
APPENDIX A: BENCHMARK STATEMENTS

The number within the parentheses following each benchmark correlates to the following Foundation Skills: 1 - Communication; 2 - Problem Solving; 3 - Resource Access and Utilization; 4 - Linking and Generating Knowledge; 5 - Citizenship.

K-4

SCIENCE AS INQUIRY

In grades K-4, what students know and are able to do includes:

A. THE ABILITIES

NECESSARY TO DO SCIENTIFIC INQUIRY

- SI-E-A1 asking appropriate questions about organisms and events in the environment; (1, 3)
- SI-E-A2 planning and/or designing and conducting a scientific investigation; (2, 3)
- SI-E-A3 communicating that observations are made with one's senses; (1, 3)
- SI-E-A4 employing equipment and tools to gather data and extend the sensory observations; (3)
- SI-E-A5 using data, including numbers and graphs, to explain observations and experiments; (1, 2, 3)
- SI-E-A6 communicating observations and experiments in oral and written formats; (1, 3)
- SI-E-A7 utilizing safety procedures during experiments; (3, 5)

5-8

SCIENCE AS INQUIRY

As students in grades 5-8 extend their knowledge, what they know and are able to do includes:

A. THE ABILITIES NECESSARY TO DO SCIENTIFIC INQUIRY

- SI-M-A1 identifying questions that can be used to design a scientific investigation; (1, 2, 3)
- SI-M-A2 designing and conducting a scientific investigation; (1, 2, 3, 4, 5)
- SI-M-A3 using mathematics and appropriate tools and techniques to gather, analyze, and interpret data; (1, 2, 3, 4, 5)
- SI-M-A4 developing descriptions, explanations, and graphs using data; (1, 2, 3, 4)
- SI-M-A5 developing models and predictions using the relationships between data and explanations; (1, 2, 3, 4)
- SI-M-A6 comparing alternative explanations and predictions; (1, 3, 4)
- SI-M-A7 communicating scientific procedures, information, and explanations; (1, 3)
- SI-M-A8 utilizing safety procedures during scientific investigations; (3, 5)

9-12

SCIENCE AS INQUIRY

As students in grades 9-12 extend and refine their knowledge, what they know and are able to do includes:

A. THE ABILITIES NECESSARY TO DO SCIENTIFIC INQUIRY

- SI-H-A1 identifying questions and concepts that guide scientific investigations; (2, 4)
- SI-H-A2 designing and conducting scientific investigations; (1, 2, 3, 4, 5)
- SI-H-A3 using technology and mathematics to improve investigations and communications; (1, 2, 3)
- SI-H-A4 formulating and revising scientific explanations and models using logic and evidence; (1, 2, 3, 4)
- SI-H-A5 recognizing and analyzing alternative explanations and models; (4)
- SI-H-A6 communicating and defending a scientific argument; (1, 3, 4)
- SI-H-A7 utilizing science safety procedures during scientific investigations; (3, 5)

K-4 (CONT.)

B. UNDERSTANDING SCIENTIFIC INQUIRY

- SI-E-B1 categorizing questions into what is known, what is not known, and what questions need to be explained; (2, 4)
- SI-E-B2 using appropriate experiments depending on the questions to be explored; (2, 4)
- SI-E-B3 choosing appropriate equipment and tools to conduct an experiment; (2, 3, 5)
- SI-E-B4 developing explanations by using observations and experiments; (1, 2, 3, 4)
- SI-E-B5 presenting the results of experiments; (1, 3)
- SI-E-B6 reviewing and asking questions about the results of investigations; (1, 3, 4)

5-8 (CONT.)

B. UNDERSTANDING SCIENTIFIC INQUIRY

- SI-M-B1 recognizing that different kinds of questions guide different kinds of scientific investigations; (2, 4)
- SI-M-B2 communicating that current scientific knowledge guides scientific investigations; (1, 3, 4)
- SI-M-B3 understanding that mathematics, technology, and scientific techniques used in an experiment can limit or enhance the accuracy of scientific knowledge; (3, 4)
- SI-M-B4 using data and logical arguments to propose, modify, or elaborate on principles and models; (1, 2, 3, 4)
- SI-M-B5 understanding that scientific knowledge is enhanced through peer review, alternative explanations, and constructive criticism; (1, 4, 5)
- SI-M-B6 communicating that scientific investigations can result in new ideas, new methods or procedures, and new technologies; (1, 3, 4)
- SI-M-B7 understanding that scientific development/technology is driven by societal needs and funding; (4, 5)

9-12 (CONT.)

