



Alignment Document

State of Connecticut And Aventa Learning Biology

Biology 2005-2007 Benchmark Blueprint

State Standard Number	State Standard Area / Description	Unit Name	Course Topic Description
0	How is scientific knowledge created and communicated?	The Nature of Science and Biology	Science and The Scientific Method
0	Scientific Inquiry	The Nature of Science and Biology	Science and The Scientific Method and Lab
NA	Scientific inquiry is a thoughtful and coordinated attempt to search out, describe, explain and predict natural phenomena	The Nature of Science and Biology	Science and The Scientific Method
NA	Scientific inquiry progresses through a continuous process of questioning, data collection, analysis and interpretation.	The Nature of Science and Biology	Science and The Scientific Method and Lab
NA	Scientific inquiry requires the sharing of findings and ideas for critical review by colleagues and other scientists.	The Nature of Science and Biology	Science and The Scientific Method and Lab
0	Scientific Literacy	The Nature of Science and Biology	Science and The Scientific Method
NA	Scientific literacy includes the ability to read, write, discuss and present coherent ideas about science.	The Nature of Science and Biology	Science and The Scientific Method
NA	Scientific literacy also includes the ability to search for and assess the relevance and credibility of scientific information found in various print and electronic media.	The Nature of Science and Biology	Science and The Scientific Method
0	Scientific Numeracy	Cell Structure	Cell Structure: Part One



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NA	Scientific numeracy includes the ability to use mathematical operations and procedures to calculate, analyze and present scientific data and ideas.	Cell Structure	Cell Structure and Lab
D INQ.1	Identify questions that can be answered through scientific investigation.	The Nature of Science and Biology	Science and The Scientific Method and Lab
D INQ.2	Read, interpret and examine the credibility and validity of scientific claims in different sources of information.	The Nature of Science and Biology	Characteristics of Life
D INQ.3	Formulate a testable hypothesis and demonstrate logical connections between the scientific concepts guiding the hypothesis and the design of the experiment.	The Nature of Science and Biology	Science and The Scientific Method and Lab
D INQ.4	Design and conduct appropriate types of scientific investigations to answer different questions.	The Nature of Science and Biology	Science and The Scientific Method and Lab
D INQ.5	Identify independent and dependent variables, including those that are kept constant and those used as controls.	The Nature of Science and Biology	Science and The Scientific Method and Lab
D INQ.6	Use appropriate tools and techniques to make observations and gather data.	Cell Structure	Cell Structure
D INQ.7	Assess the reliability of the data that was generated in the investigation.	The Nature of Science and Biology	Science and The Scientific Method and Lab
D INQ.8	Use mathematical operations to analyze and interpret data, and present relationships between variables in appropriate forms.	Cell Structure	Cell Structure
D INQ.9	Articulate conclusions and explanations based on research data, and assess results based on the design of the investigation.	The Nature of Science and Biology	Science and The Scientific Method and Lab
D INQ.10	Communicate about science in different formats, using relevant science vocabulary, supporting evidence and clear logic.	The Nature of Science and Biology	Characteristics of Life
IV	Cell Chemistry and Biotechnology		
IV.A	How are organisms structured to ensure efficiency and survival?		
IV.A.10.1	Fundamental life processes depend on the physical structure and the chemical activities of the cell.	The Nature of Science and Biology and Photosynthesis	Chemistry of Life: Introduction and Photosynthesis and Cellular Respiration



