1. The Earth and celestial phenomena can be described by principles of relative motion and perspective.

Students:
• explain complex phenomena, such as tides, variations in day length, solar insolation, apparent motion of the planets, and annual traverse of the constellations.
• describe current theories about the origin of the universe and solar system.

This is evident, for example, when students:
▲ create models, drawings, or demonstrations to explain changes in day length, solar insolation, and the apparent motion of planets.

2. Many of the phenomena that we observe on Earth involve interactions among components of air, water, and land.

Students:
• use the concepts of density and heat energy to explain observations of weather patterns, seasonal changes, and the movements of the Earth's plates.
• explain how incoming solar radiations, ocean currents, and land masses affect weather and climate.

This is evident, for example, when students:
▲ use diagrams of ocean currents at different latitudes to develop explanations for the patterns present.

3. Matter is made up of particles whose properties determine the observable characteristics of matter and its reactivity.

Students:
• explain the properties of materials in terms of the arrangement and properties of the atoms that compose them.
• use atomic and molecular models to explain common chemical reactions.
• apply the principle of conservation of mass to chemical reactions.
• use kinetic molecular theory to explain rates of reactions and the relationships among temperature, pressure, and volume of a substance.

This is evident, for example, when students:
▲ use the atomic theory of elements to justify their choice of an element for use as a lighter than air gas for a launch vehicle.
▲ represent common chemical reactions using three-dimensional models of the molecules involved.
▲ discuss and explain a variety of everyday phenomena involving rates of chemical reactions, in terms of the kinetic molecular theory (e.g., use of refrigeration to keep food from spoiling, ripening of fruit in a bowl, use of kindling wood to start a fire, different types of flames that come from a Bunsen burner).

4. Energy exists in many forms, and when these forms change energy is conserved.

Students:
• observe and describe transmission of various forms of energy.
• explain heat in terms of kinetic molecular theory.
• explain variations in wavelength and frequency in terms of the source of the vibrations that produce them, e.g., molecules, electrons, and nuclear particles.
• explain the uses and hazards of radioactivity.

This is evident, for example, when students:
▲ demonstrate through drawings, models, and diagrams how the potential energy that exists in the chemical bonds of fossil fuels can be converted to electrical energy in a power plant (potential energy $\rightarrow$ heat energy $\rightarrow$ mechanical energy $\rightarrow$ electrical energy).
▲ investigate the sources of radioactive emissions in their environment and the dangers and benefits they pose for humans.

5. Energy and matter interact through forces that result in changes in motion.

Students:
• explain and predict different patterns of motion of objects (e.g., linear and angular motion, velocity and acceleration, momentum and inertia).
• explain chemical bonding in terms of the motion of electrons.
• compare energy relationships within an atom's nucleus to those outside the nucleus.

This is evident, for example, when students:
▲ construct drawings, models, and diagrams representing several different types of chemical bonds to demonstrate the basis of the bond, the strength of the bond, and the type of electrical attraction that exists.
Students will understand and apply scientific concepts, principles, and theories pertaining to the physical setting and living environment and recognize the historical development of ideas in science.

The Living Environment

1. Living things are both similar to and different from each other and nonliving things.

Students:
- explain how diversity of populations within ecosystems relates to the stability of ecosystems.
- describe and explain the structures and functions of the human body at different organizational levels (e.g., systems, tissues, cells, organelles).
- explain how a one-celled organism is able to function despite lacking the levels of organization present in more complex organisms.

2. Organisms inherit genetic information in a variety of ways that result in continuity of structure and function between parents and offspring.

Students:
- explain how the structure and replication of genetic material result in offspring that resemble their parents.
- explain how the technology of genetic engineering allows humans to alter the genetic makeup of organisms.

This is evident, for example, when students:
- record outward characteristics of fruit flies and then breed them to determine patterns of inheritance.

3. Individual organisms and species change over time.

Students:
- explain the mechanisms and patterns of evolution.

This is evident, for example, when students:
- determine characteristics of the environment that affect a hypothetical organism and explore how different characteristics of the species give it a selective advantage.

4. The continuity of life is sustained through reproduction and development.

Students:
- explain how organisms, including humans, reproduce their own kind.

This is evident, for example, when students:
- observe the development of fruit flies or rapidly maturing plants, from fertilized egg to mature adult, relating embryological development and structural adaptations to the propagation of the species.

5. Organisms maintain a dynamic equilibrium that sustains life.

Students:
- explain the basic biochemical processes in living organisms and their importance in maintaining dynamic equilibrium.
- explain disease as a failure of homeostasis.
- relate processes at the system level to the cellular level in order to explain dynamic equilibrium in multicelled organisms.

This is evident, for example, when students:
- investigate the biochemical processes of the immune system, and its relationship to maintaining mental and physical health.

6. Plants and animals depend on each other and their physical environment.

Students:
- explain factors that limit growth of individuals and populations.
- explain the importance of preserving diversity of species and habitats.
- explain how the living and nonliving environments change over time and respond to disturbances.

This is evident, for example, when students:
- conduct a long-term investigation of a local ecosystem.

7. Human decisions and activities have had a profound impact on the physical and living environment.

Students:
- describe the range of interrelationships of humans with the living and nonliving environment.
- explain the impact of technological development and growth in the human population on the living and nonliving environment.
- explain how individual choices and societal actions can contribute to improving the environment.

This is evident, for example, when students:
- compile a case study of a technological development that has had a significant impact on the environment.