B. UNDERSTANDING SCIENTIFIC INQUIRY

- SI-H-B1 communicating that scientists usually base their investigations on existing models, explanations, and theories; (1, 3, 4)
- SI-H-B2 communicating that scientists conduct investigations for a variety of reasons, such as exploration of new areas, discovery of new aspects of the natural world, confirmation of prior investigations, evaluation of current theories, and comparison of models and theories; (1, 3, 4)
- SI-H-B3 communicating that scientists rely on technology to enhance the gathering and manipulation of data; (1, 3)
- SI-H-B4 analyzing a proposed explanation of scientific evidence according to the following criteria: following a logical structure, following rules of evidence, allowing for questions and modifications, and basing it on historical and current scientific knowledge; (2, 4, 5)
- SI-H-B5 communicating that the results of scientific inquiry, new knowledge, and methods emerge from different types of investigations and public communication among scientists; (1, 3, 4, 5)

K-4

PHYSICAL SCIENCE

A. PROPERTIES OF OBJECTS AND MATERIALS

- PS-E-A1 observing, describing, and classifying objects by properties (size, weight, shape, color, texture, and temperature); (4)
- PS-E-A2 measuring properties of objects using appropriate materials, tools, and technology; (3, 4, 5)
- PS-E-A3 observing and describing the objects by the properties of the materials from which they are made (paper, wood, metal); (2, 4)
- PS-E-A4 describing the properties of the different states of matter and identifying the conditions that cause matter to change states; (2, 3)
- PS-E-A5 creating mixtures and separating them based on differences in properties (salt, sand); (2, 3)

B. POSITION AND MOTION OF OBJECTS

- PS-E-B1 observing and describing the position of an object relative to another object or the background; (1, 2)
- PS-E-B2 exploring and recognizing that the position and motion of objects can be changed by pushing or pulling (force) over time; (1, 2, 3)
- PS-E-B3 describing an object's motion by tracing and measuring its position over time; (1, 2, 3, 4)

5-8

PHYSICAL SCIENCE

A. PROPERTIES AND CHANGES OF PROPERTIES IN MATTER

- PS-M-A1 investigating, measuring, and communicating the properties of different substances which are independent of the amount of the substance; (1, 2, 3, 4)
- PS-M-A2 understanding that all matter is made up of particles called atoms and that atoms of different elements are different; (2, 4)
- PS-M-A3 grouping substances according to similar properties and/or behaviors; (4)
- PS-M-A4 understanding that atoms and molecules are perpetually in motion; (4)
- PS-M-A5 investigating the relationships among temperature, molecular motion, phase changes, and physical properties of matter; (2, 3)
- PS-M-A6 investigating chemical reactions between different substances to discover that new substances formed may have new physical properties and do have new chemical properties; (2, 3, 4, 5)
- PS-M-A7 understanding that during a chemical reaction in a closed system, the mass of the products is equal to that of the reactants (2, 3, 4)

9-12

PHYSICAL SCIENCE

A. MEASUREMENT AND SYMBOLIC REPRESENTATION

- PS-H-A1 manipulating and analyzing quantitative data using the SI system; (2, 3, 4)
- PS-H-A2 understanding the language of chemistry (formulas, equations, symbols) and its relationship to molecules, atoms, ions, and subatomic particles; (1, 2, 3, 4)

B. ATOMIC STRUCTURE

- PS-H-B1 describing the structure of the atom and identifying and characterizing the particles that compose it (including the structure and properties of isotopes); (1, 2, 4)
- PS-H-B2 describing the nature and importance of radioactive isotopes and nuclear reactions (fission, fusion, radioactive decay); (1, 2, 3, 4, 5)
- PS-H-B3 understanding that an atom's electron configuration, particularly that of the outermost electrons, determines the chemical properties of that atom; (2, 3, 4)

C. THE STRUCTURE AND PROPERTIES OF MATTER

- PS-H-C1 distinguishing among elements, compounds, and/or mixtures; (1, 2, 4)

K-4 (CONT.)

PS-E-B4 investigating and describing how the motion of an object is related to the strength of the force (pushing or pulling) and the mass of the object; (1, 2, 3, 4)

C. FORMS OF ENERGY

- PS-E-C1 experimenting and communicating how vibrations of objects produce sound and how changing the rate of vibration varies the pitch; (2)
- PS-E-C2 investigating and describing how light travels and what happens when light strikes an object (reflection, refraction, and absorption); (2)
- PS-E-C3 investigating and describing different ways heat can be produced and moved from one object to another by conduction; (2)
- PS-E-C4 investigating and describing how electricity travels in a circuit; (2)
- PS-E-C5 investigating and communicating that magnetism and gravity can exert forces on objects without touching the objects; (2)
- PS-E-C6 exploring and describing simple energy transformations; (2)
- PS-E-C7 exploring and describing the uses of energy at school, home, and play; (1, 2, 4, 5)

5-8 (CONT.)

