

# **Grade Level Expectations for the Sunshine State Standards**

## **Science Eighth Grade**



**FLORIDA DEPARTMENT OF EDUCATION**

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**Sunshine State Standards  
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Eighth Grade**

The eighth grade student:

*The Nature of Matter*

- determines the physical properties of matter that can be observed without altering the substance (for example, mass, volume, boiling point, density).
- knows the difference between transparent, translucent, and opaque objects.
- understands that weight will vary with the location of the mass in the universe, but the mass will remain constant.
- knows that the average kinetic energy of the atoms or molecules of different objects varies with their temperature.
- understands that changes in energy cause phase changes.
- knows how to use clues (for example, change in color or form) to determine whether a change is chemical or physical.
- determines the relationship between mass and volume of an assortment of common substances.
- knows that matter is mostly neutral, but that particles can attain a charge by the gain or loss of electrons.
- understands the relationship between the energy of a wave and its frequency (the greater the frequency of the wave, the greater the energy of the wave).
- understands the relationship of energy and wavelength to the electromagnetic spectrum.
- knows that there is an energy difference between an electron near the nucleus and one further away.
- knows that when electrons are transferred from one substance to another, the general properties of both substances change.
- extends and refines knowledge of uses of forms of energy to improve the quality of life.

*Energy*

- understands that energy can be transferred by radiation, conduction, and convection.
- knows examples of natural and man-made systems in which energy is transferred from one form to another.
- understands how the principle of conservation of energy is applied during an energy transfer.

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- knows ways to measure the various forms of energy that come from the Sun.
- knows that energy conversions are never 100% efficient and that some energy is transformed to heat and is unavailable for further useful work (for example, a food pyramid reflects the energy that is used and lost in each part of a food chain).
- knows that a transfer of thermal energy occurs in chemical reactions.
- knows the processes by which thermal energy tends to flow from a system of higher temperature to a system of lower temperature.
- knows that the average kinetic energy of the atoms or molecules that make up an object changes when the temperature of the object changes.
- understands that energy changes cause weather to change (for example, formation of high and low pressure systems in the atmosphere results from changes in temperature).
- knows that sound travels in a medium (cannot travel in a vacuum), and travels at different speeds through various media.
- knows the parts of a wave (crest, trough, wavelength, amplitude).
- understands that wavelength determines the colors of visible light.
- understands that wavelength determines the pitch of sound.
- knows that waves vary greatly in character (for example, sound, ultraviolet, infrared, ocean waves).
- understands that as energy is transferred from one system to another there is a reduction in the amount of useful energy.
- knows that energy transfer is not efficient.
- understands how fossil fuels are formed in the Earth, why they are nonrenewable, and the advantages and disadvantages of their use.

*Force and Motion*

- knows that speed, velocity, and acceleration can be calculated, estimated, and defined.
- knows that the magnitude of linear acceleration can be calculated.
- knows ways to measure the frequency of waves.
- knows some technological devices that use wave energy (for example, sonar, ultrasound, laser).
- knows that many forces act at a distance.

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- knows some common contact forces (for example, friction, buoyancy, tension).
- recognizes the forces that act on a given object.
- knows that the overall effect of a force can be predicted.
- knows that forces may be balanced or unbalanced.
- understands that unbalanced forces cause objects to accelerate.
- knows that simple machines can be used to change the direction or size of a force.
- 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.
- knows ways in which a net force (for example, the sum of all acting forces) can act on an object (for example, 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).
- knows that gravity is a universal force that every mass exerts on every other mass.

*Processes that Shape the Earth*

- uses observations and tests to identify mineral samples.
- understands how sedimentary, igneous, and metamorphic rocks are formed and categorized.
- knows that over the whole Earth, organisms are growing, dying, and decaying and new organisms are being produced.
- knows ways conditions that exist in one system influence the conditions that exist in other systems (for example, the relationship between mountain building, island formation, and trench formation; interactions between the atmosphere and hydrosphere affect weather patterns).
- extends and refines knowledge of ways in which living things reshape the landscape.
- understands concepts of time and size relating to the interaction of Earth's processes (for example, the distance between atoms measured in Angstrom units as opposed to distance between stars measured in light-years).
- understands that quality of life is relevant to personal experience.
- knows that legislation can be adopted to protect the Earth from detrimental human activities.

