APPENDIX B

SCIENCE CONTENT ASSESSED BY THE FCAT, ITEM FORMATS, AND ASSESSMENT SCHEDULE BY BENCHMARK

Strand A: The Nature of Matter		
1. The student understands that all matter has observable, measurable properties.		
GRADE 5 BENCHMARK	**GRADE 8 BENCHMARK**	**GRADE 11 BENCHMARK**
SC.A.1.2.1 The student determines that the properties of materials (e.g., density and volume) can be compared and measured (e.g., using rulers, balances, and thermometers). AA MC	SC.A.1.3.1 The student identifies various ways in which substances differ (e.g., mass, volume, shape, density, texture, and reaction to temperature and light). (Also assesses A.1.3.2 and A.1.3.6) AA MC, GR, SR	SC.A.1.4.1 The student knows that the electron configuration in atoms determines how a substance reacts and how much energy is involved in its reactions. CS MC, GR
SC.A.1.2.2 The student knows that common materials (e.g., water) can be changed from one state to another by heating and cooling. CS MC	SC.A.1.3.2 The student understands the difference between weight and mass. (Assessed as A.1.3.1)	SC.A.1.4.2 The student knows that the vast diversity of the properties of materials is primarily due to variations in the forces that hold molecules together. (Also assesses A.1.4.5) CS MC
SC.A.1.2.3 The student knows that the weight of an object always equals the sum of its parts. CS MC	SC.A.1.3.3 The student knows that temperature measures the average energy of motion of the particles that make up the substance. CS MC	SC.A.1.4.3 The student knows that a change from one phase of matter to another involves a gain or loss of energy. (Also assesses B.1.4.3) AA MC, GR
SC.A.1.2.4 The student knows that different materials are made by physically combining substances and that different objects can be made by combining different materials. AA MC	SC.A.1.3.4 The student knows that atoms in solids are close together and do not move around easily; in liquids, atoms tend to move farther apart; in gas, atoms are quite far apart and move around freely. CS MC	SC.A.1.4.4 The student experiments and determines that the rates of reaction among atoms and molecules depend on the concentration, pressure, and temperature of the reactants and the presence or absence of catalysts. AA MC, GR, SR
SC.A.1.2.5 The student knows that materials made by chemically combining two or more substances may have properties that differ from the original materials. CS MC	SC.A.1.3.5 The student knows the difference between a physical change in a substance (i.e., altering the shape, form, volume, or density) and a chemical change (i.e., producing new substances with different characteristics). CS MC	SC.A.1.4.5 The student knows that connections (bonds) form between substances when outer-shell electrons are either transferred or shared between their atoms, changing the properties of substances. (Assessed as A.1.4.2)
	SC.A.1.3.6 The student knows that equal volumes of different substances may have different masses. (Assessed as A.1.3.1)	

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SCIENCE CONTENT ASSESSED BY THE FCAT, ITEM FORMATS, AND ASSESSMENT SCHEDULE BY BENCHMARK

Strand A: The Nature of Matter		
2. The student understands the basic principles of atomic theory.		
GRADE 5 BENCHMARK	**GRADE 8 BENCHMARK**	**GRADE 11 BENCHMARK**
SC.A.2.2.1 The student knows that materials may be made of parts too small to be seen without magnification. CS MC	SC.A.2.3.1 The student describes and compares the properties of particles and waves. CS MC	SC.A.2.4.1 The student knows that the number and configuration of electrons will equal the number of protons in an electrically neutral atom and when an atom gains or loses electrons, the charge is unbalanced. CS MC, GR
	SC.A.2.3.2 The student knows the general properties of the atom (a massive nucleus of neutral neutrons and positive protons surrounded by a cloud of negative electrons) and accepts that single atoms are not visible. CS MC	SC.A.2.4.2 The student knows the difference between an element, a molecule, and a compound. CS MC
	SC.A.2.3.3 The student knows that radiation, light, and heat are forms of energy used to cook food, treat diseases, and provide energy. (Assessed as B.1.3.1)	SC.A.2.4.3 The student knows that a number of elements have heavier, unstable nuclei that decay, spontaneously giving off smaller particles and waves that result in a small loss of mass and release a large amount of energy. (Also assesses A.2.4.4) CS MC
		SC.A.2.4.4 The student knows that nuclear energy is released when small, light atoms are fused into heavier ones. (Assessed as A.2.4.3)
		SC.A.2.4.5 The student knows that elements are arranged into groups and families based on similarities in electron structure and that their physical and chemical properties can be predicted. AA MC

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APPENDIX B
SCIENCE CONTENT ASSESSED BY THE FCAT, ITEM FORMATS, AND ASSESSMENT SCHEDULE BY BENCHMARK

