

## Science

### **Standard: 1 - Understands basic features of the Earth and its processes.**

#### Level I: Primary (Grades K-2)

Knows that short-term weather conditions can change daily, and weather patterns change over the seasons

Knows that rocks come in many different shapes and sizes

#### Level II: Upper Elementary (Grades 3-5)

Knows that water can change from one state to another (solid, liquid, gas) through various processes

Knows how features on the Earth's surface are constantly changed by a combination of slow and rapid processes

#### Level III: Middle School (Grades 6-8)

Knows the processes involved in the weather and water cycle.

Knows processes involved in the rock cycle and soil formation

#### Level IV: High School (Grades 9-12)

Knows the major external and internal sources of energy on Earth

Knows that elements exist in fixed amounts and move through the solid Earth, oceans, atmosphere, and living things as part of geo-chemical cycles

### **Standard: 2 - Understands essential ideas about the composition and structure of the universe and the Earth's place in it**

#### Level I: Primary (Grades K-2)

Knows basic patterns of the Sun and Moon

#### Level II: Upper Elementary (Grades 3-5)

Knows that the Earth is one of several planets that orbit the Sun, and the Moon orbits around the Earth

Knows that astronomical objects in space are massive in size and are separated from one another by vast distances

Level III: Middle School (Grades 6-8)

Knows characteristics of our Sun and other celestial bodies and their positions in the universe

Level IV: High School (Grades 9-12)

Knows ways in which technology has increased our understanding of the universe (e.g., visual, radio, and x-ray telescopes collect information about the universe from electromagnetic waves; computers interpret vast amounts of data from space; space probes gather information from distant parts of the Solar System)

Knows that evidence suggests that our universe is expanding

**Standard: 3 - Knows about the diversity and unity that characterize life**

Level I: Primary (Grades K-2)

Knows that plants and animals have features that help them live in different environments

Level II: Upper Elementary (Grades 3-5)

Knows different ways in which living things can be grouped

Level III: Middle School (Grades 6-8)

Knows ways in which living things can be classified because of their great variety and diversity

Level IV: High School (Grades 9-12)

Knows how organisms are classified into a hierarchy of groups and subgroups based on similarities that reflect their evolutionary relationships

Knows how variation of organisms within a species increases the chance of survival of the species, and how the great diversity of species on Earth increases the chance of survival of life in the event of major global changes

**Standard: 4 - Knows the general structure and functions of cells in organisms and understands the genetic basis for the transfer of biological characteristics from one generation to the next**

### Level I: Primary (Grades K-2)

Knows that while plants and animals closely resemble their parents differences exist among individuals of the same kind of plant or animal

Knows that animals require air, water, food, and shelter; plants require air, water, nutrients, and light for energy and growth

### Level II: Upper Elementary (Grades 3-5)

Knows that many characteristics of an organism are inherited from the parents of the organism and other characteristics result from an individual's interactions with the environment

Knows that each plant or animal has different structures which serve different functions in growth, survival, and reproduction

### Level III: Middle School (Grades 6-8)

Understands asexual, sexual reproduction and that hereditary information is contained in genes.

### Level IV: High School (Grades 9-12)

Knows the chemical and structural properties of DNA and its role in specifying the characteristics of an organism (e.g., DNA is a large polymer formed from subunits of four kinds [A, G, C, and T]; genetic information is encoded in genes as a string of these subunits, and replicated by a templating mechanism; each DNA molecule in a cell forms a single chromosome)

Knows that mutations and new gene combinations may have positive, negative, or no effects on the organism

Knows features of human genetics

Knows the structures of different types of cell parts and the functions they perform

Understands cell differentiation

Understand the structure and functions of the ten human body systems

**Standard: 5 - Understands how species depend on one another and on the environment for survival**

Level I: Primary (Grades K-2)

Knows that living things are found almost everywhere in the world and that distinct environments support the life of different types of plants and animals

Knows that some kinds of organisms that once lived on Earth have completely disappeared

Level II: Upper Elementary (Grades 3-5)

Knows that changes in the environment can have different effects on different organisms and knows that all organisms cause changes in their environments, and these changes can be beneficial or detrimental.

