

Science

Grade Six

Focus on Earth Sciences

Plate Tectonics and Earth's Structure

1. Plate tectonics accounts for important features of Earth's surface and major geologic events.

Shaping Earth's Surface

2. Topography is reshaped by the weathering of rock and soil and by the transportation and deposition of sediment. As a basis for understanding this concept:
- Students know* water running downhill is the dominant process in shaping the landscape, including California's landscape.
 - Students know* rivers and streams are dynamic systems that erode, transport sediment, change course, and flood their banks in natural and recurring patterns.
 - Students know* beaches are dynamic systems in which the sand is supplied by rivers and moved along the coast by the action of waves.
 - Students know* earthquakes, volcanic eruptions, landslides, and floods change human and wildlife habitats.

Heat (Thermal Energy) (Physical Sciences)

3. Heat moves in a predictable flow from warmer objects to cooler objects until all the objects are at the same temperature. As a basis for understanding this concept:
- Students know* energy can be carried from one place to another by heat flow or by waves, including water, light and sound waves, or by moving objects.
 - Students know* that when fuel is consumed, most of the energy released becomes heat energy.
 - Students know* heat energy is also transferred between objects by radiation (radiation can travel through space).

Energy in the Earth System

4. Many phenomena on Earth's surface are affected by the transfer of energy through radiation and convection currents. As a basis for understanding this concept:
 - a. *Students know* the sun is the major source of energy for phenomena on Earth's surface; it powers winds, ocean currents, and the water cycle.
 - b. *Students know* solar energy reaches Earth through radiation, mostly in the form of visible light.
 - d. *Students know* convection currents distribute heat in the atmosphere and oceans.
 - e. *Students know* differences in pressure, heat, air movement, and humidity result in changes of weather.

Ecology (Life Sciences)

5. Organisms in ecosystems exchange energy and nutrients among themselves and with the environment:
 - a. *Students know* energy entering ecosystems as sunlight is transferred by producers into chemical energy through photosynthesis and then from organism to organism through food webs.
 - b. *Students know* matter is transferred over time from one organism to others in the food web and between organisms and the physical environment.
 - c. *Students know* populations of organisms can be categorized by the functions they serve in an ecosystem.
 - d. *Students know* different kinds of organisms may play similar ecological roles in similar biomes.
 - e. *Students know* the number and types of organisms an ecosystem can support depends on the resources available and on abiotic factors, such as quantities of light and water, a range of temperatures, and soil composition.

Resources

6. Sources of energy and materials differ in amounts, distribution, usefulness, and the time required for their formation. As a basis for understanding this concept:
 - b. *Students know* different natural energy and material resources, including air, soil, rocks, minerals, petroleum, fresh water, wildlife, and forests, and know how to classify them as renewable or nonrenewable.

Investigation and Experimentation

7. Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other three strands, students should develop their own questions and perform investigations. Students will:
- a. Develop a hypothesis.
 - b. Select and use appropriate tools and technology (including calculators, computers, balances, spring scales, microscopes, and binoculars) to perform tests, collect data, and display data.
 - c. Construct appropriate graphs from data and develop qualitative statements about the relationships between variables.
 - d. Communicate the steps and results from an investigation in written reports and oral presentations.
 - e. Recognize whether evidence is consistent with a proposed explanation.

Science

Grade Seven

Focus on Life Sciences

Cell Biology

1. All living organisms are composed of cells, from just one to many trillions, whose details usually are visible only through a microscope. As a basis for understanding this concept:
 - a. *Students know* cells function similarly in all living organisms.
 - c. *Students know* the nucleus is the repository for genetic information in plant and animal cells.
 - e. *Students know* cells divide to increase their numbers through a process of mitosis, which results in two daughter cells with identical sets of chromosomes.

Genetics

2. A typical cell of any organism contains genetic instructions that specify its traits. Those traits may be modified by environmental influences. As a basis for understanding this concept:
 - b. *Students know* sexual reproduction produces offspring that inherit half their genes from each parent.
 - d. *Students know* plant and animal cells contain many thousands of different genes and typically have two copies of every gene. The two copies (or alleles) of the gene may or may not be identical, and one may be dominant in determining the phenotype while the other is recessive.

Evolution

3. Biological evolution accounts for the diversity of species developed through gradual processes over many generations. As a basis for understanding this concept:
 - a. *Students know* both genetic variation and environmental factors are causes of evolution and diversity of organisms.
 - c. *Students know* how independent lines of evidence from geology, fossils, and comparative anatomy provide the bases for the theory of evolution.
 - e. *Students know* that extinction of a species occurs when the environment changes and the adaptive characteristics of a species are insufficient for its survival.

Earth and Life History (Earth Sciences)

4. Evidence from rocks allows us to understand the evolution of life on Earth. As a basis for understanding this concept:

- a. *Students know* Earth processes today are similar to those that occurred in the past and slow geologic processes have large cumulative effects over long periods of time.
- e. Students know fossils provide evidence of how life and environmental conditions have changed.

Structure and Function in Living Systems

5. The anatomy and physiology of plants and animals illustrate the complementary nature of structure and function. As a basis for understanding this concept:

- c. *Students know* how bones and muscles work together to provide a structural framework for movement.
- d. *Students know* how the reproductive organs of the human female and male generate eggs and sperm and how sexual activity may lead to fertilization and pregnancy.
- f. *Students know* the structures and processes by which flowering plants generate pollen, ovules, seeds, and fruit.
- g. *Students know* how to relate the structures of the eye and ear to their functions.