0	Most of the chemical activities of the cell are catalyzed by enzymes that function only in a narrow range of temperature and acidity conditions.	The Nature of Science and Biology and Photosynthesis	Chemistry of Life, Photosynthesis and Cellular Respiration and Enzymes Lab
0	The cellular processes of photosynthesis and respiration involve transformation of matter and energy.	Photosynthesis	Photosynthesis and Cellular Respiration
IV.A.10.1.D 27	Describe significant similarities and differences in the basic structure of plant and animal cells.	Cell Structure	Cell Structure
IV.A.10.1.D 28	Describe the general role of DNA and RNA in protein synthesis.	Genetics	How Proteins Are Made and Protein Synthesis: From Gene to Protein
IV.A.10.1.D 29	Describe the general role of enzymes in metabolic cell processes.	The Nature of Science and Biology and Photosynthesis	Chemistry of Life, Photosynthesis and Cellular Respiration and Enzymes Lab
IV.A.10.1.D 30	Explain the role of the cell membrane in supporting cell functions.	Cell Structure	Cell Structure and The Cell Membrane
IV.B	How do science and technology affect the quality of our lives?		
IV.B.10.2	Microorganisms have an essential role in life processes and cycles on Earth.	Biological Diversity	Domain Bacteria
0	Understanding the growth and spread patterns of viruses and bacteria enables the development of methods to prevent and treat infectious diseases.	Animal Organization	The Lymphatic System And Immunity
IV.B.10.2.D 31	Describe the similarities and differences between bacteria and viruses.	Biological Diversity	Prokaryotes, Bacterial Structure and Bacterial Reproduction
IV.B.10.2.D 32	Describe how bacterial and viral infectious diseases are transmitted, and explain the roles of sanitation, vaccination and antibiotic medications in the prevention and treatment of infectious diseases.	Animal Organization	The Lymphatic System And Immunity
IV.B.10.2.D 33	Explain how bacteria and yeasts are used to produce foods for human consumption.	Genetics	Biotechnology and the Genetics Revolution
IV.C	How do science and technology affect the quality of our lives?	Genetics	Biotechnology and the Genetics Revolution
IV.C.10.3	Similarities in the chemical and structural properties of DNA in all living organisms allow the transfer of genes from one organism to another.	Genetics	The Chromosome Theory Of Inheritance

0	The principles of genetics and cellular chemistry can be used to produce new foods and medicines in biotechnological processes.	Genetics	Biotechnology and the Genetics Revolution
IV.C.10.3.D 34	Describe, in general terms, how the genetic information of organisms can be altered to make them produce new materials.	Genetics	Biotechnology and the Genetics Revolution
IV.C.10.3.D 35	Explain the risks and benefits of altering the genetic composition and cell products of existing organisms.	Genetics	Biotechnology and the Genetics Revolution
V	Genetics, Evolution and Biodiversity	Genetics	Mendel and Heredity
V.A	What processes are responsible for life's unity and diversity?	Genetics	Mendel and Heredity
V.A.10.4	In sexually reproducing organisms, each offspring contains a mix of characteristics inherited from both parents.	Cell Structure	Meiosis and Sexual Reproduction
0	Genetic information is stored in genes that are located on chromosomes inside the cell nucleus.	Cell Structure	Meiosis and Sexual Reproduction
0	Most organisms have two genes for each trait, one on each of the homologous chromosomes in the cell nucleus.	Cell Structure	Meiosis and Sexual Reproduction
V.A.10.4.D 36	Explain how meiosis contributes to the genetic variability of organisms.	Cell Structure	Meiosis and Sexual Reproduction
V.A.10.4.D 37	Use the Punnet Square technique to predict the distribution of traits in mono- and di-hybrid crossings.	Genetics	Mendel and Heredity
V.A.10.4.D 38	Deduce the probable mode of inheritance of traits (e.g., recessive/dominant, sex-linked) from pedigree diagrams showing phenotypes.	Genetics	The Chromosome Theory Of Inheritance
V.A.10.4.D 39	Describe the difference between genetic disorders and infectious diseases.	Genetics	The Chromosome Theory Of Inheritance
V.B	What processes are responsible for life's unity and diversity?	Genetics	Mendel and Heredity
V.B.10.5	Evolution and biodiversity are the result of genetic changes that occur over time in constantly changing environments.	Evolution	Descent With Modification



