

Science Benchmarks Assessed at Grade 10

SUNSHINE STATE STANDARDS BENCHMARK	ITEM FORMATS
GRADE 10	GRADE 10
STRAND A: THE NATURE OF MATTER	
SC.A.1.4.1 The student knows that the electron configuration in atoms determines how a substance reacts and how much energy is involved in its reactions. CS	MC, GR
SC.A.1.4.2 The student knows that the vast diversity of the properties of materials is primarily due to variations in the forces that hold molecules together. CS	MC Also assesses A.1.4.5
SC.A.1.4.3 The student knows that a change from one phase of matter to another involves a gain or loss of energy. CS	MC, GR
SC.A.1.4.4 The student experiments and determines that the rates of reaction among atoms and molecules depend on the concentration, pressure, and temperature of the reactants and the presence or absence of catalysts. AA	MC, GR,SR
SC.A.1.4.5 The student knows that connections (bonds) form between substances when outer-shell electrons are either transferred or shared between their atoms, changing the properties of substances.	Assessed as A.1.4.2
SC.A.2.4.1 The student knows that the number and configuration of electrons will equal the number of protons in an electrically neutral atom and when an atom gains or loses electrons, the charge is unbalanced. CS	MC, GR
SC.A.2.4.2 The student knows the difference between an element, a molecule, and a compound. CS	MC
SC.A.2.4.3 The student knows that a number of elements have heavier, unstable nuclei that decay, spontaneously giving off smaller particles and waves that result in a small loss of mass and release a large amount of energy. CS	MC Also assesses A.2.4.4
SC.A.2.4.4 The student knows that nuclear energy is released when small, light atoms are fused into heavier ones.	Assessed as A.2.4.3
SC.A.2.4.5 The student knows that elements are arranged into groups and families based on similarities in electron structure and that their physical and chemical properties can be predicted. AA	MC
SC.A.2.4.6 The student understands that matter may act as a wave, a particle, or something else entirely different with its own characteristic behavior. CS	MC

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AA: Annually Assessed SR: Short Response

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Science Benchmarks Assessed at Grade 10 (continued)

SUNSHINE STATE STANDARDS BENCHMARK	ITEM FORMATS
GRADE 10	GRADE 10
STRAND B: ENERGY	
SC.B.1.4.1 The student understands how knowledge of energy is fundamental to all the scientific disciplines (e.g., the energy required for biological processes in living organisms and the energy required for the building, erosion, and rebuilding of the Earth). AA	MC, GR, SR Also assesses B.1.4.2
SC.B.1.4.2 The student understands that there is conservation of mass and energy when matter is transformed.	Assessed as B.1.4.1
SC.B.1.4.3 The student knows that temperature is a measure of the average translational kinetic energy of motion of the molecules in an object. CS	MC, GR
SC.B.1.4.4 The student knows that as electrical charges oscillate, they create time-varying electric and magnetic fields that propagate away from the source as an electromagnetic wave. CS	MC, GR
SC.B.1.4.5 The student knows that each source of energy presents advantages and disadvantages to its use in society (e.g., political and economic implications may determine a society's selection of renewable or nonrenewable energy sources).	Assessed as G.2.4.2
SC.B.1.4.6 The student knows that the first law of thermodynamics relates the transfer of energy to the work done and the heat transferred.	Assessed as B.1.4.7
SC.B.1.4.7 The student knows that the total amount of usable energy always decreases, even though the total amount of energy is conserved in any transfer. CS	MC, GR Also assesses B.1.4.6
SC.B.2.4.1 The student knows that the structure of the universe is the result of interactions involving fundamental particles (matter) and basic forces (energy) and that evidence suggests that the universe contains all of the matter and energy that ever existed. CS	MC

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Science Benchmarks Assessed at Grade 10 (continued)

SUNSHINE STATE STANDARDS BENCHMARK	ITEM FORMATS
GRADE 10	GRADE 10
STRAND C: FORCE AND MOTION	
SC.C.1.4.1 The student knows that all motion is relative to whatever frame of reference is chosen and that there is no absolute frame of reference from which to observe all motion. CS	MC, GR
SC.C.1.4.2 The student knows that any change in velocity is an acceleration. CS	MC, GR
SC.C.2.4.1 The student knows that acceleration due to gravitational force is proportional to mass and inversely proportional to the square of the distance between the objects. AA	MC, GR
SC.C.2.4.2 The student knows that electrical forces exist between any two charged objects.	Assessed as C.2.4.3
SC.C.2.4.3 The student describes how magnetic force and electrical force are two aspects of a single force. CS	MC Also assesses C.2.4.2
SC.C.2.4.4 The student knows that the forces that hold the nucleus of an atom together are much stronger than electromagnetic force and that this is the reason for the great amount of energy released from the nuclear reactions in the sun and other stars. CS	MC
SC.C.2.4.5 The student knows that most observable forces can be traced to electric forces acting between atoms or molecules. CS	MC
SC.C.2.4.6 The student explains that all forces come in pairs commonly called action and reaction. CS	MC
STRAND D: PROCESSES THAT SHAPE THE EARTH	
SC.D.1.4.1 The student knows how climatic patterns on Earth result from an interplay of many factors (Earth's topography, its rotation on its axis, solar radiation, the transfer of heat energy where the atmosphere interfaces with lands and oceans, and wind and ocean currents). AA	MC, SR
SC.D.1.4.2 The student knows that the solid crust of Earth consists of slow-moving, separate plates that float on a denser, molten layer of Earth and that these plates interact with each other, changing the Earth's surface in many ways (e.g., forming mountain ranges and rift valleys, causing earthquake and volcanic activity, and forming undersea mountains that can become ocean islands). AA	MC, SR
SC.D.1.4.3 The student knows that changes in Earth's climate, geological activity, and life forms may be traced and compared. CS	MC
SC.D.1.4.4 The student knows that Earth's systems and organisms are the result of a long, continuous change over time.	Assessed as F.2.4.3
SC.D.2.4.1 The student understands the interconnectedness of the systems on Earth and the quality of life. AA	MC, SR Also assesses G.2.4.4