Strand A: The Nature of Matter		
2. The student understands the basic principles of atomic theory.		
GRADE 5 BENCHMARK	**GRADE 8 BENCHMARK**	**GRADE 11 BENCHMARK**
		SC.A.2.4.6 The student understands that matter may act as a wave, a particle, or something else entirely different with its own characteristic behavior. CS MC
Strand B: Energy		
1. The student recognizes that energy may be changed in form with varying efficiency.		
GRADE 5 BENCHMARK	**GRADE 8 BENCHMARK**	**GRADE 11 BENCHMARK**
SC.B.1.2.1 The student knows how to trace the flow of energy in a system (e.g., as in an ecosystem). AA MC, SR	SC.B.1.3.1 The student identifies forms of energy and explains that they can be measured and compared. (Also assesses A.2.3.3, B.1.3.2, B.1.3.3, and B.1.3.4) AA MC, GR, SR, ER	SC.B.1.4.1 The student understands how knowledge of energy is fundamental to all the scientific disciplines (e.g., the energy required for biological processes in living organisms and the energy required for the building, erosion, and rebuilding of the Earth). (Also assesses B.1.4.2) AA MC, GR, SR
SC.B.1.2.2 The student recognizes various forms of energy (e.g., heat, light, and electricity). (Also assesses B.1.2.3, B.1.2.4, B.1.2.5, and B.1.2.6) AA MC	SC.B.1.3.2 The student knows that energy cannot be created or destroyed, but only changed from one form to another. (Assessed as B.1.3.1)	SC.B.1.4.2 The student understands that there is conservation of mass and energy when matter is transformed. (Assessed as B.1.4.1)
SC.B.1.2.3 The student knows that most things that emit light also emit heat. (Assessed as B.1.2.2)	SC.B.1.3.3 The student knows the various forms in which energy comes to Earth from the sun (e.g., visible light, infrared, and microwave). (Assessed as B.1.3.1)	SC.B.1.4.3 The student knows that temperature is a measure of the average translational kinetic energy of motion of the molecules in an object. (Assessed as A.1.4.3)

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APPENDIX B
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Strand B: Energy		
1. The student recognizes that energy may be changed in form with varying efficiency.		
GRADE 5 BENCHMARK	**GRADE 8 BENCHMARK**	**GRADE 11 BENCHMARK**
SC.B.1.2.4 The student knows the many ways in which energy can be transformed from one type to another. (Assessed as B.1.2.2)	SC.B.1.3.4 The student knows that energy conversions are never 100% efficient (i.e., some energy is transformed to heat and is unavailable for further useful work). (Assessed as B.1.3.1)	SC.B.1.4.4 The student knows that as electrical charges oscillate, they create time-varying electric and magnetic fields that propagate away from the source as an electromagnetic wave. CS MC, GR
SC.B.1.2.5 The student knows that various forms of energy (e.g., mechanical, chemical, electrical, magnetic, nuclear, and radiant) can be measured in ways that make it possible to determine the amount of energy that is transformed. (Assessed as B.1.2.2)	SC.B.1.3.5 The student knows the processes by which thermal energy tends to flow from a system of higher temperature to a system of lower temperature. CS MC	SC.B.1.4.5 The student knows that each source of energy presents advantages and disadvantages to its use in society (e.g., political and economic implications may determine a society's selection of renewable or nonrenewable energy sources). (Assessed as G.2.4.2)
SC.B.1.2.6 The student knows ways that heat can move from one object to another. (Assessed as B.1.2.2)	SC.B.1.3.6 The student knows the properties of waves (e.g., frequency, wavelength, and amplitude); that each wave consists of a number of crests and troughs; and the effects of different media on waves. (Also assesses C.1.3.2) AA MC, GR, SR	SC.B.1.4.6 The student knows that the first law of thermodynamics relates the transfer of energy to the work done and the heat transferred. (Assessed as B.1.4.7)
		SC.B.1.4.7 The student knows that the total amount of usable energy always decreases, even though the total amount of energy is conserved in any transfer. (Also assesses B.1.4.6) CS MC, GR

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SCIENCE CONTENT ASSESSED BY THE FCAT, ITEM FORMATS, AND ASSESSMENT SCHEDULE BY BENCHMARK

Strand B: Energy		
2. The student understands the interaction of matter and energy.		
GRADE 5 BENCHMARK	**GRADE 8 BENCHMARK**	**GRADE 11 BENCHMARK**
SC.B.2.2.1 The student knows that some source of energy is needed for organisms to stay alive and grow. CS MC	SC.B.2.3.1 The student knows that most events in the universe (e.g., weather changes, moving cars, and the transfer of a nervous impulse in the human body) involve some form of energy transfer and that these changes almost always increase the total disorder of the system and its surroundings, reducing the amount of useful energy. AA MC	SC.B.2.4.1 The student knows that the structure of the universe is the result of interactions involving fundamental particles (matter) and basic forces (energy) and that evidence suggests that the universe contains all of the matter and energy that ever existed. CS MC
SC.B.2.2.2 The student recognizes the costs and risks to society and the environment posed by the use of nonrenewable energy. (Assessed as D.2.2.1)	SC.B.2.3.2 The student knows that most of the energy used today is derived from burning stored energy collected by organisms millions of years ago (i.e., nonrenewable fossil fuels). (Assessed as G.2.3.1)	
SC.B.2.2.3 The student knows that the limited supply of usable energy sources (e.g., fuels such as coal or oil) places great significance on the development of renewable energy sources. (Assessed as D.2.2.1)		
Strand C: Force and Motion		
1. The student understands that types of motion may be described, measured, and predicted.		
GRADE 5 BENCHMARK	**GRADE 8 BENCHMARK**	**GRADE 11 BENCHMARK**
SC.C.1.2.1 The student understands that the motion of an object can be described and measured. CS MC	SC.C.1.3.1 The student knows that the motion of an object can be described by its position, direction of motion, and speed. CS MC, GR	SC.C.1.4.1 The student knows that all motion is relative to whatever frame of reference is chosen and that there is no absolute frame of reference from which to observe all motion. (Also assesses C.1.4.2 and C.2.4.6) AA MC, GR

