

**Sixth Grade California Science Content Standards
Focus on Earth Science**

**Science Olympiad
Events**

Plate Tectonics and Earth's Structure

1. Plate tectonics accounts for important features of Earth's surface and major geologic events. As a basis for understanding this concept:	
a. <i>Students know</i> evidence of plate tectonics is derived from the fit of the continents; the location of earthquakes, volcanoes, and midocean ridges; and the distribution of fossils, rock types, and ancient climatic zones.	Oceanography
b. <i>Students know</i> Earth is composed of several layers: a cold, brittle lithosphere; a hot, convecting mantle; and a dense, metallic core.	Oceanography
c. <i>Students know</i> lithospheric plates the size of continents and oceans move at rates of centimeters per year in response to movements in the mantle.	Oceanography

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:	
c. <i>Students know</i> beaches are dynamic systems in which the sand is supplied by rivers and moved along the coast by the action of waves.	Oceanography
d. <i>Students know</i> 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:	
a. <i>Students know</i> 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.	Oceanography, Ecology
d. <i>Students know</i> heat energy is also transferred between objects by radiation (radiation can travel through space).	Solar System

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. <i>Students know</i> the sun is the major source of energy for phenomena on Earth's surface; it powers winds, ocean currents, and the water cycle.	Oceanography, Awesome Aquifers, Solar System, Meteorology, Ecology
b. <i>Students know</i> solar energy reaches Earth through radiation, mostly in the form of visible light.	Solar System
d. <i>Students know</i> convection currents distribute heat in the atmosphere and oceans.	Meteorology
e. <i>Students know</i> differences in pressure, heat, air movement, and humidity result in changes of weather.	Meteorology

Ecology (Life Sciences)

5. Organisms in ecosystems exchange energy and nutrients among themselves and with the environment. As a basis for understanding this concept:	
a. <i>Students know</i> energy entering ecosystems as sunlight is transferred by producers into chemical energy through photosynthesis and then from organism to organism through food webs.	Ecology
b. <i>Students know</i> matter is transferred over time from one organism to others in the food web and between organisms and the physical environment.	Don't Bug Me, Ecology
c. <i>Students know</i> populations of organisms can be categorized by the functions they serve in an ecosystem.	Don't Bug Me, Ecology
d. <i>Students know</i> different kinds of organisms may play similar ecological roles in similar biomes.	Don't Bug Me, Ecology
e. <i>Students know</i> 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.	Don't Bug Me, Ecology

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:	
a. <i>Students know</i> the utility of energy sources is determined by factors that are involved in converting these sources to useful forms and the consequences of the conversion process.	Ecology

b. <i>Students know</i> 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.	Ecology
c. <i>Students know</i> the natural origin of the materials used to make common objects.	Ecology

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.	Experimental Design, Storm the Castle, Bottle Rocket, Tower Building, Mission Possible, Wheeled Vehicle
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.	Experimental Design, Storm the Castle, Bottle Rocket, Tower Building, Mission Possible, Wheeled Vehicle
c. Construct appropriate graphs from data and develop qualitative statements about the relationships between variables.	Experimental Design, Storm the Castle, Bottle Rocket, Tower Building, Mission Possible, Wheeled Vehicle
d. Communicate the steps and results from an investigation in written reports and oral presentations.	Experimental Design, Storm the Castle,
f. Read a topographic map and a geologic map for evidence provided on the maps and construct and interpret a simple scale map.	Road Scholar
g. Interpret events by sequence and time from natural phenomena (e.g., the relative ages of rocks and intrusions).	Rocks and Minerals
h. Identify changes in natural phenomena over time without manipulating the phenomena (e.g., a tree limb, a grove of trees, a stream, a hillslope).	Heredity, Ecology

Seventh Grade Science Content Standards

Focus on Life Science

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:	
a. <i>Students know</i> the differences between the life cycles and reproduction methods of sexual and asexual organisms.	Heredity
b. <i>Students know</i> sexual reproduction produces offspring that inherit half their genes from each parent.	Heredity
c. <i>Students know</i> an inherited trait can be determined by one or more genes.	Heredity
d. <i>Students know</i> 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.	Heredity
e. <i>Students know</i> DNA (deoxyribonucleic acid) is the genetic material of living organisms and is located in the chromosomes of each cell.	Heredity

