

Wyoming Department of Education Required Virtual Education Course Syllabus

Sheridan County School District # 1

Program Name	Sheridan County School District #1 Virtual School	Content Area	SC
Course ID	AC03056	Grade Level	11 - 12
Course Name	AP Biology	# of Credits	1
SCED Code	03056	Curriculum Type	Acellus

COURSE DESCRIPTION

AP Biology is an introductory college-level biology course. Students cultivate their understanding of biology through inquiry-based investigations by exploring topics in the following areas: Evolution Drives the Diversity and Unity of Life, Water Potential, Cell Structure, Cellular Respiration, Pigments and Photosynthesis, The Cell Cycle, Mitosis and Meiosis, History of Genetics, Human Genetics, Chromosomal Alterations, DNA and Genes, Viruses and Bacteria, Classifications, Animalia, Ecosystems, Population Growth, and Interaction. It is recommended that students complete Honors Biology and Honors Chemistry prior to taking AP Biology. Acellus AP Biology has been audited and approved by the College Board. Acellus AP Biology is A-G Approved through the University of California.

WYOMING CONTENT AND PERFORMANCE STANDARDS

STANDARD #	BENCHMARK (Standard/Indicator) Use the Standards and Benchmarks as Spreadsheets
HS-LS1-1	Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells.
HS-LS1-2	Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multi-cellular organisms.
HS-LS1-3	Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.
HS-LS1-4	Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.
HS-LS1-5	Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.
HS-LS1-7	Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of sugar molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy.
HS-LS2-1	Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.
HS-LS2-2	Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.
HS-LS2-3	Construct an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions, and revise as needed.
HS-LS2-4	Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.
HS-LS2-5	Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere.

HS-LS2-6	Evaluate the claims, evidence, and reasoning that the complex biotic and abiotic interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a modified ecosystem.
HS-LS2-7	Evaluate and assess impacts on the environment and biodiversity in order to refine or design a solution for detrimental impacts or enhancement for positive impacts.
HS-LS2-8	Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce.
HS-LS3-1	Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.
HS-LS3-2	Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and /or (3) mutations caused by environmental factors.
HS-LS3-3	Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.
HS-LS4-1	Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence.
HS-LS4-2	Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment.
HS-LS4-3	Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait.
HS-LS4-4	Construct an explanation based on evidence for how natural selection leads to adaptation of populations.
HS-LS4-5	Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species.
HS-LS4-6	Create and/or use a simulation to evaluate the impacts of human activity on biodiversity.
HS-ESS2-5	Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes.
HS-ESS2-7	Construct an argument based on evidence about the simultaneous coevolution of Earth's systems and life on Earth.

SCOPE AND SEQUENCE

UNIT OUTLINE	STANDARD#	OUTCOMES OBJECTIVES/STUDENT CENTERED GOALS
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Unit 1 - Evolution Drives the Diversity and Unity of Life	HS-LS2-8; HS-LS4-1; HS-LS4-2; HS-LS4-3; HS-LS4-4; HS-ESS2-7	In this unit, students study evolution. They learn about the nature of science, evidence for evolution, natural selection - descent with modification, the Hardy - Weinberg Theorem, Hardy - Weinberg Equilibrium, biological evolution, phylogeny (evolutionary history), and the modern synthesis theory of evolution.
Unit 2 - Water Potential	HS-ESS2-5	In this unit students study water potential. They learn about abiogenesis, properties of water, organic molecules, origin of cells, endosymbiosis, characteristics of life, cell membranes - structure, selective permeability, diffusion and cell size, water potential - concentration gradient, and experience a virtual lab on water potential
Unit 3 - Cell Structure	HS-LS1-3	In this unit students study cell structure. They learn about basic cell structure, prokaryotes, eukaryotes, mitochondria and chloroplasts, cytoskeleton, metabolism, and experience a virtual lab on calorimetry. Students also learn about enzyme structure and function, denaturation, enzyme catalyzed EA, enzyme kinetics, and experience a virtual lab on 'fingertipase' - enzyme catalysis.
Unit 4 - Cellular Respiration	HS-LS1-5; HS-LS2-5; HS-LS1-7	In this unit students respiration - photosynthesis overview, glycolysis, anaerobic respiration, redox reactions, aerobic respiration overview, glycolysis in depth, citric acid cycle, and oxidative phosphorylation, and experience a virtual lab on cellular respiration.
Unit 5 - Pigments & Photosynthesis	HS-LS1-5; HS-LS2-5; HS-LS1-7	In this unit students study pigments and photosynthesis. They begin with an overview of photosynthesis, and learn about plant pigments, have a lab demo on plant pigments and photosynthesis, and go on to learn about light reactions, photosystems, photophosphorylation, and carbon fixation (or calvin cycle). They put it all together in a disucssion of photosynthesis and respiration, and then study feedback mechanisms.
Unit 6 - The Cell Cycle	HS-LS1-3; HS-LS1-4;	In this unit students learn about the cell cycle. They learn why cells divide, and about the origin of the cell cycle, chromosome structure, and phases of the cycle, and they experience three virtual labs on cell division. They also learn about variances in the cell cycle, control of the cell cycle, and uncontrolled cell cycle.
Unit 7 - Mitosis & Meiosis	HS-LS1-4;	In this unit students study mitosis and meiosis. They learn about two types of cell reproduction, meiosis overview, the phases of meiosis, and meiosis and genetic variation, and experience two more virtual labs on cell division. They also learn about meiosis and gamete formation.

