**Curriculum**

**Advanced Placement Biology**

**Course Overview**

This course seeks to meet the objectives of a first-year college course in biology. It aims to achieve knowledge of the facts, principles, and processes of biology, and to develop understanding of the means by which biological information is collected and interpreted. Specific areas studied include molecular and cellular biology, genetics and evolution, flowering plant and vertebrate animal structure and physiology, and ecology. The course leads to the Advanced Placement Biology Examination in May, following which students carry out independent projects.

**Department Standards**

**STANDARD 1: THE NATURE OF SCIENCE**

**STANDARD 2: SCIENCE AND TECHNOLOGY**

**STANDARD 3: THE PHYSICAL SETTING**

**STANDARD 4: THE LIVING ENVIRONMENT**

**STANDARD 5: SCIENCE AND SOCIETY**

**Benchmarks**:

[Science Department Standards & Benchmarks](../Standards%26BenchmarksK-12.docx)

**Performance Indicators**

**AP Biology**

**Performance Indicators**

**First Quarter**

UNIT 1: BIOCHEMISTRY

Apply principles of basic chemical structure to organic and biological substances.

Evaluate biological implications of the chemical & physical properties of water.

Understand the roles of carbon, functional groups & isomers in biological molecules.

Apply the principles of dehydration & hydrolysis to biological molecules.

Relate molecular models of biological molecules to structural & molecular formulas.

Recognize the biological importance of carbohydrates, lipids, proteins, nucleic acids.

Apply correct procedures for compound & stereo microscopes.

Compare hydrolysis of starch by enzymes and acids in a full written analysis of data.

Recall stages of mitosis using prepared slides of *Allium* roots.

*Independent reading:* Differentiate populations, communities and ecosystems.

Understand the various types of distribution of species.

Summarize the main features of major acquatic and terrestrial biomes.

UNIT 2: CELLS & METABOLISM

Compare images and resolution from light microscopes, scanning electron microscopes & transmission electron microscopes.

Interpret electron microscope images of prokaryotic cell structure.

Interpret electron microsope and fluorescent microscope images of animal and plant cell structure, organelles, cytoskeleton and cell boundaries.

Compare simple diffusion, osmosis, facilitated diffusion, active & vesicle transport.

Understand how cell metabolism depends on free energy and energy transfer.

Interpret line graphs showing the effects of temperature, pH and substrate concentration on rates of enzyme-catalyzed reactions.

Relate enzyme structure to function and to enzyme regulation in organisms.

Investigate the relationship between solute concentration and rate of osmosis, producing line graphs and written analysis of the results.

Generate a line graph of a catalase enzyme reaction; explain rate changes in a report.

*Independent reading:* Differentiate innate and learned aspects of animal behavior.

Recognize how inclusive fitness may lead to altruism.

*Project:* Create a poster and contribute to a presentation about a terrestrial biome.

**Second Quarter**

UNIT 3: CELL ACTIVITY

Recognize the general importance of redox reactions in biochemistry.

Remember the main stages of glycolysis, focussing on the products.

Compare the pathways and energy derived in fermentation and aerobic respiration.

Compare the roles of substrate level, oxidative and photo-phosphorylation.

Interpret and explain graphs of the rate of photosynthesis against light intensity, CO2 concentration and temperature.

Understand the importance of photosynthetic pigments in energy gathering.

Trace the pathway of carbon through the Calvin cycle and into triose phosphates. Compare carbon fixation in C3 plants, C4 plants, and CAM plants.

Compare cell division in prokaryotes with the eukaryotic cell cycle.

Remember the stages of interphase and mitosis.

Compare cytokinesis in animal and plant cells.

Explain how the cell cycle is controlled, and how loss of control may lead to cancer. Generate a paper chromatogram of plant pigments; explain the results in an essay.

Investigate the effect of changing substrate concentration on the rate of invertase enzyme action; construct a line graph of results and explain in a laboratory report.

Use respiromemeters to compare oxygen uptake in germinating and dry peas at two temperatures; construct a line graph and explain the results in a written report.