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:	
c. <i>Students know</i> that the rock cycle includes the formation of new sediment and rocks and that rocks are often found in layers, with the oldest generally on the bottom.	Rocks and Minerals
d. <i>Students know</i> that evidence from geologic layers and radioactive dating indicates Earth is approximately 4.6 billion years old and that life on this planet has existed for more than 3 billion years.	Rocks and Minerals

Physical Principles in Living Systems (Physical Sciences)

i. <i>Students know</i> how levers confer mechanical advantage and how the application of this principle applies to the musculoskeletal system.	Simple Machines
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Investigation and Experimentation

Science Olympiad Events

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. Select and use appropriate tools and technology (including calculators, computers, balances, spring scales, microscopes, and binoculars) to perform tests, collect data, and display data.	Balloon Launch Glider, Experimental Design, Storm the Castle, Tower Building, Wheeled Vehicle
b. Use a variety of print and electronic resources (including the World Wide Web) to collect information and evidence as part of a research project.	Compute This
c. Communicate the logical connection among hypotheses, science concepts, tests conducted, data collected, and conclusions drawn from the scientific evidence.	Experimental Design, Compute This
d. Construct scale models, maps, and appropriately labeled diagrams to communicate scientific knowledge (e.g., motion of Earth's plates and cell structure).	Experimental Design, Compute This
e. Communicate the steps and results from an investigation in written reports and oral presentations.	Write It/Do It, Science Word

Eighth Grade Science Content Standards Focus on Physical Science

Science Olympiad Events

Motion

1. The velocity of an object is the rate of change of its position. As a basis for understanding this concept:	
b. <i>Students know</i> that average speed is the total distance traveled divided by the total time elapsed and that the speed of an object along the path traveled can vary.	Balloon Race, Wheeled Vehicle
c. <i>Students know</i> how to solve problems involving distance, time, and average speed.	Balloon Race, Wheeled Vehicle
f. <i>Students know</i> how to interpret graphs of position versus time and graphs of speed versus time for motion in a single direction.	Storm the Castle

Forces

2. Unbalanced forces cause changes in velocity. As a basis for understanding this concept:	
a. <i>Students know</i> a force has both direction and magnitude.	Balloon Race,
b. <i>Students know</i> when an object is subject to two or more forces at once, the result is the cumulative effect of all the forces.	Balloon Race
c. <i>Students know</i> when the forces on an object are balanced, the motion of the object does not change.	Balloon Race
e. <i>Students know</i> 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).	Balloon Race
g. <i>Students know</i> the role of gravity in forming and maintaining the shapes of planets, stars, and the solar system.	Solar System

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:	
c. <i>Students know</i> how to use astronomical units and light years as measures of distances between the Sun, stars, and Earth.	Solar System
e. <i>Students know</i> the appearance, general composition, relative position and size, and motion of objects in the solar system, including planets, planetary satellites, comets, and asteroids.	Solar System

Reactions

5. Chemical reactions are processes in which atoms are rearranged into different combinations of molecules. As a basis for understanding this concept:	
d. <i>Students know</i> physical processes include freezing and boiling, in which a material changes form with no chemical reaction.	Science Crime Busters
e. <i>Students know</i> how to determine whether a solution is acidic, basic, or neutral.	Food Science

Chemistry of Living Systems (Life Sciences)

6. Principles of chemistry underlie the functioning of biological systems. As a basis for understanding this concept:	
a. <i>Students know</i> that carbon, because of its ability to combine in many ways with itself and other elements, has a central role in the chemistry of living organisms.	Ecology

b. <i>Students know</i> that living organisms are made of molecules consisting largely of carbon, hydrogen, nitrogen, oxygen, phosphorus, and sulfur.	Ecology
c. <i>Students know</i> that living organisms have many different kinds of molecules, including small ones, such as water and salt, and very large ones, such as carbohydrates, fats, proteins, and DNA.	Food Science

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:	
c. <i>Students know</i> substances can be classified by their properties, including their melting temperature, density, hardness, and thermal and electrical conductivity.	Food Science, Science Crime Busters