Unit 8 - History of Genetics	HS-LS1-1; HS-LS3-1; HS-LS3-2; HS-LS3-3	In this unit students study the history of genetics. They learn about mendelian theory of inheritance, demo: mendel inheritance, the punnett square, punnett squares - monohybrid crosses, punnett squares - dihybrid crosses, and the law of probability, and they practice with probability,
Unit 9 - Human Genetics	HS-LS1-1; HS-LS3-1; HS-LS3-2; HS-LS3-3	In this unit students study human genetics. They learn about exceptions to mendel's rules, human genetics – pedigrees, and human genetics – karyotypes, and they practice with pedigrees and with karyotypes.
Unit 10 - Chromosomal Alterations	HS-LS1-1; HS-LS3-1; HS-LS3-2; HS-LS3-3	In this unit students study chromosomal alterations. They learn about diagramming nondisjunction, and chromosomal theory of inheritance, and they experience three virtual labs on genetics. They also learn about gene mapping, mutations, and more chromosomal alterations.
Unit 11 - DNA	HS-LS1-1; HS-LS3-1; HS-LS3-2; HS-LS3-3	In this unit students study DNA. They learn about the race for the double helix, the structure of DNA, DNA replication, DNA replication - a closer look, priming DNA replication, the central dogma of biology, and cracking the genetic code.
Unit 12 - Genes	HS-LS1-1; HS-LS3-1; HS-LS3-2; HS-LS3-3	In this unit students study Genes. They learn about how genetic material is moved from nucleus to cytoplasm, TRNA and RRNA, gene anatomy, steps of transcription, RNA processing, steps of translation, operons - gene expression in prokaryotes, control of gene expression in eukaryotes, and biotechnology. They also experience a virtual lab on biotechnology.
Unit 13 - Viruses and Bacteria	HS-LS1-3	In this unit students study viruses and bacteria. They learn about biodiversity, taxonomy of biodiversity, classification of viruses, evolution of viruses, genetics of viruses, classificaton of bacteria, anatomy of bacteria, and genetics of bacteria. They also experience a lab on bacterial transformation.
Unit 14 - Classifications	HS-LS1-2; HS-LS1-3	In this unit students study classifications. They learn about classification of Protista, classification of fungi, classification of plantae, anatomy of a plant, and plant responses to stimuli. They also experience a virtual lab ontranspiration.
Unit 15 - Animalia	HS-LS1-2; HS-LS1-3	In this unit students study animalia. They learn about classification of animalia, divisons of animalia, development of animalia, nervous system, immune system, endocrine system, animal response to stimuli, and learned behaviors. They also experience a virtual lab on fruit fly behavior.

Unit 16 - Ecosystems	HS-LS2-1; HS-LS2-2; HS-LS2-3; HS-LS2-4; HS-LS2-6; HS-LS2-8	In this unit students study ecosystems. They learn about biological hierarchy, abiotic and biotic factors, energy flow in ecosystem, and energy dynamics. They experience two virtual labs on energy dynamics, and go on to learn about biogeochemical cycles, earth's terrestrial biomes, earth's aquatic biomes, ecological succession.
Unit 17 - Population Growth & Interaction	HS-LS2-7; HS-LS2-8; HS-LS4-5; HS-LS4-6	In this unit students study population growth and interaction. They learn about species interaction, population dynamics, and growth strategies.