

## SCIENCE CONTENT STANDARDS GRADE 4

In the physical sciences, students learn to design and build simple electrical circuits, and experiment with components such as wires, batteries and bulbs. They observe that electrically charged objects may either attract or repel one another, and that electrical energy can be converted into heat, light, and motion. They know that magnets have two poles (North and South) and that like poles repel each other (N-to-N or S-to-S) while unlike poles (N-to-S) attract. They also learn how to make a simple electromagnet and know how electromagnets are used in simple devices.

All living organisms require energy to live and grow, and all animals depend on plants for food either directly or indirectly. Nutrients are recycled as living organisms die and decompose. In grade 4 students expand their knowledge of food chains and food webs to include not only producers and consumers that they have discussed previously, but also the decomposers of plant and animal remains such as insects, fungi, and bacteria. Students learn about other ecological relationships between plants and animals, such as animals using plants for shelter or nesting, and plants using animals for pollination and seed dispersal.

Grade 4 students study rocks, minerals, and the processes of erosion. It is appropriate to work with minerals before rocks. It is also appropriate to study the processes of weathering and erosion as a way of leading into the study of the formation of sedimentary rocks. The processes of weathering and erosion continually break up rocks to form sediments. These sediments are later deposited and eventually produce new sedimentary rocks. Some changes on the surface of the Earth take place very slowly, but these slow processes may ultimately have a great effect on the shape of the Earth's surface.

In grade 4, students learn to formulate and justify predictions based on cause- and-effect relationships, differentiate observation from inference, and conduct multiple trials to test their predictions. In collecting data during investigative activities, they learn to follow a written set of instructions, and continue to build their skills at expressing measurements in metric system units. Data analysis includes construction and interpretation of one and two variable graphs.

### Physical Sciences

- Electricity and magnetism are related effects that have many useful applications in everyday life. As a basis for understanding this concept, students know:
  - **how to design and build simple series and parallel circuits by using components such as wires, batteries, and bulbs.**
  - a simple compass can be used to detect magnetic effects, including Earth's magnetic field.
  - **electric currents produce magnetic fields and how to build a simple electromagnet.**
  - the role of electromagnets in the construction of electric motors, electric generators, and simple devices such as doorbells and earphones.
  - electrically charged objects attract or repel each other.

- ⊖ magnets have two poles, labeled north and south, and like poles repel each other while unlike poles attract each other.
- ⊖ electrical energy can be converted to heat, light, and motion.

## Life Sciences

- All organisms need energy and matter to live and grow. As a basis for understanding this concept, students know:
  - ⊖ plants are the primary source of matter and energy entering most food chains.
  - ⊖ **producers and consumers (herbivores, carnivores, omnivores, and decomposers) are related in food chains and food webs, and may compete with each other for resources in an ecosystem.**
  - ⊖ decomposers, including many fungi, insects, and microorganisms such as bacteria, recycle matter from dead plants and animals.
- Living organisms depend on one another and on their environment for survival. As a basis for understanding this concept, students know:
  - ⊖ ecosystems can be characterized in terms of their living and nonliving components.
  - ⊖ **for any particular environment, some kinds of plants and animals survive well, some survive less well, and some cannot survive at all.**
  - ⊖ many plants depend on animals for pollination and seed dispersal, while animals depend on plants for food and shelter.
  - ⊖ most microorganisms do not cause disease and many are beneficial.

## Earth Sciences

- The properties of rocks and minerals reflect the processes that formed them. As a basis for understanding this concept, students know:
  - ⊖ **how to differentiate among igneous, sedimentary, and metamorphic rocks by their properties and methods of formation (the rock cycle).**
  - ⊖ **how to identify common rock-forming minerals (including quartz, calcite, feldspar, mica, and hornblende) and ore minerals using a table of diagnostic properties.**
  - ⊖ fossils may be found in sedimentary rock.

## Science Process Skills (Investigation and Experimentation)

- Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept, and to address the content the other three strands, students should develop their own questions and perform investigations. Students will:
  - ⊖ differentiate observation from inference (interpretation), and know that scientists' explanations come partly from what they observe and partly from how they interpret their observations.
  - ⊖ **measure and estimate mass, length, or volume of objects using metric units**
  - ⊖ formulate predictions and justify predictions based on cause and effect relationships.
  - ⊖ **conduct multiple trials to test a prediction and draw conclusions about the relationships between results and predictions.**
  - ⊖ construct and interpret graphs from measurements.
  - ⊖ **follow a set of written and/or oral instructions for a scientific investigation.**