Density and Buoyancy

8. All objects experience a buoyant force when immersed in a fluid. As a basis for understanding this concept:	
a. <i>Students know</i> density is mass per unit volume.	Balloon Race
b. <i>Students know</i> how to calculate the density of substances (regular and irregular solids and liquids) from measurements of mass and volume.	Balloon Race
c. <i>Students know</i> the buoyant force on an object in a fluid is an upward force equal to the weight of the fluid the object has displaced.	Balloon Race
d. <i>Students know</i> how to predict whether an object will float or sink.	Balloon Race

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:	
a. Plan and conduct a scientific investigation to test a hypothesis.	Experimental Design, Balloon Launch Glider, Balloon Race, Mission Possible, Storm the Castle, Tower Building, Wheeled Vehicle
b. Evaluate the accuracy and reproducibility of data.	Experimental Design, Storm the Castle, Balloon Race
c. Distinguish between variable and controlled parameters in a test.	Experimental Design, Balloon Launch Glider, Balloon Race, Mission Possible, Storm the Castle, Tower Building, Wheeled Vehicle
e. Construct appropriate graphs from data and develop quantitative statements about the relationships between variables.	Experimental Design, Balloon Launch Glider, Balloon Race, Mission Possible, Storm the Castle, Tower Building, Wheeled Vehicle
f. Apply simple mathematic relationships to determine a missing quantity in a mathematic expression, given the two remaining terms (including speed = distance/time, density = mass/volume, force = pressure \times area, volume = area \times height).	Balloon Race, Simple Machines
g. Distinguish between linear and nonlinear relationships on a graph of data.	Experimental Design

High School Physics Science Content Standards Motion and Forces

Science Olympiad Events

1. Newton's laws predict the motion of most objects. As a basis for understanding this concept:	
g. <i>Students know</i> circular motion requires the application of a constant force directed toward the center of the circle.	Physics Lab
i. * <i>Students know</i> how to solve two-dimensional trajectory problems.	Physics Lab, Storm the Castle

j. * <i>Students know</i> how to resolve two-dimensional vectors into their components and calculate the magnitude and direction of a vector from its components.	Physics Lab
k. * <i>Students know</i> how to solve two-dimensional problems involving balanced forces (statics).	Storm the Castle
l. * <i>Students know</i> how to solve problems in circular motion by using the formula for centripetal acceleration in the following form: $a=v^2/r$.	Physics Lab

Conservation of Energy and Momentum

2. The laws of conservation of energy and momentum provide a way to predict and describe the movement of objects. As a basis for understanding this concept:	
d. <i>Students know</i> how to calculate momentum as the product mv .	Physics Lab

Waves

4. Waves have characteristic properties that do not depend on the type of wave. As a basis for understanding this concept:	
a. <i>Students know</i> waves carry energy from one place to another.	Oceanography
b. <i>Students know</i> how to identify transverse and longitudinal waves in mechanical media, such as springs and ropes, and on the earth (seismic waves).	Oceanography
c. <i>Students know</i> how to solve problems involving wavelength, frequency, and wave speed.	Oceanography
d. <i>Students know</i> sound is a longitudinal wave whose speed depends on the properties of the medium in which it propagates.	Sounds of Music
f. <i>Students know</i> how to identify the characteristic properties of waves: interference (beats), diffraction, refraction, Doppler effect, and polarization.	Sounds of Music

Electric and Magnetic Phenomena

5. Electric and magnetic phenomena are related and have many practical applications. As a basis for understanding this concept:	
a. <i>Students know</i> how to predict the voltage or current in simple direct current (DC) electric circuits constructed from batteries, wires, resistors, and capacitors.	Circuit Lab
b. <i>Students know</i> how to solve problems involving Ohm's law.	Circuit Lab
c. <i>Students know</i> any resistive element in a DC circuit dissipates energy, which heats the resistor. Students can calculate the power (rate of energy dissipation) in any resistive circuit element by using the formula $\text{Power} = IR$ (potential difference) $\times I$ (current) $= I^2R$.	Circuit Lab
e. <i>Students know</i> charged particles are sources of electric fields and are subject to the forces of the electric fields from other charges.	Circuit Lab
f. <i>Students know</i> magnetic materials and electric currents (moving electric charges) are sources of magnetic fields and are subject to forces arising from the magnetic fields of other sources.	Circuit Lab
g. <i>Students know</i> how to determine the direction of a magnetic field produced by a current flowing in a straight wire or in a coil.	Circuit Lab
h. <i>Students know</i> changing magnetic fields produce electric fields, thereby inducing currents in nearby conductors.	Circuit Lab
k. * <i>Students know</i> the force on a charged particle in an electric field is qE , where E is the electric field at the position of the particle and q is the charge of the particle.	Circuit Lab
l. * <i>Students know</i> how to calculate the electric field resulting from a point charge.	Circuit Lab