- PS-M-A8 discovering and recording how factors such as temperature influence chemical reactions; (2)
- PS-M-A9 identifying elements and compounds found in common foods, clothing, household materials, and automobiles; (1, 2, 3, 4, 5)

B. MOTIONS AND FORCES

- PS-M-B1 describing and graphing the motions of objects; (1, 2, 3)
- PS-M-B2 recognizing different forces and describing their effects (gravity, electrical, magnetic); (1, 2)
- PS-M-B3 understanding that, when an object is not being subjected to a force, it will continue to move at a constant speed and in a straight line; (2, 3, 4)
- PS-M-B4 describing how forces acting on an object will reinforce or cancel one another, depending upon their direction and magnitude; (1, 2)
- PS-M-B5 understanding that unbalanced forces will cause changes in the speed or direction of an object's motion; (2, 4)

C. TRANSFORMATIONS OF ENERGY

- PS-M-C1 identifying and comparing the characteristics of different types of energy; (2, 3, 4)
- PS-M-C2 understanding the different kinds of energy transformations and the fact that energy can be neither destroyed nor created; (2, 3, 4)

9-12 (CONT.)

- PS-H-C2 discovering the patterns of physical and chemical properties found on the periodic table of the elements; (2, 4)
- PS-H-C3 understanding that physical properties of substances reflect the nature of interactions among its particles; (2, 4)
- PS-H-C4 separating mixtures based upon the physical properties of their components; (2)
- PS-H-C5 understanding that chemical bonds are formed between atoms when the outermost electrons are transferred or shared to produce ionic and covalent compounds; (1, 2, 4)
- PS-H-C6 recognizing that carbon atoms can bond to one another in chains, rings, and branching networks to form a variety of structures; (1, 2, 3, 4)
- PS-H-C7 using the kinetic theory to describe the behavior of atoms and molecules during phase changes and to describe the behavior of matter in its different phases; (1, 2, 4)

D. CHEMICAL REACTIONS

- PS-H-D1 observing and describing changes in matter and citing evidence of chemical change; (1, 2, 4)
- PS-H-D2 comparing, contrasting, and measuring the pH of acids and bases using a variety of indicators; (1, 2, 3, 4)
- PS-H-D3 writing balanced equations to represent a variety of chemical reactions (acid/base, oxidation/reduction, etc.); (2)

K-4 (CONT.)

5-8 (CONT.)

9-12 (CONT.)

- PS-M-C3 understanding that the Sun is a major source of energy and that energy arrives at Earth's surface as light with a range of wavelengths; (2, 3, 4)
- PS-M-C4 observing and describing the interactions of light and matter (reflection, refraction, absorption, transmission, scattering); (1, 2, 3, 4)
- PS-M-C5 investigating and describing the movement of heat and the effects of heat in objects and systems; (2, 3, 4)
- PS-M-C6 describing the types of energy that can be involved, converted, or released in electrical circuits; (2, 3, 4)
- PS-M-C7 understanding that energy is involved in chemical reactions; (2, 4)
- PS-M-C8 comparing the uses of different energy resources and their effects upon the environment; (1, 2, 3, 4, 5)

- PS-H-D4 analyzing the factors that affect the rate and equilibrium of a chemical reaction; (1, 2, 4)
- PS-H-D5 applying the law of conservation of matter to chemical reactions; (1, 2, 4)
- PS-H-D6 comparing and contrasting the energy changes that accompany changes in matter; (1, 2, 4)
- PS-H-D7 identifying important chemical reactions that occur in living systems, the home, industry, and the environment; (1, 2, 3, 4, 5)

E. FORCES AND MOTION

- PS-H-E1 recognizing the characteristics and relative strengths of the forces of nature (gravitational, electrical, magnetic, nuclear); (4, 5)
- PS-H-E2 understanding the relationship of displacement, time, rate of motion, and rate of change of motion; representing rate and changes of motion mathematically and graphically; (1, 2, 3, 4)
- PS-H-E3 understanding effects of forces on changes in motion as explained by Newtonian mechanics; (1, 4)
- PS-H-E4 illustrating how frame of reference affects our ability to judge motion; (1, 2, 4)

F. ENERGY

- PS-H-F1 describing and representing relationships among energy, work, power, and efficiency; (2, 3, 4)
- PS-H-F2 applying the universal law of conservation of matter, energy, and momentum, and recognizing their implications; (2, 3, 4, 5)

K-4 (CONT.)

