HSCE Code	Expectation	District Curriculum	Amount of Time Spent	Current Instructional Materials and Activities
Standard B1	**INQUIRY, REFLECTION, AND SOCIAL IMPLICATIONS**			
Statement B1.1	**Scientific Inquiry** Science is a way of understanding nature. Scientific research may begin by generating new scientific questions that can be answered through replicable scientific investigations that are logically developed and conducted systematically. Scientific conclusions and explanations result from careful analysis of empirical evidence and the use of logical reasoning. Some questions in science are addressed through indirect rather than direct observation, evaluating the consistency of new evidence with results predicted by models of natural processes. Results from investigations are communicated in reports that are scrutinized through a peer review process.			
B1.1A	Generate new questions that can be investigated in the laboratory or field.			
B1.1B	Evaluate the uncertainties or validity of scientific conclusions using an understanding of sources of measurement error, the challenges of controlling variables, accuracy of data analysis, logic of argument, logic of experimental design, and/or the dependence on underlying assumptions.			
B1.1C	Conduct scientific investigations using appropriate tools and techniques (e.g., selecting an instrument that measures the desired quantity—length, volume, weight, time interval, temperature—with the appropriate level of precision).			
B1.1D	Identify patterns in data and relate them to theoretical models.			
B1.1E	Describe a reason for a given conclusion using evidence from an investigation.			
B1.1f	Predict what would happen if the variables, methods, or timing of an investigation were changed.			
B1.1g	Use empirical evidence to explain and critique the reasoning used to draw a scientific conclusion or explanation.			
B1.1h	Design and conduct a systematic scientific investigation that tests a hypothesis. Draw conclusions from data presented in charts or tables.			
B1.1i	Distinguish between scientific explanations that are regarded as current scientific consensus and the emerging questions that active researchers investigate.			
Statement B1.2	**Scientific Reflection and Social Implications** The integrity of the scientific process depends on scientists and citizens understanding and respecting the "Nature of Science." Openness to new ideas, skepticism, and honesty are attributes required for good scientific practice. Scientists must use logical reasoning during investigation			

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	design, analysis, conclusion, and communication. Science can produce critical insights on societal problems from a personal and local scale to a global scale. Science both aids in the development of technology and provides tools for assessing the costs, risks, and benefits of technological systems. Scientific conclusions and arguments play a role in personal choice and public policy decisions. New technology and scientific discoveries have had a major influence in shaping human history. Science and technology continue to offer diverse and significant career opportunities.			
B1.2A	Critique whether or not specific questions can be answered through scientific investigations.			
B1.2B	Identify and critique arguments about personal or societal issues based on scientific evidence.			
B1.2C	Develop an understanding of a scientific concept by accessing information from multiple sources. Evaluate the scientific accuracy and significance of the information.			
B1.2D	Evaluate scientific explanations in a peer review process or discussion format.			
B1.2E	Evaluate the future career and occupational prospects of science fields.			
B1.2f	Critique solutions to problems, given criteria and scientific constraints.			
B1.2g	Identify scientific tradeoffs in design decisions and choose among alternative solutions.			
B1.2h	Describe the distinctions between scientific theories, laws, hypotheses, and observations.			
B1.2i	Explain the progression of ideas and explanations that leads to science theories that are part of the current scientific consensus or core knowledge.			
B1.2j	Apply science principles or scientific data to anticipate effects of technological design decisions.			
B1.2k	Analyze how science and society interact from a historical, political, economic, or social perspective.			
Standard B2	**ORGANIZATION AND DEVELOPMENT OF LIVING SYSTEMS**			

