

Wyoming Department of Education Required Virtual Education Course Syllabus

2201000 - Washakie County School District No. 1

Program Name	Washakie #1 Online	Content Area	SC
Course ID	W03051G0.5012	Grade Level	9-12
Course Name	WOL-Biology-A	# of Credits	0.5 Total
SCED Code	03051G0.5012	Curriculum Type	K-12 Fuel Education

COURSE DESCRIPTION

In the first semester section of this comprehensive course, students investigate the chemistry of living things: the cell, genetics, evolution, the structure and function of living things, and ecology. The program consists of indepth online lessons, including extensive animations, an associated reference book, collaborative explorations, virtual laboratories, and hands-on laboratory experiments students can conduct at home.

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-LS1-6	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-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-LS2-3	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-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 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 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.

SCOPE AND SEQUENCE

UNIT OUTLINE	STANDARD#	OUTCOMES OBJECTIVES/STUDENT CENTERED GOALS
Semester 1		
Unit 1: The Science of Biology <ul style="list-style-type: none"> • Semester Introduction • Biology and Scientific Methods • Scientific Processes 1 • Scientific Processes 2 • Laboratory: Using a Microscope • The Characteristics of Life 1 • The Characteristics of Life 2 • The Characteristics of Life 3 • Energy and Life • Structure and Function 	HS-LS1-2 HS-LS1-3 HS-LS1-5 HS-LS1-7 HS-LS2-3 HS-LS2-4 HS-LS1-4 HS-LS4-1 HS-LS4-2 HS-LS4-3 HS-LS4-4 HS-LS4-5	<p>Students read scientific text about various systems in life science and analyze organizational systems including cell structure, gene expression, organ systems in humans and other animals.</p> <p>Students read scientific text about homeostasis and feedback mechanisms in living systems.</p> <p>Students read scientific text and analyze diagrams outlining photosynthesis. They then write descriptions and perform online quizzes to translate their understanding of the importance of light energy to cells and all living things.</p> <p>Students read scientific text and analyze diagrams of cellular respiration to understand glucose provides the vast majority of chemical energy to living things and gives ATP through the process of cellular respiration.</p> <p>Students read scientific text, analyze diagrams, and complete online activities to understand systems of living things for aerobic conditions and for those living things, such as bacteria, that do not use oxygen.</p> <p>Students read scientific text and analyze diagrams of mitosis and the cell specialization required to produce plants and animals.</p> <p>Students read scientific text and analyze diagrams explaining the theory of evolution through examination of Earth's history and environmental factors, specific animal examples of mutation and reproduction, and genetic evidence. Further, students participate in a discussion with peers on the process of natural selection.</p> <p>Students complete online activities to better understand the process of evolution and learn to craft an argument based on gathered evidence through their honors project work. Students perform a laboratory experiment modeling natural selection on leg length in lizards and discuss their results with others.</p> <p>Students read scientific text and complete online activities to better understand genetic variation and the importance of a diverse population in face of environmental variables such as weather extremes, changes in food supply, or disease.</p> <p>Students perform a laboratory experiment to model how natural selection will act on a hypothetical trait</p>

		<p>of leg length in lizards.</p> <p>Students read scientific text and analyze numerous examples of how environmental conditions, such as extreme weather, sudden impacts, and loss of habitat can change the composition of an ecosystem.</p>
<p>Unit 2: The Chemistry of Life</p> <ul style="list-style-type: none"> • Chemistry Review • Chemical Bonds • Carbon and Life • Organic Compounds and Trace Elements Ions in Living Things • Useful Chemicals from Living Things • Water • Laboratory: Investigating Biological Compounds 1 • Laboratory: Investigating Biological Compounds 2 • Simple Carbohydrates • Complex Carbohydrates • Lipids • Amino Acids and Proteins • Levels of Protein Structure • Proteins as Enzymes • Nucleic Acids • ATP 	<p>HS-LS1-1 HS-LS1-3 HS-LS1-6 HS-LS1-7 HS-LS2-3 HS-LS2-4</p>	<p>Students read scientific text and analyze diagrams outlining the structure of DNA and learning how important it is for all living things. Students learn about proteins as carriers of oxygen, enzymes and providing structure and support for cells.</p> <p>Students read scientific text about various systems in life science and analyze organizational systems including cell structure, gene expression, organ systems in humans and other animals.</p> <p>Students read scientific text about homeostasis and feedback mechanisms in living systems.</p> <p>Students read scientific text about amino acids as important building blocks for many living things and conduct an investigation to identify the presence of organic molecules.</p> <p>Students read scientific text and analyze diagrams of cellular respiration to understand glucose provides the vast majority of chemical energy to living things and gives ATP through the process of cellular respiration.</p> <p>Students read scientific text, analyze diagrams, and complete online activities to understand systems of living things for aerobic conditions and for those living things, such as bacteria, that do not use oxygen.</p>
<p>Unit 3: Cell Biology</p> <ul style="list-style-type: none"> • The Cell and Life • Cell Structure • Cell Organelles • Two Types of Cells • Cell Membrane Structure • Movement Across Membranes • Passive Transport • Active Transport • Laboratory: Determining the Rate of Diffusion 1 • Laboratory: Determining the Rate of Diffusion 2 • Glycolysis and Fermentation • The Krebs Cycle • The Electron Transport System • Light and Photosynthesis • Photosynthesis and Glucose • Chemical Energy and Life • Respiration and Photosynthesis 	<p>HS-LS1-1 HS-LS1-2 HS-LS1-3 HS-LS1-5 HS-LS1-7 HS-LS2-3 HS-LS2-4 HS-LS2-5 HS-LS1-4 HS-LS3-1 HS-LS3-2 HS-LS4-2</p>	<p>Students read scientific text and analyze diagrams outlining the structure of DNA and learning how important it is for all living things. Students learn about proteins as carriers of oxygen, enzymes and providing structure and support for cells.</p> <p>Students read scientific text about various systems in life science and analyze organizational systems including cell structure, gene expression, organ systems in humans and other animals.</p> <p>Students read scientific text about homeostasis and feedback mechanisms in living systems.</p> <p>Students read scientific text and analyze diagrams outlining photosynthesis. They then write descriptions and perform online quizzes to translate their understanding of the importance of light energy to cells and all living things.</p> <p>Students read scientific text and analyze diagrams</p>