Chemistry Science Content Standards

Atomic and Molecular Structure

1. The periodic table displays the elements in increasing atomic number and shows how periodicity of the physical and chemical properties of the elements relates to atomic structure. As a basis for understanding this concept:	
f. * <i>Students know</i> how to use the periodic table to identify the lanthanide, actinide, and transactinide elements and know that the transuranium elements were synthesized and identified in laboratory experiments through the use of nuclear accelerators.	Chemistry Lab
i. * <i>Students know</i> the experimental basis for the development of the quantum theory of atomic structure and the historical importance of the Bohr model of the atom.	Chemistry Lab

Chemical Bonds

2. Biological, chemical, and physical properties of matter result from the ability of atoms to form bonds from electrostatic forces between electrons and protons and between atoms and molecules. As a basis for understanding this concept:	
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a. <i>Students know</i> atoms combine to form molecules by sharing electrons to form covalent or metallic bonds or by exchanging electrons to form ionic bonds.	Chemistry Lab
b. <i>Students know</i> chemical bonds between atoms in molecules such as H ₂ , CH ₄ , NH ₃ , H ₂ CCH ₂ , N ₂ , Cl ₂ , and many large biological molecules are covalent.	Chemistry Lab
h. * <i>Students know</i> how to identify solids and liquids held together by van der Waals forces or hydrogen bonding and relate these forces to volatility and boiling/ melting point temperatures.	Chemistry Lab

Conservation of Matter and Stoichiometry

3. The conservation of atoms in chemical reactions leads to the principle of conservation of matter and the ability to calculate the mass of products and reactants. As a basis for understanding this concept:	
d. <i>Students know</i> how to determine the molar mass of a molecule from its chemical formula and a table of atomic masses and how to convert the mass of a molecular substance to moles, number of particles, or volume of gas at standard temperature and pressure.	Chemistry Lab

Gases and Their Properties

4. The kinetic molecular theory describes the motion of atoms and molecules and explains the properties of gases. As a basis for understanding this concept:	
a. <i>Students know</i> the random motion of molecules and their collisions with a surface create the observable pressure on that surface.	Chemistry Lab
b. <i>Students know</i> the random motion of molecules explains the diffusion of gases.	Chemistry Lab
c. <i>Students know</i> how to apply the gas laws to relations between the pressure, temperature, and volume of any amount of an ideal gas or any mixture of ideal gases.	Chemistry Lab
d. <i>Students know</i> the values and meanings of standard temperature and pressure (STP).	Chemistry Lab
g. * <i>Students know</i> the kinetic theory of gases relates the absolute temperature of a gas to the average kinetic energy of its molecules or atoms.	Chemistry Lab
h. * <i>Students know</i> how to solve problems by using the ideal gas law in the form $PV = nRT$.	Chemistry Lab
i. * <i>Students know</i> how to apply Dalton's law of partial pressures to describe the composition of gases and Graham's law to predict diffusion of gases.	Chemistry Lab

Acids and Bases

5. Acids, bases, and salts are three classes of compounds that form ions in water solutions. As a basis for understanding this concept:	
c. <i>Students know</i> strong acids and bases fully dissociate and weak acids and bases partially dissociate.	Food Science
d. <i>Students know</i> how to use the pH scale to characterize acid and base solutions.	Food Science

Solutions

6. Solutions are homogeneous mixtures of two or more substances. As a basis for understanding this concept:	
f. * <i>Students know</i> how molecules in a solution are separated or purified by the methods of chromatography and distillation.	Forensics