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Statement L2.p1	**Cells *(prerequisite)*** All organisms are composed of cells, from just one cell to many cells. Water accounts for more than two-thirds of the weight of a cell, which gives cells many of their properties. In multicellular organisms, specialized cells perform specialized functions. Organs and organ systems are composed of cells and function to serve the needs of organisms for food, air, and waste removal. The way in which cells function is similar in all living organisms. *(prerequisite)*			
L2.p1A	Distinguish between living and nonliving systems. *(prerequisite)*			
L2.p1B	Explain the importance of both water and the element carbon to cells. *(prerequisite)*			
L2.p1C	Describe growth and development in terms of increase in cell number, cell size, and/or cell products. *(prerequisite)*			
L2.p1d	Explain how the systems in a multicellular organism work together to support the organism. *(prerequisite)*			
L2.p1E	Compare and contrast how different organisms accomplish similar functions (e.g., obtain oxygen for respiration, and excrete waste). *(prerequisite)*			
Statement L2.p2	**Cell Function *(prerequisite)*** Cells carry out the many functions needed to sustain life. They grow and divide, thereby producing more cells. Food is used to provide energy for the work that cells do and is a source of the molecular building blocks from which needed materials are assembled. *(prerequisite)*			
L2.p2A	Describe how organisms sustain life by obtaining, transporting, transforming, releasing, and eliminating matter and energy. *(prerequisite)*			
L2.p2B	Describe the effect of limiting food to developing cells. *(prerequisite)*			
Statement L2.p3	**Plants as Producers (prerequisite)** Plants are producers; they use the energy from light to make sugar molecules from the atoms of carbon dioxide and water. Plants use these sugars, along with minerals from the soil, to form fats, proteins, and carbohydrates. This food can be used immediately, incorporated into the cells of a plant as the plant grows, or stored for later use. *(prerequisite)*			
L2.p3A	Explain the significance of carbon in organic molecules. *(prerequisite)*			
L2.p3B	Explain the origins of plant mass. *(prerequisite)*			
L2.p3C	Predict what would happen to plants growing in low carbon dioxide atmospheres. *(prerequisite)*			
L2.p3D	Explain how the roots of specific plants grow. *(prerequisite)*			

HSCE Code	Expectation	District Curriculum	Amount of Time Spent	Current Instructional Materials and Activities
Statement L2.p4	**Animals as Consumers *(prerequisite)*** All animals, including humans, are consumers; they obtain food by eating other organisms or their products. Consumers break down the structures of the organisms they eat to obtain the materials they need to grow and function. Decomposers, including bacteria and fungi, use dead organisms or their products for food. *(prerequisite)*			
L2.p4A	Classify different organisms based on how they obtain energy for growth and development. *(prerequisite)*			
L2.p4B	Explain how an organism obtains energy from the food it consumes. *(prerequisite)*			
Statement L2.p5	**Common Elements *(prerequisite)*** Living systems are made of complex molecules that consist mostly of a few elements, especially carbon, hydrogen, oxygen, nitrogen, and phosphorous. *(prerequisite)*			
L2.p5A	Recognize the six most common elements in organic molecules (C, H, N, O, P, S). *(prerequisite)*			
L2.p5B	Identify the most common complex molecules that make up living organisms. *(prerequisite)*			
L2.p5C	Predict what would happen if essential elements were withheld from developing cells. *(prerequisite)*			
Statement B2.1	**Transformation of Matter and Energy in Cells** In multicellular organisms, cells are specialized to carry out specific functions such as transport, reproduction, or energy transformation.			
B2.1A	Explain how cells transform energy (ultimately obtained from the sun) from one form to another through the processes of photosynthesis and respiration. Identify the reactants and products in the general reaction of photosynthesis.			
B2.1B	Compare and contrast the transformation of matter and energy during photosynthesis and respiration.			
B2.1C	Explain cell division, growth, and development as a consequence of an increase in cell number, cell size, and/ or cell products.			
Statement B2.1x	**Cell Differentiation** Following fertilization, cell division produces a small cluster of cells that then differentiate by appearance and function to form the basic tissues of an embryo**.**			
B2.1d	Describe how, through cell division, cells can become specialized for specific function.			
B2.1e	Predict what would happen if the cells from one part of a developing embryo were transplanted to another part of the embryo.			
Statement B2.2	**Organic Molecules** There are four major categories of organic molecules that make up			