5-8 (CONT.)

9-12 (CONT.)

G. INTERACTIONS OF ENERGY AND MATTER

PS-H-G1 giving examples of the transport of energy through wave action; (1, 4)

PS-H-G2 analyzing the relationship and interaction of magnetic and electrical fields and the forces they produce; (1, 2, 3, 4)

PS-H-G3 characterizing and differentiating electromagnetic and mechanical waves and their effects on objects as well as humans; (1, 2, 4)

PS-H-G4 explaining the possible hazards of exposure to various forms and amounts of energy; (1, 4, 5)

K-4

LIFE SCIENCE

A. CHARACTERISTICS OF ORGANISMS

- LS-E-A1 identifying the needs of plants and animals, based on age-appropriate recorded observations; (1, 2, 3, 4)
- LS-E-A2 distinguishing between living and nonliving things; (1, 2, 3, 4)
- LS-E-A3 locating and comparing major plant and animal structures and their functions; (1, 3)
- LS-E-A4 recognizing that there is great diversity among organisms; (1)
- LS-E-A5 locating major human body organs and describing their functions; (1, 4)
- LS-E-A6 recognizing the food groups necessary to maintain a healthy body; (1, 2, 4, 5)

B. LIFE CYCLES OF ORGANISMS

- LS-E-B1 observing and describing the life cycles of some plants and animals; (1, 3)
- LS-E-B2 observing, comparing, and grouping plants and animals according to likenesses and/or differences; (1, 2, 4)
- LS-E-B3 observing and recording how the offspring of plants and animals are similar to their parents; (1, 2, 3, 4)
- LS-E-B4 observing, recording, and graphing student growth over time using a variety of quantitative measures (height, weight, linear measure of feet and hands, etc.); (1, 3)

5-8

LIFE SCIENCE

A. STRUCTURE AND FUNCTION IN LIVING SYSTEMS

- LS-M-A1 describing the observable components and functions of a cell, such as the cell membrane, nucleus, and movement of molecules into and out of cells; (1)
- LS-M-A2 comparing and contrasting the basic structures and functions of different plant and animal cells; (1, 2, 3, 4)
- LS-M-A3 observing and analyzing the growth and development of selected organisms, including a seed plant, an insect with complete metamorphosis, and an amphibian; (1, 2, 3, 4)
- LS-M-A4 describing the basic processes of photosynthesis and respiration and their importance to life; (1, 4, 5)
- LS-M-A5 investigating human body systems and their functions (including circulatory, digestive, skeletal, respiratory); (1, 3, 4)
- LS-M-A6 describing how the human body changes with age and listing factors that affect the length and quality of life; (1, 2, 3, 4, 5)
- LS-M-A7 describing communicable and noncommunicable diseases; (1, 2, 3, 4, 5)

9-12

LIFE SCIENCE

A. THE CELL

- LS-H-A1 observing cells, identifying organelles, relating structure to function, and differentiating among cell types; (1, 2, 3, 4)
- LS-H-A2 demonstrating a knowledge of cellular transport; (1, 3, 4)
- LS-H-A3 investigating cell differentiation and describing stages of embryological development in representative organisms; (1, 2, 3, 4)

B. THE MOLECULAR BASIS OF HEREDITY

- LS-H-B1 explaining the relationship among chromosomes, DNA, genes, RNA, and proteins; (1, 3, 4)
- LS-H-B2 comparing and contrasting mitosis and meiosis; (1, 3, 4)
- LS-H-B3 describing the transmission of traits from parent to offspring and the influence of environmental factors on gene expression; (1, 2, 3, 4, 5)
- LS-H-B4 exploring advances in biotechnology and identifying possible positive and negative effects; (1, 2, 3, 4, 5)

C. BIOLOGICAL EVOLUTION

- LS-H-C1 exploring experimental evidence that supports the theory of the origin of life; (1, 3)

K-4 (CONT.)

C. ORGANISMS AND THEIR ENVIRONMENTS

- LS-E-C1 examining the habitats of plants and animals and determining how basic needs are met within each habitat; (1, 2, 3, 4, 5)
- LS-E-C2 describing how the features of some plants and animals enable them to live in specific habitats; (1, 2, 3, 4, 5)
- LS-E-C3 observing animals and plants and describing interaction or interdependence; (1, 4)

5-8 (CONT.)

