AP Biology

Course Description and Philosophy

The Advanced Placement Biology course is a rigorous course for those students who have a background, ability and motivation to take a first-year college biology course. The syllabus is outlined in the CEEB Advanced Placement Course Description Booklet. In-depth studies and experimentation will prepare students for the Advanced Placement Examination in order for them to qualify for college credit and/or placement. Extensive laboratory sessions are scheduled relating to topics covered in lecture and discussion periods are included. Major areas of study include molecular, cellular, organism and population biology.

It is expected that students enrolled in this course be able readers and successful science students, particularly in their previous biology course. Students will be evaluated using tests, AP and enrichment labs, as well as two half-year examinations that will contribute to 20% of their final grade for the course.

Text Reference:


Updated July 2007
UNIT I: The Chemistry of Life

Essential Question: How is water important to life on earth?

Objectives – Students will be able to:

- Describe the structure of the atom
- Differentiate between covalent and ionic bonds
- Describe intermolecular forces
- Explain the polarity of water and how this contributes to cohesion and adhesion
- Describe how water moderates temperatures on Earth
- Describe the role of water as a solvent for living organisms
- Differentiate between hydrophilic and hydrophobic substances
- Differentiate between acids and bases, and describe where they lie on the pH scale
- Describe the role of carbon as a building block for biological molecules
- Differentiate between structural and geometric isomers, and enantiomers
- Describe the role of functional groups in chemical reactions, and describe the properties of the common groups in biology
- Describe the components of a polymer and how they are formed
- Describe carbohydrates including mono-, di- and polysaccharides and their roles
- Define lipids and the roles of fats, phospholipids and steroids
- Describe the structure of proteins, and their varying roles in biochemical processes
- Describe nucleic acids in terms of structure, as well as the role of DNA and RNA
- Define metabolism and differentiate between anabolism and catabolism
- State the 1st and 2nd law of thermodynamics
- Explain the role of ATP in powering cellular work
- Explain the role of enzymes in metabolic reactions
- Explain how metabolism is controlled
<table>
<thead>
<tr>
<th>Chapter 1: Introduction – Themes in the Study of Life</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Life’s Hierarchical Order</td>
</tr>
<tr>
<td>- Evolution, Unity and Diversity</td>
</tr>
<tr>
<td>- Science as a Process</td>
</tr>
<tr>
<td>Chapter 2: The Chemical Context of Life</td>
</tr>
<tr>
<td>- Chemical Elements and Compounds</td>
</tr>
<tr>
<td>- Atoms and Molecules</td>
</tr>
<tr>
<td>Chapter 3: Water and the Fitness of the Environment</td>
</tr>
<tr>
<td>- Effects of Water’s Polarity</td>
</tr>
<tr>
<td>- Dissociation of Water Molecules</td>
</tr>
<tr>
<td>Chapter 4: Carbon and the Molecular Diversity of Life</td>
</tr>
<tr>
<td>- The Importance of Carbon</td>
</tr>
<tr>
<td>- Functional Groups</td>
</tr>
<tr>
<td>Chapter 5: The Structure and Function of Macromolecules</td>
</tr>
<tr>
<td>- Polymer Principles</td>
</tr>
<tr>
<td>- Carbohydrates - Fuel and Building Material</td>
</tr>
<tr>
<td>- Lipids – Diverse Hydrophobic Molecules</td>
</tr>
<tr>
<td>- Proteins - The Molecular Tools of the Cell</td>
</tr>
<tr>
<td>- Nucleic Acids – Informational</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Method</th>
<th>Unit 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tests/Quizzes</td>
<td>5.1 – A, B, C</td>
</tr>
<tr>
<td>Term Paper</td>
<td>5.4 – A</td>
</tr>
<tr>
<td>Lab Activities</td>
<td>5.5 – A, B</td>
</tr>
<tr>
<td>Lab Handouts</td>
<td></td>
</tr>
<tr>
<td>Laserdisk</td>
<td></td>
</tr>
<tr>
<td>Small Group Work</td>
<td></td>
</tr>
<tr>
<td>Lab Work</td>
<td></td>
</tr>
<tr>
<td>Lecture</td>
<td></td>
</tr>
<tr>
<td>Discussion</td>
<td></td>
</tr>
<tr>
<td>Individual Research</td>
<td></td>
</tr>
<tr>
<td>Lab Supplies</td>
<td></td>
</tr>
<tr>
<td>Media Center</td>
<td></td>
</tr>
<tr>
<td>Internet Research</td>
<td></td>
</tr>
<tr>
<td>Laserdisk Player</td>
<td></td>
</tr>
<tr>
<td>PowerPoint</td>
<td></td>
</tr>
<tr>
<td>VCR/DVD</td>
<td></td>
</tr>
<tr>
<td>SmartBoard</td>
<td></td>
</tr>
</tbody>
</table>
Differentiated Learning Activities
- Students will perform a lab studying enzymes and how changes in temperature, pH, concentration and substrate concentration affect the rate of reactions. Resources will include lab equipment and chemicals, as well as a set of lab instructions.