0	Mutations and recombination of genes create genetic variability in populations.	Cell Structure	Meiosis and Sexual Reproduction
0	Changes in the environment may result in the selection of organisms that are better able to survive and reproduce.	Evolution	Descent With Modification
V.B.10.5.D 40	Explain how the processes of genetic mutation and natural selection are related to the evolution of species.	Evolution	Descent With Modification
V.B.10.5.D 41	Explain how the current theory of evolution provides a scientific explanation for fossil records of ancient life forms.	Evolution	Descent With Modification
V.B.10.5.D 42	Describe how structural and behavioral adaptations increase the chances for organisms to survive in their environments.		
V.C	How do science and technology affect the quality of our lives?	Population Ecology	Population Growth
V.C.10.6	Living organisms have the capability of producing populations of unlimited size, but the environment can support only a limited number of individuals from each species.	Evolution	Descent With Modification
0	Human populations grow due to advances in agriculture, medicine, construction and the use of energy.	Population Ecology	Population Growth
0	Humans modify ecosystems as a result of rapid population growth, use of technology and consumption of resources.	Population Ecology	Population Growth
V.C.10.6.D 43	Describe the factors that affect the carrying capacity of the environment.	Population Ecology	Population Growth
V.C.10.6.D 44	Explain how change in population density is affected by emigration, immigration, birth rate and death rate, and relate these factors to the exponential growth of human populations.	Population Ecology	Population Growth
V.C.10.6.D 45	Explain how technological advances have affected the size and growth rate of human populations throughout history.	Population Ecology	Population Growth
B	Biology		
B.1	Cell Biology		



B.1.1	The fundamental life processes of plants and animals depend on a variety of chemical reactions that occur in specialized areas of the organism's cells.	Photosynthesis	Photosynthesis and Cellular Respiration
B.1.1.1	Cells are enclosed within semi-permeable membranes that regulate their interaction with their surroundings.	Cell Structure	Cell Structure and The Cell Membrane
B.1.1.2	Enzymes are proteins that catalyze biochemical reactions without altering the reaction equilibrium and the activities of enzymes depend on the temperature, ionic conditions and the pH of the surroundings.	The Nature of Science and Biology and Photosynthesis	Chemistry of Life, Photosynthesis and Cellular Respiration and Enzymes Lab
B.1.1.3	Prokaryotic cells, eukaryotic cells (including those from plants and animals), and viruses differ in complexity and general structure.	Cell Structure and Biological Div	Cell Structure and Prokaryotes
B.1.1.4	The central dogma of molecular biology outlines the flow of information from transcription of ribonucleic acid (RNA) in the nucleus to translation of proteins on ribosomes in the cytoplasm.	Genetics	How Proteins Are Made and Protein Synthesis
B.1.1.5	The endoplasmic reticulum and Golgi apparatus have a role in the secretion of proteins.	Cell Structure	Cell Structure
B.1.1.6	Usable energy is captured from sunlight by chloroplasts and is stored through the synthesis of sugar from carbon dioxide.	Photosynthesis	Photosynthesis and Cellular Respiration
B.1.1.7	The role of the mitochondria is to make stored chemical-bond energy available to cells by completing the breakdown of glucose to carbon dioxide.	Photosynthesis	Photosynthesis and Cellular Respiration
B.1.1.8	Most macromolecules (polysaccharides, nucleic acids, proteins, lipids) in cells and organisms are synthesized from a small collection of simple precursors.	The Nature of Science and Biology	Chemistry of Life
B.2	Genetics		
B.2.1	Mutation and sexual reproduction lead to genetic variation in a population.	Cell Structure	Meiosis and Sexual Reproduction



B.2.1.1	Meiosis is an early step in sexual reproduction in which the pairs of chromosomes separate and segregate randomly during cell division to produce gametes containing one chromosome of each type.	Cell Structure	Meiosis and Sexual Reproduction
B.2.1.2	Only certain cells in a multicellular organism undergo meiosis.	Cell Structure	Meiosis and Sexual Reproduction
B.2.1.3	Random chromosome segregation explains the probability that a particular allele will be in a gamete.	Genetics	Mendel and Heredity
B.2.1.4	New combinations of alleles may be generated in a zygote through the fusion of male and female gametes (fertilization).	Cell Structure	Meiosis and Sexual Reproduction
B.2.1.5	Approximately half of an individual's DNA sequence comes from each parent.	Genetics	The Chromosome Theory Of Inheritance
B.2.1.6	Genes on specific chromosomes determine an individual's sex.	Genetics	The Chromosome Theory Of Inheritance
B.2.1.7	Possible combinations of alleles in a zygote can be predicted from the genetic makeup of the parents.	Genetics	Mendel and Heredity
B.2.2	A multicellular organism develops from a single zygote, and its phenotype depends on its genotype, which is established at fertilization.	Cell Structure	Meiosis and Sexual Reproduction
B.2.2.1	The probable outcome of phenotypes in a genetic cross can be predicted from the genotypes of the parents and mode of inheritance (autosomal or X-linked, dominant or recessive).	Genetics	Mendel and Heredity
B.2.2.2	Mendel's laws of segregation and independent assortment are the basis of genetics.	Genetics	Mendel and Heredity
B.2.2.3	The probable mode of inheritance can be predicted from a pedigree diagram showing phenotypes.	Genetics	The Chromosome Theory Of Inheritance
B.2.2.4	Data on frequency of recombination at meiosis can be used to estimate genetic distances between loci and to interpret genetic maps of chromosomes.		