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Strand C: Force and Motion		
1. The student understands that types of motion may be described, measured, and predicted.		
GRADE 5 BENCHMARK	**GRADE 8 BENCHMARK**	**GRADE 11 BENCHMARK**
SC.C.1.2.2 The student knows that waves travel at different speeds through different materials. CS MC	SC.C.1.3.2 The student knows that vibrations in materials set up wave disturbances that spread away from the source (e.g., sound and earthquake waves). (Assessed as B.1.3.6)	SC.C.1.4.2 The student knows that any change in velocity is an acceleration. (Assessed as C.1.4.1)
2. The student understands that the types of force that act on an object and the effect of that force can be described, measured, and predicted.		
GRADE 5 BENCHMARK	**GRADE 8 BENCHMARK**	**GRADE 11 BENCHMARK**
SC.C.2.2.1 The student recognizes that forces of gravity, magnetism, and electricity operate simple machines. CS MC	SC.C.2.3.1 The student knows that many forces (e.g., gravitational, electrical, and magnetic) act at a distance (i.e., without contact). CS MC	SC.C.2.4.1 The student knows that acceleration due to gravitational force is proportional to mass and inversely proportional to the square of the distance between the objects. AA MC, GR
SC.C.2.2.2 The student knows that an object may move in a straight line at a constant speed, speed up, slow down, or change direction dependent on net force acting on the object. (Assessed as C.2.2.4)	SC.C.2.3.2 The student knows common contact forces. (Assessed as C.2.3.6)	SC.C.2.4.2 The student knows that electrical forces exist between any two charged objects. (Assessed as C.2.4.3)
SC.C.2.2.3 The student knows that the more massive an object is, the less effect a given force has. (Assessed as C.2.2.4)	SC.C.2.3.3 The student knows that if more than one force acts on an object, then the forces can reinforce or cancel each other, depending on their direction and magnitude. (Assessed as C.2.3.6)	SC.C.2.4.3 The student describes how magnetic force and electrical force are two aspects of a single force. (Also assesses C.2.4.2) CS MC
SC.C.2.2.4 The student knows that the motion of an object is determined by the overall effect of all of the forces acting on the object. (Also assesses C.2.2.2 and C.2.2.3) AA MC, SR, ER	SC.C.2.3.4 The student knows that simple machines can be used to change the direction or size of a force. CS MC, GR	SC.C.2.4.4 The student knows that the forces that hold the nucleus of an atom together are much stronger than electromagnetic force and that this is the reason for the great amount of energy released from the nuclear reactions in the sun and other stars. CS MC

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Strand C: Force and Motion		
2. The student understands that the types of force that act on an object and the effect of that force can be described, measured, and predicted.		
GRADE 5 BENCHMARK	**GRADE 8 BENCHMARK**	**GRADE 11 BENCHMARK**
	SC.C.2.3.5 The student understands that an object in motion will continue at a constant speed and in a straight line until acted upon by a force and that an object at rest will remain at rest until acted upon by a force. (Assessed as C.2.3.6)	SC.C.2.4.5 The student knows that most observable forces can be traced to electric forces acting between atoms or molecules. CS MC
	SC.C.2.3.6 The student explains and shows the ways in which a net force (i.e., the sum of all acting forces) can act on an object (e.g., speeding up an object traveling in the same direction as the net force, slowing down an object traveling in the direction opposite of the net force). (Also assesses C.2.3.2, C.2.3.3, and C.2.3.5) AA MC, GR, SR	SC.C.2.4.6 The student explains that all forces come in pairs commonly called action and reaction. (Assessed as C.1.4.1)
	SC.C.2.3.7 The student knows that gravity is a universal force that every mass exerts on every other mass. CS MC	

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APPENDIX B
SCIENCE CONTENT ASSESSED BY THE FCAT, ITEM FORMATS, AND ASSESSMENT SCHEDULE BY BENCHMARK