Ethical Decision Making/Character Education
- Discussion in class regarding academic integrity on tests, assignments and lab work

UNIT II: The Cell

Essential Question: What are the components and roles of the endomembrane system of a cell?

Objectives – Students will be able to:

- Describe how microscopes are utilized to study cells
- Differentiate between prokaryotic and eukaryotic cells
- Explain the role of membranes in eukaryotic cells
- Describe the role and structure of a cell nucleus
- Explain the role of ribosomes
- Describe the components of the endomembrane system, including the role of each component in cell function
- Explain the roles of mitochondria and chloroplasts as energy transformers in cells
- Describe the role of the cytoskeleton in structural support, cell motility and regulation
- Define cell wall, and describe the components and role of the structure in plant cells
- Detail the functions and structure of the extracellular matrix in animal cells
- Explain how new data has allowed for changes in the model of the cell membrane
- List and describe the components of a membrane
- Explain how certain materials are able to travel across membranes
- Describe the role of transport proteins
- Differentiate between passive and active transport across membranes
- Describe osmosis
- Differentiate between hypertonic and hypotonic solutions
- Explain how water uptake/loss affects cellular function/survival
- Describe ion pumps and their roles in active transport
- Differentiate between exocytosis and endocytosis
- Explain how cellular respiration and fermentation are catabolic pathways
- Explain the role of ATP in the cell
- Describe the role of redox reactions in the release of energy
- Describe the movement of electrons during cellular respiration
- Describe the Krebs cycle, glycolysis, and electron transport
- Describe fermentation
- Explain the role of feedback mechanisms in the control of respiration
- Differentiate between autotrophs and heterotrophs
- Explain the role and structure of chloroplasts
- Describe how light reactions and the Calvin cycle convert light into chemical energy
- Describe alternative mechanisms for carbon fixation

<table>
<thead>
<tr>
<th>Topic/Content Skills</th>
<th>Assessment</th>
<th>Resources</th>
<th>Instructional Method</th>
<th>Tech Infusion</th>
<th>NJCCCS: Unit II</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Chapter 7: A Tour of the Cell</strong></td>
<td>Tests/Quizzes</td>
<td>Text</td>
<td>Lecture</td>
<td>Internet Research</td>
<td>5.1 – A, B</td>
</tr>
<tr>
<td>- How We Study Cells</td>
<td>Term Paper</td>
<td>Lab Handouts</td>
<td>Discussion</td>
<td>Laserdisk Player</td>
<td>5.2 – B</td>
</tr>
<tr>
<td>- A Panoramic View of the Cell</td>
<td>Lab Activities</td>
<td>Laserdisk</td>
<td>Small Group Work</td>
<td>PowerPoint</td>
<td>5.4 – A, C</td>
</tr>
<tr>
<td>- The Nucleus and Ribosomes</td>
<td>Homework</td>
<td>iBooks</td>
<td>Individual Research</td>
<td>iBooks/Probes</td>
<td>5.5 – A</td>
</tr>
<tr>
<td>- The Endomembrane System</td>
<td>Media Center</td>
<td>Lab Work</td>
<td>Lab Work</td>
<td>VCR/DVD</td>
<td>5.6 - B</td>
</tr>
<tr>
<td>- Other Membranous Organelles</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- The Cytoskeleton</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Cell Surfaces and Junctions</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Chapter 8: Membrane Structure and Function**
- Membrane Structure
- Traffic Across Membranes
**Chapter 9:** Cellular Respiration: Harvesting Chemical Energy
- Principles of Energy Harvest
- The Process of Cellular Respiration
- Related Metabolic Processes

