Standard 1: Life Science

As a basis for understanding Life Science, Grade 7 students will develop the following knowledge, skills and understandings:

1. Students understand the principles of heredity and its related concepts.

1.2 Students understand structure and function of cells and organisms.
   1.2.1 The anatomy and physiology of plants and selected organisms illustrate the complementary nature of structure and function.
       1.2.1.1 Know the structures and processes by which flowering plants generate pollen, ovules, seeds, and fruit.
       1.2.1.2 Know that reproduction is a characteristic of all living things and is essential to the continuation of a species.

1.3 Students understand relationships among organisms and their physical environment.
   1.3.1 All populations living together and the physical factors with which they interact compose an ecosystem.
       1.3.1.1 Understand that there are specialized relationships between organisms and plants with positive and negative outcomes.
       1.3.1.2 Describe anatomical and behavioral characteristics of primates and how they serve specific functions for survival.
       1.3.1.3 Compare the effects of natural and man-made environments on the behavioral characteristics of an organism or population.
       1.3.1.4 Outline how the biotic and abiotic environments affect the character of an ecosystem.
       1.3.1.5 Account for how a population consists of all individuals of a species that occur together at a given place and time.
       1.3.1.6 Explain how populations live in interrelationships.
       1.3.1.7 Define how populations of organisms can be categorized by the functions they serve in an ecosystem.
       1.3.1.8 Demonstrate how organisms in ecosystems exchange energy and nutrients among themselves and with the environment.
       1.3.1.9 Identify how different kinds of organisms may play similar ecological roles in similar ecosystems.
       1.3.1.10 Explain how energy entering ecosystems as sunlight is transferred by producers into chemical energy through photosynthesis and then from organism to organism through food webs.
       1.3.1.11 Use examples to outline how energy is transferred over time from one organism to others in the food web and between organisms and the physical environment.
       1.3.1.12 Define how different kinds of organisms may play similar ecological roles in similar ecosystems.
       1.3.1.13 Justify how the structures and processes of flowering plants form the basis of the food web.
       1.3.1.14 Explain how the number and types of organisms an ecosystem can support depends on the biotic and abiotic resources available e.g., biomass, quantities of light and water, a range of temperatures, and soil composition.
       1.3.1.15 Explore how the responsible relationship with life on earth respects the diversity of ecosystems and involves decisions that honor and protect natural systems.
1.3.1.16 Consider the effect of humans as a powerful agent of change in earth’s ecosystems.

### 1.4 Students understand biological evolution and the diversity of life.

1.4.1 Biological evolution accounts for the diversity of species developed through gradual processes over many generations.

1.4.1.1 Understand how genetic variation and environmental factors are causes of evolution and diversity in organisms.

1.4.1.2 Demonstrate how species acquire many of their unique characteristics through biological adaptation, which involves the selection of naturally occurring variation in populations.

1.4.1.3 Articulate the reasoning used by Charles Darwin in reaching his conclusion that natural selection is the mechanism of evolution.

1.4.1.4 Synthesize and understand how independent lines of evidence from geology, fossils, and comparative anatomy provide the bases for the theory of evolution.

1.4.1.5 Understand that when the environment changes and the adaptive characteristics of a species are insufficient for its survival it leads to extinction of a species.

1.4.1.6 Account for significant developments and extinctions of plant and animal life on the geologic time scale.

1.4.1.7 Comprehend that changes within an environment can be natural or influenced by humans.

### Standard 2: Physical Science

No standards apply.

### Standard 3: Earth and Space Science

As a basis for understanding Earth Science, Grade 7 students will develop the following skills, knowledge and understandings:

3.1 Students understand earth’s composition and structure.

3.1.1 Soil is an underlying basis of life on earth.

3.1.1.1 Know that observation is a foundation for gathering data and allows scientists to make conclusions.

3.1.1.2 Examine observations and data about a fictional garden paying particular attention to differences between observation and evidence.

3.1.1.3 Demonstrate knowledge of the constituent parts of soil (weathered rock and decomposed organic matter) via observation of 2 types.

3.1.1.4 Use a soil tube to demonstrate that soil is composed of different particle sizes and components.
### 3.1.5 Observe and describe 2 soils scientifically, paying particular attention to color, consistency and texture.