Organic Chemistry and Biochemistry

10. The bonding characteristics of carbon allow the formation of many different organic molecules of varied sizes, shapes, and chemical properties and provide the biochemical basis of life. As a basis for understanding this concept:	
a. <i>Students know</i> large molecules (polymers), such as proteins, nucleic acids, and starch, are formed by repetitive combinations of simple subunits.	Food Science
c. <i>Students know</i> amino acids are the building blocks of proteins.	Food Science

Nuclear Processes

11. Nuclear processes are those in which an atomic nucleus changes, including radioactive decay of naturally occurring and human-made isotopes, nuclear fission, and nuclear fusion. As a basis for understanding this concept:	
a. <i>Students know</i> protons and neutrons in the nucleus are held together by nuclear forces that overcome the electromagnetic repulsion between the protons.	Chemistry Lab
b. <i>Students know</i> the energy release per gram of material is much larger in nuclear fusion or fission reactions than in chemical reactions. The change in mass (calculated by $E = mc^2$) is small but significant in nuclear reactions.	Chemistry Lab
c. <i>Students know</i> some naturally occurring isotopes of elements are radioactive, as are isotopes formed in nuclear reactions.	Chemistry Lab

d. <i>Students know</i> the three most common forms of radioactive decay (alpha, beta, and gamma) and know how the nucleus changes in each type of decay.	Chemistry Lab
e. <i>Students know</i> alpha, beta, and gamma radiation produce different amounts and kinds of damage in matter and have different penetrations.	Chemistry Lab
f. * <i>Students know</i> how to calculate the amount of a radioactive substance remaining after an integral number of half-lives have passed.	Chemistry Lab
g. * <i>Students know</i> protons and neutrons have substructures and consist of particles called quarks.	Chemistry Lab

Biology Science Content Standards

Genetics

2. Mutation and sexual reproduction lead to genetic variation in a population. As a basis for understanding this concept:	
a. <i>Students know</i> meiosis is an early step in sexual reproduction in which the pairs of chromosomes separate and segregate randomly during cell division to produce gametes containing one chromosome of each type.	Designer Genes
b. <i>Students know</i> only certain cells in a multicellular organism undergo meiosis.	Designer Genes
c. <i>Students know</i> how random chromosome segregation explains the probability that a particular allele will be in a gamete.	Designer Genes
d. <i>Students know</i> new combinations of alleles may be generated in a zygote through the fusion of male and female gametes (fertilization).	Designer Genes
e. <i>Students know</i> why approximately half of an individual's DNA sequence comes from each parent.	Designer Genes
f. <i>Students know</i> the role of chromosomes in determining an individual's sex.	Designer Genes
g. <i>Students know</i> how to predict possible combinations of alleles in a zygote from the genetic makeup of the parents.	Designer Genes
3. A multicellular organism develops from a single zygote, and its phenotype depends on its genotype, which is established at fertilization. As a basis for understanding this concept:	
a. <i>Students know</i> how to predict the probable outcome of phenotypes in a genetic cross from the genotypes of the parents and mode of inheritance (autosomal or X-linked, dominant or recessive).	Designer Genes
b. <i>Students know</i> the genetic basis for Mendel's laws of segregation and independent assortment.	Designer Genes
c. * <i>Students know</i> how to predict the probable mode of inheritance from a pedigree diagram showing phenotypes.	Designer Genes
d. * <i>Students know</i> how to use data on frequency of recombination at meiosis to estimate genetic distances between loci and to interpret genetic maps of chromosomes.	Designer Genes
4. Genes are a set of instructions encoded in the DNA sequence of each organism that specify the sequence of amino acids in proteins characteristic of that organism. As a basis for understanding this concept:	
a. <i>Students know</i> the general pathway by which ribosomes synthesize proteins, using tRNAs to translate genetic information in mRNA.	Designer Genes
b. <i>Students know</i> how to apply the genetic coding rules to predict the sequence of amino acids from a sequence of codons in RNA.	Designer Genes
c. <i>Students know</i> how mutations in the DNA sequence of a gene may or may not affect the expression of the gene or the sequence of amino acids in an encoded protein.	Designer Genes
d. <i>Students know</i> specialization of cells in multicellular organisms is usually due to different patterns of gene expression rather than to differences of the genes themselves.	Designer Genes
e. <i>Students know</i> proteins can differ from one another in the number and sequence of amino acids.	Designer Genes
f. * <i>Students know</i> why proteins having different amino acid sequences typically have different shapes and chemical properties.	Designer Genes
5. The genetic composition of cells can be altered by incorporation of exogenous DNA into the cells. As a basis for understanding this concept:	
a. <i>Students know</i> the general structures and functions of DNA, RNA, and protein.	
b. <i>Students know</i> how to apply base-pairing rules to explain precise copying of DNA during semiconservative replication and transcription of information from DNA into mRNA.	Designer Genes