HSCE Code	Expectation	District Curriculum	Amount of Time Spent	Current Instructional Materials and Activities
	living systems: carbohydrates, fats, proteins, and nucleic acids.			
B2.2A	Explain how carbon can join to other carbon atoms in chains and rings to form large and complex molecules.			
B2.2B	Recognize the six most common elements in organic molecules (C, H, N, O, P, S).			
B2.2C	Describe the composition of the four major categories of organic molecules (carbohydrates, lipids, proteins, and nucleic acids).			
B2.2D	Explain the general structure and primary functions of the major complex organic molecules that compose living organisms.			
B2.2E	Describe how dehydration and hydrolysis relate to organic molecules.			
Statement B2.2x	**Proteins** Protein molecules are long, usually folded chains composed mostly of amino acids and are made of C, H, O, and N. Protein molecules assemble fats and carbohydrates; they function as enzymes, structural components, and hormones. The function of each protein molecule depends on its specific sequence of amino acids and the shape of the molecule.			
B2.2f	Explain the role of enzymes and other proteins in biochemical functions (e.g., the protein hemoglobin carries oxygen in some organisms, digestive enzymes, and hormones).			
B2.2g	Propose how moving an organism to a new environment may influence its ability to survive and predict the possible impact of this type of transfer.			
Statement B2.3	**Maintaining Environmental Stability** The internal environment of living things must remain relatively constant. Many systems work together to maintain stability. Stability is challenged by changing physical, chemical, and environmental conditions as well as the presence of disease agents.			
B2.3A	Describe how cells function in a narrow range of physical conditions, such as temperature and pH (acidity), to perform life functions.			
B2.3B	Describe how the maintenance of a relatively stable internal environment is required for the continuation of life.			
B2.3C	Explain how stability is challenged by changing physical, chemical, and environmental conditions as well as the presence of disease agents.			
Statement B2.3x	**Homeostasis** The internal environment of living things must remain relatively constant. Many systems work together to maintain homeostasis. When homeostasis is lost, death occurs.			
B2.3d	Identify the general functions of the major systems of the human body (digestion, respiration, reproduction, circulation, excretion, protection from disease, and			

HSCE Code	Expectation	District Curriculum	Amount of Time Spent	Current Instructional Materials and Activities
	movement, control, and coordination) and describe ways that these systems interact with each other.			
B2.3e	Describe how human body systems maintain relatively constant internal conditions (temperature, acidity, and blood sugar).			
B2.3f	Explain how human organ systems help maintain human health.			
B2.3g	Compare the structure and function of a human body system or subsystem to a nonliving system (e.g., human joints to hinges, enzyme and substrate to interlocking puzzle pieces).			
Statement B2.4	**Cell Specialization** In multicellular organisms, specialized cells perform specialized functions. Organs and organ systems are composed of cells and function to serve the needs of cells for food, air, and waste removal. The way in which cells function is similar in all living organisms.			
B2.4A	Explain that living things can be classified based on structural, embryological, and molecular (relatedness of DNA sequence) evidence.			
B2.4B	Describe how various organisms have developed different specializations to accomplish a particular function and yet the end result is the same (e.g., excreting nitrogenous wastes in animals, obtaining oxygen for respiration).			
B2.4C	Explain how different organisms accomplish the same result using different structural specializations (gills vs. lungs vs. membranes).			
B2.4d	Analyze the relationships among organisms based on their shared physical, biochemical, genetic, and cellular characteristics and functional processes.			
B2.4e	Explain how cellular respiration is important for the production of ATP (build on aerobic vs. anaerobic).			
B2.4f	Recognize and describe that both living and nonliving things are composed of compounds, which are themselves made up of elements joined by energy containing bonds, such as those in ATP.			
B2.4g	Explain that some structures in the modern eukaryotic cell developed from early prokaryotes, such as mitochondria, and in plants, chloroplasts.			
B2.4h	Describe the structures of viruses and bacteria.			
B2.4i	Recognize that while viruses lack cellular structure, they have the genetic material to invade living cells.			
Statement B2.5	**Living Organism Composition** All living or once-living organisms are composed of carbohydrates, lipids, proteins, and nucleic acids. Carbohydrates and lipids contain many carbon-hydrogen bonds that also store energy.			
B2.5A	Recognize and explain that macromolecules such as lipids contain high			