### 3.1.6 Identify and understand that there are different types of soil on the planet.

### 3.1.7 Discuss the domino effect caused by degradation and misuse of soil.

### 3.1.8 Identify the necessary chemical components of soil and understand how they are found in different amounts in different soils.

### 3.1.9 Conduct an experiment on different soils to determine the amount of organic matter and determine what is causing plants to die in the soil.

### 3.1.10 Design and conduct a scientific experiment in order to answer a question about soil.

### 3.1.11 Use appropriate tools and techniques to gather, analyze and interpret data.

### 3.1.12 Understand that different kinds of questions suggest different kinds of scientific investigations.

### 3.1.13 Explain how topography is reshaped by the weathering of rock and soil and by the transportation and deposition of sediment.

### 3.1.14 Demonstrate that water running downhill is the dominant process in erosion.

### 3.1.15 Show by examples that rivers and streams are dynamic systems that erode, transport sediment, change course, and flood their banks in natural and recurring patterns.

### 3.1.16 Model how beaches are dynamic systems in which the sand is supplied by rivers and moved along the coast by the action of waves.

#### 3.1.2 Rocks and Minerals

**3.1.2.1** Classify materials used by people which occur naturally on earth as natural resources.

**3.1.2.2** Perform a series of tests on a pure mineral substance to observe its physical properties. These properties are based on the unique structure of the substance.

**3.1.2.3** Grow crystals of copper sulfate and other solutions to observe the structure their characteristic properties, such as hardness, crystalline shape and color.

**3.1.2.4** Observe crystal samples and test their physical properties to better understand that crystals form naturally in the earth and have characteristic physical properties such as hardness, color, crystalline shape, luster, transparency, light refraction, reaction with acid.

**3.1.2.5** Identify samples of minerals within rocks to support understanding that rocks are made of minerals.

**3.1.2.6** Discuss how most rocks and minerals are non-renewable natural resources, formed by earth processes over extremely long periods of time.

**3.1.2.7** Separate rocks into three categories-sedimentary, igneous and metamorphic-based on their formation and some physical characteristics such as fossil remains, banding and crystal structure. Sedimentary rocks are formed by the ongoing deposition of rocks and other sediments that are cemented together. Igneous rocks are formed by the cooling of magma and metamorphic rocks are formed from earth's heat and pressure on rocks.

**3.1.2.8** Examine fossil samples as evidence of how life and environmental conditions on earth have changed.

**3.1.2.9** Demonstrate through a model that rocks are found in layers with the older materials in the lower layers and younger materials in the upper layers.

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*Adapted from National (NSES), McRel and California State Science Standards*  
*Sub-standards in gray are not addressed at this grade level.*  
*Adapted by the Board on January 29, 2009*
3.1.2.10 Describe the rock cycle as both the formation and destruction of rocks from one type to another through a simulation game.

3.1.3 Plate tectonics accounts for important features of Earth's surface and major geologic events.

3.1.3.1 Use a systematic approach to thinking critically about risks and benefits to complex issues affected by plate tectonics by identifying and evaluating relevant evidence to make good decisions.

3.1.3.2 Explain how volcanoes can be a constructive force and compare differences between volcanic eruptions and identify the different shapes of volcanoes as a result of these eruptions.

3.1.3.3 Draw a scaled diagram of Earth showing its composition of several layers: a cold, brittle lithosphere; a hot convecting mantle; and a dense, metallic core.

3.1.3.4 Identify that the crust and upper part of the mantel are known as the lithosphere.

3.1.3.5 Order major events in the history of the earth on a geological time scale.

3.1.3.6 Discuss how fossils provide important evidence about how life and environmental conditions on Earth have changed over geological time.

3.1.3.7 Differentiate between the idea of Continental Drift and the Theory of Plate Tectonics.

3.1.3.8 Explain how the continents are part of large lithospheric plates that have moved over geological time and continue to move at a rate of centimeters per year.

3.1.3.9 Account for evidence of plate tectonics being derived from the fit of the continents; the location of earthquakes, volcanoes, and mid-ocean ridges; and the distribution of fossils, rock types, and ancient climatic zones.

3.1.3.10 By modeling and mapping identify earthquakes are sudden motions along breaks in the crust called faults and that volcanoes and fissures are locations where magma reaches the surface.

