

EARTH AND SPACE SCIENCE UPDATED INDICATORS FROM APPROVED 2006 STANDARDS

1.1.1	The student designs investigations, including developing questions, gathering and analyzing data, and designing and conducting research.
1.1.2	▲The student designs investigations, including developing questions, gathering and analyzing data, and designing and conducting research.
1.1.3	▲The student correctly uses the appropriate technological tools and mathematics in their own scientific investigations.
1.1.4	▲The student actively engages in conducting an inquiry, formulating and revising his or her scientific explanations and models (physical, conceptual, or mathematical) using logic and evidence, and recognizing that potential alternative explanations and models.
1.1.5	The student communicates (reports) and defends the design, results, and conclusion of his/her investigation.
1.1.6	The student understands methods used to test hypotheses about the cause of a remote past event (historical hypothesis) that cannot be confirmed by experiment and/or direct observation by formulating competing hypotheses and then collecting the kinds of data (evidence) that would support one and refute the other.
2A.1.1	▲The student understands atoms, the fundamental organizational unit of matter, are composed of subatomic particles, organized in a small, dense, positively charged nucleus (containing protons and neutrons which determines the atomic mass) and surrounded by a negatively charged electron cloud (containing electrons, which determines the size of the atom).
2A.1.2	The student understands isotopes are atoms with the same atomic number (same number of protons) but different numbers of neutrons. The nuclei of some atoms are radioactive isotopes that spontaneously decay, releasing radioactive energy.
2A.2.1	The student understands chemists use kinetic and potential energy to explain the physical and chemical properties of matter on earth. Matter may exist in any of these three states: solids, liquids, and gases.
2A.2.2	▲The student understands the periodic table lists elements according to increasing atomic number. This table organizes physical and chemical trends by groups, periods, and categories.
2A.2.3	▲The student understands chemical bonds result when valence electrons are transferred or shared between atoms. Ionic compounds result from atoms transferring electrons. Molecular compounds result from atoms sharing electrons.
2A.3.1	▲The student understands a chemical reaction occurs when one or more substances (reactants) react to form a different chemical substance(s) (products).
2A.3.2	The student understands there are different types of chemical reactions all of which demonstrate the Law of Conservation of Mass (e.g., synthesis, decomposition, combustion, single and double replacement, acid/base, and oxidation/reduction).
2B.1.2	The student understands physicists use conservation laws to analyze the motion of objects.
2B.2.1	The student understands matter has energy. Mass and energy can be interchanged. The total energy in the universe is constant, but the type of energy may vary.
2B.3.1	The student understands there are four fundamental forces in nature: strong nuclear force, weak nuclear force, electromagnetic force, and gravitational force.
2B.3.2	▲The student understands waves have energy and can transfer energy when they interact with matter.
2B.3.3	▲The student understands electromagnetic waves result when a charged particle is accelerated or decelerated.
3.3.1	The student understands biological evolution, descent with modification, is a scientific explanation for the history of the diversification of organisms from common ancestors.
3.3.3	The student understands biological evolution is used to explain the earth's present day biodiversity: the number, variety and variability of organisms.
3.3.6	The student understands biological evolution is used as a broad, unifying theoretical framework for biology.
3.3.7	The student explains proposed scientific explanations of the origin of life as well as scientific criticisms of those explanations.
3.4.1	▲The student understands atoms and molecules on the Earth cycle among the living and nonliving components of the biosphere.
3.4.2	The student understands energy is received, transformed and expended in ecosystems.
3.5.1	The student recognizes that organic systems need an ongoing input of energy in order to sustain both their chemical and physical organization.
3.5.2	▲The student understands the Sun is the primary source of energy for life through the process of photosynthesis
3.5.4	The student understands the structure and function of an organism serves to acquire, transform, release, and eliminate the matter and energy used to sustain the organism.

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4.1.1	The student understands constructive and destructive processes dynamically reshape the surface of the Earth.
4.1.2	▲The student understands the theory of plate tectonics explains that internal energy drives the Earth's ever changing structure.
4.1.3	The student understands that the ultimate source of atmospheric and oceanic energy comes from the Sun. Energy flow determines global climate and weather which is influenced by geographic features, cloud cover, and the Earth's rotation.
4.2.1	▲The student understands geological time is used to understand the Earth's past.
4.3.1	The student understands gravitational attraction of objects in the solar system keeps solar system objects in orbit.
4.3.2	▲The student understands the relationship between the Earth, Moon, and Sun explains the seasons, tides and moon phases.
4.3.3	The student understands the relative sizes and distances of objects in the solar system.
4.3.4	The student understands the Sun, Earth, and other objects in the solar system formed from a nebular cloud of dust and gas.
4.4.1	▲The student understands stellar evolution.
4.4.2	▲The student understands the current scientific explanation of the origin and structure of the universe.
4.4.3	The student understands how the tools of astronomy have revolutionized the study of the universe
5.1.1	▲The student understands technology is the application of scientific knowledge for functional purposes.
5.1.2	The student understands creativity, imagination, and a broad scientific knowledge base are required to produce useful results.
5.1.3	The student understands science advances new technologies. New technologies open new areas for scientific inquiry.
6.4.1	The student understands that natural processes on the Earth may be hazardous for humans.
6.4.2	The student understands there is a need to assess potential risk and danger from natural and human-induced hazards
6.5.1	The student understands how societal concerns and challenges can determine the rate of advancement in science and technology. Science and technology provides society with options of what we are capable of doing, not necessarily what we should do.
7.1.3	The student recognizes the universality of basic science concepts and the influence of personal and cultural beliefs that embed science in society.
7.1.4	The student recognizes that society helps create the ways of thinking (mindsets) required for scientific advances, both toward training scientists and educating a populace to utilize benefits of science (e.g., standards of hygiene, attitudes toward forces of nature, etc.).
7.1.5	The student understands there are many issues which involve morals, ethics, values or spiritual beliefs that go beyond what science can explain, but for which solid scientific literacy is useful.
7.1.6	The student recognizes society's role in supporting topics of research and determining institutions where research is conducted.
7.2.1	The student understands scientific knowledge describes and explains the natural world. Scientific knowledge is provisional and is subject to change as new evidence becomes available.
7.2.2	The student understands scientific knowledge begins with empirical observations, which are the data (also called facts or evidence) upon which further scientific knowledge is built.
7.2.3	The student understands scientific knowledge consists of hypotheses, inferences, laws, and theories.
7.2.4	The student understands a testable hypothesis or inference must be subject to confirmation by empirical evidence.
7.3.1	The student demonstrates an understanding of the history of science.