Strand D: Processes that Shape the Earth		
1. The student recognizes that processes in the lithosphere, atmosphere, hydrosphere, and biosphere interact to shape the Earth.		
GRADE 5 BENCHMARK	**GRADE 8 BENCHMARK**	**GRADE 11 BENCHMARK**
SC.D.1.2.1 The student knows that larger rocks can be broken down into smaller rocks, which in turn can be broken down to combine with organic material to form soil. (Assessed as D.1.2.4)	SC.D.1.3.1 The student knows that mechanical and chemical activities shape and reshape the Earth's land surface by eroding rock and soil in some areas and depositing them in other areas, sometimes in seasonal layers. CS MC	SC.D.1.4.1 The student knows how climatic patterns on Earth result from an interplay of many factors (Earth's topography, its rotation on its axis, solar radiation, the transfer of heat energy where the atmosphere interfaces with lands and oceans, and wind and ocean currents). AA MC, SR
SC.D.1.2.2 The student knows that 75 percent of the surface of the Earth is covered by water. (Assessed as D.1.2.4)	SC.D.1.3.2 The student knows that over the whole Earth, organisms are growing, dying, and decaying as new organisms are produced by the old ones. (Assessed as D.1.3.4)	SC.D.1.4.2 The student knows that the solid crust of Earth consists of slow-moving, separate plates that float on a denser, molten layer of Earth and that these plates interact with each other, changing the Earth's surface in many ways (e.g., forming mountain ranges and rift valleys, causing earthquake and volcanic activity, and forming undersea mountains that can become ocean islands). AA MC, SR
SC.D.1.2.3 The student knows that the water cycle is influenced by temperature, pressure, and the topography of the land. CS MC	SC.D.1.3.3 The student knows how conditions that exist in one system influence the conditions that exist in other systems. CS MC	SC.D.1.4.3 The student knows that changes in Earth's climate, geological activity, and life forms may be traced and compared. CS MC
SC.D.1.2.4 The student knows that the surface of the Earth is in a continuous state of change as waves, weather, and shifts of the land constantly change and produce many new features. (Also assesses D.1.2.1, D.1.2.2, and D.1.2.5) AA MC, SR, ER	SC.D.1.3.4 The student knows the ways in which plants and animals reshape the landscape (e.g., bacteria, fungi, worms, rodents, and other organisms add organic matter to the soil, increasing soil fertility, encouraging plant growth, and strengthening resistance to erosion). (Also assesses D.1.3.2) AA MC	SC.D.1.4.4 The student knows that Earth's systems and organisms are the result of a long, continuous change over time. (Assessed as F.2.4.3)

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Strand D: Processes that Shape the Earth		
1. The student recognizes that processes in the lithosphere, atmosphere, hydrosphere, and biosphere interact to shape the Earth.		
GRADE 5 BENCHMARK	**GRADE 8 BENCHMARK**	**GRADE 11 BENCHMARK**
SC.D.1.2.5 The student knows that some changes in the Earth's surface are due to slow processes and some changes are due to rapid processes. (Assessed as D.1.2.4)	SC.D.1.3.5 The student understands concepts of time and size relating to the interaction of Earth's processes (e.g., lightning striking in a split second as opposed to the shifting of the Earth's plates altering the landscape, distance between atoms measured in Angstrom units as opposed to distance between stars measured in light-years). CS MC, GR	
2. The student understands the need for protection of the natural systems on Earth.		
GRADE 5 BENCHMARK	**GRADE 8 BENCHMARK**	**GRADE 11 BENCHMARK**
SC.D.2.2.1 The student knows that using, recycling, and reducing the use of natural resources improve and protect the quality of life. (Also assesses B.2.2.2 and B.2.2.3) CS MC	SC.D.2.3.1 The student understands that quality of life is relevant to personal experience. (Not assessed)	SC.D.2.4.1 The student understands the interconnectedness of the systems on Earth and the quality of life. (Also assesses G.2.4.4) AA MC, SR
	SC.D.2.3.2 The student knows the positive and negative consequences of human action on the Earth's systems. (Assessed as G.2.3.2)	
Strand E: Earth and Space		
1. The student understands the interaction and organization in the Solar System and the universe and how this affects life on Earth.		
GRADE 5 BENCHMARK	**GRADE 8 BENCHMARK**	**GRADE 11 BENCHMARK**
SC.E.1.2.1 The student knows that the tilt of the Earth on its own axis as it rotates and revolves around the sun causes changes in season, length of day, and energy available. AA MC, SR	SC.E.1.3.1 The student understands the vast size of our Solar System and the relationship of the planets and their satellites. (Also assesses E.1.3.2) AA MC, GR, SR	SC.E.1.4.1 The student understands the relationships between events on Earth and the movements of the Earth, its moon, the other planets, and the sun. (Also assesses E.1.4.2 and E.1.4.3) AA MC, SR

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Strand E: Earth and Space

1. The student understands the interaction and organization in the Solar System and the universe and how this affects life on Earth.

GRADE 5 BENCHMARK	GRADE 8 BENCHMARK	GRADE 11 BENCHMARK
SC.E.1.2.2 The student knows that the combination of the Earth's movement and the moon's own orbit around the Earth results in the appearance of cyclical phases of the moon. CS MC	SC.E.1.3.2 The student knows that available data from various satellite probes show the similarities and differences among planets and their moons in the Solar System. (Assessed as E.1.3.1)	SC.E.1.4.2 The student knows how the characteristics of other planets and satellites are similar to and different from those of the Earth. (Assessed as E.1.4.1)
SC.E.1.2.3 The student knows that the sun is a star and that its energy can be captured or concentrated to generate heat and light for work on Earth. CS MC	SC.E.1.3.3 The student understands that our sun is one of many stars in our galaxy. (Assessed as E.2.3.1)	SC.E.1.4.3 The student knows the various reasons that Earth is the only planet in our Solar System that appears to be capable of supporting life as we know it. (Assessed as E.1.4.1)
SC.E.1.2.4 The student knows that the planets differ in size, characteristics, and composition and that they orbit the sun in our Solar System. (Also assesses E.1.2.5) CS MC	SC.E.1.3.4 The student knows that stars appear to be made of similar chemical elements, although they differ in age, size, temperature, and distance. CS MC	
SC.E.1.2.5 The student understands the arrangement of planets in our Solar System. (Assessed as E.1.2.4)		