HSCE Code	Expectation	District Curriculum	Amount of Time Spent	Current Instructional Materials and Activities
	energy bonds.			
B2.5B	Explain how major systems and processes work together in animals and plants, including relationships between organelles, cells, tissues, organs, organ systems, and organisms. Relate these to molecular functions.			
B2.5C	Describe how energy is transferred and transformed from the Sun to energy-rich molecules during photosynthesis.			
B2.5D	Describe how individual cells break down energy-rich molecules to provide energy for cell functions.			
Statement B2.5x	**Energy Transfer** All living or once-living organisms are composed of carbohydrates, lipids, proteins, and nucleic acids. Carbohydrates and lipids contain many carbon-hydrogen bonds that also store energy. However, that energy must be transferred to ATP (adenosine triphosphate) to be usable by the cell.			
B2.5e	Explain the interrelated nature of photosynthesis and cellular respiration in terms of ATP synthesis and degradation.			
B2.5f	Relate plant structures and functions to the process of photosynthesis and respiration.			
B2.5g	Compare and contrast plant and animal cells.			
B2.5h	Explain the role of cell membranes as a highly selective barrier (diffusion, osmosis, and active transport).			
B2.5i	Relate cell parts/organelles to their function.			
Statement B2.6x	**Internal/External Cell Regulation** Cellular processes are regulated both internally and externally by environments in which cells exist, including local environments that lead to cell differentiation during the development of multicellular organisms. During the development of complex multicellular organisms, cell differentiation is regulated through the expression of different genes.			
B2.6a	Explain that the regulatory and behavioral responses of an organism to external stimuli occur in order to maintain both short- and long-term equilibrium.			
B2.r6b	Explain that complex interactions among the different kinds of molecules in the cell cause distinct cycles of activities, such as growth and division. Note that cell behavior can also be affected by molecules from other parts of the organism, such as hormones. *(recommended)*			
B2.r6c	Recognize and explain that communication and/or interaction are required between cells to coordinate their diverse activities. *(recommended)*			

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B2.r6d	Explain how higher levels of organization result from specific complex interactions of smaller units and that their maintenance requires a constant input of energy as well as new material. *(recommended)*			
B2.r6e	Analyze the body's response to medical interventions such as organ transplants, medicines, and inoculations. *(recommended)*			
Standard B3	**INTERDEPENDENCE OF LIVING SYSTEMS AND THE ENVIRONMENT**			
Statement L3.p1	**Populations, Communities, and Ecosystems *(prerequisite)*** Organisms of one species form a population. Populations of different organisms interact and form communities. Living communities and the nonliving factors that interact with them form ecosystems. *(prerequisite)*			
L3.p1A	Provide examples of a population, community, and ecosystem. *(prerequisite)*			
Statement L3.p2	**L3.p2 Relationships Among Organisms *(prerequisite)*** Two types of organisms may interact with one another in several ways; they may be in a producer/consumer, predator/ prey, or parasite/host relationship. Or one organism may scavenge or decompose another. Relationships may be competitive or mutually beneficial. Some species have become so adapted to each other that neither could survive without the other. *(prerequisite)*			
L3.p2A	Describe common relationships among organisms and provide examples of producer/consumer, predator/ prey, or parasite/host relationship. *(prerequisite)*			
L3.p2B	Describe common ecological relationships between and among species and their environments (competition, territory, carrying capacity, natural balance, population, dependence, survival, and other biotic and abiotic factors). *(prerequisite)*			
L3.p2C	Describe the role of decomposers in the transfer of energy in an ecosystem. *(prerequisite)*			
L3.p2D	Explain how two organisms can be mutually beneficial and how that can lead to interdependency. *(prerequisite)*			
Statement L3.p3	**Factors Influencing Ecosystems *(prerequisite)*** The number of organisms and populations an ecosystem can support depends on the biotic resources available and abiotic factors, such as quantity of light and water, range of temperatures, and soil composition. *(prerequisite)*			
L3.p3A	Identify the factors in an ecosystem that influence fluctuations in population size. *(prerequisite)*			