*Independent reading:* Interpret survivorship curves & graphs of population growth.

Compare life histories of K-selected & r-selected organisms.

Compare regulation of populations by biotic and abiotic factors.

Interpret human age-structure pyramids.

UNIT 4: GENETICS

Compare the advantages of asexual and sexual reproduction.

Remember the behavior of chromosomes in the stages of meiosis I and II.

Explain the sources of variation during meiosis and fertilization.

Interpret Mendel’s Laws of Inheritance through his monohybrid and dihybrid experiments, and extend the theory to incomplete dominance and codominance.

Understand how pleiotropy, epistasis, polygenic inheritance, environmental effects, sex linkage and gene linkage may cause variations in Mendel’s laws of inheritance.

Recognize how and why human genetics may be studied through pedigree analysis.

Compare gene and chromosome mutations, using human examples.

Use gene linkage data to understand simple chromosome mapping.

Apply appropriate symbols and diagrams to solve genetic problems: dihybrid, incomplete dominance & codominance, pedigree analysis, sex & gene linkage.

Understand how the discovery of DNA structure was a cooperative event.

Use molecular models to understand DNA replication to make identical molecules.

Recognize the need for proofreading by DNA polymerase and repair by DNA ligase. Apply chi-squared tests to data derived by growing and harvesting genetic corn. Execute and extended breeding program with *Drosophila*; collate and apply chi-squared tests to results and explain the data in a written report.

Apply sterile technique to crossing *Sordaria* fungi; check for recombinant offspring.

*Independent reading:* Compare competition, predation, parasitism and mutualism.

Understand the nature of food chains and webs.

Recognize the importance of ecological succession and island biogeography.

*Project:* Plan and execute a debate on opposing sides of a current biological issue.

**Third Quarter**

UNIT 5: MOLECULAR GENETICS

Interpret flow diagrams of transcription and translation in protein synthesis.

Compare transcription and translation in prokaryotes and eukaryotes.

Recognize the significance of mutations and the redundant genetic code.

Evaluate the importance of viral genome research in DNA technology.

Compare prokaryotic and eukaryotic genome organization and regulation.

Recognize the significance of oncogene mutation and virus infection in cancer.

Explain how the universal genetic code allows for DNA technology.

Evaluate the applications of DNA technology in research, medicine and agriculture.

Carry out gene cloning and bacterial transformation procedures using restriction enzymes, DNA ligase, gel electrophoresis and sterile technique.

*Independent reading:* Differentiate the roles of producers, consumers & detritivores.

Compare energy flow and material cycling in ecosystems.

Interpret pyramid diagrams of energy, biomass and numbers for trophic levels.

Explain how the transfer of energy is related to biological magnification of toxins.

UNIT 6: EVOLUTION

Understand the Darwinian theory of evolution through descent with modification.

Evaluate morphological & molecular evidence of evolution in fossils & living species.

Understand the main causes of microevolution in gene pools.

Calculate allele, genotype & phenotype frequencies in Hardy-Weinberg equilibrium.

Contrast the impact of natural selection with the other causes of microeveolution.

Compare sympatric speciation & allopatric speciation through geographic isolation.

Explain how hybridization is limited by reproductive isolation.

Discuss limitations of evolutionary change, and the universal ancestor concept.

Understand how phylogeny is based on fossil, morphological & molecular evidence.

Recognize the need for changes in classification and the introduction of domains.

Evaluate theories for the origin of life, early cells and the role of RNA.

Recognize the need for radiometric dating of rocks and fossils.

Participate in a simulation of changes in allele frequency in a population, recording group results in a line graph, with a written analysis of the data.

*Independent reading:* Recognize the wide diversity in prokaryote structure, habitat and metabolism, and the need for separate domains Archaea and Bacteria.

Recognize that the kingdom Protista contains very diverse organisms.

*Project:* Plan a group poster and presentation about an invertebrate animal phylum.

**Fourth Quarter**

UNIT 7: PLANTS

Understand how cells & tissues function in plant structure, growth & development.