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Science Benchmarks Assessed at Grade 10 (continued)

SUNSHINE STATE STANDARDS BENCHMARK	ITEM FORMATS
GRADE 10	GRADE 10
STRAND E: EARTH AND SPACE	
SC.E.1.4.1 The student understands the relationships between events on Earth and the movements of the Earth, its moon, the other planets, and the sun. AA	MC, SR Also assesses E.1.4.2 and E.1.4.3
SC.E.1.4.2 The student knows how the characteristics of other planets and satellites are similar to and different from those of the Earth.	Assessed as E.1.4.1
SC.E.1.4.3 The student knows the various reasons that Earth is the only planet in our Solar System that appears to be capable of supporting life as we know it.	Assessed as E.1.4.1
SC.E.2.4.1 The student knows that the stages in the development of three categories of stars are based on mass: stars that have the approximate mass of our sun, stars that are two-to-three-stellar masses and develop into neutron stars, and stars that are five-to-six-stellar masses and develop into black holes. CS	MC
SC.E.2.4.2 The student identifies the arrangement of bodies found within and outside our galaxy. CS	MC
SC.E.2.4.3 The student knows astronomical distance and time. CS	MC, GR
SC.E.2.4.4 The student understands stellar equilibrium.	Not assessed
SC.E.2.4.5 The student knows various scientific theories on how the universe was formed.	Not assessed
SC.E.2.4.6 The student knows the various ways in which scientists collect and generate data about our universe (e.g., X-ray telescopes, computer simulations of gravitational systems, nuclear reactions, space probes, and supercollider simulations).	Assessed as H.1.4.1
SC.E.2.4.7 The student knows that mathematical models and computer simulations are used in studying evidence from many sources to form a scientific account of the universe.	Assessed as H.1.4.1

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Science Benchmarks Assessed at Grade 10 (continued)

SUNSHINE STATE STANDARDS BENCHMARK	ITEM FORMATS
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STRAND F: PROCESSES OF LIFE	
SC.F.1.4.1 The student knows that the body processes involve specific biochemical reactions governed by biochemical principles. AA	MC, SR Also assesses F.1.4.3 and F.1.4.5
SC.F.1.4.2 The student knows that body structures are uniquely designed and adapted for their function.	Assessed as F.2.4.3
SC.F.1.4.3 The student knows that membranes are sites for chemical synthesis and essential energy conversions.	Assessed as F.1.4.1
SC.F.1.4.4 The student understands that biological systems obey the same laws of conservation as physical systems. CS	MC
SC.F.1.4.5 The student knows that complex interactions among the different kinds of molecules in the cell cause distinct cycles of activity governed by proteins.	Assessed as F.1.4.1
SC.F.1.4.6 The student knows that separate parts of the body communicate with each other using electrical and/or chemical signals.	Assessed as F.1.4.7
SC.F.1.4.7 The student knows that organisms respond to internal and external stimuli. CS	MC Also assesses F.1.4.6 and F.1.4.8
SC.F.1.4.8 The student knows that cell behavior can be affected by molecules from other parts of the organism or even from other organisms.	Assessed as F.1.4.7
SC.F.2.4.1 The student understands the mechanisms of asexual and sexual reproduction and knows the different genetic advantages and disadvantages of asexual and sexual reproduction. CS	MC, GR
SC.F.2.4.2 The student knows that every cell contains a “blueprint” coded in DNA molecules that specify how proteins are assembled to regulate cells. CS	MC
SC.F.2.4.3 The student understands the mechanisms of change (e.g., mutation and natural selection) that lead to adaptations in a species and their ability to survive naturally in changing conditions and to increase species diversity. AA	MC, SR Also assesses D.1.4.4 and F.1.4.2