<ul style="list-style-type: none"> • Laboratory: The Rate of Photosynthesis 1 • Laboratory: The Rate of Photosynthesis 2 • Reproduction and Development • Mitosis • Laboratory: Observing Mitosis • Cell Differentiation • Cell Specialization • Sexual Reproduction • Meiosis I • Meiosis II 		<p>of cellular respiration to understand glucose provides the vast majority of chemical energy to living things and gives ATP through the process of cellular respiration.</p> <p>Students read scientific text, analyze diagrams, and complete online activities to understand systems of living things for aerobic conditions and for those living things, such as bacteria, that do not use oxygen.</p> <p>Students read scientific text and analyze diagrams of mitosis and the cell specialization required to produce plants and animals.</p> <p>Students read scientific text and complete online activities to understand inheritance and how physical traits are passed from parent to offspring.</p> <p>Students read scientific text and perform online activities examining mutations by sexual reproduction and environmental factors and gain an understanding of how sexual reproduction increases variation in a population.</p> <p>Students complete online activities to better understand the process of evolution and learn to craft an argument based on gathered evidence through their honors project work. Students perform a laboratory experiment modeling natural selection on leg length in lizards and discuss their results with others.</p>
<p>Unit 4: Mendelian Genetics</p> <ul style="list-style-type: none"> • The Work of Gregor Mendel • Mendelian Inheritance • Laboratory: Genetic Crosses 1 • Laboratory: Genetic Crosses 2 • Pedigrees • Laboratory: Gene Mapping • Chromosomes and Genes • Genes and Alleles • Genetic Variation 	<p>HS-LS1-1 HS-LS3-1 HS-LS3-3 HS-LS4-1 HS-LS4-3</p>	<p>Students read scientific text and analyze diagrams outlining the structure of DNA and learning how important it is for all living things. Students learn about proteins as carriers of oxygen, enzymes and providing structure and support for cells.</p> <p>Students read scientific text and complete online activities to understand inheritance and how physical traits are passed from parent to offspring.</p> <p>Students read scientific text and perform a laboratory experiment examining genetic crosses to investigate variation in populations. Students read about a fictional fruit-dove population and changes in allele frequencies of a given trait and perform a laboratory experiment modeling natural selection on leg length in lizards and discuss their results with others.</p> <p>Students read scientific text and analyze diagrams explaining the theory of evolution through examination of Earth's history and environmental factors, specific animal examples of mutation and reproduction, and genetic evidence. Further, students participate in a discussion with peers on the process of natural selection.</p>

		Students read scientific text and complete online activities to better understand genetic variation and the importance of a diverse population in face of environmental variables such as weather extremes, changes in food supply, or disease.
Unit 5: Molecular Genetics <ul style="list-style-type: none"> • DNA, RNA, and Proteins • Structure of DNA • Structures of RNA • DNA Replication • Transcription • Laboratory: Modeling DNA • Laboratory: Modeling DNA Replication • DNA Makes RNA • RNA Makes Protein • The Genetic Code 	HS-LS1-1 HS-LS3-1	Students read scientific text and analyze diagrams outlining the structure of DNA and learning how important it is for all living things. Students learn about proteins as carriers of oxygen, enzymes and providing structure and support for cells. Students read scientific text and complete online activities to understand inheritance and how physical traits are passed from parent to offspring.
Unit 6: Semester Review and Test <ul style="list-style-type: none"> • Semester Review Semester Test 		