Explain how water flows through a vascular plant from root hairs to leaf mesophyll.

Analyze the effects of environmental conditions on stomatal opening and closure.

Explain how organic nutrients flow from sources to sinks though vascular plants.

Recognize the need for both macronutrients and micronutrients in plants.

Understand the importance of nitrogen fixation for plant nutrition.

Contrast asexual and sexual reproduction in flowering plants.

Check how pollination & fertilization lead to development in monocots and dicots.

Compare the effects of auxins, cytokinins, gibberellins, abscisic acid and ethylene.

Understand that plants can respond to their environment in a variety of ways.

Measure the rate of transpiration in a green plant shoot and calculate the rate of water loss under various environmental conditions.

*Independent reading:* Summarize the main groups of living plants.

Evaluate the advantages and difficulties of land adaptation in plants.

UNIT 8: VERTEBRATE SYSTEMS

Understand how food is digested and absorbed in vertebrate animals.

Compare circulatory systems in animals from different phyla.

Explain how breathing and circulation contribute to the exchange of gases.

Compare innate and acquired immunity, and humoral and cell-mediated responses.

Explain the role of antigens in vaccination, transfusion and auto-immune diseases.

Explain why animals need an excretory system adapted for various environments.

Understand the connection between kidney structure and function.

Explain thermoregulation and countercurrent exchange systems in animals.

Compare hormone action by extracellular & intracellular receptors

Understand the secretions of main endocrine glands, and their feedback regulation.

Interpret flow diagrams of gametogenesis and associated hormone systems.

Understand the main events in human fertilization, implantation and gestation.

Attribute developmental functions to embryonic cell layers & embryonic induction.

Understand the importance of membranes and ion channels in nerve impulses.

Compare somatic & autonomic, sympathetic & parasympathetic nervous systems.

Associate structure and function in the central and peripheral nervous systems.

Measure changes in heart rate in *Daphnia*, and heart rate and blood pressure in humans, generating graphical data, and analyzing the results in a written report.

*Independent reading:* Compare early development and body plans in animal phyla.

*Project:* Plan a project on a chosen topic, and make a final presentation to the class.

**Assessments**

**AP Biology**

**Assessments**

**First Quarter**

Weekly formative Quizzes on new material, including independent reading

Formative Essays on Water, Carbon, and Animal Behavior

Laboratory Reports on Starch Hydrolysis and Diffusion & Osmosis

Summative Unit Tests on Biochemistry and Cells & Metabolism

Project Presentation on Biomes (terrestrial world ecosystems)

**Second Quarter**

Weekly formative Quizzes on new material, including independent reading

Formative Essays on Plant Pigments and Chromosome Genetics.

Laboratory Reports on Catalase Enzyme, Invertase Enzyme, Cellular Respiration

Genetics problems (ungraded)

Summative Unit Tests on Cell Activity and Genetics

Project Presentation on Current Issues in biological science (debate format)

First Semester Examination (Quarter 1 and 2)

**Third Quarter**

Weekly formative Quizzes on new material, including independent reading

Formative Essays on Trophic Levels and Domains

Laboratory Reports on Drosophila Genetics and Population Genetics

Population Genetics problems (ungraded)

Summative Unit Tests on Molecular Genetics, Evolution, and Plants

Project Presentation on Invertebrate Phyla

 **Fourth Quarter**

Weekly formative Quizzes on new material, including independent reading

Formative Essay on Immune System

Laboratory Report on Daphnia and Circulatory System

Summative Unit Test on Vertebrate Systems

Mock AP Examination (whole year)

