

Standard 4—Science

Intermediate

Physical Setting

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

Students:

- explain daily, monthly, and seasonal changes on earth.

This is evident, for example, when students:

- ▲ create models, drawings, or demonstrations describing the arrangement, interaction, and movement of the Earth, moon, and sun.
- ▲ plan and conduct an investigation of the night sky to describe the arrangement, interaction, and movement of celestial bodies.

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

Students:

- explain how the atmosphere (air), hydrosphere (water), and lithosphere (land) interact, evolve, and change.
- describe volcano and earthquake patterns, the rock cycle, and weather and climate changes.

This is evident, for example, when students:

- ▲ add heat to and subtract heat from water and graph the temperature changes, including the resulting phase changes.
- ▲ make a record of reported earthquakes and volcanoes and interpret the patterns formed worldwide.

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

Students:

- observe and describe properties of materials, such as density, conductivity, and solubility.
- distinguish between chemical and physical changes.
- develop their own mental models to explain common chemical reactions and changes in states of matter.

This is evident, for example, when students:

- ▲ test and compare the properties (hardness, shape, color, etc.) of an array of materials.
- ▲ observe an ice cube as it begins to melt at temperature and construct an explanation for what happens, including sketches and written descriptions of their ideas.

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

Students:

- describe the sources and identify the transformations of energy observed in everyday life.
- observe and describe heating and cooling events.
- observe and describe energy changes as related to chemical reactions.
- observe and describe the properties of sound, light, magnetism, and electricity.
- describe situations that support the principle of conservation of energy.

This is evident, for example, when students:

- ▲ design and construct devices to transform/transfer energy.
- ▲ conduct supervised explorations of chemical reactions (not including ammonia and bleach products) for selected household products, such as hot and cold packs used to treat sport injuries.
- ▲ build an electromagnet and investigate the effects of using different types of core materials, varying thicknesses of wire, and different circuit types.

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

Students:

- describe different patterns of motion of objects.
- observe, describe, and compare effects of forces (gravity, electric current, and magnetism) on the motion of objects.

This is evident, for example, when students:

- ▲ investigate physics in everyday life, such as at an amusement park or a playground.
- ▲ use simple machines made of pulleys and levers to lift objects and describe how each machine transforms the force applied to it.
- ▲ build “Rube Goldberg” type devices and describe the energy transformations evident in them.

Key ideas are identified by numbers (1).
Performance indicators are identified by bullets (•).
Sample tasks are identified by triangles (▲).

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:

- compare and contrast the parts of plants, animals, and one-celled organisms.
- explain the functioning of the major human organ systems and their interactions.

This is evident, for example, when students:

- ▲ conduct a survey of the school grounds and develop appropriate classification keys to group plants and animals by shared characteristics.
- ▲ use spring-type clothespins to investigate muscle fatigue or rulers to determine the effect of amount of sleep on hand-eye coordination.

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

Students:

- describe sexual and asexual mechanisms for passing genetic materials from generation to generation.
- describe simple mechanisms related to the inheritance of some physical traits in offspring.

This is evident, for example, when students:

- ▲ contrast dominance and blending as models for explaining inheritance of traits.
- ▲ trace patterns of inheritance for selected human traits.

3. Individual organisms and species change over time.

Students:

- describe sources of variation in organisms and their structures and relate the variations to survival.
- describe factors responsible for competition within species and the significance of that competition.

This is evident, for example, when students:

- ▲ conduct a long-term investigation of plant or animal communities.
- ▲ investigate the acquired effects of industrialization on tree trunk color and those effects on different insect species.

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

Students:

- observe and describe the variations in reproductive patterns of organisms, including asexual and sexual reproduction.
- explain the role of sperm and egg cells in sexual reproduction.
- observe and describe developmental patterns in selected plants and animals (e.g., insects, frogs, humans, seed-bearing plants).
- observe and describe cell division at the microscopic level and its macroscopic effects.

This is evident, for example, when students:

- ▲ apply a model of the genetic code as an analogue for the role of the genetic code in human populations.

5. Organisms maintain a dynamic equilibrium that sustains life.

Students:

- compare the way a variety of living specimens carry out basic life functions and maintain dynamic equilibrium.
- describe the importance of major nutrients, vitamins, and minerals in maintaining health and promoting growth and explain the need for a constant input of energy for living organisms.

This is evident, for example, when students:

- ▲ record and compare the behaviors of animals in their natural habitats and relate how these behaviors are important to the animals.
- ▲ design and conduct a survey of personal nutrition and exercise habits, and analyze and critique the results of that survey.

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

Students:

- describe the flow of energy and matter through food chains and food webs.
- provide evidence that green plants make food and explain the significance of this process to other organisms.

This is evident, for example, when students:

- ▲ construct a food web for a community of organisms and explore how elimination of a particular part of a chain affects the rest of the chain and web.

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

Students:

- describe how living things, including humans, depend upon the living and nonliving environment for their survival.
- describe the effects of environmental changes on humans and other populations.

This is evident, for example, when students:

- ▲ conduct an extended investigation of a local environment affected by human actions, (e.g., a pond, stream, forest, empty lot).