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L3.p3B	Distinguish between the living (biotic) and nonliving (abiotic) components of an ecosystem. *(prerequisite)*			
L3.p3C	Explain how biotic and abiotic factors cycle in an ecosystem (water, carbon, oxygen, and nitrogen). *(prerequisite)*			
L3.p3D	Predict how changes in one population might affect other populations based upon their relationships in a food web. *(prerequisite)*			
Statement L3.p4	**Human Impact on Ecosystems *(prerequisite)*** All organisms cause changes in their environments. Some of these changes are detrimental, whereas others are beneficial. *(prerequisite)*			
L3.p4A	Recognize that, and describe how, human beings are part of Earth's ecosystems. Note that human activities can deliberately or inadvertently alter the equilibrium in ecosystems. *(prerequisite)*			
Statement B3.1	**Photosynthesis and Respiration** Organisms acquire their energy directly or indirectly from sunlight. Plants capture the Sun's energy and use it to convert carbon dioxide and water to sugar and oxygen through the process of photosynthesis. Through the process of cellular respiration, animals are able to release the energy stored in the molecules produced by plants and use it for cellular processes, producing carbon dioxide and water.			
B3.1A	Describe how organisms acquire energy directly or indirectly from sunlight.			
B3.1B	Illustrate and describe the energy conversions that occur during photosynthesis and respiration.			
B3.1C	Recognize the equations for photosynthesis and respiration and identify the reactants and products for both.			
B3.1D	Explain how living organisms gain and use mass through the processes of photosynthesis and respiration.			
B3.1e	Write the chemical equation for photosynthesis and cellular respiration and explain in words what they mean.			
B3.1f	Summarize the process of photosynthesis.			
Statement B3.2	**Ecosystems** The chemical elements that make up the molecules of living things pass through food webs and are combined and recombined in different ways. At each link in an ecosystem, some energy is stored in newly made structures, but much is dissipated into the environment as heat. Continual input of energy from sunlight keeps the process going.			
B3.2A	Identify how energy is stored in an ecosystem.			

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B3.2B	Describe energy transfer through an ecosystem, accounting for energy lost to the environment as heat.			
B3.2C	Draw the flow of energy through an ecosystem. Predict changes in the food web when one or more organisms are removed.			
Statement B3.3	**Element Recombination** As matter cycles and energy flows through different levels of organization of living systems—cells, organs, organisms, and communities—and between living systems and the physical environment, chemical elements are recombined in different ways. Each recombination results in storage and dissipation of energy into the environment as heat. Matter and energy are conserved in each change.			
B3.3A	Use a food web to identify and distinguish producers, consumers, and decomposers and explain the transfer of energy through trophic levels.			
B3.3b	Describe environmental processes (e.g., the carbon and nitrogen cycles) and their role in processing matter crucial for sustaining life.			
Statement B3.4	**Changes in Ecosystems** Although the interrelationships and interdependence of organisms may generate biological communities in ecosystems that are stable for hundreds or thousands of years, ecosystems always change when climate changes or when one or more new species appear as a result of migration or local evolution. The impact of the human species has major consequences for other species.			
B3.4A	Describe ecosystem stability. Understand that if a disaster such as flood or fire occurs, the damaged ecosystem is likely to recover in stages of succession that eventually result in a system similar to the original one.			
B3.4B	Recognize and describe that a great diversity of species increases the chance that at least some living organisms will survive in the face of cataclysmic changes in the environment.			
B3.4C	Examine the negative impact of human activities.			
Statement B3.4x	**Human Impact** Humans can have tremendous impact on the environment. Sometimes their impact is beneficial, and sometimes it is detrimental.			
B3.4d	Describe the greenhouse effect and list possible causes.			
B3.4e	List the possible causes and consequences of global warming.			
Statement B3.5	**Populations** Populations of living things increase and decrease in size as they			