Final Project on biological topics chosen by individual students

**Core Topics**

**AP Biology**

**Core Topics**

**First Quarter**

UNIT 1: BIOCHEMISTRY

Review of general chemistry

Biological role of water

Basic carbon chemistry

Biological macromolecules

Independent reading: General Ecology

UNIT 2: CELLS & METABOLISM

Prokaryotic and eukaryotic cell structure

Cellular membranes and cell transport

Cell metabolism and enzymes

Independent reading: Animal Behavior

**Second Quarter**

UNIT 3: CELL ACTIVITY

Glycolysis, fermentation and cell respiration

Photosynthesis

Cell cycle and mitosis

Independent reading: Population Ecology

UNIT 4: GENETICS

Meiosis and sexual life cycles

Mendelian and chromosomal inheritance

DNA structure and replication

Independent reading: Community Ecology

**Third Quarter**

UNIT 5: MOLECULAR GENETICS

Genes and proteins

Viral, bacterial and eukaryotic genomes

DNA technology

Independent reading: Ecosystems

UNIT 6: EVOLUTION

Darwinian evolution

Population genetics

Speciation; Phylogeny and the origin of diversity

Independent reading: Diversity of Prokaryotes and Protists

**Fourth Quarter**

UNIT 7: PLANTS

Plant structure, growth and development

Plant transport systems and nutrition

Flowering plant reproduction

Plant hormones and responses

Independent reading: Diversity of Plants

UNIT 8: VERTEBRATE SYSTEMS

Major body systems of vertebrate animals, focusing on humans

Independent reading: Diversity of Animals

**Specific Content**

**AP Biology**

**Specific Content**

**First Quarter**

UNIT 1: BIOCHEMISTRY

Atoms, molecules, ions & isotopes; covalent, ionic and hydrogen bonding

Characteristics of water molecules; biological implications of the nature of water

Carbon atoms and bonding; functional groups and isomers in organic molecules

Principles of dehydration synthesis and hydrolysis

Carbohydrates: molecular structure and general function in organisms of monosaccharides, disaccharides and polysaccharides

Lipids: molecular structure and general function in organisms of triglycerides, phospholipids, steroids and waxes

Proteins: molecular structure and denaturation; enzymes and other examples

Nucleic acids: nucleotides and basic structure of RNA and DNA

*Laboratory work:* Microscopy, Starch Hydrolysis, Mitosis

*Independent reading:* General Ecology

Populations, communities and ecosystems

Distribution of species: dispersal, biotic & abiotic factors

Major aquatic and terrestrial biomes

UNIT 2: CELLS & METABOLISM

Microscopy: light microscopes, scanning and transmission electron microscopes

Prokaryotic & eukaryotic cell structure; general animal and plant cells; nucleus

Organelles: rough & smooth endoplasmic reticulum, Golgi apparatus, lysosomes, vacuoles, mitochondria, chloroplasts, peroxisomes and cytoskeletal fibers

Cellular membranes, walls and junctions

Cell transport: nature of the plasma membrane; simple diffusion and osmosis

Facilitated diffusion and active transport; ion pumps and gated channels

Vesicle transport: exocytosis, endocytosis and receptor-mediated endocytosis

Cell metabolism: catabolism, anabolism, free energy and laws of thermodynamics

Rates of reaction: general effects of temperature, concentration and catalysts

Enzyme structure & function; reaction pathways; energy coupling, using ATP

Rates of enzyme reactions affected by temperature, pH and substrate concentration

Enzyme regulation in cells and organisms

*Laboratory work:* Diffusion & Osmosis, Catalase

*Independent reading:* Animal Behavior

Ethology: fixed action patterns and imprinting

Genetic components of behavior: movement, signalling and mating behavior

Environmental component of behavior: learning, habituation, operant conditioning

Evolution of behavior: foraging, sexual selection and agonistic behavior

Inclusive fitness and reciprocal altruism

*Field Trip:* Royal Botanic Gardens, Kew for Biomes

*First Quarter Project:* Biomes

**Second Quarter**

UNIT 3: CELL ACTIVITY

Redox reactions and ATP production by chemiosmosis

Glycolysis: an outline of the eight reaction stages and types of enzymes

Anaerobic respiration: lactate and alcoholic fermentation

Aerobic respiration: oxidation of pyruvate and outline stages of the Krebs cycle

Substrate level phosphorylation and production of reduced coenzymes

Electron transport chain: oxidation of reduced coenzymes and proton pumps

Photosynthesis: rates depend on light intensity, CO2 concentration and temperature

