# Grade 7 – Science Standards

| Standard | E&S Activities | Billy B & Me CD Songs |
|---|---|---|
| **I. Inquiry** | | |
| **A. Abilities Necessary to do Scientific Inquiry** | | |
| **1. Identify process skills that can be used in scientific investigations.** | | |
| **a. Observe** | | |
| 1. Observe patterns of objects and events. | | |
| 2. Distinguish between qualitative and quantitative observations | | |
| **b. Classify** | | |
| 1. Arrange data in sequential order. | **3 - Energy Chains** | |
| 2. Use scientific (e.g., field guides, charts, periodic tables, etc.) and dichotomous keys for classification. | | |
| **c. Measure** | | |
| 1. Select and use appropriate tools (e.g., metric ruler, graduated cylinder, thermometer, balances, spring scales, and stopwatches) and units (e.g., meter, liter, Celsius, gram, Newton, and second) to measure to the unit required in a particular situation. | | |
| 2. Select and use appropriate metric prefixes to include milli-, centi-, and kilo-. | | |
| **d. Infer** | | |
| 1. Make inferences based on observations. | **4 - What Powers the Move?** | |
| **e. Predict** | | |
| 1. Predict the results of actions based on patterns in data and experiences. | **4 - What Powers the Move?** | |
| **2. Design and conduct a scientific investigation.** | | |
| a. Recognize potential hazards within a scientific investigation and practice appropriate safety procedures. | | |
| b. Pose questions and problems to be investigated. | | |
| c. Obtain scientific information from a variety of sources (such as Internet, electronic encyclopedias, journals, community resources, etc.). | **5 - In the Driver's Seat** | |
| d. Distinguish and operationally define independent (manipulated) and dependent (responding) variables. | | |
| e. Manipulate one variable over time with repeated trials and controlled conditions. | | |

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| f. Collect and record data using appropriate metric measurements. | | |
| g. Organize data in tables and graphs. | | |
| h. Analyze data to construct explanations and draw conclusions. | **5 - In the Driver's Seat** | |
| **3. Use appropriate tools and techniques to gather, analyze, and interpret data.** | | |
| a. Select and use appropriate tools and technology (such as calculators, computers, probes, thermometers, balances, spring scales, microscopes, binoculars, and hand lenses) to perform tests, collect data, and display data. | **5 - In the Driver's Seat** | |
| b. Analyze and interpret data using computer hardware and software designed for these purposes. | | |
| **4. Develop descriptions, explanations, predictions, and models using evidence.** | | |
| a. Discriminate among observations, inferences, and predictions. | | |
| b. Construct and/or use models to carry out/support scientific investigations. | | |
| **5. Think critically and logically to make relationships between evidence and explanations.** | | |
| a. Review and summarize data to show cause-effect relationships in experiments. | | |
| b. State explanations in terms of independent (manipulated) and dependent (responding) variables. | | |
| c. State hypotheses in ways that include the independent (manipulated) and dependent (responding) variables. | | |
| **6. Recognize and analyze alternative explanations and predictions.** | | |
| a. Analyze different ideas and explanations to consider alternative ideas. | | |
| b. Accept the skepticism of others as part of the scientific process. (N) | | |
| **7. Communicate scientific procedures and explanations.** | | |
| a. Use drawings, written and oral expression to communicate information. | **2 - May the Source Be with You**<br>**4 - What Powers the Move?** | |
| b. Create drawings, diagrams, charts, tables and graphs to communicate data. | **2 - May the Source Be with You**<br>**4 - What Powers the Move?**<br>**5 - In the Driver's Seat** | |
| c. Interpret and describe patterns of data on drawings, diagrams, charts, tables, graphs, and maps. | | |
| d. Create and/or use scientific models to communicate information. | | |
| **8. Use mathematics in all aspects of scientific inquiry.** | | |