2. The student recognizes the vastness of the universe and the Earth's place in it.

GRADE 5 BENCHMARK	GRADE 8 BENCHMARK	GRADE 11 BENCHMARK
SC.E.2.2.1 The student knows that, in addition to the sun, there are many other stars that are far away. CS MC	SC.E.2.3.1 The student knows that thousands of other galaxies appear to have the same elements, forces, and forms of energy found in our Solar System. (Also assesses E.1.3.3) CS MC	SC.E.2.4.1 The student knows that the stages in the development of three categories of stars are based on mass: stars that have the approximate mass of our sun, stars that are two-to-three-stellar masses and develop into neutron stars, and stars that are five-to-six-stellar masses and develop into black holes. CS MC

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Strand E: Earth and Space		
2. The student recognizes the vastness of the universe and the Earth's place in it.		
GRADE 5 BENCHMARK	**GRADE 8 BENCHMARK**	**GRADE 11 BENCHMARK**
		SC.E.2.4.2 The student identifies the arrangement of bodies found within and outside our galaxy. CS MC
		SC.E.2.4.3 The student knows astronomical distance and time. CS MC, GR
		SC.E.2.4.4 The student understands stellar equilibrium. (Not assessed)
		SC.E.2.4.5 The student knows various scientific theories on how the universe was formed. (Not assessed)
		SC.E.2.4.6 The student knows the various ways in which scientists collect and generate data about our universe (e.g., X-ray telescopes, computer simulations of gravitational systems, nuclear reactions, space probes, and supercollider simulations). (Assessed as H.1.4.1)
		SC.E.2.4.7 The student knows that mathematical models and computer simulations are used in studying evidence from many sources to form a scientific account of the universe. (Assessed as H.1.4.1)

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Strand F: Processes of Life		
1. The student describes patterns of structure and function in living things.		
GRADE 5 BENCHMARK	**GRADE 8 BENCHMARK**	**GRADE 11 BENCHMARK**
SC.F.1.2.1 The student knows that the human body is made of systems with structures and functions that are related. CS MC	SC.F.1.3.1 The student understands that living things are composed of major systems that function in reproduction, growth, maintenance, and regulation. AA MC, SR	SC.F.1.4.1 The student knows that the body processes involve specific biochemical reactions governed by biochemical principles. (Also assesses F.1.4.3 and F.1.4.5) AA MC, SR
SC.F.1.2.2 The student knows how all animals depend on plants. CS MC	SC.F.1.3.2 The student knows that the structural basis of most organisms is the cell and most organisms are single cells, while some, including humans, are multicellular. CS MC	SC.F.1.4.2 The student knows that body structures are uniquely designed and adapted for their function. (Assessed as F.2.4.3)
SC.F.1.2.3 The student knows that living things are different but share similar structures. AA MC, SR	SC.F.1.3.3 The student knows that in multicellular organisms cells grow and divide to make more cells in order to form and repair various organs and tissues. CS MC	SC.F.1.4.3 The student knows that membranes are sites for chemical synthesis and essential energy conversions. (Assessed as F.1.4.1)
SC.F.1.2.4 The student knows that similar cells form different kinds of structures. CS MC	SC.F.1.3.4 The student knows that the levels of structural organization for function in living things include cells, tissues, organs, systems, and organisms. CS MC	SC.F.1.4.4 The student understands that biological systems obey the same laws of conservation as physical systems. CS MC
	SC.F.1.3.5 The student explains how the life functions of organisms are related to what occurs within the cell. CS MC	SC.F.1.4.5 The student knows that complex interactions among the different kinds of molecules in the cell cause distinct cycles of activity governed by proteins. (Assessed as F.1.4.1)
	SC.F.1.3.6 The student knows that the cells with similar functions have similar structures, whereas those with different structures have different functions. CS MC	SC.F.1.4.6 The student knows that separate parts of the body communicate with each other using electrical and/or chemical signals. (Assessed as F.1.4.7)

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SCIENCE CONTENT ASSESSED BY THE FCAT, ITEM FORMATS, AND ASSESSMENT SCHEDULE BY BENCHMARK

