

Correlation of
Healthy Water, Healthy People
Educator's Guide
&
Testing Kit Manual
To The
Science Content Standards
Grades 6-12
For California Public Schools

Grade Six Focus on Earth Science

SHAPING EARTH'S SURFACES

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:

- a. *Students know* water running downhill is the dominant process in shaping the landscape, including California's landscape.

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Turbidity or Not Turbidity: That is the Question! (pg: 83)

- b. *Students know* rivers and streams are dynamic systems that erode, transport sediment, change course, and flood their banks in natural and recurring patterns.

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Conductivity (pg: 11)

Total Dissolved Solids (pg: 45)

Turbidity (pg: 49)

- d. *Students know* earthquakes, volcanic eruptions, landslides, and floods change human and wildlife habitats.

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Turbidity or Not Turbidity: That is the Question! (pg: 83)

ECOLOGY (LIFE SCIENCES)

5. Organisms in ecosystems exchange energy and nutrients among themselves and with the environment. As a basis for understanding this concept:

- b. *Students know* matter is transferred over time from one organism to others in the food web and between organisms and the physical environment.

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Wash It Away (pg: 121)

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- c. *Students know* populations of organisms can be categorized by the functions they serve in an ecosystem.

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Bacteria (pg: 5)

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- d. *Students know* different kinds of organisms may play similar ecological roles in similar biomes.

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Nitrate (pg: 25)

- 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.

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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.

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- c. *Students know* the natural origin of the materials used to make common objects.

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INVESTIGATION & 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.

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- 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.

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- c. Construct appropriate graphs from data and develop qualitative statements about the relationships between variables.

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- d. Communicate the steps and results from an investigation in written reports and oral presentations.

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- e. Recognize whether evidence is consistent with a proposed explanation.

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- f. Read a topographic map and a geologic map for evidence provided on the maps and construct and interpret a simple scale map.

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- g. Interpret events by sequence and time from natural phenomena (e.g., the relative ages of rocks and intrusions).

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- h. Identify changes in natural phenomena over time without manipulating the phenomena (e.g., a tree limb, a grove of trees, a stream, a hill slope).

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Grade Seven Focus on Life Science

EVOLUTION

3. Biological evolution accounts for the diversity of species developed through gradual processes over many generations. As a basis for understanding this concept:
 - e. *Students know* that extinction of a species occurs when the environment changes and that the adaptive characteristics of a species are insufficient for its survival.

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INVESTIGATION & 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. Select and use appropriate tools and technology (including calculators, computers, balances, spring scales, microscopes, and binoculars) to perform tests, collect data, and display data.

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- 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.

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- c. Communicate the logical connection among hypotheses, science concepts, tests conducted, data collected, and conclusions drawn from the scientific evidence.

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- d. Construct scale models, maps, and appropriately labeled diagrams to communicate scientific knowledge (e. g., motion of Earth's plates and cell structure).

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- e. Communicate the steps and results from an investigation in written reports and oral presentations.

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Grade Eight

Focus on Physical Science

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:
- 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.

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pH (pg: 29)
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- d. *Students know* the states of matter (solid, liquid, gas) depend on molecular motion.

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Temperature (pg: 41)

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.

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pH (pg: 29)
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- e. *Students know* how to determine whether a solution is acidic, basic, or neutral.

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CHEMISTRY OF LIVING THINGS (LIFE SCIENCE)

6. Principles of chemistry underlie the functioning of biological systems. As a basis for understanding this concept:

- a. *Students know* 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.

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Alkalinity (pg: 1)

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- b. *Students know* that living organisms are made of molecules consisting largely of carbon, hydrogen, nitrogen, oxygen, phosphorus, and sulfur.

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- c. *Students know* 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.

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Nitrate (pg: 25)

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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. *Students know* substances can be classified by their properties, including their melting temperature, density, hardness, and thermal and electrical conductivity.

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INVESTIGATION & 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.

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b. Evaluate the accuracy and reproducibility of data.

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c. Distinguish between variable and controlled parameters in a test.

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e. Construct appropriate graphs from data and develop quantitative statements about the relationships between variables.

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Chemistry - Grades Nine Through Twelve

Standards that all students are expected to achieve in the course of their studies are unmarked.
Standards that all students should have the opportunity to learn are marked with an asterisk (*).

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:
 - b. *Students know* chemical bonds between atoms in molecules such as H₂, CH₄, NH₃, H₂CCH₂, N₂, Cl₂, and many large biological molecules are covalent.

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pH (pg: 29)

- h. * *Students know* 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.

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Temperature (pg: 41)

CONSERVATION OF MATTER & 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:
 - c. *Students know* one mole equals 6.02×10^{23} particles (atoms or molecules).