**Chapter 10:** Photosynthesis
- Photosynthesis in Nature
- The Pathways of Photosynthesis

**Chapter 11:** Cell Communication
- An Overview of Cell Signaling
- Signal Reception and the Initiation of Transduction
- Signal-Transduction Pathways
- Cellular Responses to Signals

**Chapter 12:** The Cell Cycle
- The Key Roles of Cell Division
- The Mitotic Cell Cycle
- Regulation of the Cell Cycle

**Differentiated Learning Activities**
- Using iBooks and *Computers for Biology*, the students will participate in a lab describing and studying fermentation

**UNIT III: Genetics**
Essential Question: How does the chromosomal basis of sex vary with organisms?

Objectives – Students will be able to:

- Compare and contrast sexual and asexual reproduction
- Define homologous chromosomes, sex chromosomes and autosomes
- Differentiate between haploid cells and diploid cells
- Define fertilization, zygote and meiosis
- Define and describe alternation of generations
- Compare and contrast meiosis and mitosis
- List and describe the stages of meiosis I and meiosis II, and mitosis
- Describe the mechanisms of genetic variation
- Describe Gregor Mendel’s experiments and his conclusions
- Explain the law of segregation
- Differentiate between dominant and recessive alleles
- Differentiate between homozygous and heterozygous
- Distinguish between a genotype and a phenotype
- Perform a test cross to predict genotypes and phenotypes
- Describe the law of independent assortment
- Distinguish between incomplete and complete dominance, and codominance
- Define pleiotropy and epistasis
- Explain polygenic inheritance
- Use a human disorder as an example of Mendelian patterns of inheritance
- Explain the use of genetic testing as a preventative approach to Mendelian disorders
- Describe the chromosome theory of inheritance
- Describe the work performed by Morgan with fruit flies
- Define linked genes
- Describe genetic recombination and how data can be used to map a chromosome’s genetic loci
- Explain how the chromosomal basis of sex varies with organism
- Describe some patterns of inheritance involved with sex-linked genes
- Define nondisjunction, polyploidy
- Describe how chromosome structure can be altered, and possible conditions
- Describe genomic imprinting
- Explain how scientists searching for genetic material discovered DNA
- Describe how Watson and Crick determined the structure of DNA
- Describe the mechanism by which DNA replicates
- Explain the role of enzymes and proteins during DNA replication
- Describe how genes specify proteins
- Differentiate between transcription and translation, and describe the mechanism of each
- Describe the role of signal peptides
- Compare and contrast protein synthesis in prokaryotes
and eukaryotes
- Describe how researchers discovered viruses
- Describe the “anatomy” of a virus
- Explain how viruses use a host cell to reproduce
- Compare and contrast the lytic cycle and the lysogenic cycle
- Define viroids and prions
- Relate the short generation span and evolutionary adaptation of bacteria
- Describe how genetic recombination can produce new bacterial strains
- Explain how bacteria adjust their metabolism using the control of gene expression
- Describe the structure of chromatin
- Explain how the genome is organized at the level of DNA, including repetition and non-coding sequences
- Describe how the genome is altered via amplification, loss and rearrangement
- Describe how gene expression is controlled via chromatin modifications, transcription initiation and posttranscriptional mechanisms
- Describe how genetic changes can result in cancer
- Explain how DNA technology allows for gene cloning
- Describe the use of restriction enzymes
- Explain how cloned DNA is analyzed and some practical applications of DNA technology
- Describe how cell division, differentiation and morphogenesis are involved in embryonic development
- Describe how transcriptional regulation allows cells to make different proteins
- Describe the control of axis formation in the early embryo
- Explain the role of homeotic genes and homeobox genes