Strand F: Processes of Life		
1. The student describes patterns of structure and function in living things.		
GRADE 5 BENCHMARK	**GRADE 8 BENCHMARK**	**GRADE 11 BENCHMARK**
	SC.F.1.3.7 The student knows that behavior is a response to the environment and influences growth, development, maintenance, and reproduction. CS MC	SC.F.1.4.7 The student knows that organisms respond to internal and external stimuli. (Also assesses F.1.4.6 and F.1.4.8) CS MC
		SC.F.1.4.8 The student knows that cell behavior can be affected by molecules from other parts of the organism or even from other organisms. (Assessed as F.1.4.7)
2. The student understands the process and importance of genetic diversity.		
GRADE 5 BENCHMARK	**GRADE 8 BENCHMARK**	**GRADE 11 BENCHMARK**
SC.F.2.2.1 The student knows that many characteristics of an organism are inherited from the parents of the organism, but that other characteristics are learned from an individual's interactions with the environment. CS MC	SC.F.2.3.1 The student knows the patterns and advantages of sexual and asexual reproduction in plants and animals. CS MC	SC.F.2.4.1 The student understands the mechanisms of asexual and sexual reproduction and knows the different genetic advantages and disadvantages of asexual and sexual reproduction. CS MC, GR
	SC.F.2.3.2 The student knows that the variation in each species is due to the exchange and interaction of genetic information as it is passed from parent to offspring. AA MC, SR	SC.F.2.4.2 The student knows that every cell contains a "blueprint" coded in DNA molecules that specify how proteins are assembled to regulate cells. CS MC
	SC.F.2.3.3 The student knows that generally organisms in a population live long enough to reproduce because they have survival characteristics. (Also assesses F.2.3.4 and G.1.3.2) AA MC	SC.F.2.4.3 The student understands the mechanisms of change (e.g., mutation and natural selection) that lead to adaptations in a species and their ability to survive naturally in changing conditions and to increase species diversity. (Also assesses D.1.4.4 and F.1.4.2) AA MC, SR

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Strand F: Processes of Life		
2. The student understands the process and importance of genetic diversity.		
GRADE 5 BENCHMARK	**GRADE 8 BENCHMARK**	**GRADE 11 BENCHMARK**
	SC.F.2.3.4 The student knows that the fossil record provides evidence that changes in the kinds of plants and animals in the environment have been occurring over time. (Assessed as F.2.3.3)	
Strand G: How Living Things Interact with Their Environment		
1. The student understands the competitive, interdependent, cyclic nature of living things in the environment.		
GRADE 5 BENCHMARK	**GRADE 8 BENCHMARK**	**GRADE 11 BENCHMARK**
SC.G.1.2.1 The student knows ways that plants, animals, and protists interact. CS MC	SC.G.1.3.1 The student knows that viruses depend on other living things. (Assessed as G.1.3.4)	SC.G.1.4.1 The student knows of the great diversity and interdependence of living things. (Also assesses G.1.4.2) AA MC, SR
SC.G.1.2.2 The student knows that living things compete in a climatic region with other living things and that structural adaptations make them fit for an environment. AA MC, SR	SC.G.1.3.2 The student knows that biological adaptations include changes in structures, behaviors, or physiology that enhance reproductive success in a particular environment. (Assessed as F.2.3.3)	SC.G.1.4.2 The student understands how the flow of energy through an ecosystem made up of producers, consumers, and decomposers carries out the processes of life and that some energy dissipates as heat and is not recycled. (Assessed as G.1.4.1)
SC.G.1.2.3 The student knows that green plants use carbon dioxide, water, and sunlight energy to turn minerals and nutrients into food for growth, maintenance, and reproduction. AA MC, SR	SC.G.1.3.3 The student understands that the classification of living things is based on a given set of criteria and is a tool for understanding biodiversity and interrelationships. CS MC	SC.G.1.4.3 The student knows that the chemical elements that make up the molecules of living things are combined and recombined in different ways. CS MC

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Strand G: How Living Things Interact with Their Environment		
1. The student understands the competitive, interdependent, cyclic nature of living things in the environment.		
GRADE 5 BENCHMARK	**GRADE 8 BENCHMARK**	**GRADE 11 BENCHMARK**
SC.G.1.2.4 The student knows that some organisms decompose dead plants and animals into simple minerals and nutrients for use by living things and thereby recycle matter. (Assessed as G.1.2.6)	SC.G.1.3.4 The student knows that the interactions of organisms with each other and with the nonliving parts of their environments result in the flow of energy and the cycling of matter throughout the system. (Also assesses G.1.3.1 and G.1.3.5) AA MC, SR	
SC.G.1.2.5 The student knows that animals eat plants or other animals to acquire the energy they need for survival. CS MC	SC.G.1.3.5 The student knows that life is maintained by a continuous input of energy from the sun and by the recycling of the atoms that make up the molecules of living organisms. (Assessed as G.1.3.4)	
SC.G.1.2.6 The student knows that organisms are growing, dying, and decaying and that new organisms are being produced from the materials of dead organisms. (Also assesses G.1.2.4) CS MC		
SC.G.1.2.7 The student knows that variations in light, water, temperature, and soil content are largely responsible for the existence of different kinds of organisms and population densities in an ecosystem. CS MC		