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ACIDS & BASES

5. Acids, bases, and salts are three classes of compounds that form ions in water solutions. As a basis for understanding this concept:
 - a. *Students know* the observable properties of acids, bases, and salt solutions.

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- b. *Students know* acids are hydrogen-ion-donating and bases are hydrogen-ion-accepting substances.

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- d. *Students know* how to use the pH scale to characterize acid and base solutions.

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- f. * *Students know* how to calculate pH from the hydrogen-ion concentration.

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- g. * *Students know* buffers stabilize pH in acid-base reactions.

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SOLUTIONS

6. Solutions are homogenous mixtures of two or more substances. As a basis for understanding this concept:

- c. *Students know* temperature, pressure, and surface area affect the dissolving process.

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Total Dissolved Solids (pg: 45)

- d. *Students know* how to calculate the concentration of a solute in terms of grams per liter, molarity, parts per million, and percent composition.

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REACTION RATES

8. Chemical reaction rates depend on factors that influence the frequency of collision of reactant molecules. As a basis for understanding this concept:

- a. *Students know* the rate of reaction is the decrease in concentration of reactants or the increase in concentration of products with time.

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Hardness (pg: 19)

- b. *Students know* how reaction rates depend on such factors as concentration, temperature, and pressure.

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Biology/Life Sciences - Grades Nine Through Twelve

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ECOLOGY

6. Stability in an ecosystem is a balance between competing effects. As a basis for understanding this concept:
 - a. *Students know* biodiversity is the sum total of different kinds of organisms and is affected by alterations of habitats.

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- b. *Students know* how to analyze changes in an ecosystem resulting from changes in climate, human activity, introduction of nonnative species, or changes in population size.

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- c. *Students know* how fluctuations in population size in an ecosystem are determined by the relative rates of birth, immigration, emigration, and death.

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- d. *Students know* how water, carbon, and nitrogen cycle between abiotic resources and organic matter in the ecosystem and how oxygen cycles through photosynthesis and respiration.

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- e. *Students know* a vital part of an ecosystem is the stability of its producers and decomposers.

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PHYSIOLOGY

1. Organisms have a variety of mechanisms to combat disease. As a basis for understanding the human immune response:
 - d. *Students know* 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.

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Earth Sciences - Grades Nine Through Twelve

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ENERGY IN THE EARTH SYSTEM

4. Energy enters the Earth system primarily as solar radiation and eventually escapes as heat. As a basis for understanding this concept:
 - b. *Students know* the fate of incoming solar radiation in terms of reflection, absorption, and photosynthesis.

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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:
 - a. *Students know* the carbon cycle of photosynthesis and respiration and the nitrogen cycle.

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- b. *Students know* 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.

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- c. *Students know* the movement of matter among reservoirs is driven by Earth's internal and external sources of energy.

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STRUCTURE & COMPOSITION OF THE ATMOSPHERE

8. Life has changed Earth's atmosphere, and changes in the atmosphere affect conditions for life. As a basis for understanding this concept:
- a. *Students know* the thermal structure and chemical composition of the atmosphere.

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Nitrate (pg: 25)

CALIFORNIA GEOLOGY

9. The geology of California underlies the state's wealth of natural resources as well as its natural hazards. As a basis for understanding this concept:
- c. *Students know* the importance of water to society, the origins of California's fresh water, and the relationship between supply and need.

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Investigation & Experimentation - Grades 9 to 12

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.

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- b. Identify and communicate sources of unavoidable experimental error.

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- c. Identify possible reasons for inconsistent results, such as sources of error or uncontrolled conditions.

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- d. Formulate explanations by using logic and evidence.

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Turbidity (pg: 49)

- e. Solve scientific problems by using quadratic equations and simple trigonometric, exponential, and logarithmic functions.

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- g. Recognize the usefulness and limitations of models and theories as scientific representations of reality.

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- h. Read and interpret topographic and geologic maps.

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- i. Analyze the locations, sequences, or time intervals that are characteristic of natural phenomena (e.g., relative ages of rocks, locations of planets over time, and succession of species in an ecosystem).

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- j. Recognize the issues of statistical variability and the need for controlled tests.

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Hitting the Mark (pg: 49)

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- k. Recognize the cumulative nature of scientific evidence.

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Mapping It Out (pg: 6)

Carts and Horses (pg: 42)

Setting the Standards (pg: 107)

- l. Analyze situations and solve problems that require combining and applying concepts from more than one area of science.

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Phosphate (pg: 35)
Temperature (pg: 41)
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- m. Investigate a science-based societal issue by researching the literature, analyzing data, and communicating the findings. Examples of issues include irradiation of food, cloning of animals by somatic cell nuclear transfer, choice of energy sources, and land and water use decisions in California.

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