Physical Principles in Living Systems (Physical Sciences)

6. Physical principles underlie biological structures and functions. As a basis for understanding this concept:

- a. *Students know* visible light is a small band within a very broad electromagnetic spectrum.
- c. *Students know* light travels in straight lines if the medium it travels through does not change.
- e. *Students know* that white light is a mixture of many wavelengths (colors) and that retinal cells react differently to different wavelengths.
- f. *Students know* light can be reflected, refracted, transmitted, and absorbed by matter.
- h. *Students know* how to compare joints in the body (wrist, shoulder, thigh) with structures used in machines and simple devices (hinge, ball-and-socket, and sliding joints).
- j. Students know that contractions of the heart generate blood pressure and that heart valves prevent backflow of blood in the circulatory system.

Investigation and Experimentation

7. Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other three strands, students should develop their own questions and perform investigations. Students will:
 - c.* Communicate the logical connection among hypotheses, science concepts, tests conducted, data collected, and conclusions drawn from the scientific evidence.
 - d.* Construct scale models, maps, and appropriately labeled diagrams to communicate scientific knowledge (e.g., motion of Earth's plates and cell structure).
 - e.* Communicate the steps and results from an investigation in written reports and oral presentations.

Science

Grade Eight

Focus on Physical Sciences

Motion

1. The velocity of an object is the rate of change of its position. As a basis for understanding this concept:
 - a. *Students know* position is defined in relation to some choice of a standard reference point and a set of reference directions.
 - c. *Students know* how to solve problems involving distance, time, and average speed.
 - e. *Students know* changes in velocity may be due to changes in speed, direction, or both.
 - f. *Students know* how to interpret graphs of position versus time and graphs of speed versus time for motion in a single direction.

Forces

2. Unbalanced forces cause changes in velocity. As a basis for understanding this concept:
 - a. *Students know* a force has both direction and magnitude.
 - b. *Students know* when an object is subject to two or more forces at once, the result is the cumulative effect of all the forces.
 - c. *Students know* when the forces on an object are balanced, the motion of the object does not change.
 - e. *Students know* that when the forces on an object are unbalanced, the object will change its velocity (that is, it will speed up, slow down, or change direction).
 - g. *Students know* the role of gravity in forming and maintaining the shapes of planets, stars, and the solar system.

Structure of Matter

3. Each of the more than 100 elements of matter has distinct properties and a distinct atomic structure. All forms of matter are composed of one or more of the elements. As a basis for understanding this concept:
 - a. *Students know* the structure of the atom and know it is composed of protons, neutrons, and electrons.

- b. *Students know* that compounds are formed by combining two or more different elements and that compounds have properties that are different from their constituent elements.
- c. *Students know* atoms and molecules form solids by building up repeating patterns, such as the crystal structure of NaCl or long-chain polymers.
- d. *Students know* the states of matter (solid, liquid, gas) depend on molecular motion.
- e. *Students know* that in solids the atoms are closely locked in position and can only vibrate; in liquids the atoms and molecules are more loosely connected and can collide with and move past one another; and in gases the atoms and molecules are free to move independently, colliding frequently.
- f. *Students know* how to use the periodic table to identify elements in simple compounds.

Earth in the Solar System (Earth Sciences)

- 4. The structure and composition of the universe can be learned from studying stars and galaxies and their evolution. As a basis for understanding this concept:
 - a. *Students know* galaxies are clusters of billions of stars and may have different shapes.
 - b. *Students know* that the Sun is one of many stars in the Milky Way galaxy and that stars may differ in size, temperature, and color.
 - c. *Students know* how to use astronomical units and light years as measures of distances between the Sun, stars, and Earth.
 - d. *Students know* that stars are the source of light for all bright objects in outer space and that the Moon and planets shine by reflected sunlight, not by their own light.

Reactions

- 5. Chemical reactions are processes in which atoms are rearranged into different combinations of molecules. As a basis for understanding this concept:
 - a. *Students know* reactant atoms and molecules interact to form products with different chemical properties.
 - b. *Students know* the idea of atoms explains the conservation of matter: In chemical reactions the number of atoms stays the same no matter how they are arranged, so their total mass stays the same.
 - c. *Students know* chemical reactions usually liberate heat or absorb heat.
 - d. *Students know* physical processes include freezing and boiling, in which a material changes form with no chemical reaction.
 - e. *Students know* how to determine whether a solution is acidic, basic, or neutral.

Periodic Table

7. The organization of the periodic table is based on the properties of the elements and reflects the structure of atoms. As a basis for understanding this concept:
- Students know* how to identify regions corresponding to metals, nonmetals, and inert gases.
 - Students know* each element has a specific number of protons in the nucleus (the atomic number).
 - Students know* substances can be classified by their properties.

Density and Buoyancy

8. All objects experience a buoyant force when immersed in a fluid. As a basis for understanding this concept:
- Students know* density is mass per unit volume.
 - Students know* how to calculate the density of substances (regular and irregular solids and liquids) from measurements of mass and volume.
 - Students know* how to predict whether an object will float or sink.

Investigation and Experimentation

9. Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other three strands, students should develop their own questions and perform investigations. Students will:
- Plan and conduct a scientific investigation to test a hypothesis.
 - Evaluate the accuracy and reproducibility of data.
 - Distinguish between variable and controlled parameters in a test.
 - Construct appropriate graphs from data and develop quantitative statements about the relationships between variables.
 - Distinguish between linear and nonlinear relationships on a graph of data.

