Santa Barbara School Districts

Content Standards – Science

What should students know and do? When should they learn it?

Grade 7

LIFE SCIENCE

Cell Biology

- Describe the differences between plant and animal cells.
- Explain the process of mitosis and its role in cell division.
- Describe how cells differentiate to form multicellular organisms.

Genetics

- Explain inheritance of genetic traits.
- Explain the difference between sexual and asexual reproductions.
- Demonstrate knowledge about the role of DNA in genetics.
- Explain mechanisms that cause variation in individuals.

Evolution

- Explain the roles of geology, fossils, and comparative anatomy in providing the basis for the theory of evolution.
- Explain how organisms are classified.
- Explain the reasoning for the theory of evolution.
- Describe the role of natural selection in the mechanism of evolution.

Earth and Life History

- Explain the role of geology in influencing the history of life on Earth.
- Describe the ongoing cycle of rock formation.

Structure, Function, and Physical Principles in Living Systems

- Explain the different organizational levels of organisms from cells to systems and their interrelationships.
- Define the process of plant reproduction.
- Demonstrate how physical principles are related to structure and function, such as: visible light (eye), mechanical advantage (joints), and pressure (blood flow).

Scientific Investigation

- Develop and perform individual science investigations.
- Construct models, maps, and diagrams to demonstrate scientific principles.
- Demonstrate scientific knowledge through written, electronic, and oral reports.

Grade 8

PHYSICAL SCIENCE

Physics

- Define frame of reference.
- Interpret graphs on velocity and speed.
- Describe and calculate velocity and average speed.
- Explain motion in terms of forces (balanced and unbalanced) and mass.
- Describe Newton's three laws.
- Describe the composition, position, and motion of objects in our solar system.

- Use astronomical units and light years to describe distances to stars.
- Calculate density and buoyancy.

Chemistry

- Describe change of states in matter in terms of molecular motion.
- Distinguish between elements, compounds, and mixtures.
- Explain the role of protons, neutrons, and electrons in the makeup of atoms.
- Use the periodic table to identify elements.
- Show how the periodic table is organized on the properties/structure of the atom.
- Identify metals, nonmetals, and inert gases and describe the properties of each group.
- Define the elements in terms of protons and isotopes.
- Distinguish between chemical reaction and physical change.
- Determine if a substance is acidic, basic, or neutral.
- Describe or show how the principles of chemistry underlie the functioning of biological systems.

Scientific Investigation

- Plan and conduct scientific investigations.
- Use simple algebra to solve for one unknown in an equation.
- Evaluate experiments conducted by other investigators.

Grades 9-12

PHYSICS

- Explain the movement of objects by gravity and the three laws of motion as expressed by Newton.
- Solve problems involving velocity, acceleration, and a change in an object's momentum caused by the application of an unbalanced force.
- Solve problems involving work and the conservation of mechanical energy.
- Explain how heat and work are part of the conservation of energy within a thermodynamic system.
- Explain how sound and light waves carry energy from one place to another.
- Solve problems involving wavelength, frequency, and wave speed.
- Recognize wave properties such as interference, diffraction, refraction, polarization, and the Doppler effect.
- Predict the voltage or current in simple direct electric circuits constructed from batteries, wires, resistors, and capacitors.
- Solve simple direct current circuit problems using power and voltage equations combining P=IV and Ohm's Law, V=IR.
- Explain the nature and direction of electromagnetic induction resulting from changing electric and magnetic fields.

Earth Science Standards Covered in Physics

- Explain the structure and scale of our solar system and its change through time.
- Explain the character of stars and galaxies and the Earth's location in the universe.
- Explain the location and structure of continents, sea floor, and related incidence of earthquakes and volcanoes resulting from the movement of tectonic plates.
- Explain global movement of air and ocean as driven by heat convection.
- Explain past and present climate resulting from latitude, elevation, and relative location of mountains and ocean.
- Explain the thermodynamic balance of the Earth system including the function of solar energy.

Grades 9-12

CHEMISTRY

- Define the position of an element in the Periodic Table to its atomic number and atomic mass.
- Define the physical and chemical properties of the elements on the Periodic Table as related to atomic structure.
- Explain how biological, chemical, and physical properties of matter result from the ability of atoms to form bonds based on electrostatic forces between electrons and protons, and between atoms and molecules.
- Explain how 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.
- Explain the kinetic molecular theory that describes the motion of atoms and molecules and define the properties of gases.
- Describe how acids, bases, and salts are classes of compounds that form ions in water solutions.
- Explain how solutions are homogeneous mixtures of two or more substances.
- Explain how energy is exchanged or transformed in all chemical reactions and physical changes of matter.
- Describe how chemical reaction rates depend on factors that influence the frequency of collision of reactant molecules.
- Explain how chemical equilibrium is a dynamic process at the molecular level.
- Explain how the bonding characteristics of carbon lead to many different molecules with varied sizes, shapes, and chemical properties, providing the biochemical basis of life.
- Describe how nuclear processes are those in which an atomic nucleus changes, including radioactive decay of naturally occurring and man-made isotopes, and nuclear fusion.

Earth Science Standards Covered in Chemistry

- Explain the evolution and chemical structure of the atmosphere, especially in terms of carbon dioxide, oxygen, and the ozone layer.
- Explain the thermodynamic balance of the Earth system including the function of solar energy.

Grades 9-12

BIOLOGY

- Recognize that life processes of organisms depend on a variety of chemical reactions that are carried out in specialized areas of their cells.
- Explain the processes of meiosis, sexual reproduction and mutation leading to genetic variation in a population.
- Predict the probable phenotypic and genotypic outcomes of given crosses and explain the modes of inheritance involved.
- Explain how genetic engineering can modify organisms.
- Recognize the stability in an ecosystem as a balance among competing effects.
- Recognize that changing allele frequencies in the gene pool can cause populations to become more or less stable over time.
- Recognize that evolution is the result of genetic changes that occur in constantly changing environments.
- Explain how, through the coordinated structures and functions of organ systems, the internal environment of the human body remains relatively stable despite changes in the external environment.
- Recognize some of the mechanisms involved in the human immune response.

Earth Science Standards Covered in Biology

- Explain the energy-driven cycles of nitrogen and carbon through earth reservoirs.
- Explain the thermodynamic balance of the Earth system including the function of solar energy.

These state standards have been established by the California Board of Education and adopted by the Santa Barbara School Districts Board of Education. A complete set of standards is available at the District Office.