<table>
<thead>
<tr>
<th>Topic/Content Skills</th>
<th>Assessment</th>
<th>Resources</th>
<th>Instructional Method</th>
<th>Tech Infusion</th>
<th>NJCCCS: Unit III</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Chapter 13: Meiosis and Sexual Life Cycles</strong></td>
<td>Tests/Quizzes, Term Paper, Lab Activities, Homework</td>
<td>Text, Lab Handouts, Laserdisk, iBooks, Media Center, Lab Supplies</td>
<td>Lecture, Discussion, Small Group Work, Individual Research, Lab Work</td>
<td>Internet Research, Laserdisk Player, PowerPoint, iBooks/Probes, VCR/DVD, SmartBoard</td>
<td>5.1 – A, B, 5.2 – A, B, 5.3 – C, 5.4 – A, B, C, 5.5 – A, C</td>
</tr>
<tr>
<td>An Intro to Heredity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The Role of Meiosis in Sexual Life Cycles</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Origins of Genetic Variation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Chapter 14: Mendel and the Gene Idea</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gregor Mendel’s Discoveries</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extending Mendelian Genetics</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
- Mendelian Inheritance in Humans

**Chapter 15: The Chromosomal Basis of Inheritance**
- Relating Mendelism to Chromosomes
- Sex Chromosomes
- Errors and Exceptions in Chromosomal Inheritance

**Chapter 16: The Molecular Basis of Inheritance**
- DNA as the Genetic Material
- DNA Replication and Repair

**Chapter 17: From Gene to Protein**
- The Connection Between Genes and Proteins
- The Synthesis and Processing of RNA
- The Synthesis of Protein

**Chapter 18: Microbial Models: The Genetics of Viruses and Bacteria**
- The Genetics of Viruses
- The Genetics of Bacteria

**Chapter 19: The Organization and Control of Eukaryotic Genomes**
- The Structure of Chromatin
- Genome Organization at the DNA Level
- The Control of Gene Expression
- The Molecular Biology of
Cancer

**Chapter 20: DNA Technology**
- DNA Cloning
- Analysis of Cloned DNA
- Practical Applications of DNA Technology

**Chapter 21: The Genetic Basis of Development**
- From Single Cell to Multicellular Organism
- Differential Gene Expression
- Genetic and Cellular Mechanisms of Pattern Formation

**Differentiated Learning Activities:**
- Students will perform AP Lab 6 “Molecular Biology” where they will study advances in genetic technology and participate in a gene splicing activity

**Ethical Decision Making/Character Education:**
- Students will write a term paper describing the ethics of gene manipulation

**UNIT IV: Mechanisms of Evolution**
**Essential Question:** How are Darwinian selection and Mendelian inheritance related to each other?

**Objectives – Students will be able to:**

- Describe the historical context for evolutionary theory
- Compare and contrast natural theology and geological gradualism
- Describe the significance of the work done by Lamarck
- Describe the two main points made by Darwin in *The Origin of the Species*; evolution and natural selection
- Explain how the fossil record, biogeography, comparative anatomy, comparative embryology and molecular biology provide evidence of evolution
- Describe how Darwinian selection and Mendelian inheritance are related
- Describe how the genetic structure of a population depends upon its allele and genotype frequencies
- Explain the Hardy-Weinberg theorem
- Describe how mutation and sexual recombination contribute to genetic variation within and between populations
- Define evolutionary fitness
- Describe the effect of natural selection on a varying characteristic
- Describe the biological species concept
- Explain how gene pools of biological species are isolated
- Differentiate between allopatric speciation and sympatric speciation
- Describe how genetic change in population accounts for speciation
- Describe the punctuated equilibrium model
- Describe the origin of evolutionary novelty
- Describe where fossils are found and how paleontologists date fossils
- Explain how taxonomy classifies species
- Describe how organisms are classified according to their evolutionary history
- Explain how molecular biology is a tool for systematics
- Describe the role of phenetics in systematic analysis

<table>
<thead>
<tr>
<th>Topic/Content Skills</th>
<th>Assessment</th>
<th>Resources</th>
<th>Instructional Method</th>
<th>Tech Infusion</th>
<th>NJCCCS: Unit IV</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Chapter 22:</strong> Descent with Modification: A Darwinian View of Life</td>
<td>Tests/Quizzes, Term Paper, Lab Activities, Homework</td>
<td>Text, Lab Handouts, iBooks, Media Center</td>
<td>Lecture, Discussion, Small Group Work, Individual Research, Lab Work</td>
<td>Internet Research, Laserdisk Player, PowerPoint, iBooks/Probes, VCR/DVD</td>
<td>5.1 – A, B, 5.2 – A, B, 5.5 – B, C</td>
</tr>
</tbody>
</table>
- The Darwinian Revolution
- Evidence of Evolution

