Wyoming Department of Education Required Virtual Education Course Syllabus

BIG HORN COUNTY SCHOOL DISTRICT #1

Program Name	WYCA	Content Area	Science
Course ID	CASC86321	Grade Level	9, 10, 11, 12
Course Name	AP Biology B	# of Credits	0.5
SCED Code	03056E0.5022	Curriculum Type	Connections Academy

COURSE DESCRIPTION

AP Biology B is taught at the same level as a first-year college biology class. In this course, the student will develop a framework for biology and gain a deeper understanding of science as a process. Some of the major themes throughout this course include diversity of organisms, the structure and function of plants and animals, population dynamics, and global issues with ecology.

This course adheres closely to the College Board standards for AP Biology and will prepare the student to take the AP Biology Exam.

WYOMING CONTENT AND PERFORMANCE STANDARDS

STANDARD#	BENCHMARK
HS-PS2-6	Communicate scientific and technical information about why the molecular-level structure is important in the functioning of materials.
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-LS1-4	Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.
HS-LS1-6	Construct explanations and revise, as needed, based on evidence for: 1) how carbon, hydrogen, and oxygen may combine with other elements to form amino acids and/or other large carbon-based molecules, and 2) how other hydrocarbons may also combine to form large carbon-based molecules.
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-LS2-7	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-LS4-2	Construct an explanation based on evidence that the process of evolution primarily result s 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
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-ESS3-1	Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.
HS-ESS3-3	Use computational tools to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity.

SCOPE AND SEQUENCE

UNIT OUTLINE	STANDARD#	OUTCOMES
Unit 1: Getting Started The Getting Started unit will serve as an introduction to the AP Biology Framework.		•understand how the course is organized and how to use the course navigational tools •understand the course requirements •describe the format and timing of the AP Biology Exam •explain what can be considered science and how science is practiced •identify what types of questions can be answered by science •explain the difference between a law and theory •describe the types of scientific investigations that will be conducted in this course
Unit 2: Genetics Unit 2, "Genetics," introduces students to Big Idea #3: Living systems store, retrieve, transmit and respond to information essential to life processes. In this module, students will explore the processes of cell division and transcription and translation. They will also explore chromosomal inheritance through examples of Mendelian and non-Mendelian genetics.	HS-LS1-1, HS-LS1-4, HS-LS3-1, HS-LS3-2, HS-LS3-3, HS-LS4-3	•make predictions about natural phenomena occurring during the cell cycle •describe the events that occur in the cell cycle •construct an explanation, using visual representations or narratives, as to how DNA in chromosomes is transmitted to the next generation via mitosis, or meiosis followed by fertilization •represent the connection between meiosis and increased genetic diversity necessary for evolution •evaluate evidence provided by data sets to support the claim that heritable information is passed from one generation to another generation through mitosis, or meiosis followed by fertilization •construct a representation that connects the process of meiosis to the passage of traits from parent to offspring •pose questions about ethical, social, or medical issues surrounding human genetic disorders •apply mathematical routines to determine Mendelian patterns of inheritance provided by data sets •explain deviations from Mendel's model of the inheritance of traits •explain how the inheritance patterns of many traits cannot be accounted for by Mendelian genetics •describe representations of an appropriate example of inheritance patterns that cannot be explained by Mendel's model of the inheritance of traits •construct scientific explanations that use the structures and mechanisms of DNA and RNA to support the claim that DNA and, in some cases, that RNA are the primary sources of heritable information •justify the selection of data from historical investigations that support the claim that DNA is the source of heritable information •describe representations and models that illustrate how genetic information is copied for transmission between generations •describe representations and models illustrating how genetic information is translated into polypeptides •justify the claim that humans can manipulate heritable information by identifying at least two commonly used technologies •predict how a change in a specific DNA or RNA sequence can result in changes in gene expression •refine representations to illustrate how interactions between external stimuli and gene expression result in specialization of cells, tissues, and organs •describe the connection between the regulation of gene expression and observed differences between different kinds of organisms •describe the connection between the regulation of gene expression and observed differences between individuals in a population •explain how the regulation of gene expression is essential for the processes and structures that support efficient cell function •explain the connection between genetic variations in organisms and phenotypic variations in populations •use representations to describe how gene regulation influences cell products and function