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| a. Use mathematics to gather, organize and present data. | **5 - In the Driver's Seat** | |
| b. Use mathematics to structure convincing explanations. | **5 - In the Driver's Seat** | |
| **B. Abilities of Technological Design**<br>**1. Identify appropriate problems for technological design.** | | |
| a. Identify a specific need for a product. | **4 - What Powers the Move?** | |
| b. Determine whether the product will meet the needs and be used. | **4 - What Powers the Move?** | |
| **2. Design a solution or product.** | | |
| a. Compare and contrast different proposals using selected criteria (e.g., cost, time, trade-off, and materials needed). | **4 - What Powers the Move?** | |
| b. Communicate ideas with drawings and simple models. | **4 - What Powers the Move?** | |
| **3. Implement a proposed design.** | | |
| a. Select suitable tools and techniques to ensure adequate accuracy. | | |
| b. Organize materials, devise a plan and work collaboratively where appropriate. | | |
| **4. Evaluate completed technological designs or products.** | | |
| a. Measure the quality of the product based on the original purpose or need and the degree to which it meets the needs of the users. | | |
| b. Suggest improvements and try proposed modifications to the design. | | |
| **5. Communicate the process of technological design.** | | |
| a. Identify the stages of problem design: (1) problem identification, (2) solution design, (3) implementation, and (4) evaluation. | | |
| **C. Understandings about Science and Technology**<br>**1. Scientific inquiry and technological design have similarities and differences.** | | |
| a. Compare and contrast scientific inquiry and technological design. | | |
| **2. Many different people in different cultures have made and continue to make contributions to science and technology.** | | |
| a. Describe examples of contributions people have made to science and technology. (H, N) | **4 - What Powers the Move?** | |
| **3. Science and technology are reciprocal.** | | |
| a. Explain how science and technology are essential to each other. (T) | | |
| **4. Perfectly designed solutions do not exist.** | | |
| a. Discuss factors that affect product design and alter the original design. (T) | | |

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| b. Discuss risk versus benefit factors in product design. (P) | **4 - What Powers the Move?** | |
| **5. Technological designs have constraints.** | | |
| a. Describe examples of constraints on technological designs. (T) | | |
| b. Explain why constraints on technological design are unavoidable. (T, N) | | |
| **6. Technological solutions have intended benefits and unintended consequences.** | | |
| **II. Life Science**<br>**Unit of Study: Organization and Classification of Living Things**<br>**A. Structure and Function in Living Systems**<br>**1. All organisms are composed of cells - the fundamental unit of life. Most organisms are single cells; other organisms, including humans, are multicellular.** | | |
| a. Explain why the cell is the most basic unit of living things. | | |
| b. Classify organisms as single-celled (e.g., bacteria, algae, protozoa, and certain fungi) or multicellular (e.g., animals [vertebrate/ invertebrate]). | | |
| c. Give evidence to support the statement that single-celled organisms comprise the greatest biomass of life on Earth. | | |
| d. Analyze the use of single-celled organisms in industry and in the production of food and problems single-celled organisms can cause for humans. (T, P) | | |
| **2. Cells carry on the many functions needed to sustain life. They grow and divide thereby producing more cells. This requires that they take in nutrients, which they use to provide energy for the work that cells do and to make the materials that a cell or an organism needs.** | | |
| a. Compare the major components of the cell (nucleus*, cytoplasm*, cell membrane*, cell wall*, vacuole*, mitochondrion, nuclear membrane, and chromosome), and their general functions (e.g., mitochondrion is the site of energy production). | | **Energy** |
| b. Describe the processes of respiration (aerobic and anaerobic), growth and reproduction (asexual and sexual), removal of wastes, and cellular transport (osmosis and diffusion) in cells. | | |
| c. Demonstrate diffusion and osmosis. | | |
| **3. Living systems at all levels of organization demonstrate the complementary nature of structure and function. Important levels of organization for structure and function include cells, organs, tissues, organ systems, whole organisms, and ecosystems. Specialized cells perform specialized functions in multicellular organisms. Groups of specialized cells cooperate to form a tissue, such as a muscle. Different tissues are in turn grouped together to form larger functional units, called organs. Each type of cell, tissue, and organ has a distinct structure and set of functions that serve the organism as a whole.** | | |
| a. Compare and contrast the major structures and functions of typical plant and animal cells. | | **The Rock and Roll of Photosynthesis**<br>**Energy** |