c. <i>Students know</i> how genetic engineering (biotechnology) is used to produce novel biomedical and agricultural products.	Designer Genes
d. * <i>Students know</i> how basic DNA technology (restriction digestion by endonucleases, gel electrophoresis, ligation, and transformation) is used to construct recombinant DNA molecules.	Designer Genes
e. * <i>Students know</i> how exogenous DNA can be inserted into bacterial cells to alter their genetic makeup and support expression of new protein products.	Designer Genes

Ecology

6. Stability in an ecosystem is a balance between competing effects. As a basis for understanding this concept:	
a. <i>Students know</i> biodiversity is the sum total of different kinds of organisms and is affected by alterations of habitats.	Ecology, Entomology
b. <i>Students know</i> how to analyze changes in an ecosystem resulting from changes in climate, human activity, introduction of nonnative species, or changes in population size.	Ecology
c. <i>Students know</i> how fluctuations in population size in an ecosystem are determined by the relative rates of birth, immigration, emigration, and death.	Ecology
d. <i>Students know</i> how water, carbon, and nitrogen cycle between abiotic resources and organic matter in the ecosystem and how oxygen cycles through photosynthesis and respiration.	Ecology
e. <i>Students know</i> a vital part of an ecosystem is the stability of its producers and decomposers.	Ecology
f. <i>Students know</i> at each link in a food web some energy is stored in newly made structures but much energy is dissipated into the environment as heat. This dissipation may be represented in an energy pyramid.	Ecology, Entomology
g. * <i>Students know</i> how to distinguish between the accommodation of an individual organism to its environment and the gradual adaptation of a lineage of organisms through genetic change.	Ecology

Evolution

8. Evolution is the result of genetic changes that occur in constantly changing environments. As a basis for understanding this concept:	
a. <i>Students know</i> how natural selection determines the differential survival of groups of organisms.	Entomology
b. <i>Students know</i> a great diversity of species increases the chance that at least some organisms survive major changes in the environment.	Entomology

Physiology

9. As a result of the coordinated structures and functions of organ systems, the internal environment of the human body remains relatively stable (homeostatic) despite changes in the outside environment. As a basis for understanding this concept:	
a. <i>Students know</i> how the complementary activity of major body systems provides cells with oxygen and nutrients and removes toxic waste products such as carbon dioxide.	Health Science
b. <i>Students know</i> how the nervous system mediates communication between different parts of the body and the body's interactions with the environment.	Health Science
c. <i>Students know</i> how feedback loops in the nervous and endocrine systems regulate conditions in the body.	Health Science
d. <i>Students know</i> the functions of the nervous system and the role of neurons in transmitting electrochemical impulses.	Health Science
e. <i>Students know</i> the roles of sensory neurons, interneurons, and motor neurons in sensation, thought, and response.	Health Science
g. * <i>Students know</i> the homeostatic role of the kidneys in the removal of nitrogenous wastes and the role of the liver in blood detoxification and glucose balance.	Health Science
i. * <i>Students know</i> how hormones (including digestive, reproductive, osmoregulatory) provide internal feedback mechanisms for homeostasis at the cellular level and in whole organisms.	Health Science
10. Organisms have a variety of mechanisms to combat disease. As a basis for understanding the human immune response:	
a. <i>Students know</i> the role of the skin in providing nonspecific defenses against infection.	Health Science
b. <i>Students know</i> the role of antibodies in the body's response to infection.	Health Science
c. <i>Students know</i> how vaccination protects an individual from infectious diseases.	Health Science

d. <i>Students know</i> there are important differences between bacteria and viruses with respect to their requirements for growth and replication, the body's primary defenses against bacterial and viral infections, and effective treatments of these infections.	Health Science
e. <i>Students know</i> why an individual with a compromised immune system (for example, a person with AIDS) may be unable to fight off and survive infections by microorganisms that are usually benign.	Health Science
f. * <i>Students know</i> the roles of phagocytes, B-lymphocytes, and T-lymphocytes in the immune system.	Health Science