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	interact with other populations and with the environment. The rate of change is dependent upon relative birth and death rates.			
B3.5A	Graph changes in population growth, given a data table.			
B3.5B	Explain the influences that affect population growth.			
B3.5C	Predict the consequences of an invading organism on the survival of other organisms.			
Statement B3.5x	**Environmental Factors** The shape of population growth curves vary with the type of organism and environmental conditions, such as availability of nutrients and space. As the population increases and resources become more scarce, the population usually stabilizes at the carrying capacity of that environment.			
B3.5d	Describe different reproductive strategies employed by various organisms and explain their advantages and disadvantages.			
B3.5e	Recognize that and describe how the physical or chemical environment may influence the rate, extent, and nature of population dynamics within ecosystems.			
B3.5f	Graph an example of exponential growth. Then show the population leveling off at the carrying capacity of the environment.			
B3.5g	Diagram and describe the stages of the life cycle for a human disease-causing organism. *(recommended)*			
Standard B4	**GENETICS**			
L4.p1	**Reproduction *(prerequisite)*** Reproduction is a characteristic of all living systems; because no individual organism lives forever, reproduction is essential to the continuation of every species. Some organisms reproduce asexually. Other organisms reproduce sexually. *(prerequisite)*			
L4.p1A	Compare and contrast the differences between sexual and asexual reproduction. *(prerequisite)*			
L4.p1B	Discuss the advantages and disadvantages of sexual vs. asexual reproduction. *(prerequisite)*			
Statement L4.p2	**Heredity and Environment (prerequisite)** The characteristics of organisms are influenced by heredity and environment. For some characteristics, inheritance is more important. For other characteristics, interactions with the environment are more important. *(prerequisite)*			

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L4.p2A	Explain that the traits of an individual are influenced by both the environment and the genetics of the individual. Acquired traits are not inherited; only genetic traits are inherited. *(prerequisite)*			
Statement B4.1	**Genetics and Inherited Traits** Hereditary information is contained in genes, located in the chromosomes of each cell. Cells contain many thousands of different genes. One or many genes can determine an inherited trait of an individual, and a single gene can influence more than one trait. Before a cell divides, this genetic information must be copied and apportioned evenly into the daughter cells.			
B4.1A	Draw and label a homologous chromosome pair with heterozygous alleles highlighting a particular gene location.			
B4.1B	Explain that the information passed from parents to offspring is transmitted by means of genes that are coded in DNA molecules. These genes contain the information for the production of proteins.			
B4.1c	Differentiate between dominant, recessive, codominant, polygenic, and sex-linked traits.			
B4.1d	Explain the genetic basis for Mendel's laws of segregation and independent assortment.			
B4.1e	Determine the genotype and phenotype of monohybrid crosses using a Punnett Square.			
Statement B4.2	**DNA** The genetic information encoded in DNA molecules provides instructions for assembling protein molecules. Genes are segments of DNA molecules. Inserting, deleting, or substituting DNA segments can alter genes. An altered gene may be passed on to every cell that develops from it. The resulting features may help, harm, or have little or no effect on the offspring's success in its environment.			
B4.2A	Show that when mutations occur in sex cells, they can be passed on to offspring (inherited mutations), but if they occur in other cells, they can be passed on to descendant cells only (noninherited mutations).			
B4.2B	Recognize that every species has its own characteristic DNA sequence.			
B4.2C	Describe the structure and function of DNA.			
B4.2D	Predict the consequences that changes in the DNA composition of particular genes may have on an organism (e.g., sickle cell anemia, other).			
B4.2E	Propose possible effects (on the genes) of exposing an organism to radiation and toxic chemicals.			