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| b. Observe, compare, and contrast different types of cells and tissues (e.g., epithelial, nerve, bone, blood, and muscle). (T) | | |
| c. Differentiate among cells, tissues, organs, and organ systems. | | |
| d. Compare and contrast the structure and functions of cells, tissues, and organs in single-celled and multicellular organisms. Compare and contrast the structure and functions of cells, tissues, and organs in single-celled and multicellular organisms. | | |
| e. Classify living organisms according to similarities in structure using a dichotomous key (kingdom, phylum, class, order, family, genus, and species). | | |
| **4. The human organism has systems for digestion, respiration*, circulation*, excretion, movement*, control, and coordination*, and protection from disease. These systems interact with one another.** | | |
| a. Identify the general functions of the major body systems and give examples of how these systems work together (e.g., respiratory and circulatory). | | |
| b. Explain how the nervous and endocrine systems are regulators of activities in humans. | | |
| c. Define regulation as the process of monitoring and coordinating activities in an organism. | | |
| d. Illustrate the parts and describe the functions of the organs of the nervous system (e.g., parts of the brain, the spinal cord, and nerves). | | |
| e. Illustrate the parts and describe the functions of the glands of the endocrine system (e.g., pituitary, thyroid, adrenal glands, and pancreas). | | |
| f. Illustrate the parts and describe the functions of the digestive system including mouth, esophagus, stomach, small intestine, large intestine, rectum, liver, pancreas, and gall bladder. | | |
| g. Design an appropriate diet and describe the effects and benefits on body functions. (P) | | |
| h. Illustrate the parts and describe the functions of the organs of the excretory system including kidneys, liver, and urinary bladder. | | |
| i. Compare and contrast the human body organs and systems to other animals (e.g., earthworm, frog, and chicken). | | |
| **5. Disease is a breakdown in structures or functions of an organism. Some diseases are the result of intrinsic failures of the system. Others are the result of damage by infection by other organisms.** | | |

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| a. Describe the work of scientists (e.g., Pasteur, Fleming, Salk) in the discovery and prevention of disease. (H) | | |
| b. Differentiate among a virus, a bacterium, and a protist. | | |
| c. List common diseases caused by viruses (e.g., polio, measles, smallpox), bacteria (e.g., tetanus, strep throat), and protists (e.g., malaria). | | |
| d. Identify the intrinsic diseases associated with the digestive system (e.g., Crohn's disease), and the nervous and endocrine systems (e.g., diabetes and Parkinson's disease). | | |
| e. Examine how health care technology has improved the quality of human life (e.g., computerized tomography [CT], artificial organs, bionics, magnetic resonance imaging [MRI], and ultrasound). (T) | | |
| **B. Regulation and Behavior**<br>**1. All organisms must be able to obtain and use resources, grow, reproduce, and maintain stable internal conditions while living in a constantly changing external environment.** | | |
| a. Analyze the basic characteristics and needs of living things. | | |
| b. Compare and contrast how organisms use resources, grow, reproduce, and maintain stable internal conditions (homeostasis). | | |
| **2. Regulation of an organism's internal environment involves sensing the internal environment and changing physiological activities to keep conditions within the range required to survive.** | | |
| a. Contrast warm-blooded and cold-blooded animals' mechanisms to control their internal environment. | | |
| b. Infer how environmental stimuli cause changes in hormone production that allow organisms to survive (e.g., adrenaline is produced in response to fear or excitement). | | |
| **3. Behavior is one kind of response an organism can make to an internal or environmental stimulus. A behavioral response requires coordination and communication at many levels, including cells, organ systems, and whole organisms. Behavioral response is a set of actions determined in part by heredity and in part from experience.** | | |
| a. Evaluate behaviors to determine if they are inherited or learned. | | |
| b. Predict an organism's response to an environmental stimulus based on its level of organization (e.g., endospore formation, and hibernation). | | |
| **Unit of Study: Genetics**<br><br>**C. Reproduction and Heredity**<br>**1. Reproduction is a characteristic of all living systems and essential to the continuation of every species. Some organisms reproduce asexually. Other organisms reproduce sexually.** | | |
| a. Compare and contrast sexual and asexual reproduction. | | |

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| b. Account for the adaptability of species that reproduce sexually versus asexually. | | |
| **2. In many species, females produce eggs and males produce sperm. An egg and a sperm unite to begin the development of a new individual. That new individual receives genetic information from its mother (via the egg) and its father (via the sperm). Sexually produced offspring never are identical to either of their parents.** | | |
| a. Explain the formation of sex cells (meiosis) and how this results in each cell having only half the genetic material needed to produce a new individual. | | |
| b. Analyze how the combination of sex cells results in a new combination of genetic information different from either parent. | | |
| **3. Every organism requires a set of instructions for specifying its traits. Heredity is the passage of these instructions from one generation to another. Hereditary information is contained in genes, located in the chromosomes of each cell. Each gene carries a single unit of information. An inherited trait of an individual can be determined by one or by many genes, and a single gene can influence more than one trait. A human cell contains many thousands of different genes.** | | |
| a. Identify the historical contributions and significance of discoveries of Gregor Mendel as related to genetics. (H) | | |
| b. Describe the relationship between genes and chromosomes and their relationship to inherited characteristics. | | |
| c. Analyze how traits are passed from parents to offspring through pairs of genes. | | |
| d. Explain how inherited traits are determined by one or many genes. | | |
| **4. The characteristics of an organism can be described in terms of a combination of traits. Some traits are inherited and others result from interactions with the environment.** | | |
| a. Differentiate between dominant and recessive traits (genotypes and phenotypes). | | |
| b. Categorize traits as inherited or acquired. | | |
| c. Construct and use Punnett squares to explain how single genetic traits are combined and passed to offspring. | | |
| d. Calculate the probability of simple phenotypes and genotypes. | | |
| e. Discuss advantages and disadvantages of selective breeding, genetic engineering, and biomedical research. (P) | | |
| **Unit of Study:**<br>**Ecology - The Biotic Environment**<br><br>**D. Populations and Ecosystems**<br>**1. A population consists of all individuals of a species that occur together at a given place and time. All populations living together and the physical factors with which they interact compose an ecosystem.** | | |
| a. Describe the characteristics of populations. * | | |
| b. Distinguish between populations and communities. | | |

