
- Laboratory: Genetic Crosses 1
- Laboratory: Genetic Crosses 2
- Chromosomes and Genes
- Genes and Alleles
- Review: Chromosomes, Genes, and Alleles
- Proteins Express DNA
- Review: Proteins Express DNA

Unit 5: Semester Review and Test

- Semester Review

- Semester Test

Semester 2

Unit 1: Molecular Genetics

- Semester Introduction
- DNA, RNA, and Proteins
- Structure of DNA
- Review: Structure of DNA
- Structures of RNA
- Review: Structures of RNA
- DNA Replication
- Review: DNA Replication
- Laboratory: Modeling DNA
- Laboratory: Modeling DNA Replication
- DNA Makes RNA
- Review: DNA Makes RNA
- RNA Makes Protein
- Review: RNA Makes Protein
- The Genetic Code
- Review: The Genetic Code

Unit 2: Evolution

- Evolution and Biology
- Evolution of Populations
- Review: Evolution Biology and Populations
- Variation in Populations
- Types of Natural Selection
- Review: Variation and Types of Natural Selection
- Evidence for Evolution 1
- Evidence for Evolution 2
- Evolution and Earth History
- Review: Evidence for Evolution and Earth History
- Laboratory: Process of Natural Selection 1
- Laboratory: Process of Natural Selection 2
- Genetic Basis of Evolution
- Review: Genetic Basis for Evolution

- Classification and Taxonomy
- Modern Classification
- Review: Classification, Taxonomy
- Laboratory: Dichotomous Key

Unit 3: Systems of Living Things

- Getting Energy
- Review: Getting Energy
- Digestion in Humans
- Laboratory: Human Digestion Actions 1
- Review: Digestion in Human
- Laboratory: Human Digestion Actions 2
- Oxygen and the Human Body
- Review: Oxygen and the Human Body
- Human Nervous System
- Review: Human Nervous System
- Muscular Systems
- Review: Muscular Systems
- How Muscles Contract
- Review: How Muscles Contract
- Laboratory: Chicken Muscles 1
- Laboratory: Chicken Muscles 2
- Fern Reproduction
- Review: Fern Reproduction
- Human Reproduction
- Review: Human Reproduction
- Human Immune Response 1
- Human Immune Response 2
- Review: Human Immune Response

Unit 4: Ecology and the Environment

- Ecosystems
- Biomes
- Review: Ecosystems and Biomes
- Energy Flow in Ecosystems
- Food Chains and Food Webs

- Review: Energy Flow, Food Chains, and Webs
- Succession
- Review: Succession
- Laboratory: Patterns of Succession
- Laboratory: The Effects of Acidity on Seed Germination 1
- Water and Nitrogen Cycles
- Review: Water and Nitrogen Cycles
- Laboratory: Fixation in Root Nodules 1
- Laboratory: Fixation in Root Nodules 2
- Laboratory: The Effects of Acidity on Seed Germination 2

Unit 5: Semester Review and Test

- Semester Review
- Semester Test