B.2.3	Genes are a set of instructions encoded in the DNA sequence of each organism that specify the sequence of amino acids in proteins characteristic of that organism.	Cell Structure	Chromosomes and Cell Reproduction
B.2.3.1	Ribosomes synthesize proteins, using tRNAs to translate genetic information in the mRNA.	Genetics	Protein Synthesis
B.2.3.2	The sequence of amino acids in a protein can be predicted from the sequence of codons in the RNA, by applying universal genetic coding rules.		
B.2.3.3	Mutations in the DNA sequence of a gene may or may not affect the expression of the gene or the sequence of amino acids in an encoded protein.	Genetics	The Chromosome Theory Of Inheritance
B.2.3.4	Specialization of cells in multicellular organisms is usually due to different patterns of gene expression rather than to differences of the genes themselves.	Genetics	The Chromosome Theory Of Inheritance
B.2.3.5	Proteins can differ from one another in the number and sequence of amino acids.	The Nature of Science and Genetics	Chemistry of Life and How Proteins Are Made
B.2.3.6	Proteins having different amino acid sequences typically have different shapes and chemical properties.	The Nature of Science	Chemistry of Life
B.2.4	The genetic composition of cells can be altered by incorporation of exogenous DNA into the cells.	Genetics	Biotechnology and the Genetics Revolution
B.2.4.1	Base-pairing rules are used to explain the precise copying of DNA during semi-conservative replication and transcription of information from DNA into mRNA.	Genetics	How Proteins Are Made
B.2.4.2	Genetic engineering (biotechnology) is used to produce novel biomedical and agricultural products.	Genetics	Biotechnology and the Genetics Revolution
B.2.4.3	DNA technology (restriction digestion by endonucleases, gel electrophoresis, ligation and transformation) is used to construct recombinant DNA molecules.	Genetics	Biotechnology and the Genetics Revolution

B.2.4.4	Exogenous DNA can be inserted into bacterial cells to alter their genetic makeup and support expression of new protein products.	Genetics	Biotechnology and the Genetics Revolution
B.3	Ecology		
B.3.1	Stability in an ecosystem is a balance between competing effects.		
B.3.1.1	Biodiversity is the sum total of different kinds of organisms and is affected by alterations of habitats.	Population Ecology	Community And Ecosystem Dynamics
B.3.1.2	Changes in an ecosystem can result from changes in climate, human activity, introduction of nonnative species, or changes in population size.	Population Ecology	Community And Ecosystem Dynamics and The Biosphere And Mass Extinctions
B.3.1.3	Fluctuations in population size in an ecosystem are determined by the relative rates of birth, immigration, emigration and death.	Population Ecology	Population Growth
B.3.1.4	Water, carbon and nitrogen cycle between abiotic resources and organic matter in the ecosystem and oxygen cycles through photosynthesis and respiration.	Population Ecology	The Biosphere And Mass Extinctions
B.3.1.5	A vital part of an ecosystem is the stability of its producers and decomposers.		
B.3.1.6	At each link in a food web some energy is stored in newly made structures, but much energy is dissipated into the environment as heat.	Photosynthesis	Photosynthesis and Cellular Respiration
B.3.1.7	The accommodation of an individual organism to its environment is different from the gradual adaptation of a lineage of organisms through genetic change.	Genetics	The Chromosome Theory Of Inheritance
B.4	Evolution		
B.4.1	The frequency of an allele in a gene pool of a population depends on many factors and may be stable or unstable over time.	Genetics	Evolution and Genetics
B.4.1.1	Natural selection acts on the phenotype rather than the genotype of an organism.	Genetics	The Chromosome Theory Of Inheritance