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Statement B4.2x	**DNA, RNA, and Protein Synthesis** Protein synthesis begins with the information in a sequence of DNA bases being copied onto messenger RNA. This molecule moves from the nucleus to the ribosome in the cytoplasm where it is "read." Transfer RNA brings amino acids to the ribosome, where they are connected in the correct sequence to form a specific protein.			
B4.2f	Demonstrate how the genetic information in DNA molecules provides instructions for assembling protein molecules and that this is virtually the same mechanism for all life forms.			
B4.2g	Describe the processes of replication, transcription, and translation and how they relate to each other in molecular biology.			
B4.2h	Recognize that genetic engineering techniques provide great potential and responsibilities.			
B4.2i	Explain how recombinant DNA technology allows scientists to analyze the structure and function of genes. *(recommended)*			
Statement B4.3	**Cell Division — Mitosis and Meiosis** Sorting and recombination of genes in sexual reproduction results in a great variety of possible gene combinations from the offspring of any two parents.			
B4.3A	Compare and contrast the processes of cell division (mitosis and meiosis), particularly as those processes relate to production of new cells and to passing on genetic information between generations.			
B4.3B	Explain why only mutations occurring in gametes (sex cells) can be passed on to offspring.			
B4.3C	Explain how it might be possible to identify genetic defects from just a karyotype of a few cells.			
B4.3d	Explain that the sorting and recombination of genes in sexual reproduction result in a great variety of possible gene combinations from the offspring of two parents.			
B4.3e	Recognize that genetic variation can occur from such processes as crossing over, jumping genes, and deletion and duplication of genes.			
B4.3f	Predict how mutations may be transferred to progeny.			
B4.3g	Explain that cellular differentiation results from gene expression and/or environmental influence (e.g., metamorphosis, nutrition).			
Statement B4.4x	**Genetic Variation** Genetic variation is essential to biodiversity and the stability of a population. Genetic variation is ensured by the formation of gametes and their combination to form a zygote. Opportunities for genetic variation also occur during cell division when chromosomes exchange			

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	genetic material causing permanent changes in the DNA sequences of the chromosomes. Random mutations in DNA structure caused by the environment are another source of genetic variation.			
B4.4a	Describe how inserting, deleting, or substituting DNA segments can alter a gene. Recognize that an altered gene may be passed on to every cell that develops from it and that the resulting features may help, harm, or have little or no effect on the offspring's success in its environment.			
B4.4b	Explain that gene mutation in a cell can result in uncontrolled cell division called cancer. Also know that exposure of cells to certain chemicals and radiation increases mutations and thus increases the chance of cancer.			
B4.4c	Explain how mutations in the DNA sequence of a gene may be silent or result in phenotypic change in an organism and in its offspring.			
Statement B4.r5x	**Recombinant DNA** Recombinant DNA technology allows scientists in the laboratory to combine the genes from different sources, sometimes different species, into a single DNA molecule. This manipulation of genes using bacterial plasmids has been used for many practical purposes including the mass production of chemicals and drugs. *(recommended)*			
B4.r5a	Explain how recombinant DNA technology allows scientists to analyze the structure and function of genes. *(recommended)*			
B4.r5b	Evaluate the advantages and disadvantages of human manipulation of DNA. *(recommended)*			
Standard B5	**EVOLUTION AND BIODIVERSITY**			
Statement L5.p1	**Survival and Extinction *(prerequisite)*** Individual organisms with certain traits in particular environments are more likely than others to survive and have offspring. When an environment changes, the advantage or disadvantage of characteristics can change. Extinction of a species occurs when the environment changes and the characteristics of a species are insufficient to allow survival. Fossils indicate that many organisms that lived long ago are extinct. Extinction of species is common; most of the species that have lived on the Earth no longer exist. *(prerequisite)*			
L5.p1A	Define a species and give examples. *(prerequisite)*			
L5.p1B	Define a population and identify local populations. *(prerequisite)*			
L5.p1C	Explain how extinction removes genes from the gene pool.			