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Strand G: How Living Things Interact with Their Environment		
2. The student understands the consequences of using limited natural resources.		
GRADE 5 BENCHMARK	**GRADE 8 BENCHMARK**	**GRADE 11 BENCHMARK**
SC.G.2.2.1 The student knows that all living things must compete for Earth's limited resources; organisms best adapted to compete for the available resources will be successful and pass their adaptations (traits) to their offspring. AA MC, SR	SC.G.2.3.1 The student knows that some resources are renewable and others are nonrenewable. (Also assesses B.2.3.2) CS MC	SC.G.2.4.1 The student knows that layers of energy-rich organic materials have been gradually turned into great coal beds and oil pools (fossil fuels) by the pressure of the overlying earth and that humans burn fossil fuels to release the stored energy as heat and carbon dioxide. CS MC
SC.G.2.2.2 The student knows that the size of a population is dependent upon the available resources within its community. CS MC	SC.G.2.3.2 The student knows that all biotic and abiotic factors are interrelated and that if one factor is changed or removed, it impacts the availability of other resources within the system. (Also assesses D.2.3.2, G.2.3.3, and G.2.3.4) AA MC, GR, SR	SC.G.2.4.2 The student knows that changes in a component of an ecosystem will have unpredictable effects on the entire system but that the components of the system tend to react in a way that will restore the ecosystem to its original condition. (Also assesses B.1.4.5 and G.2.4.5) AA MC, SR, ER
SC.G.2.2.3 The student understands that changes in the habitat of an organism may be beneficial or harmful. CS MC	SC.G.2.3.3 The student knows that a brief change in the limited resources of an ecosystem may alter the size of a population or the average size of individual organisms and that long-term change may result in the elimination of animal and plant populations inhabiting the Earth. (Assessed as G.2.3.2)	SC.G.2.4.3 The student understands how genetic variation of offspring contributes to population control in an environment and that natural selection ensures that those who are best adapted to their surroundings survive to reproduce. CS MC
	SC.G.2.3.4 The student understands that humans are a part of an ecosystem and their activities may deliberately or inadvertently alter the equilibrium in ecosystems. (Assessed as G.2.3.2)	SC.G.2.4.4 The student knows that the world ecosystems are shaped by physical factors that limit their productivity. (Assessed as D.2.4.1)

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Strand G: How Living Things Interact with Their Environment		
2. The student understands the consequences of using limited natural resources.		
GRADE 5 BENCHMARK	**GRADE 8 BENCHMARK**	**GRADE 11 BENCHMARK**
		SC.G.2.4.5 The student understands that the amount of life any environment can support is limited and that human activities can change the flow of energy and reduce the fertility of the Earth. (Assessed as G.2.4.2)
		SC.G.2.4.6 The student knows the ways in which humans today are placing their environmental support systems at risk (e.g., rapid human population growth, environmental degradation, and resource depletion). CS MC
Strand H: The Nature of Science		
1. The student uses the scientific processes and habits of mind to solve problems.		
GRADE 5 BENCHMARK	**GRADE 8 BENCHMARK**	**GRADE 11 BENCHMARK**
SC.H.1.2.1 The student knows that it is important to keep accurate records and descriptions to provide information and clues on causes of discrepancies in repeated experiments. AA MC	SC.H.1.3.1 The student knows that scientific knowledge is subject to modification as new information challenges prevailing theories and as a new theory leads to looking at old observations in a new way. AA MC, SR	SC.H.1.4.1 The student knows that investigations are conducted to explore new phenomena, to check on previous results, to test how well a theory predicts, and to compare different theories. (Also assesses H.1.2.1, H.1.2.2, H.2.4.2, E.2.4.6, and E.2.4.7) AA MC, GR, SR, ER
SC.H.1.2.2 The student knows that a successful method to explore the natural world is to observe and record, and then analyze and communicate the results. (Also assesses H.1.2.4 and H.3.2.2) AA MC, SR, ER	SC.H.1.3.2 The student knows that the study of the events that led scientists to discoveries can provide information about the inquiry process and its effects. CS MC	SC.H.1.4.2 The student knows that from time to time, major shifts occur in the scientific view of how the world works, but that more often the changes that take place in the body of scientific knowledge are small modifications of prior knowledge. (Also assesses H.1.3.2, H.1.4.3, H.1.4.5, and H.1.4.6) CS MC

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Strand H: The Nature of Science		
1. The student uses the scientific processes and habits of mind to solve problems.		
GRADE 5 BENCHMARK	**GRADE 8 BENCHMARK**	**GRADE 11 BENCHMARK**
SC.H.1.2.3 The student knows that to work collaboratively, all team members should be free to reach, explain, and justify their own individual conclusions. (Not assessed)	SC.H.1.3.3 The student knows that science disciplines differ from one another in topic, techniques, and outcomes, but that they share a common purpose, philosophy, and enterprise. CS MC	SC.H.1.4.3 The student understands that no matter how well one theory fits observations, a new theory might fit them as well or better, or might fit a wider range of observations, because in science, the testing, revising, and occasional discarding of theories, new and old, never ends and leads to an increasingly better understanding of how things work in the world, but not to absolute truth. (Assessed as H.1.4.2)
SC.H.1.2.4 The student knows that to compare and contrast observations and results is an essential skill in science. (Assessed as H.1.2.2)	SC.H.1.3.4 The student knows that accurate record keeping, openness, and replication are essential to maintaining an investigator's credibility with other scientists and society. (Also assesses H.1.3.7) AA MC, SR	SC.H.1.4.4 The student knows that scientists in any one research group tend to see things alike and that therefore scientific teams are expected to seek out the possible sources of bias in the design of their investigations and in their data analysis. CS MC
SC.H.1.2.5 The student knows that a model of something is different from the real thing, but can be used to learn something about the real thing. CS MC	SC.H.1.3.5 The student knows that a change in one or more variables may alter the outcome of an investigation. AA MC, GR, SR, ER	SC.H.1.4.5 The student understands that new ideas in science are limited by the context in which they are conceived, are often rejected by the scientific establishment, sometimes spring from unexpected findings, and usually grow slowly from many contributors. (Assessed as H.1.4.2)