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SUNSHINE STATE STANDARDS BENCHMARK	ITEM FORMATS
GRADE 10	GRADE 10
STRAND G: HOW LIVING THINGS INTERACT WITH THEIR ENVIRONMENT	
SC.G.1.4.1 The student knows of the great diversity and interdependence of living things. AA	MC, SR Also assesses G.1.4.2
SC.G.1.4.2 The student understands how the flow of energy through an ecosystem made up of producers, consumers, and decomposers carries out the processes of life and that some energy dissipates as heat and is not recycled.	Assessed as G.1.4.1
SC.G.1.4.3 The student knows that the chemical elements that make up the molecules of living things are combined and recombined in different ways. CS	MC
SC.G.2.4.1 The student knows that layers of energy-rich organic materials have been gradually turned into great coal beds and oil pools (fossil fuels) by the pressure of the overlying earth and that humans burn fossil fuels to release the stored energy as heat and carbon dioxide. CS	MC
SC.G.2.4.2 The student knows that changes in a component of an ecosystem will have unpredictable effects on the entire system but that the components of the system tend to react in a way that will restore the ecosystem to its original condition. AA	MC, SR, ER Also assesses B.1.4.5 and G.2.4.5
SC.G.2.4.3 The student understands how genetic variation of offspring contributes to population control in an environment and that natural selection ensures that those who are best adapted to their surroundings survive to reproduce. CS	MC
SC.G.2.4.4 The student knows that the world ecosystems are shaped by physical factors that limit their productivity.	Assessed as D.2.4.1
SC.G.2.4.5 The student understands that the amount of life any environment can support is limited and that human activities can change the flow of energy and reduce the fertility of the Earth.	Assessed as G.2.4.2
SC.G.2.4.6 The student knows the ways in which humans today are placing their environmental support systems at risk (e.g., rapid human population growth, environmental degradation, and resource depletion). CS	MC

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Science Benchmarks Assessed at Grade 10 (continued)

SUNSHINE STATE STANDARDS BENCHMARK	ITEM FORMATS
GRADE 10	GRADE 10
STRAND H: THE NATURE OF SCIENCE	
SC.H.1.4.1 The student knows that investigations are conducted to explore new phenomena, to check on previous results, to test how well a theory predicts, and to compare different theories. AA	MC, GR, SR, ER Also assesses H.1.2.1, H.1.2.2, H.2.4.2, E.2.4.6, and E.2.4.7
SC.H.1.4.2 The student knows that from time to time, major shifts occur in the scientific view of how the world works, but that more often the changes that take place in the body of scientific knowledge are small modifications of prior knowledge. CS	MC Also assesses H 1.3.2, H.1.4.3, and H.1.4.6
SC.H.1.4.3 The student understands that no matter how well one theory fits observations, a new theory might fit them as well or better, or might fit a wider range of observations, because in science, the testing, revising, and occasional discarding of theories, new and old, never ends and leads to an increasingly better understanding of how things work in the world, but not to absolute truth.	Assessed as H.1.4.2
SC.H.1.4.4 The student knows that scientists in any one research group tend to see things alike and that therefore scientific teams are expected to seek out the possible sources of bias in the design of their investigations and in their data analysis. CS	MC
SC.H.1.4.5 The student understands that new ideas in science are limited by the context in which they are conceived, are often rejected by the scientific establishment, sometimes spring from unexpected findings, and usually grow slowly from many contributors. CS	MC
SC.H.1.4.6 The student understands that, in the short run, new ideas that do not mesh well with mainstream ideas in science often encounter vigorous criticism and that, in the long run, theories are judged by how they fit with other theories, the range of observations they explain, how well they explain observations, and how effective they are in predicting new findings.	Assessed as H.1.4.2
SC.H.1.4.7 The student understands the importance of a sense of responsibility, a commitment to peer review, truthful reporting of the methods and outcomes of investigations, and making the public aware of the findings. CS	MC
SC.H.2.4.1 The student knows that scientists assume that the universe is a vast system in which basic rules exist that may range from very simple to extremely complex, but that scientists operate on the belief that the rules can be discovered by careful, systemic study. AA	MC

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SC.H.2.4.2 The student knows that scientists control conditions in order to obtain evidence, but when that is not possible for practical or ethical reasons, they try to observe a wide range of natural occurrences to discern patterns.	Assessed as H.1.4.1
SC.H.3.4.1 The student knows that performance testing is often conducted using small-scale models, computer simulations, or analogous systems to reduce the chance of system failure. CS	MC
SC.H.3.4.2 The student knows that technological problems often create a demand for new scientific knowledge and that new technologies make it possible for scientists to extend their research in a way that advances science. AA	MC, SR Also assesses H.3.4.5 and H.3.4.6
SC.H.3.4.3 The student knows that scientists can bring information, insights, and analytical skills to matters of public concern and help people understand the possible causes and effects of events. CS	MC
SC.H.3.4.4 The student knows that funds for science research come from federal government agencies, industry, and private foundations and that this funding often influences the areas of discovery.	Not assessed
SC.H.3.4.5 The student knows that the value of a technology may differ for different people and at different times.	Assessed as H.3.4.2
SC.H.3.4.6 The student knows that scientific knowledge is used by those who engage in design and technology to solve practical problems, taking human values and limitations into account.	Assessed as H.3.4.2

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