B. REPRODUCTION AND HEREDITY

- LS-M-B1 describing the importance of body cell division (mitosis) and sex cell production (meiosis); (1, 4)
- LS-M-B2 describing the role of chromosomes and genes in heredity; (1, 4)
- LS-M-B3 describing how heredity allows parents to pass certain traits to offspring; (1, 4)

C. POPULATIONS AND ECOSYSTEMS

- LS-M-C1 constructing and using classification systems based on the structure of organisms; (1, 2, 3, 4)
- LS-M-C2 modeling and interpreting food chains and food webs; (1, 2, 3, 4)
- LS-M-C3 investigating major ecosystems and recognizing physical properties and organisms within each; (1, 2, 3, 4, 5)
- LS-M-C4 explaining the interaction and interdependence of nonliving and living components within ecosystems; (1, 2, 3, 4, 5)

D. ADAPTATIONS OF ORGANISMS

- LS-M-D1 describing the importance of plant and animal adaptation, including local examples; (1, 3, 4, 5)
- LS-M-D2 explaining how some members of a species survive under changed environmental conditions; (1,2,3,4,5)

9-12 (CONT.)

- LS-H-C2 recognizing the evidence for evolution; (1, 3, 4)
- LS-H-C3 discussing the patterns, mechanisms, and rate of evolution; (1, 3, 4)
- LS-H-C4 classifying organisms; (1, 2, 3, 4)
- LS-H-C5 distinguishing among the kingdoms; (1, 3, 4)
- LS-H-C6 comparing and contrasting life cycles of organisms; (1, 2, 3, 4)
- LS-H-C7 comparing viruses to cells; (1, 2, 3, 4)

D. INTERDEPENDENCE OF ORGANISMS

- LS-H-D1 illustrating the biogeochemical cycles and explaining their importance; (1, 2, 3, 4, 5)
- LS-H-D2 describing trophic levels and energy flows; (1, 3, 4, 5)
- LS-H-D3 investigating population dynamics; (2, 3, 4, 5)
- LS-H-D4 exploring how humans have impacted ecosystems and the need for societies to plan for the future; (1, 2, 4, 5)

E. MATTER, ENERGY, AND ORGANIZATION OF LIVING SYSTEMS

- LS-H-E1 comparing and contrasting photosynthesis and cellular respiration; emphasizing their relationships; (1, 2, 3, 4)
- LS-H-E2 recognizing the importance of the ATP cycle in energy usage within the cell; (1, 2, 3, 4)
- LS-H-E3 differentiating among levels of biological organization; (1, 4)

K-4 (CONT.)

5-8 (CONT.)

9-12 (CONT.)

F. SYSTEMS AND THE BEHAVIOR OF ORGANISMS

- LS-H-F1 identifying the structure and functions of organ systems; (1, 3, 4)
- LS-H-F2 identifying mechanisms involved in homeostasis; (1, 3, 4)
- LS-H-F3 recognizing that behavior is the response of an organism to internal changes and/or external stimuli; (1, 3, 4)
- LS-H-F4 recognizing that behavior patterns have adaptive value; (3, 4)

G. PERSONAL AND COMMUNITY HEALTH

- LS-H-G1 relating fitness and health to longevity; (1, 3, 4, 5)
- LS-H-G2 contrasting how organisms cause disease; (1, 3, 4, 5)
- LS-H-G3 explaining the role of the immune system in fighting disease; (1, 3, 4, 5)
- LS-H-G4 exploring current research on the major diseases with regard to cause, symptoms, treatment, prevention, and cure; (1, 3, 4, 5)
- LS-H-G5 researching technology used in prevention, diagnosis, and treatment of diseases/ disorders; (1, 3, 4, 5)

K-4

EARTH AND SPACE SCIENCE

A. PROPERTIES OF EARTH MATERIALS

- ESS-E-A1 understanding that Earth materials are rocks, minerals, and soils; (1)
- ESS-E-A2 understanding that approximately three-fourths of Earth's surface is covered with water and relating how this condition affects weather patterns and climates; (1)
- ESS-E-A3 investigating, observing, and describing how water changes from one form to another and interacts with the atmosphere; (2, 4)
- ESS-E-A4 investigating, observing, measuring, and describing changes in daily weather patterns and phenomena; (2, 4)
- ESS-E-A5 observing and communicating that rocks are composed of various substances; (1)
- ESS-E-A6 observing and describing variations in soil; (1)
- ESS-E-A7 investigating fossils and describing how they provide evidence about plants and animals that lived long ago and the environment in which they lived; (1, 2, 4)