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| c. Distinguish between habitats and niches. | | |
| d. Differentiate between an ecosystem and a biome. | | |
| **2. Populations of organisms can be categorized by the function they serve in an ecosystem. All animals, including humans, are consumers, which obtain food by eating other organisms. Decomposers, primarily bacteria and fungi, are consumers that use waste materials and dead organisms for food. Food webs identify the relationships among producers, consumers, and decomposers in an ecosystem.** | | |
| a. Analyze the role of producers, consumers and decomposers in an ecosystem. | | |
| b. Identify kinds of relationships organisms have with each other (predator/prey, competition). | | |
| c. Analyze energy flow in a food chain and its relationship to a food web. | | |
| **3. The number of organisms an ecosystem can support depends on the biotic resources available. Given adequate biotic resources and no disease or predators, populations (including humans) increase at rapid rates. Lack of resources and other factors, such as predation and climate, limit the growth of populations in specific niches in the ecosystem.** | | |
| a. Compare and contrast how cooperation, competition and predation affect population growth. | | |
| b. Analyze the effects of overpopulation within an ecosystem on the amount of resources available. (P) | | |
| c. Analyze how natural hazards (earthquakes, landslides, wildfires, volcanic eruptions, floods, and storms) affect populations. (P) | | |
| **III. Earth Science**<br>**Unit of Study: Ecology - The Abiotic Environment**<br><br>**A. Structure of the Earth System**<br>**1. Landforms are the result of a combination of constructive forces (e.g., deposition of sediments) and destructive forces (e.g., weathering and erosion).** | | |
| a. Distinguish among weathering, erosion, and deposition. | | |
| b. Examine how physical weathering and chemical weathering breaks rocks into fragments. | | |
| c. Investigate and examine how the earth's surface is constantly changing by weathering, erosion, deposition and human impact. (P) | | |
| d. Examine the effects of weathering, erosion, and deposition on the formation of major landform regions in South Carolina. | | |
| e. Relate the fertility of floodplains to deposition of sediments. | | |
| f. Discuss the benefits and hazards of living on a floodplain. (P) | | |

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| **2. Soil consists of weathered rocks and decomposed organic material from dead plants, animals, and bacteria. Soils are often found in layers, with each having a different chemical composition. Living organisms have played many roles in the Earth system, including affecting the composition of the atmosphere, producing some types of rocks, and contributing to the weathering of rocks.** | | |
| a. Discuss how climatic conditions affect the development of soils. | | |
| b. Analyze soil properties that can be observed (soil profile, composition, texture, particle size) and measured (permeability, temperature, pH, moisture) to predict soil quality. | | |
| c. Explain why soil (sediments) can be a major pollutant of streams. (P) | | |
| d. Evaluate ways in which human activities have effected soil and the measures taken to control the impact (silt fences, ground cover, farming, land use, nutrient balance). (P) | | |
| **3. Water, which covers the majority of the Earth's surface, circulates through the crust, oceans, and atmosphere in what is known as the "water cycle." Water evaporates from the Earth's surface, rises and cools as it moves to higher elevations, condenses as rain or snow, and falls to the surface where it collects in lakes, oceans, soil, and in rocks underground.** | | |
| a. Define groundwater, runoff, drainage divide and drainage basin (watershed). | | |
| b. Infer what happens to water that does not soak into the ground or evaporate. | | |
| c. Analyze the factors that affect runoff. | | |
| d. Differentiate between drainage divides and drainage basins using maps or aerial photography and illustrate the relationships between groundwater and surface water in a watershed. (T) | | |
| e. Identify and illustrate groundwater zones including water table, zone of saturation, and zone of aeration. | | |
| f. Identify technologies designed to reduce sources of point and non-point water pollution. (T, P) | | |
| **4. The atmosphere is a mixture of nitrogen, oxygen, and trace gases that include water vapor.** | | |
| a. Infer how air pollution effects people and the environment. | | |
| b. Infer how air pollution effects the human body. | | |
| c. Analyze ways air pollution can be reduced. | | |
| d. Analyze how chemical hazards (pollutants in air, water, soil, and food) effect populations and ecological succession. (P) | | |