Unit 3: Transmission Unit 3, "Transmission," continues to address Big Idea #3: Living systems store, retrieve, transmit and respond to information essential to life processes. This unit addresses how living systems transmit and respond to information, including signal transduction pathways and cell communication.	HS-LS1-2, HS-LS2-8, HS-LS3-2, HS-LS4-2	•compare and contrast processes by which genetic variation is produced and maintained in organisms from multiple domains •construct an explanation of the multiple processes that increase variation within a population •construct explanations based on evidence of how variation in molecular units provides cells with a wider range of functions •construct an explanation of how viruses introduce genetic variation in host organisms •use representations and appropriate models to describe how viral replication introduces genetic variation in the viral population •describe basic chemical processes for cell communication shared across evolutionary lines of descent •generate scientific questions involving cell communication as it relates to the process of evolution •use representation(s) and appropriate models to describe features of a cell signaling pathway •construct explanations of cell communication through cell-to-cell direct contact or through chemical signaling •create representation(s) that depict how cell-to-cell communication occurs by direct contact or from a distance through chemical signaling •explain how signal pathways mediate gene expression, including how this process can affect protein production •use representations to describe mechanisms of the regulation of gene expression •describe a model that expresses the key elements of signal transduction pathways by which a signal is converted to a cellular response •justify claims based on scientific evidence that changes in signal transduction pathways can alter cellular response •describe a model that expresses key elements to show how change in signal transduction can alter cellular response •construct an explanation of how certain drugs affect signal reception and, consequently, signal transduction pathways •analyze data that indicate how organisms exchange information in response to internal changes and external cues, and which can change behavior •create a representation that describes how organisms exchange information in response to internal changes and external cues, and which can result in changes in behavior •describe how organisms exchange information in response to internal changes or environmental cues •construct an explanation, based on scientific theories and models, about how nervous systems detect external and internal signals, transmit and integrate information, and produce responses •describe how nervous systems detect external and internal signals •describe how nervous systems transmit information •describe how the vertebrate brain integrates information to produce a response •create a visual representation of complex nervous systems to describe/explain how these systems detect external and internal signals, transmit and integrate information, and produce responses •create a visual representation to describe how nervous systems detect external and internal signals •create a visual representation to describe how nervous systems transmit information •create a visual representation to describe how the vertebrate brain integrates information to produce a response
Unit 4: Systems & Populations Unit 4, "Systems and Populations," introduces students to Big Idea #4: Biological systems interact, and these systems and their interactions possess complex properties. This unit concentrates on biological interactions at various levels, from molecular, to cellular, to systems and organs, to populations and communities.	HS-PS2-6, HS-LS1-2, HS-LS1-6, HS-LS2-1, HS-LS2-2, HS-LS4-4	•explain the connection between the sequence and the subcomponents of a biological polymer and its properties •refine representations and models to explain how the subcomponents of a biological polymer and their sequence determine the properties of that polymer •use models to predict and justify that changes in the subcomponents of a biological polymer affect the functionality of the molecule •analyze data to identify how molecular interactions affect structure and function •construct explanations based on evidence of how variation in molecular units provides cells with a wider range of functions •use representations and models to analyze how cooperative interactions within organisms promote efficiency in the use of energy and matter •evaluate scientific questions concerning organisms that exhibit complex properties due to the interaction of their constituent parts •predict the effects of a change in a component(s) of a biological system on the functionality of an organism(s) •refine representations and models to illustrate biocomplexity due to interactions of the constituent parts •justify the selection of the kind of data needed to answer scientific questions about the interaction of populations within communities •apply mathematical routines to quantities that describe communities composed of populations of organisms that interact in complex ways •predict the effects of a change in the community's populations on the community
		•apply mathematical routines to quantities that describe interactions among living systems and their environment, which result in the movement of matter and energy •use visual representations to analyze situations or solve problems qualitatively to illustrate how interactions among living systems and with their environment result in the movement of matter and energy •predict the effects of a change of matter or energy availability on communities
Unit 5: Change & Biodiversity Unit 5, "Change and Biodiversity," continues to address Big Idea #4: Biological systems interact, and these systems and their interactions possess complex properties. This unit addresses the effects of variation and diversity, phenotypic expression, and human and environmental impacts on an ecosystem.	HS-LS2-1, HS-LS2-2, HS-LS2-7, HS-LS4-4, HS-LS4-5, HS-ESS3-1, HS-ESS3-3	•explain how the distribution of ecosystems changes over time by identifying large-scale events that have resulted in these changes in the past •predict consequences of human actions on both local and global ecosystems •construct explanations of the influence of environmental factors on the phenotype of an organism •predict the effects of a change in an environmental factor on the genotypic expression of the phenotype •predict how a change in genotype, when expressed as a phenotype, provides a variation that can be subject to natural selection •use evidence to justify a claim that a variety of phenotypic responses to a single environmental factor can result from different genotypes within the population •use theories and models to make scientific claims and/or predictions about the effects of variation within populations on survival and fitness •make scientific claims and predictions about how species diversity within an ecosystem influences ecosystem stability