Science
Grades 6-8

The Nature of Matter

Standard 1:

The student understands that all matter has observable, measurable properties. (SC.A.1.3)

1. identifies various ways in which substances differ (e.g., mass, volume, shape, density, texture, and reaction to temperature and light).
2. understands the difference between weight and mass.
3. knows that temperature measures the average energy of motion of the particles that make up the substance.
4. 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.
5. 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).
6. knows that equal volumes of different substances may have different masses.

Standard 2:

The student understands the basic principles of atomic theory. (SC.A.2.3)

1. describes and compares the properties of particles and waves.
2. 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.
3. knows that radiation, light, and heat are forms of energy used to cook food, treat diseases, and provide energy.

Energy

Standard 1:

The student recognizes that energy may be changed in form with varying efficiency. (SC.B.1.3)

1. identifies forms of energy and explains that they can be measured and compared.
2. knows that energy cannot be created or destroyed, but only changed from one form to another.
3. knows the various forms in which energy comes to Earth from the sun (e.g., visible light, infrared, and microwave).
4. knows that energy conversions are never 100% efficient (i.e., some energy is transformed to heat and is unavailable for further useful work).
5. knows the processes by which thermal energy tends to flow from a system of higher temperature to a system of lower temperature.
6. 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.

Standard 2:

The student understands the interaction of matter and energy. (SC.B.2.3)

1. 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.
2. 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).

Force and Motion

Standard 1:

The student understands that types of motion may be described, measured, and predicted. (SC.C.1.3)

1. knows that the motion of an object can be described by its position, direction of motion, and speed.
2. knows that vibrations in materials set up wave disturbances that spread away from the source (e.g., sound and earthquake waves).

Standard 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. (SC.C.2.3)

1. knows that many forces (e.g., gravitational, electrical, and magnetic) act at a distance (i.e., without contact).
2. knows common contact forces.
3. 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.
4. knows that simple machines can be used to change the direction or size of a force.
5. 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.
6. 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).
7. knows that gravity is a universal force that every mass exerts on every other mass.

Processes that Shape the Earth

Standard 1:

The student recognizes that processes in the lithosphere, atmosphere, hydrosphere, and biosphere interact to shape the Earth. (SC.D.1.3)

1. 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.
2. knows that over the whole Earth, organisms are growing, dying, and decaying as new organisms are produced by the old ones.
3. knows how conditions that exist in one system influence the conditions that exist in other systems.
4. 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).
5. 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).

Standard 2:

The student understands the need for protection of the natural systems on Earth. (SC.D.2.3)

1. understands that quality of life is relevant to personal experience.
2. knows the positive and negative consequences of human action on the Earth's systems.

Earth and Space

Standard 1:

The student understands the interaction and organization in the Solar System and the universe and how this affects life on Earth. (SC.E.1.3)

1. understands the vast size of our Solar System and the relationship of the planets and their satellites.
2. knows that available data from various satellite probes show the similarities and differences among planets and their moons in the Solar System.
3. understands that our sun is one of many stars in our galaxy.
4. knows that stars appear to be made of similar chemical elements, although they differ in age, size, temperature, and distance.

Standard 2:

The student recognizes the vastness of the universe and the Earth's place in it. (SC.E.2.3)

1. knows that thousands of other galaxies appear to have the same elements, forces, and forms of energy found in our Solar System.

Processes of Life

Standard 1:

The student describes patterns of structure and function in living things. (SC.F.1.3)

1. understands that living things are composed of major systems that function in reproduction, growth, maintenance, and regulation.
2. knows that the structural basis of most organisms is the cell and most organisms are single cells, while some, including humans, are multicellular.
3. knows that in multicellular organisms cells grow and divide to make more cells in order to form and repair various organs and tissues.

4. knows that the levels of structural organization for function in living things include cells, tissues, organs, systems, and organisms.
5. explains how the life functions of organisms are related to what occurs within the cell.
6. knows that the cells with similar functions have similar structures, whereas those with different structures have different functions.
7. knows that behavior is a response to the environment and influences growth, development, maintenance, and reproduction.

Standard 2:

The student understands the process and importance of genetic diversity. (SC.F.2.3)

1. knows the patterns and advantages of sexual and asexual reproduction in plants and animals.
2. 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.
3. knows that generally organisms in a population live long enough to reproduce because they have survival characteristics.
4. knows that the fossil record provides evidence that changes in the kinds of plants and animals in the environment have been occurring over time.

How Living Things Interact with Their Environment

Standard 1:

The student understands the competitive, interdependent, cyclic nature of living things in the environment. (SC.G.1.3)

1. knows that viruses depend on other living things.
2. knows that biological adaptations include changes in structures, behaviors, or physiology that enhance reproductive success in a particular environment.
3. understands that the classification of living things is based on a given set of criteria and is a tool for understanding biodiversity and interrelationships.
4. 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.
5. 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.

Standard 2:

The student understands the consequences of using limited natural resources. (SC.G.2.3)

1. knows that some resources are renewable and others are nonrenewable.
2. 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.
3. 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.
4. understands that humans are a part of an ecosystem and their activities may deliberately or inadvertently alter the equilibrium in ecosystems.

The Nature of Science

Standard 1:

The student uses the scientific processes and habits of mind to solve problems. (SC.H.1.3)

1. 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.
2. knows that the study of the events that led scientists to discoveries can provide information about the inquiry process and its effects.
3. knows that science disciplines differ from one another in topic, techniques, and outcomes, but that they share a common purpose, philosophy, and enterprise.
4. knows that accurate record keeping, openness, and replication are essential to maintaining an investigator's credibility with other scientists and society.
5. knows that a change in one or more variables may alter the outcome of an investigation.
6. recognizes the scientific contributions that are made by individuals of diverse backgrounds, interests, talents, and motivations.
7. knows that when similar investigations give different results, the scientific challenge is to verify whether the differences are significant by further study.

Standard 2:

The student understands that most natural events occur in comprehensible, consistent patterns. (SC.H.2.3)

1. recognizes that patterns exist within and across systems.

Standard 3:

The student understands that science, technology, and society are interwoven and interdependent. (SC.H.3.3)

1. knows that science ethics demand that scientists must not knowingly subject coworkers, students, the neighborhood, or the community to health or property risks.
2. knows that special care must be taken in using animals in scientific research.
3. 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.
4. 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.
5. 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.
6. 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.
7. 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.