5-8

EARTH AND SPACE SCIENCE

A. STRUCTURE OF EARTH

- ESS-M-A1 understanding that Earth is layered by density with an inner and outer core, a mantle, and a thin outer crust; (1)
- ESS-M-A2 understanding that Earth's crust and solid upper mantle are dividing plates that move in response to convection currents (energy transfers) in the mantle; (1)
- ESS-M-A3 investigating the characteristics of earthquakes and volcanoes and identifying zones where they may occur; (2, 3, 4)
- ESS-M-A4 investigating how soils are formed from weathered rock and decomposed organic material; (2, 3, 4)
- ESS-M-A5 identifying the characteristics and uses of minerals and rocks and recognizing that rocks are mixtures of minerals; (2, 3, 4)
- ESS-M-A6 explaining the processes involved in the rock cycle; (1, 4)
- ESS-M-A7 modeling how landforms result from the interaction of constructive and destructive forces; (1, 2, 3, 4)

9-12

EARTH AND SPACE SCIENCE

A. ENERGY IN EARTH'S SYSTEM

- ESS-H-A1 investigating the methods of energy transfer and identifying the Sun as the major source of energy for most of Earth's systems; (1, 3, 4)
- ESS-H-A2 modeling the seasonal changes in the relative position and appearance of the Sun and inferring the consequences with respect to Earth's temperature; (1, 2, 3, 4)
- ESS-H-A3 explaining fission and fusion in relation to Earth's internal and external heat sources; (1, 3, 4)
- ESS-H-A4 explaining how decay of radioactive isotopes and the gravitational energy from Earth's original formation generates Earth's internal heat; (1, 3, 4)
- ESS-H-A5 demonstrating how the Sun's radiant energy causes convection currents within the atmosphere and the oceans; (1, 2, 3, 4)
- ESS-H-A6 describing the energy transfer from the Sun to Earth and its atmosphere as it relates to the development of weather and climate patterns; (1, 2, 3, 4)

K-4 (CONT.)

B. OBJECTS IN THE SKY

- ESS-E-B1 observing and describing the characteristics of objects in the sky; (1)
- ESS-E-B2 demonstrating how the relationship of Earth, the Moon, and the Sun causes eclipses and moon phases; (2, 3, 4)
- ESS-E-B3 observing and recording the changing appearances and positions of the Moon in the sky at night and determining the monthly pattern of lunar change; (1, 2, 3, 4)
- ESS-E-B4 modeling changes that occur because of the rotation of Earth (alternation of night and day) and the revolution of Earth around the Sun; (1, 2, 3, 4)
- ESS-E-B5 understanding that the Sun, a star, is a source of heat and light energy and identifying its effects upon Earth; (1, 2, 3, 4)
- ESS-E-B6 understanding that knowledge of Earth as well as of the universe is gained through space exploration; (1)

5-8 (CONT.)

- ESS-M-A8 identifying the man-made and natural causes of coastal erosion and the steps taken to combat it; (1, 2, 3, 4, 5)
- ESS-M-A9 comparing and contrasting topographic features of the ocean floor to those formed above sea level; (2, 3, 4)
- ESS-M-A10 explaining (illustrating) how water circulates—on and through the crust, in the oceans, and in the atmosphere—in the water cycle; (1, 4)
- ESS-M-A11 understanding that the atmosphere interacts with the hydrosphere to affect weather and climate conditions; (1, 4)
- ESS-M-A12 predicting weather patterns through use of a weather map; (1, 2, 3, 4, 5)

B. EARTH HISTORY

- ESS-M-B1 investigating how fossils show the development of life over time; (2, 3, 4)
- ESS-M-B2 devising a model that demonstrates supporting evidence that Earth has existed for a vast period of time; (1, 2, 3, 4)
- ESS-M-B3 understanding that the Earth processes, such as erosion and weathering, that affect Earth today are similar to those which occurred in the past; (1, 2, 3, 4)

9-12 (CONT.)

