Science Standards
Grades 8

Strand:

S1 Scientific Inquiry: The student demonstrates abilities necessary to do scientific inquiry and an understanding about scientific inquiry; that is, the student:

Standards: S1a: develops research questions that can be answered through scientific investigations.

S1b: accesses, evaluates and uses information from a variety of reliable scientific sources.

S1c: designs, conducts and records scientific investigations following the general procedures of scientific inquiry.

S1d: applies appropriate tools and techniques to systematically collect, record, analyze, and interpret data.

S1e: develops logical descriptions, explanations, predictions, and models using evidence.

S1f: recognizes and analyzes interpretations, conclusions, and predictions based upon alternative evidence and explanations.

S1g: communicates scientific procedures, explanations, and conclusions using appropriate scientific language and writing, and mathematics.

Strand:

S2 History and Nature of Science: The student demonstrates an understanding of science as a human endeavor and the history and nature of science; that is, the student:

Standards: S2a: cites examples of scientists from diverse backgrounds, and explains how they use scientific habits of mind (such as: reasoning, insight, skill, creativity, intellectual honesty, tolerance for ambiguity, skepticisms, and openness to new ideas) in their work.

S2b: explains how scientists formulate and test their explanations, revising when necessary.

S2c: investigates and explains how scientists communicate their results and ideas, and describes and identifies situations in which scientists disagree about interpretation of evidence.

S2d: examines the effects of science on cultural development and states the relationship between scientific innovation and human history.

Strand:

S3 Personal & Social Perspectives: The student demonstrates an understanding of safety, natural and human hazards, and their risks and benefits; that is, the student:

Standards: S3a: demonstrates personal and group safety and resource conservation when engaged in science.

S3b: thinks critically and analyzes risks and benefits associated with natural, chemical, biological, and personal hazards.

S3c: evaluates the interrelationships of environmental degradation on the global community.

Strand:

S4 Science and Technology: The student demonstrates an understanding about science and technology and the nature of technological design; that is, the student:

Standards: S4a: assesses societal challenges that may inspire scientific research.

S4b: evaluates an invention or design and proposes modifications.

S4c: identifies a technological problem and develops a plan for design, implementation, and evaluation.

S4d: explores how technological risks lead to new technologies and how unintended consequences impact society.

S4e: analyzes how technology responds to societal, political, and economic needs.

Strand:

S5 Physical Science: The student demonstrates a conceptual understanding of matter, motions and forces, and transfer of energy; that is, the student:

Standards: S5a: examines particulate nature of matter and chemical change.

Components:

S5a1. describes the characteristics of an element, and recognizes that everything is made out of elements.

S5a2. shows how elements can combine in a multitude of ways to produce a great number of compounds.

S5a3. compares the properties of compounds with those of the elements from which they are made.

S5a4. explains that matter can be thought of as being composed of particles.

S5a5. compares the motion and arrangement of particles in different phases of matter.

Standards: S5b: examines conservation of matter by exploring phase change and chemical change.

Components:

S5b1. demonstrates through investigations that mass is conserved when substances change state.

S5b2. cites evidence to explain that the products of a chemical change have different properties than the reactants.

S5b3. demonstrates through investigations that mass is conserved during a chemical change.

S5b4. analyzes data to determine factors (e.g., concentration, temperature) that can influence reaction rates.

S5b5. describes the effect of temperature change on the motion and arrangement of particles.

S5b6. explains why mass is conserved (in terms of particles) during phase changes and chemical change.

Standards: S5c: investigates the relationships among force, mass, and motion of an object or system.

Components:

S5c1. distinguishes kinetic and potential energy.

S5c2. investigates and identifies conditions/variables that would change the potential energy and resulting kinetic energy of an object.

Standards: S5d: investigates phase change and the transfer of heat energy.

Components:

S5d1. investigates and explains that heat energy moves in predictable ways, flowing from warmer objects to cooler ones, until both are at the same temperature.

S5d2. differentiates among conduction, convection and radiation.

S5d3. describes heat transfer using a particulate model.

S5d4. investigates and explains how temperature changes during phase changes.

Strand:

S6 Life Science: The student demonstrates a conceptual understanding of the structure and function of living systems, populations and ecosystems; that is, the student:

Standards: S6a: describes cell processes.

Components:

S6a1. connects an organism's need for food with cells' need for food.

S6a2. demonstrates through investigations that food is a source of energy (fuel) and building materials for cells.