Photosynthetic pigments: absorbance & action spectra of chlorophylls & carotenoids

Light reactions: photosystems; cyclic and non-cyclic photophosphorylation

Carbon fixation by the Calvin cycle: rubisco and the role of ATP & NADPH

Photorespiration and the effect on C3 plants, C4 plants, and CAM plants

Cell division in prokaryotes by binary fission

Cell cycle: interphase with details of G1, S and G2 stages

Mitosis: details of prophase, metaphase, anaphase and telophase

Cytokinesis: comparison of animal and plant cells

Control of the cell cycle: cell differentiation, check points, cyclins, and kinases

Cancer and the loss of control of cell division

*Laboratory work:* Chromatography, Invertase, Cell Respiration

*Independent reading:* Population Ecology

Population density: dispersion, demography and survivorship curves

Life histories: variety including K-selection & r-selection

Population growth: non-mathematical understanding of exponential growth

Carrying capacity and logistic population growth

Regulation of populations by biotic and abiotic factors

Human population and age structure pyramids

UNIT 4: GENETICS

Asexual reproduction and sexual life cycles

Meiosis: details of all stages of meiosis I and II

Sources of variation in sexual reproduction

Mendelian inheritance: monohybrid, dihybrid and test crosses

Incomplete dominance, multiple alleles and codominance

Pleiotropy, epistasis, polygenic inheritance and environmental effects

Humans genetics and pedigree analysis

Genes and chromosomes: sex linkage in Drosophila and humans

X-inactivation in female mammals, and formation of Barr bodies

Nondisjunction, chromosome alteration and an outline of imprinting

Gene linkage, recombinant DNA and chromosome mapping

Genetic problems: monohybrid & dihybrid, incomplete dominance & codominance, pedigree analysis, sex linkage & gene linkage, probability

DNA structure and brief history of discovery

DNA replication including main enzymes and details of nucleotide addition

Proofreading by DNA polymerase and repair by DNA ligase

Evidence of semiconservative replication

Telomeres and their role in cancer *Laboratory work:* Genetic Corn, *Drosophila*, *Sordaria*

*Independent reading:* Community Ecology

Interspecific interaction: competition, predation, parasitism, disease, and mutualism

Trophic structure: food chains and webs

Outline of disturbance, ecological succession, and island biogeography

*Second Quarter Project:* Current Issues

**Third Quarter**

UNIT 5: MOLECULAR GENETICS

Transcription: initiation, elongation, termination and the role of RNA polymerase

mRNA editing in eukaryotes

Universal genetic code: codons and anticodons

Translation: initiation, elongation, termination; polyribosomes

Prokaryotic and eukaryotic protein synthesis

Point and frameshift mutations

Viruses: genomes; structural variety and infectivity; plant and animal viruses

Reproduction of bacteriophages by lytic and lysogenic cycles

Restriction enzymes and prophages

Retroviruses, proviruses and reverse transcriptase

Bacterial genome: plasmids and recombination

Transformation, transduction and conjugation including F and R plasmids

Gene regulation in prokaryotes: inducible and repressible operons

Eukaryotic genomes: DNA packing, histones and nucleosomes

Eukaryotic regulation: chromatin modification, transcription and RNA interference

Cancer, tumor viruses, oncogenes and tumor suppressing genes

Non-coding DNA, repetitive DNA, multigene families and transposons

DNA technology: cloning, restriction enzymes and DNA ligase

DNA hybridization and cDNA using reverse transcriptase

Gel electrophoresis and PCR technology; restriction fragment length polymorphisms

Applications of DNA technology in research, medicine, forensics, and agriculture

*Field Trip:* National Centre for Biotechnology Education for DNA technology

*Independent reading:* Ecosystems

Trophic levels: producers, consumers and detritivores

Primary productivity and energy flow through ecosystems

Pyramids of energy, biomass and numbers

Cycling of materials through ecosystems; decomposition rates; human impact

UNIT 6: EVOLUTION

Darwinian theory of evolution through descent with modification

Evidence of evolution: artificial selection, evolution in action, homologous and vestigial structures, molecular relationships, biogeography, and fossils