- ESS-H-A7 modeling the transfer of Earth's internal heat by way of convection currents in the mantle which powers the movement of the lithospheric plates; (1, 2, 3, 4)

B. GEOCHEMICAL CYCLES

- ESS-H-B1 illustrating how stable chemical atoms or elements are recycled through the solid earth, oceans, atmosphere, and organisms; (1, 2, 3, 4)
- ESS-H-B2 demonstrating Earth's internal and external energy sources as forces in moving chemical atoms or elements; (1, 2, 3, 4)

C. THE ORIGIN AND EVOLUTION OF THE EARTH SYSTEM

- ESS-H-C1 explaining the formation of the solar system from a nebular cloud of dust and gas; (1, 2, 3, 4)
- ESS-H-C2 estimating the age of Earth by using dating techniques; (1, 2, 3, 4)
- ESS-H-C3 communicating the geologic development of Louisiana; (1, 2, 3, 4)
- ESS-H-C4 examining fossil evidence as it relates to the evolution of life and the resulting changes in the amount of oxygen in the atmosphere; (1, 2, 3, 4)
- ESS-H-C5 explaining that natural processes and changes in Earth's system may take place in a matter of seconds or develop over billions of years; (1, 2, 3, 4)

K-4 (CONT.)**5-8** (CONT.)**9-12** (CONT.)**C. EARTH IN THE SOLAR SYSTEM**

- ESS-M-C1 identifying the characteristics of the Sun and other stars; (1, 2, 3, 4)
- ESS-M-C2 comparing and contrasting the celestial bodies in our solar system; (2, 4)
- ESS-M-C3 investigating the force of gravity and the ways gravity governs motion in the solar system and objects on Earth; (2, 3, 4)
- ESS-M-C4 modeling the motions of the Earth-Moon-Sun system to explain day and night, a year, eclipses, moon phases, and tides; (1, 2, 3, 4)
- ESS-M-C5 modeling the position of Earth in relationship to other objects in the solar system; (1, 2, 3, 4)
- ESS-M-C6 modeling and describing how radiant energy from the Sun affects phenomena on the Earth's surface, such as winds, ocean currents, and the water cycle; (1, 2, 3, 4)
- ESS-M-C7 modeling and explaining how seasons result from variations in amount of the Sun's energy hitting the surface due to the tilt of Earth's rotation on its axis and the length of the day; (1, 2, 3, 4)
- ESS-M-C8 understanding that space exploration is an active area of scientific and technological research and development; (1, 5)

D. THE ORIGIN AND EVOLUTION OF THE UNIVERSE

- ESS-H-D1 identifying scientific evidence that supports the latest theory of the age and origin of the universe; (1, 2, 3, 4)
- ESS-H-D2 describing the organization of the known universe; (1, 3, 4)
- ESS-H-D3 comparing and contrasting the Sun with other stars; (1, 4)
- ESS-H-D4 identifying the elements found in the Sun and other stars by investigating the spectra; (1, 2, 3, 4)
- ESS-H-D5 describing the role of hydrogen in the formation of all the natural elements; (1, 4)
- ESS-H-D6 demonstrating the laws of motion for orbiting bodies; (1, 3, 4)
- ESS-H-D7 describing the impact of technology on the study of Earth, the solar system, and the universe; (1, 2, 3, 4, 5)

K-4

SCIENCE AND THE ENVIRONMENT

A. ECOLOGICAL SYSTEMS AND INTERACTIONS

- SE-E-A1 understanding that an “ecosystem” is made of living and non-living components; (1, 3, 4)
- SE-E-A2 understanding the components of a food chain; (1, 3, 4)
- SE-E-A3 identifying ways in which humans have altered their environment, both in positive and negative ways, either for themselves or for other living things; (1, 2, 3, 4, 5)
- SE-E-A4 understanding that the original sources of all material goods are natural resources and that the conserving and recycling of natural resources is a form of stewardship; (1, 2, 3, 4, 5)
- SE-E-A5 understanding that most plant and animal species are threatened or endangered today due to habitat loss or change; (1, 2, 4)

5-8

SCIENCE AND THE ENVIRONMENT

A. ECOLOGICAL SYSTEMS AND INTERACTIONS

- SE-M-A1 demonstrating knowledge that an ecosystem includes living and nonliving factors and that humans are an integral part of ecosystems; (1, 3, 4, 5)
- SE-M-A2 demonstrating an understanding of how carrying capacity and limiting factors affect plant and animal populations; (1, 2, 3, 4, 5)
- SE-M-A3 defining the concept of *pollutant* and describing the effects of various pollutants on ecosystems; (1, 2, 3, 4, 5)
- SE-M-A4 understanding that human actions can create risks and consequences in the environment; (1, 2, 3, 4, 5)
- SE-M-A5 tracing the flow of energy through an ecosystem and demonstrating a knowledge of the roles of producers, consumers, and decomposers in the ecosystem; (1, 2, 3, 4, 5)
- SE-E-A6 distinguishing between renewable and nonrenewable resources and understanding that nonrenewable natural resources are not replenished through the natural cycles and thus are strictly limited in quantity; (1, 2, 3, 4, 5)