Earth Space Science – Science Content Standards

Earth's Place in the Universe

1. Astronomy and planetary exploration reveal the solar system's structure, scale, and change over time. As a basis for understanding this concept:	
a. <i>Students know</i> how the differences and similarities among the sun, the terrestrial planets, and the gas planets may have been established during the formation of the solar system.	Remote Sensing
c. <i>Students know</i> the evidence from geological studies of Earth and other planets suggest that the early Earth was very different from Earth today.	Remote Sensing
2. Earth-based and space-based astronomy reveal the structure, scale, and changes in stars, galaxies, and the universe over time. As a basis for understanding this concept:	
d. <i>Students know</i> that stars differ in their life cycles and that visual, radio, and X-ray telescopes may be used to collect data that reveal those differences.	Astronomy
e. * <i>Students know</i> accelerators boost subatomic particles to energy levels that simulate conditions in the stars and in the early history of the universe before stars formed.	Astronomy
f. * <i>Students know</i> the evidence indicating that the color, brightness, and evolution of a star are determined by a balance between gravitational collapse and nuclear fusion.	Astronomy

Dynamic Earth Processes

3. Plate tectonics operating over geologic time has changed the patterns of land, sea, and mountains on Earth's surface. As the basis for understanding this concept:	
a. <i>Students know</i> features of the ocean floor (magnetic patterns, age, and sea-floor topography) provide evidence of plate tectonics.	Oceanography
b. <i>Students know</i> the principal structures that form at the three different kinds of plate boundaries.	Oceanography
c. <i>Students know</i> how to explain the properties of rocks based on the physical and chemical conditions in which they formed, including plate tectonic processes.	Rocks and Minerals

Energy in the Earth System

5. Heating of Earth's surface and atmosphere by the sun drives convection within the atmosphere and oceans, producing winds and ocean currents. As a basis for understanding this concept:	
b. <i>Students know</i> the relationship between the rotation of Earth and the circular motions of ocean currents and air in pressure centers.	Oceanography
d. <i>Students know</i> properties of ocean water, such as temperature and salinity, can be used to explain the layered structure of the oceans, the generation of horizontal and vertical ocean currents, and the geographic distribution of marine organisms.	Oceanography
6. Climate is the long-term average of a region's weather and depends on many factors. As a basis for understanding this concept:	
b. <i>Students know</i> the effects on climate of latitude, elevation, topography, and proximity to large bodies of water and cold or warm ocean currents.	Oceanography

Biogeochemical Cycles

7. Each element on Earth moves among reservoirs, which exist in the solid earth, in oceans, in the atmosphere, and within and among organisms as part of biogeochemical cycles. As a basis for understanding this concept:	
b. <i>Students know</i> the global carbon cycle: the different physical and chemical forms of carbon in the atmosphere, oceans, biomass, fossil fuels, and the movement of carbon among these reservoirs.	Oceanography
d. * <i>Students know</i> the relative residence times and flow characteristics of carbon in and out of its different reservoirs.	Oceanography

Investigation and Experimentation Science Content Standards

1. 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 four strands, students should develop their own questions and perform investigations. Students will:	
a. Select and use appropriate tools and technology (such as computer-linked probes, spreadsheets, and graphing calculators) to perform tests, collect data, analyze relationships, and display data.	Experimental Design, Boomilever, Robot Ramble, Scrambler, Sounds of Music, Wright Stuff
b. Identify and communicate sources of unavoidable experimental error.	Experimental Design
c. Identify possible reasons for inconsistent results, such as sources of error or uncontrolled conditions.	Experimental Design
h. Read and interpret topographic and geologic maps.	Remote Sensing
l. Analyze situations and solve problems that require combining and applying concepts from more than one area of science.	Five Star Science, Forensics, Disease Detectives, Food Science, Fermi Questions