<table>
<thead>
<tr>
<th>Lab Supplies</th>
<th>SmartBoard</th>
</tr>
</thead>
</table>

**Chapter 23: The Evolution of Populations**
- Population Genetics
- Causes of Microevolution
- Genetic Variation, The Substrate for Natural Selection
- Natural Selection as the Mechanism of Adaptive Evolution

**Chapter 24: The Origin of Species**
- What is a Species?
- Modes of Speciation
- The Origin of Evolutionary Novelty

**Chapter 25: Tracing Phylogeny**
- The Fossil Record and Geological Time
- Phylogeny and Systematics
- The Science of Phylogenetic Systematics

**Differentiated Learning Activities:**
- Students will participate in a study of speciation and the comparative vertebrate anatomy of shark, perch frog and a fetal pig

**UNIT V: Animal Form and Function**
**Essential Question:** How is body temperature regulated in mammals?

**Objectives – Students will be able to:**

- Classify the four main categories of tissues in animals
- Describe how the organ systems of an animal are interdependent
- Explain how metabolic rate and body size are related to each other
- Describe how body shape and size affect interactions with the environment
- Describe how mechanisms of homeostasis control changes in the internal environment
- Differentiate between negative and positive feedback and their roles in homeostasis
- Describe the gastrovascular cavity and circulatory systems of invertebrates
- Describe how adaptations of the cardiovascular system reflect vertebrate phylogeny
- Describe the structure and function of arteries, veins and capillaries
- Use physical laws to describe blood flow and pressure
- Describe how substances are transferred between the blood and the interstitial fluids
- Explain the role of the lymphatic system
- Describe the role of gills in aquatic animals
- Describe the role of tracheal systems and lungs in land animals
- Explain how breathing is regulated by the brain
- Explain how gases diffuse in the lungs and other organs
- Explain the role of respiratory pigments in transporting gases and buffering blood
- Describe how the skin and mucous membranes are barriers to infection
- Explain the role of phagocytic cells, inflammation and antimicrobial proteins in infections
- Explain the role of T cells and B cells in the immune response
- Explain the differences of the invertebrate immune system
- Describe how immunity can be achieved naturally or artificially
- Explain how blood transfusions and tissue transplants are limited by the immune system
- Explain the consequences of abnormal immune function
- Describe how heat can be gained or lost
- Describe and differentiate between endothermy and ectothermy
- Explain how torpor conserves energy
- Describe the mechanisms of water balance and waste disposal in animals
- Explain how urine is produced in most excretory systems
- Describe the roles of nephrons and blood vessels in the mammalian kidney
- Describe how kidney function is regulated by the nervous system and hormone feedback
- Explain how the endocrine system and nervous system are related
- Describe how chemical systems operate with plasma-membrane proteins and target cells
- Explain the role of the hypothalamus and pituitary in the functions of the endocrine system in vertebrates
- Explain the role of the pineal gland and thyroid
- Describe how blood calcium is balanced
- Explain the role of the pancreas, adrenal medulla and adrenal cortex
- Describe the reproductive anatomies of the human male and female
- Compare and contrast spermatogenesis and oogenesis
- Describe how hormones regulate reproduction in males and females
- Describe the stages between conception and birth in humans
- Detail the stages of frog and chick embryological development
- Describe the three main functions of the nervous system
- Describe the organization and components of the nervous system and their roles
- Explain the significance of membrane potentials, action potentials, synapses and neurotransmitters in neural signaling
- Explain the development of the vertebrate brain
- Describe the roles of the brainstem, cerebellum, thalamus, hypothalamus, and cerebrum
- Describe the role of sensory receptors and how they are classified
- Describe the structure and function of photoreceptors
- Describe the structure and function of hearing organs in mammals, fishes, aquatic amphibians and invertebrates
- Explain how taste and smell are interrelated
- Explain how locomotion requires energy to overcome friction and gravity
- Describe the role of the skeleton and muscles
- Describe the role of myosin and actin interactions
- Describe how calcium ions and regulatory proteins control muscles