3.1.3.11 Model that major geologic events, such as earthquakes, volcanic eruptions, and mountain building, result from plate motions.

3.1.3.12 Demonstrate the mechanism behind plate motion as they investigate convection currents.

3.1.3.13 Discuss the effects of an earthquake on a region, showing by comparison that they vary, depending on the size of the earthquakes.

3.2 Students understand the composition and structure of the atmosphere.

3.3 Students understand the composition and structure of the universe.
Standard 4: Nature of Science

As a basis for understanding the nature of science as it relates to scientific knowledge, scientific inquiry, and scientific enterprise and to address content in the other standards Grade 7 students will:

4.1 Students understand science is a process used to solve problems. Scientific progress is made by asking meaningful questions and conducting careful investigations.

4.1.1 Develop questions, design experiments and perform investigations.
   - 4.1.1.1 Develop a question that can be tested by gathering quantitative and/or qualitative data.
   - 4.1.1.2 Formulate a hypothesis.
   - 4.1.1.3 Design an experiment to collect data that can be used to answer the question.
   - 4.1.1.4 Identify variables in an experiment that could adversely affect the outcome.
   - 4.1.1.5 Identify the independent variable.
   - 4.1.1.6 Write a procedure that is sequenced and ordered.
   - 4.1.1.7 Make observations for qualitative data collection.
   - 4.1.1.8 Use measurement for quantitative data collection.
   - 4.1.1.9 Organize data using tables, graphs, diagrams.
   - 4.1.1.10 Make a prediction based on observations.

4.1.2 Communicate the steps and results from an investigation in written reports and oral presentations.
   - 4.1.2.1 Analyze data to answer the initial question.
   - 4.1.2.2 Revise experimental method if the question is not answered.
   - 4.1.2.3 Compare the results with the hypothesis.
   - 4.1.2.4 Display findings in a written report with visual support.
   - 4.1.2.5 Formulate evidence based decisions.

4.1.3 Select and use appropriate tools and technology to perform tests, collect data, and display data.
   - 4.1.3.1 Use Excel for graph display.
   - 4.1.3.2 Formulate tables to organize data.
   - 4.1.3.3 Use photographs for observations.
   - 4.1.3.4 Use metric measurements of volume, distance and mass to record quantitative data.
   - 4.1.3.5 Use Probeware to gather field and laboratory data.
4.1.4 Use a variety of print and electronic resources (including the World Wide Web) to collect information and evidence as part of a research project.
   4.1.4.1 Identify appropriate material from World Wide Web, including databases.
   4.1.4.2 Differentiate evidence from opinion.
   4.1.4.3 Apply the correct procedure in writing a bibliography.

4.1.5 Construct scale models, maps, and appropriately labeled diagrams to communicate scientific knowledge and data (e.g., motion of Earth's plates).
   4.1.5.1 Use latitude and longitude, and points of the compass to identify positions on a map.
   4.1.5.2 Construct a 3-D model to demonstrate a process or action.
   4.1.5.3 Draw and clearly label diagrams for information.

4.2 Students understand the nature of scientific knowledge.
   4.2.1 Know that all scientific ideas are tentative and subject to change and improvement in principle, but for the most core ideas in science, there is much experimental and observational confirmation.

4.3 Students understand scientific enterprise relates to ethics and ideas.
   4.3.1 Show with evidence that ethics associated with scientific study (potential subjects must be fully informed of the risks and benefits associated with research and their right to refuse to participate; potential subjects must be fully informed of possible risks to community or property).
   4.3.2 Explain by example that throughout history, many scientific innovators have had difficulty breaking through accepted ideas of their time to reach conclusions that are now considered to be common knowledge.

4.4 Students understand the connections among science, global issues and sustainable solutions.
   4.4.1 Explore how the responsible relationship with life on Earth respects the diversity of ecosystems and involves decisions that honor and protect natural systems.
   4.4.2 Consider the effect of humans as a powerful agent of change in Earth's ecosystems.
   4.4.3 Comprehend that changes within an environment can be natural or influenced by humans.
   4.4.4 Discuss the effects of an earthquake on a region, showing by comparison that they vary, depending on the size of the earthquakes.