Population genetics: causes of microevolution in gene pools; polymorphism

Hardy-Weinberg equilibrium and calculation of allele and genotype frequencies

Stabilizing, directional, disruptive, sexual selection, and adaptive radiation

Origin of species: allopatric and sympatric speciation

Reproductive isolation through prezygotic and postzygotic barriers

Exaptation, punctuated equilibrium and the evolution of complex organs

Phylogeny based on fossil, morphological and molecular evidence

Binomial nomenclature and hierarchical classification from species to domain

Molecular clocks and the universal ancestor concept

Theories for the origin of life; early atmosphere on earth; early cells and role of RNA

Radiometric dating and the geological record; continental drift

Early prokaryotes and photosyntheizers

Endosymbiotic theory of eukaryotic origins; multicellularity

Cambrian explosion; Permian extinction; Cretaceous extinction

Five kingdom and three domain taxonomic systems

*Laboratory work:* Population Genetics

*Independent reading:* Diversity of Prokaryotes and Protists

Diversity in prokaryote structure, habitat and metabolism

Domains Archaea and Bacteria

Protists as a very diverse eukaryotic kingdom, including human parasites, diatoms, foraminifera, dinoflagellates and the seaweeds

*Third Quarter Project:* Invertebrate Phyla

**Fourth Quarter**

UNIT 7: PLANTS

Plant cell types and tissues; outline of plant structure, growth and development

Water and mineral uptake by root hairs, mycorrhizae

Apoplast & symplast routes across the cortex; endodermis and Casparian strip

Water & mineral transport: root pressure & transpiration-cohesion-tension

Stomata and the environmental regulation of water loss and carbon dioxide uptake

Translocation: pressure flow mechanism

Plant nutrition: macronutrients and micronutrients; soil types

Nitrogen fixation by soil and symbiotic bacteria; epiphytes and insectivorous plants

Flowering plant reproduction: asexual and sexual reproduction

Flower structure and the production of male and female gametophytes

Pollination, double fertilization and early development in monocots and dicots

Plant hormones: auxins, cytokinins, gibberellins, abscisic acid and ethylene

Plant responses: tropisms, photoperiodism and circadian rhythms

*Laboratory work:* Transpiration

*Independent reading:* Diversity of Plants

Plants as a kingdom of closely-related multicellular photosynthetic eukaryotes

Advantages and difficulties of land adaptation in plants

Survey of plants: bryophytes, ferns, seed plants: gymnosperms & angiosperms

UNIT 8: VERTEBRATE SYSTEMS

Digestive systems: breakdown and absorption of food in various animals

Human digestive system: major enzymes; regulation by nerves and hormones

Cardiovascular systems: transport and gas exchange in various animals

Human blood components, heart and circulation; regulation by baroreceptors

Outline of the lymphatic system

Human lungs and pathway of the air; gas exchange and transport

Regulation of breathing and oxygen dissociation curves for hemoglobin

Immune systems: defenses against pathogens in various animals

Innate immunity: skin & mucous membranes, phagocytes, inflammatory responses

Acquired immunity: antigens & antibodies; lymphocyte diversity

Humoral responses: B cells; clonal selection; primary & secondary response

Cell-mediated responses: T cells; cytotoxic & helper T cells; class I & II MHC

Vaccination; blood groups & transfusion; transplants and allergies; HIV

Excretory systems: special adaptations for land, freshwater and saltwater animals

Human kidney structure and function: ultrafiltration, secretion and reabsorption

Hormonal control of osmoregulation and salt balance

Thermoregulation in various animals: countercurrent heat exchange systems

Endocrine systems: glands; hormone action; extracellular & intracellular receptors

Human endocrine organs and main secretions: hypothalamus & pituitary; thyroid & parathyroid glands; pancreas; adrenal medulla & cortex; gonads

Tropic hormones and feedback systems

Reproductive systems in various vertebrate animals

Human gametogenesis: spermatogenesis and the role of testosterone, FSH and LH

Oogenesis and the role of estrogen, progesterone, LH and FSH in the menstrual cycle