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| **5. The sun is a major source of energy for changes on the Earth's surface. Energy is transferred in many ways. (Transfer of Energy: Physical Science)** | | |
| a. Analyze the greenhouse effect and its consequences. (P) | | |
| b. Describe ways that humans may be influencing or contributing to global warming. (P) | | **Our Changing World** |
| **6. For ecosystems, the major source of energy is sunlight. Energy entering ecosystems as sunlight is transferred by producers into chemical energy through photosynthesis. That energy then passes from organism to organism in food webs. (Populations and Ecosystems: Life Science)** | | |
| a. Describe how sunlight, through photosynthesis, is transferred by producers into chemical energy. | **1 - Energy Detectives**<br>**3 - Energy Chains**<br>**6 - Energy Challenge Game** | **The Rock and Roll of Photosynthesis** |
| b. Trace the path of solar energy through a simple food chain and food webs that include humans. | | |
| c. Examine how energy is transferred through an ecosystem. | **1 - Energy Detectives** | |
| d. Examine how energy is distributed in an energy pyramid. | | |
| **7. The number of organisms an ecosystem can support depends upon the abiotic factors. Given adequate abiotic resources and no disease or predators, populations (including humans) increase at a rapid rate. Lack of resources and other factors, such as predation and climate, limit the growth of populations in specific niches in the ecosystem. (Populations and Ecosystems: Life Science)** | | |
| a. Compare and contrast the abiotic factors that effect population growth and size (quantity of light, water, range of temperatures, soil compositions). | | |
| b. Diagram the cycles of water, carbon, oxygen, and nitrogen in the environment. | | **Water Cycle** |
| c. Analyze the vital role of single-celled organisms (e.g., phytoplankton) in the carbon and oxygen cycles. (Life Science Unit) | | |
| d. Examine how materials are reused in a continuous cycle in the ecosystem. | | |
| e. Distinguish between renewable and nonrenewable resources and examine the importance of their conservation. (P) | **2 - May the Source Be with You**<br>**4 - What Powers the Move?**<br>**6 - Energy Challenge Game** | **What, What is. . .**<br>**Resources**<br>**Reduce, Reuse, Recycle Engine Oil**<br>**We Can Save Energy** |
| f. Evaluate the effects of human population on air, water, and land. (P) | | **Our Changing World** |
| g. Analyze the benefits of solid waste management (reduce, reuse, recycle). (T, P) | | **What, What is. . .**<br>**Reduce, Reuse, Recycle Engine Oil** |

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| **IV. Physical Science**<br>**Unit of Study:**<br>**Chemical Nature of Matter**<br><br>**A. Properties and Changes of Properties in Matter**<br><br>**1. Chemical elements do not break down during normal laboratory reactions involving such treatments as heating, exposure to electric current, or reaction with acids. Substances react chemically in characteristic ways with other substances to form new substances (compounds) with different characteristic properties.** | | |
| a. Distinguish between physical and chemical properties. | | |
| b. Distinguish between physical and chemical changes. | | |
| c. Cite examples of chemical changes in matter (e.g., rusting [slow oxidation], combustion [fast oxidation], and food spoilage). | | |
| **2. In chemical reactions, the total mass is conserved.** | | |
| a. Recognize chemical symbols and chemical formulas of common substances such as NaCl (table salt), H20 (water), C6H12O6 (sugar), O2 (oxygen), CO2 (carbon dioxide), and N2 (nitrogen). | | |
| b. Identify evidences of chemical reactions (e.g., gas evolved, color and/or temperature change, precipitate formed). | | |
| c. Determine the reactants and products in simple chemical reactions such as photosynthesis (plants) and respiration (plants and animals). | | |
| d. Explain the role of the enzymes as catalysts. | | |
| e. Use balanced chemical equations such as photosynthesis and respiration to support the law of conservation of matter. | | |
| f. Explain how the total mass of matter involved in the chemical reaction does not change even when a gas is released. | | **Energy** |