<table>
<thead>
<tr>
<th>Topic/Content Skills</th>
<th>Assessment</th>
<th>Resources</th>
<th>Instructional Method</th>
<th>Tech Infusion</th>
<th>NJCCCS: Unit V</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Chapter 40</strong> – An Introduction to Animal Structure and Function</td>
<td>Tests/Quizzes Term Paper Lab Activities Homework</td>
<td>Text Lab Handouts Laserdisk iBooks Media Center Lab Supplies</td>
<td>Lecture Discussion Small Group Work Individual Research Lab Work</td>
<td>Internet Research Laserdisk Player PowerPoint iBooks/Probes VCR/DVD</td>
<td>5.1 - A, B 5.5 – A, C</td>
</tr>
</tbody>
</table>
Chapter 42: Circulation and Gas Exchange
- Circulation in Animals
- Gas Exchange in Animals

Chapter 43: The Body’s Defenses
- Nonspecific Defenses Against Infection
- How Specific Immunity Arises
- Immune Responses
- Immunity in Health and Disease

Chapter 44: Controlling the Internal Environment
- Regulation of Body Temperature
- Water Balance and Waste Disposal
- Excretory Systems

Chapter 45: Chemical Signals in Animals
- An Intro to Regulatory Systems
- Chemical Signals and Their Modes of Action
- The Vertebrate Endocrine System

Chapter 46: Animal Reproduction
- Overview of Animal
Reproduction
- Mammalian Reproduction

**Chapter 47: Animal Development**
- The Stages of Early Embryonic Development
- The Cellular and Molecular Basis of Morphogenesis and Differentiation in Animals

**Chapter 48: Nervous Systems**
- An Overview of Nervous Systems
- The Nature of Neural Signals
- Organization of Nervous Systems
- Structure and Function of the Vertebrate Brain

**Chapter 49: Sensory and Motor Mechanisms**
- Intro to Sensory Reception
- Photoreceptors
- Hearing and Equilibrium
- Chemoreception – Taste and Smell
- Movement and Locomotion

**Differentiated Learning Activities:**
- To further study the mechanisms of the excretory system, students will participate in a lab that studies urine analysis

**UNIT VI: Ecology**

**Essential Question:** What are the natural and human forces that can cause change in an ecosystem?
Objectives – Students will be able to:

- Define ecology
- Discuss the various areas of ecological research
- Describe how ecology is used to evaluate environmental issues
- Describe how climate and other abiotic factors affect the distribution of organisms
- Discuss aquatic and terrestrial biomes, and how climate is a factor in their distribution
- Describe how organisms respond to environmental variation
- Describe the two main characteristics of any population
- Describe the exponential and logistic models of population growth
- List and describe factors that limit populations
- Explain the role of trophic relationships in ecosystems
- Define primary producers and higher-order consumers
- Discuss how energy flows in ecosystems
- Explain how nutrients are moved among organic and inorganic compartments
- Describe how decomposition rates determine nutrient cycling
- Explain how chemical cycles are disturbed by human activity and population growth

<table>
<thead>
<tr>
<th>Topic/Content Skills</th>
<th>Assessment</th>
<th>Resources</th>
<th>Instructional Method</th>
<th>Tech Infusion</th>
<th>NJCCCS: Unit VI</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Chapter 50: An Intro to Ecology and the Biosphere</strong></td>
<td>Tests/Quizzes, Term Paper</td>
<td>Text, Lab Handouts, Laserdisk, iBooks, Media Center, Lab Supplies</td>
<td>Lecture, Discussion, Small Group Work, Individual Research, Lab Work</td>
<td>Internet Research, Laserdisk Player, PowerPoint, iBooks/Probes, VCR/DVD, SmartBoard</td>
<td>5.1 – A, B, 5.3 – C, 5.5 – A, B</td>
</tr>
<tr>
<td>- The Scope of Ecology</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Abiotic Factors of the Biosphere</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Aquatic and Terrestrial Biomes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Concepts of Organismal Ecology</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Chapter 52: Population Ecology</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
- Characteristics of Populations
- Life History Traits
- Population Growth Models
- Population Limiting Factors
- Human Population Growth

**Differentiated Learning Activities:**
- Students will participate in an activity/game that allows them to plot population changes over time. Students will be split into group, resources and animals, and run trials that represent generations of a species to see how changes in resources change population growth. This activity comes from a list of *Project Wild* activities for K-12.