9-12

SCIENCE AND THE ENVIRONMENT

A. ECOLOGICAL SYSTEMS AND INTERACTIONS

- SE-H-A1 demonstrating an understanding of the functions of Earth’s major ecological systems; (1, 2, 3, 4)
- SE-H-A2 investigating the flow of energy in ecological systems; (1, 2, 3, 4)
- SE-H-A3 describing how habitat, carrying capacity, and limiting factors influence plant and animal populations (including humans); (1, 3, 4, 5)
- SE-H-A4 understanding that change is a fundamental characteristic of every ecosystem and that ecosystems have varying capacities for change and recovery; (1, 2, 3, 4, 5)
- SE-H-A5 describing the dynamic interactions among divisions of the biosphere; (1, 3, 4)
- SE-H-A6 describing and explaining Earth’s biochemical and geochemical cycles and their relationship to ecosystem stability; (1, 2, 4)

K-4 (CONT.)

5-8 (CONT.)

9-12 (CONT.)

SE-M-A7 demonstrating knowledge of the natural cycles, such as the carbon cycle, nitrogen cycle, water cycle, and oxygen cycle; (1, 2, 4)

SE-M-A8 investigating and analyzing how technology affects the physical, chemical, and biological factors in an ecosystem; (1, 2, 3, 4, 5)

SE-M-A9 demonstrating relationships of characteristics of soil types to agricultural practices and productivity; (1, 2, 3, 4, 5)

SE-M-A10 identifying types of soil erosion and preventive measures; (1, 2, 3, 4, 5)

SE-H-A7 comparing and contrasting the dynamic interactions within the biosphere; (1, 2, 4)

SE-H-A8 analyzing evidence that plant and animal species have evolved physical, biochemical, and/or behavioral adaptations to their environments; (1, 2, 3, 4, 5)

SE-H-A9 demonstrating an understanding of influencing factors of biodiversity; (1, 3, 4, 5)

SE-H-A10 explaining that all species represent a vital link in a complex web of interaction; (1, 3, 4, 5)

SE-H-A11 understanding how pollutants can affect living systems; (1, 2, 3, 4, 5)

B. RESOURCES AND RESOURCE MANAGEMENT

SE-H-B1 explaining the relationships between renewable and nonrenewable resources; (1, 3, 4)

SE-H-B2 comparing and contrasting conserving and preserving resources; (1, 3, 4)

SE-H-B3 recognizing that population size and geographic and economic factors result in the inequitable distribution of Earth's resources; (1, 2, 3, 4, 5)

SE-H-B4 comparing and contrasting long and short-term consequences of resource management; (1, 2, 3, 4, 5)

SE-H-B5 analyzing resource management; (1, 2, 3, 4, 5)

K-4

5-8

9-12 (CONT.)

SE-H-B6 recognizing that sustainable development is a process of change in which resource use, investment direction, technological development, and institutional change meet society's present as well as future needs; (1, 2, 3, 4, 5)

C. ENVIRONMENTAL AWARENESS AND PROTECTION

SE-H-C1 evaluating the dynamic interaction of land, water, and air and their relationship to living things in maintaining a healthy environment; (1, 2, 3, 4, 5)

SE-H-C2 evaluating the relationships between quality of life and environmental quality; (1, 2, 3, 4, 5)

SE-H-C3 investigating and communicating how environmental policy is formed by the interaction of social, economic, technological, and political considerations; (1, 2, 3, 4, 5)

SE-H-C4 demonstrating that environmental decisions include analyses that incorporate ecological, health, social, and economic factors; (1, 2, 3, 4, 5)

SE-H-C5 analyzing how public support affects the creation and enforcement of environmental laws and regulations; (1, 2, 3, 4, 5)

K-4

5-8

9-12 (CONT.)

**D. PERSONAL CHOICES
AND RESPONSIBLE
ACTIONS**

SE-H-D1 demonstrating the effects of personal choices and actions on the natural environment; (1, 2, 3, 4, 5)

SE-H-D2 analyzing how individuals are capable of reducing and reversing their impact on the environment through thinking, planning, education, collaboration, and action; (1, 2, 3, 4, 5)

SE-H-D3 demonstrating that the most important factor in prevention and control of pollution is education; (1, 2, 3, 4, 5)

SE-H-D4 demonstrating a knowledge that environmental issues should be a local and global concern; (1, 2, 3, 4, 5)

SE-H-D5 recognizing that the development of accountability toward the environment is essential for sustainability; (1, 2, 3, 4, 5)

SE-H-D6 developing an awareness of personal responsibility as stewards of the local and global environment; (1, 2, 3, 4, 5)