B.4.1.2	Alleles that are lethal in a homozygous individual may be carried in a heterozygote and thus maintained in a gene pool.	Genetics	Mendel and Heredity
B.4.1.3	New mutations are constantly being generated in a gene pool.	Genetics	Mendel and Heredity
B.4.1.4	Variation within a species increases the likelihood that at least some members of a species will survive under changed environmental conditions.	Evolution	Descent with Modification and Evolution and Genetics
B.4.2	Evolution is the result of genetic changes that occur in constantly changing environments.	Evolution	Descent With Modification
B.4.2.1	Natural selection determines the differential survival of groups of organisms.	Evolution	Descent With Modification
B.4.2.2	A great diversity of species increases the chance that at least some organisms survive major changes in the environment.	Evolution	Descent With Modification and Evolution and Genetics
B.4.2.3	Genetic drift affects the diversity of organisms in a population.	Evolution	Descent With Modification and Evolution and Genetics
B.4.2.4	Reproductive or geographic isolation affects speciation.	Evolution	Descent With Modification and Evolution and Genetics
B.4.2.5	Fossil evidence contributes to our understanding of biological diversity, episodic speciation and mass extinction.	Evolution	Descent With Modification
B.4.2.6	Several independent molecular clocks, calibrated against each other and combined with evidence from the fossil record, can help to estimate how long ago various groups of organisms diverged evolutionarily from one another.	History of Life on Earth	Methods of Age Dating
B.5	Physiology		
B.5.1	As a result of the coordinated structures and functions of organ systems, the internal environment of the human body remains relatively stable (homeostatic) despite changes in the outside environment.	Animal Organization	Animal Cells and Tissue

B.5.1.1	The complementary activity of major body systems provides cells with oxygen and nutrients and removes toxic waste products such as carbon dioxide.	Animal Organization	Animal Cells and Tissue
B.5.1.2	The nervous system mediates communication between different parts of the body and the body's interactions with the environment.	Animal Organization	Animal Tissues
B.5.1.3	Feedback loops in the nervous and endocrine systems regulate conditions in the body.	Animal Organization	Animal Organ Systems and Homeostasis
B.5.1.4	The neurons transmit electrochemical impulses.	Animal Organization	Animal Tissues
B.5.1.5	Sensory neurons, interneurons and motor neurons all have a role in sensation, thought and response.	Animal Organization	Animal Tissues
B.5.1.6	Digestion includes the secretion of stomach acid, digestive enzymes (amylases, proteases, nucleases, lipases) and bile salts into the digestion system.	Animal Organization	The Digestive System
B.5.1.7	The kidneys have a homeostatic role in the removal of nitrogenous wastes from the blood.	Animal Organization	Animal Organ Systems and Homeostasis
B.5.1.8	The liver has a homeostatic role in detoxification and keeping the blood glucose balance.	Animal Organization	The Digestive System
B.5.1.9	Actin, myosin, Ca ²⁺ and ATP have a role in the cellular and molecular basis of muscle contraction.	Animal Organization	Animal Tissues
B.5.1.10	Hormones (including digestive, reproductive, osmoregulatory) provide internal feedback mechanisms for homeostasis at the cellular level and in whole organisms.	Animal Organization	Animal Organ Systems and Homeostasis
B.5.2	Organisms have a variety of mechanisms to combat disease.	Animal Organization	The Lymphatic System And Immunity
B.5.2.1	The skin provides nonspecific defenses against infection.	Animal Organization	Animal Tissues
B.5.2.2	Antibodies have a role in the body's response to infection.	Animal Organization	The Lymphatic System And Immunity
B.5.2.3	Vaccination protects an individual from infectious diseases.	Animal Organization	The Lymphatic System And Immunity



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B.5.2.4	There are important differences between bacteria and viruses with respect to their requirements for growth and replication, the body's primary defenses against bacterial and viral infections, and effective treatments of these infections.	Biological Div	Prokaryotes, Bacterial Structure and Bacterial Reproduction
B.5.2.5	An individual with a compromised immune system (for example, a person with AIDS) may be unable to fight off and survive infections by microorganisms that are usually benign.	Animal Organization	The Lymphatic System And Immunity
B.5.2.6	Phagocytes, B-lymphocytes and T-lymphocytes have a role in the immune system.	Animal Organization	Animal Organ Systems and Homeostasis