**Ethical Decision Making/Character Education:**
- Students will participate in a discussion after performing internet research on coral reefs and the affects of human activities such as tourism, pollution and commercial fishing. The subsequent class discussion will touch on the role of human beings as stewards of the environment, and weigh the pros and cons and ethics of conservation and the protection of highly diverse ecosystems.

**UNIT VII: Plant Form and Function**

*Essential Question:* How and where do male and female gametophytes develop in plants?
Objectives – Students will be able to:

- Describe the root and shoot systems of plants
- Describe the role of protoplasts and cell walls
- Explain how plant cells are organized into dermal, vascular and ground tissue systems
- Explain the role of meristems in cell generation
- Discuss and differentiate between primary and secondary growth in plants
- Discuss the role of selective permeability of membranes in transport processes in plants
- Describe the role of proton pumps
- Describe water transport in plants
- Explain the mechanisms by which water and minerals are absorbed by the roots
- Explain the role of xylem sap
- Discuss how transpiration is controlled by guard cells and xerophytes
- Explain the purpose of phloem sap
- Describe the nutritional requirements of plants
- Describe the role of soil in plant nutrition
- Discuss the role of nitrogen in plant nutrition, and how it is made available to plants
- Describe symbiosis and soil microbes in terms of nutritional adaptations
- Explain how parasitic plants extract nutrients, and how carnivorous plants supplement their mineral nutrition
- Explain the difference between sporophyte and gametophyte generations
- Describe where and how male and female gametophytes develop
- Discuss the pollination process
- Explain double fertilization
- Describe cloning of plants by asexual reproduction
- Explain the role of growth, morphogenesis and differentiation in production of the plant body
- Explain the role of the cytoskeleton in cell division and expansion
- Discuss the role of plant hormones in growth, development and response to stimuli
- Define and describe tropisms and turgor movements
- Explain the role of biological clocks and photoperiodism in plants
- Explain the role of phytochromes
- Describe how plants respond to environmental stress and exposure to pathogens

<table>
<thead>
<tr>
<th>Topic/Content Skills</th>
<th>Assessment</th>
<th>Resources</th>
<th>Instructional Method</th>
<th>Tech Infusion</th>
<th>NJCCCS: Unit II</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chapter 35: Plant Structure and Growth</td>
<td>Tests/Quizzes</td>
<td>Text</td>
<td>Lecture</td>
<td>Internet Research</td>
<td>5.1 – A, B</td>
</tr>
<tr>
<td></td>
<td>Term Paper</td>
<td>Lab Handouts</td>
<td>Discussion</td>
<td>Laserdisk Player</td>
<td>5.5 – A, C</td>
</tr>
<tr>
<td>Chapter 36: Transport in Plants</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>--------------------------------</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- An Overview of Transport Mechanisms in Plants</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Absorption of Water and Minerals in Plants</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Transport of Xylem Sap</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- The Control of Transpiration</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Translocation of Phloem Sap</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Chapter 37: Plant Nutrition</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Nutritional Requirements of Plants</td>
</tr>
<tr>
<td>- The Role of Soil in Plant Nutrition</td>
</tr>
<tr>
<td>- The Special Case of Nitrogen as a Plant Nutrient</td>
</tr>
<tr>
<td>- Nutritional Adaptations: Symbiosis of Plants and Soil Microbes</td>
</tr>
<tr>
<td>- Nutritional Adaptations: Parasitism and Predation by Plants</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Chapter 38: Plant Reproduction and Development</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Sexual Reproduction</td>
</tr>
<tr>
<td>- Asexual Reproduction</td>
</tr>
<tr>
<td>- Cellular Mechanisms of Plant Development</td>
</tr>
</tbody>
</table>
Chapter 39: Control Systems in Plants

- Plant Hormones
- Plant Movements as Models for Studying Control Systems
- Control of Daily and Seasonal Responses
- Phytochromes
- Plant Responses to Environmental Stress
- Defense Against Pathogens

Differentiated Learning Activities:

- Students will perform a lab studying plant reproduction in algae, ferns, mosses, conifers and angiosperms