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*Earth and Space*

- knows that available data from various satellite probes show similarities and differences among planets and their moons in our Solar System.
- knows the size, temperature, age, and brightness of the Sun compared to some other stars in the Milky Way Galaxy (for example, white dwarfs, red giants).
- knows that stars appear to be made of similar chemical elements, although they differ in age, size, temperature, and distance.
- 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*

- understands that living things are composed of major systems that function in reproduction, growth, maintenance, and regulation.
- knows the structures of cells, and their function and ways these mirror the structure and function of multicellular organisms.
- understands that cells of unicellular organisms are similar to those of multicellular organisms.
- knows the processes of division, growth, and maturation that occur during the cell cycle.
- knows some of the functions of some types of cells, tissues, organs, and systems in advanced organisms.
- understands that the diversity of cell structure permits a diversity of functions for the organism.
- knows that the cell is a system of organelles that mirrors the systems within multicellular organisms.
- knows that the cells with similar functions have similar structures, whereas those with different structures have different functions.
- uses tools to identify and compare cell structures (for example, microscope, hand lenses, bioscopes).
- knows ways behaviors that are responses to the environment may alter the normal growth, development, maintenance, and reproduction of an organism.
- knows the difference between spores and seeds in plant reproduction.
- knows that the flower is the reproductive body of a vascular plant and that it is adapted for pollination.

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- knows the difference between meiosis and mitosis and when each occurs.
- knows how dominant and recessive traits are inherited.
- uses a Punnett square to predict the results of crosses between pure and hybrid organisms.
- knows that variations within a species are the result of genetic information being passed from a parent to offspring and that interactions between the genes may occur in the process (for example, blending, crossing-over).
- knows ways organisms are adapted to their environment.
- understands that species have characteristics that enable their populations to cycle within varying periods of time (minutes to hundreds of years).
- 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*

- knows that some resources are renewable and others are nonrenewable.
- understands that changes in the environment cause changes in populations.
- extends and refines knowledge of ways that human activities may deliberately or inadvertently alter the equilibrium in the ecosystem.

*The Nature of Science*

- 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.
- extends and refines use of systematic, scientific processes to develop and test hypotheses.
- knows that the study of the events that led scientists to discoveries can provide information about the inquiry process and its effects.
- extends and refines knowledge that science disciplines differ from one another in topic, techniques, and outcomes but that they share a common purpose, philosophy, and enterprise.
- extends and refines use of accurate records, openness, and replication of experiments to ensure credibility.
- extends and refines knowledge of how to identify the independent and dependent variables in an experiment.

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- extends and refines use of appropriate experimental design, with consideration for rules, time, and materials required to solve a problem.
- extends and refines use of rules, time, and materials in ways that ensure the identification and separation of variables in an experiment to solve a problem.
- extends and refines knowledge of selected scientists and their accomplishments and recognizes their varied backgrounds, talents, interests, and goals.
- extends and refines use of criteria necessary to determine the validity of a scientific experiment.
- knows that statistical tests are used to confirm the significance of data.
- understands the importance for looking for patterns in natural events.
- knows that science ethics demand that scientists must not knowingly subject coworkers, students, the neighborhood, or the community to health or property risks.
- uses appropriate procedures for safety in the classroom, home, and community.
- extends and refines knowledge of the care, safe practices, and ethical treatment that are appropriate when using animals in field and laboratory research.
- 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.
- 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.
- 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.
- 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.
- knows ways the scientific enterprise is global and available to all.
- uses a variety of technologies to collect, analyze, and report scientific findings.
- knows that the quantity of scientific information available is increasing at an exponential rate due to the advances in technology.



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