S6a3. relates cellular respiration to the functions of body systems (e.g., how body systems function to provide cells with the necessary raw materials).

S6a4. recognizes that cells in diverse organisms share similar chemical processes.

S6a5. connects the processes of cell respiration and photosynthesis.

Standards: S6b: explains how adaptive characteristics of a species influence their chance for survival or possible extinction.

Components:

S6b1. models and describes how new trait variations can arise and gradually accumulate in successive generations through sexual reproduction.

S6b2. Defines a species as all organisms that can mate with one another to produce fertile offspring.

S6b3. provides examples of biological adaptations (i.e., changes in structures, behaviors, or physiology) that enhance survival and reproductive success in a particular environment.

S6b4. assesses through observations and investigations the reproductive advantage of different trait variations in various environments.

S6b5. provides examples of situations in which an environment changed, the adaptive characteristics of a species were insufficient, and the species went extinct.

S6b6. investigates and describes conditions that can result in extinction.

S6b7. Shows through simulations, how successful traits variation are selected

S6b8. Explains how environmental changes can alter the genetic makeup of population in future generations

S6b9 describes how new species emerge

Standards: S6c: relates diversity and evolution.

Components:

S6c1. explains that similar internal structures and chemical processes can be used to infer common ancestry among organisms.

S6c2. models and forms hypotheses about how evolutionary paths diverged from a common ancestor.

S6c3. explains how the selection of naturally occurring variations in a population leads to greater species diversity.

Standards: S6d: describes factors that limit or support the growth of populations within an ecosystem.

Components:

S6d1. analyzes data and identifies factors that influence population growth (e.g., availability of food and water, breeding space, shelter, disease, lack of resources).

S6d2. predicts how an increase or decrease in the population size of any one species could affect other populations in an ecosystem.

S6d3. analyzes data collected over time and explains ways in which organisms limit one another (e.g., predator and prey).

S6d4. Compares growth for populations with and without limiting factors

S6d5 explains why a healthy population depends on limiting factors.

Strand:

S7 Earth & Space Sciences: The student demonstrates a conceptual understanding of the Earth's systems and history; that is, the student:

Standards: S7a: analyzes the interaction of the four spheres (hydrosphere, geosphere, atmosphere and biosphere) on earth's system.

Components:

S7a1. describes the distribution and circulation of earth's water through ocean currents, glaciers, rivers, ground water, and the atmosphere.

S7a2. analyzes the impact of pollution and depletion on the global supply of water available to the biosphere.

S7a3. provides evidence that the abundance of water on earth makes earth unique among planets in the solar system.

Standards: S7b: Examines the composition and properties of the atmosphere.

Components:

S7b1. Identifies the atmosphere as a mixture of nitrogen, oxygen, and trace gases that include water vapor.

S7b2. Recognizes that atmosphere has different composition and properties at different locations and altitudes.

S7b3. Recognizes the basic relationship between atmosphere and Earth's weather and climate.

S7b4. Explains how radiant energy from the Sun drives global patterns of atmospheric circulation.

S7b5. Illustrates the action of convection currents in the movement of fluid and air masses and in the transfer of heat energy in the atmosphere and oceans.

Standards: S7c: Evaluates the impact of changes in the atmosphere and hydrosphere on weather, climate, and landforms.

Components:

S7c1. Distinguishes between weather and climate.

S7c2. Demonstrates how global temperature changes in the atmosphere and oceans influence local, regional and global weather.

S7c3. Gives examples of how abrupt geologic changes (such as volcanic eruptions) or long term temperature changes have led to climate and landform changes in the past.

S7c4. Predicts how long term changes in atmospheric and ocean temperatures can influence global climate and landform changes in the future.

Standards: S7d: Compares and contrasts characteristics of the Sun and Milky Way to those of other stars and galaxies in the universe.

Components:

S7d1. recognizes that the Sun is an average star located near the edge of a galaxy composed of billions of stars.

S7d2. identifies our milky way galaxy as one of billions of galaxies in the universe.

S7d3. classifies stars and galaxies by their major characteristics.

S7d4. Compares our Sun to other stars (i.e., size, distance, color).

S7d5. recognizes that light emitted from stars and galaxies travels over great distances to reach us and takes a very long time, which explains why the stars and galaxies that we see are as they were in the distant past.

S7d6. observes, records, describes and explains the apparent circumpolar motion of stars and constellations daily and seasonally.