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Strand H: The Nature of Science		
1. The student uses the scientific processes and habits of mind to solve problems.		
GRADE 5 BENCHMARK	**GRADE 8 BENCHMARK**	**GRADE 11 BENCHMARK**
	SC.H.1.3.6 The student recognizes the scientific contributions that are made by individuals of diverse backgrounds, interests, talents, and motivations. (Not assessed)	SC.H.1.4.6 The student understands that, in the short run, new ideas that do not mesh well with mainstream ideas in science often encounter vigorous criticism and that, in the long run, theories are judged by how they fit with other theories, the range of observations they explain, how well they explain observations, and how effective they are in predicting new findings. (Assessed as H.1.4.2)
	SC.H.1.3.7 The student knows that when similar investigations give different results, the scientific challenge is to verify whether the differences are significant by further study. (Assessed as H.1.3.4)	SC.H.1.4.7 The student understands the importance of a sense of responsibility, a commitment to peer review, truthful reporting of the methods and outcomes of investigations, and making the public aware of the findings. CS MC
2. The student understands that most natural events occur in comprehensible, consistent patterns.		
GRADE 5 BENCHMARK	**GRADE 8 BENCHMARK**	**GRADE 11 BENCHMARK**
SC.H.2.2.1 The student knows that natural events are often predictable and logical. CS MC	SC.H.2.3.1 The student recognizes that patterns exist within and across systems. CS MC	SC.H.2.4.1 The student knows that scientists assume that the universe is a vast system in which basic rules exist that may range from very simple to extremely complex, but that scientists operate on the belief that the rules can be discovered by careful, systemic study. AA MC
		SC.H.2.4.2 The student knows that scientists control conditions in order to obtain evidence, but when that is not possible for practical or ethical reasons, they try to observe a wide range of natural occurrences to discern patterns. (Assessed as H.1.4.1)

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Strand H: The Nature of Science		
3. The student understands that science, technology, and society are interwoven and interdependent.		
GRADE 5 BENCHMARK	**GRADE 8 BENCHMARK**	**GRADE 11 BENCHMARK**
SC.H.3.2.1 The student understands that people, alone or in groups, invent new tools to solve problems and do work that affects aspects of life outside of science. (Also assesses H.3.2.3) AA MC, SR	SC.H.3.3.1 The student knows that science ethics demand that scientists must not knowingly subject coworkers, students, the neighborhood, or the community to health or property risks. (Also assesses H.3.3.2 and H.3.3.3) CS MC	SC.H.3.4.1 The student knows that performance testing is often conducted using small-scale models, computer simulations, or analogous systems to reduce the chance of system failure. CS MC
SC.H.3.2.2 The student knows that data are collected and interpreted in order to explain an event or concept. (Assessed as H.1.2.2)	SC.H.3.3.2 The student knows that special care must be taken in using animals in scientific research. (Assessed as H.3.3.1)	SC.H.3.4.2 The student knows that technological problems often create a demand for new scientific knowledge and that new technologies make it possible for scientists to extend their research in a way that advances science. (Also assesses H.3.4.5 and H.3.4.6) AA MC, SR
SC.H.3.2.3 The student knows that before a group of people build something or try something new, they should determine how it may affect other people. (Assessed as H.3.2.1)	SC.H.3.3.3 The student knows that in research involving human subjects, the ethics of science require that potential subjects be fully informed about the risks and benefits associated with the research and of their right to refuse to participate. (Assessed as H.3.3.1)	SC.H.3.4.3 The student knows that scientists can bring information, insights, and analytical skills to matters of public concern and help people understand the possible causes and effects of events. CS MC

Strand H: The Nature of Science
3. The student understands that science, technology, and society are interwoven and interdependent.

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GRADE 5 BENCHMARK	GRADE 8 BENCHMARK	GRADE 11 BENCHMARK
SC.H.3.2.4 The student knows that through the use of science processes and knowledge, people can solve problems, make decisions, and form new ideas. AA MC, SR	SC.H.3.3.4 The student knows that technological design should require taking into account constraints such as natural laws, the properties of the materials used, and economic, political, social, ethical, and aesthetic values. (Also assesses H.3.3.6 and H.3.3.7) CS MC	SC.H.3.4.4 The student knows that funds for science research come from federal government agencies, industry, and private foundations and that this funding often influences the areas of discovery. (Not assessed)
	SC.H.3.3.5 The student understands that contributions to the advancement of science, mathematics, and technology have been made by different kinds of people, in different cultures, at different times, and are an intrinsic part of the development of human culture. (Not assessed)	SC.H.3.4.5 The student knows that the value of a technology may differ for different people and at different times. (Assessed as H.3.4.2)
	SC.H.3.3.6 The student knows that no matter who does science and mathematics or invents things, or when or where they do it, the knowledge and technology that result can eventually become available to everyone. (Assessed as H.3.3.4)	SC.H.3.4.6 The student knows that scientific knowledge is used by those who engage in design and technology to solve practical problems, taking human values and limitations into account. (Assessed as H.3.4.2)
	SC.H.3.3.7 The student knows that computers speed up and extend people's ability to collect, sort, and analyze data; prepare research reports; and share data and ideas with others. (Assessed as H.3.3.4)	

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