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	(prerequisite)			
L5.p1D	Explain the importance of the fossil record. *(prerequisite)*			
Statement L5.p2	**Classification *(prerequisite)*** Similarities among organisms are found in anatomical features, which can be used to infer the degree of relatedness among organisms. In classifying organisms, biologists consider details of internal and external structures to be more important than behavior or general appearance. *(prerequisite)*			
L5.p2A	Explain, with examples, that ecology studies the varieties and interactions of living things across space while evolution studies the varieties and interactions of living things across time. *(prerequisite)*			
Statement B5.1	**Theory of Evolution** The theory of evolution provides a scientific explanation for the history of life on Earth as depicted in the fossil record and in the similarities evident within the diversity of existing organisms**.**			
B5.1A	Summarize the major concepts of natural selection (differential survival and reproduction of chance inherited variants, depending on environmental conditions).			
B5.1B	Describe how natural selection provides a mechanism for evolution.			
B5.1c	Summarize the relationships between present-day organisms and those that inhabited the Earth in the past (e.g., use fossil record, embryonic stages, homologous structures, chemical basis).			
B5.1d	Explain how a new species or variety originates through he evolutionary process of natural selection.			
B5.1e	Explain how natural selection leads to organisms that are well suited for the environment (differential survival and reproduction of chance inherited variants, depending upon environmental conditions).			
B5.1f	Explain, using examples, how the fossil record, comparative anatomy, and other evidence supports the theory of evolution.			
B5.1g	Illustrate how genetic variation is preserved or eliminated from a population through natural selection (evolution) resulting in biodiversity.			
Statement B5.2x	**Molecular Evidence** Molecular evidence substantiates the anatomical evidence for evolution and provides additional detail about the sequence in which various lines of descents branched.			
B5.2a	Describe species as reproductively distinct groups of organisms that can be classified based on morphological, behavioral, and molecular similarities.			

HSCE Code	Expectation	District Curriculum	Amount of Time Spent	Current Instructional Materials and Activities
B5.2b	Explain that the degree of kinship between organisms or species can be estimated from the similarity of their DNA and protein sequences.			
B5.2c	Trace the relationship between environmental changes and changes in the gene pool, such as genetic drift and isolation of subpopulations.			
B5.r2d	Interpret a cladogram or phylogenetic tree showing evolutionary relationships among organisms. *(recommended)*			
Statement B5.3	**Natural Selection** Evolution is the consequence of natural selection, the interactions of (1) the potential for a population to increase its numbers, (2) the genetic variability of offspring due to mutation and recombination of genes, (3) a finite supply of the resources required for life, and (4) the ensuing selection from environmental pressure of those organisms better able to survive and leave offspring.			
B5.3A	Explain how natural selection acts on individuals, but it is populations that evolve. Relate genetic mutations and genetic variety produced by sexual reproduction to diversity within a given population.			
B5.3B	Describe the role of geographic isolation in speciation.			
B5.3C	Give examples of ways in which genetic variation and environmental factors are causes of evolution and the diversity of organisms.			
B5.3d	Explain how evolution through natural selection can result in changes in biodiversity.			
B5.3e	Explain how changes at the gene level are the foundation for changes in populations and eventually the formation of new species.			
B5.3f	Demonstrate and explain how biotechnology can improve a population and species.			