Fertilization, implantation, gestation and birth; the role of progesterone & oxytocin

Embryological development: ectoderm, mesoderm and endoderm

Cleavage, gastrulation, neurulation and organogenesis in various vertebrate animals

Extraembryonic membranes in amniote eggs and placental mammals

Embryonic induction and organizers

Nervous systems: information gathering and processing in various animals

Neurons and glial cells; impulses, synapses & ion channels; cranial & spinal refexes

Somatic nervous system: sensory and motor divisions and neurons

Autonomic nervous system: sympathetic and parasympathetic divisions

CNS: cerebrum, cerebellum, thalamus, hypothalamus, hippocampus and amygdala

Sensory mechanisms: hearing, balance and vision

Motor mechanisms: bone, cartilage, bone & ligaments; joints

Skeletal muscles: fibers, sarcomeres, and sliding filament model of contraction

Sarcoplasmic reticulum, neuromuscular junctions and role of membranes

Cardiac and smooth muscle functions

*Laboratory work:* Daphnia and Human Circulation

*Independent reading:* Diversity of Animals

Animals as a kingdom of closely-related multicellular eukarotes feeding by ingestion

Animal phyla: Porifera, Cnidaria, Platyhelminthes, Nematodes, Mollusks, Annelids, Arthropods, Echinoderms and Chordates, organized by embryonic body layers

Diploblastic & triploblastic phyla; acoelomate, pseudocoelomate & coelomate phyla

Protostome and deuterostome development

*Fourth Quarter Project:* Open biological, medical or environmental topic

**Resources**

**AP Biology**

**Resources**

Main textbook: *Biology* by Campbell & Reece (7th edition) with Study Guide

AP Biology Laboratory Manual for Students

Laboratory with lab stations and full laboratory equipment for advanced biology

Library of microscope slides

Video and DVD resources on a variety of topics

Laboratory handouts for students with preparation protocols for teachers

Test, quiz, essay and exam materials, with markschemes, on all units

Journals: *New Scientist* and *Scientific American* (classroom and School Library)

**First Quarter**

UNIT 1: BIOCHEMISTRY

*Biology* Chapters 2-5 and 50 (Ecology)

Molecular models

Equipment and materials for Microscopy, Starch Hydrolysis and Mitosis labs

UNIT 2: CELLS & METABOLISM

*Biology* Chapters 6-8 and 51 (Behavior)

Electron micrograph set

Equipment and materials for Diffusion & Osmosis and Catalase labs

Royal Botanic Gardens, Kew for Field Trip on Biomes

**Second Quarter**

UNIT 3: CELL ACTIVITY

*Biology* Chapters 9, 10, 12 and 52 (Population Ecology)

Molecular models

Equipment and materials for Chromatography, Invertase and Cell Respiration labs

UNIT 4: GENETICS

*Biology* Chapters 13-16 and 53 (Community Ecology)

Handouts for Genetics problems

Equipment and materials for Genetic Corn, *Drosophila* and *Sordaria* labs

**Third Quarter**

UNIT 5: MOLECULAR GENETICS

*Biology* Chapters 17-20 and 54 (Ecosystems)

Molecular models

National Centre for Biotechnology Education (NCBE) for DNA laboratory

UNIT 6: EVOLUTION

*Biology* Chapters 22-26 and 27/28 (Prokaryote and Protist Diversity)

Fossil collection (original and casts/models)

Handouts for Population Genetics problems

Equipment and materials for Population Genetics lab

**Fourth Quarter**

UNIT 7: PLANTS

*Biology* Chapters 35-39 and 29/30 (Plant Diversity)

Equipment and materials for Transpiration lab

TASIS England grounds for diversity and classification of plants

UNIT 8: VERTEBRATE SYSTEMS

*Biology* Chapters 41-49 and 32 (Animal Diversity)

Acrylic embedded animals for diversity

Human torso and organ models

Equipment and materials for *Daphnia* and Human Circulation labs