Knows the organization of simple food chains and food webs

Level III: Middle School (Grades 6-8)

Knows ways in which species interact and depend on one another in an ecosystem or food chain

Level IV: High School (Grades 9-12)

Knows how the interrelationships and interdependencies among organisms generate stable ecosystems that fluctuate around a state of rough equilibrium for hundreds or thousands of years

Understands how the processes of photosynthesis and respiration in plants transfer energy from the Sun to living systems

Knows how the amount of life an environment can support is limited by the availability of matter and energy and the ability of the ecosystem to recycle materials

Knows how natural selection and mutation and evolution has produce many variations of organisms today

**Standard: 6 - Understands basic concepts about the structure and properties of matter**

Level I: Primary (Grades K-2)

Knows that different objects are made up of many different types of materials

Knows that magnets can be used to make some things move without being touched

Knows that things near the Earth fall to the ground unless something holds them up

Level II: Upper Elementary (Grades 3-5)

Knows that properties such as length, weight, temperature, and volume can be measured using appropriate tools

Knows that materials have different states (solid, liquid, gas), and heating or cooling can change some common materials such as water from one state to another

Level III: Middle School (Grades 6-8)

Knows that matter is made up of tiny particles called atoms, and are in random motion

Level IV: High School (Grades 9-12)

Understands how elements are arranged in the periodic table, and how this arrangement shows repeating patterns among elements with similar

Knows that atoms may be bonded together into molecules or crystalline solids, and develop their own physical and chemical properties

Knows the structure of an atom both neutral and ionic

Knows that electromagnetic forces exist within and between atoms

**Standard: 7 - Understands energy types, sources, and conversions, and their relationship to heat and temperature**

Level I: Primary (Grades K-2)

Knows that the Sun supplies heat and light to Earth

Level II: Upper Elementary (Grades 3-5)

Knows the organization of a simple electrical circuit

Level III: Middle School (Grades 6-8)

Knows how the Sun acts as a major source of energy for changes on the Earth's surface

Knows that heat can be transferred through conduction, convection, and radiation

Level IV: High School (Grades 9-12)

Knows that although the total energy of the universe remains constant, matter tends to become steadily less ordered as various energy transfers and the energy tends to spread out uniformly

Knows that all energy can be considered to be either kinetic energy (energy of motion), potential energy (depends on relative position), or energy contained by a field (electromagnetic waves)

Understands the relationship between heat and temperature (heat energy consists of the random motion and vibrations of atoms, molecules, and ions; the higher the temperature, the greater the atomic or molecular motion)

**Standard: 8 - Understands motion and the principles that explain it**

Level I: Primary (Grades K-2)

Knows that vibrating objects produce sound

Knows that the position and motion of an object can be changed by pushing or pulling

Level II: Upper Elementary (Grades 3-5)

Knows that the pitch of a sound depends on the frequency of the vibration producing it

Knows that light can be reflected, refracted, or absorbed

Knows the relationship between the strength of a force and its effect on an object

Level III: Middle School (Grades 6-8)

Knows that only a narrow range of wavelengths of electromagnetic radiation can be seen by the human eye

Knows that just as electric currents can produce magnetic forces, magnets can cause electric currents

Level IV: High School (Grades 9-12)

Knows that waves have energy and can transfer energy when they interact with matter

Knows the range of the electromagnetic spectrum

Knows that laws of motion can be used to determine the effects of forces on the motion of objects

**Standard: 9 - Understands the nature of scientific knowledge is base on the process of scientific inquiry**

Level I: Primary (Grades K-2)

Knows that learning can come from careful observations and simple experiments

Knows that tools can be used to gather information and extend the senses

Level II: Upper Elementary (Grades 3-5)

Knows that although the same scientific investigation may give slightly different results when it is carried out by different persons, or at different times or places, the general evidence collected from the investigation should be replicable by others

Knows that scientific investigations involve asking and answering a question and comparing the answer to what scientists already know about the world

Plans and conducts simple investigations to gather scientific data.

Level III: Middle School (Grades 6-8)

Knows that all scientific ideas are tentative and subject to change and improvement in principle

Understands that questioning, response to criticism, and open communication are integral to the process of science

Understands the nature of scientific explanations

Level IV: High School (Grades 9-12)

Understands the use of hypotheses in science

Designs and conducts scientific investigations by formulating testable hypotheses, identifying and clarifying the method, controls, and variables; organizing and displaying data; revising methods and explanations; presenting the results; and receiving critical response from others

Uses technology (e.g., hand tools, measuring instruments, calculators, computers) and mathematics (e.g., measurement, formulas, charts, graphs) to perform accurate scientific investigations and communications