

## Grade 5

### Does Not Meet the Standards (Grade 5)

Students at this level of science succeed at few of the most fundamental science skills of the Minnesota Academic Standards. Some of the skills demonstrated may include:

- **Nature of Science and Engineering:** Understands that science is used to investigate and answer questions; uses appropriate tools and creates graphs in a scientific investigation.
- **Physical Science:** Knows that temperature changes in water can cause changes in state (liquid, gas, solid); recognizes that vibrations cause sound; identifies the type of force that starts an object moving.
- **Earth and Space Science:** Recognizes all forms of collection in the water cycle; identifies events that change the Earth's surface; observes the daily and seasonal changes in the position of the Sun.
- **Life Science:** Identifies similarities between parents and offspring; describes the structures of plants and animals; recognizes the roles of the body's defense systems and vaccinations; sorts organisms into groups based on observable characteristics; identifies differences that may give individuals an advantage in survival.

### Partially Meets the Standards (Grade 5)

Students at this level of science partially meet the science skills of the Minnesota Academic Standards. Some of the skills demonstrated may include:

- **Nature of Science and Engineering:** Recognizes effects that science has on the natural world; recognizes unfair comparisons in an investigation; selects appropriate ways (e.g., graphs, tables) to present data from a controlled experiment; understands the steps in the engineering design process.
- **Physical Science:** Knows that temperature changes can cause changes in state in common substances (air, water); describes how vibration affects pitch; builds a simple electrical circuit; recognizes ways heat energy can be generated; identifies that magnets can repel or attract; recognizes how the size of a force affects motion; identifies simple machines (e.g., lever, wedge, ramp).
- **Earth and Space Science:** Identifies erosion as a process that changes Earth's surface; identifies different forms of water in some parts of the water cycle; recognizes apparent

changes in the moon's shape.

- **Life Science:** Recognizes differences between plants and animals; recognizes how an organism's interactions with other organisms and its habitat may be beneficial or harmful; differentiates between inherited and acquired characteristics.

### Meets the Standards (Grade 5)

Students at this level of science meet the science skills of the Minnesota Academic Standards. Some of the skills demonstrated may include:

- **Nature of Science and Engineering:** Recognizes how scientific knowledge is used and communicated; identifies questions that can be investigated scientifically; recognizes the processes, evidence, logic and controls of scientific investigations; identifies the constraints, advantages and disadvantages of engineering design solutions.
- **Physical Science:** Describes changes in the properties of substances when they are heated and cooled; describes how light interacts with objects; labels the parts of an electrical circuit; identifies conductors and insulators; describes how simple machines affect force and motion.
- **Earth and Space Science:** Knows how weathering and erosion form features of the Earth's surface; understands the relationships between all parts of the water cycle; models the orbits of the Moon, Earth and Sun.
- **Life Science:** Describes the structures and functions of living organisms; understands the relationships between the living and nonliving parts of an ecosystem; recognizes how differences in individuals may give an advantage in survival and reproduction; identifies the flow of energy between organisms.

### Exceeds the Standards (Grade 5)

Students at this level of science exceed the science skills of the Minnesota Academic Standards. Some of the skills demonstrated very consistently may include:

- **Nature of Science and Engineering:** Recognizes the role of critical review in science; describes different types of investigations and which variables are controlled and not controlled; writes conclusions using data obtained from investigations; suggests engineering design solutions to solve a problem.
- **Physical Science:** Compares and contrasts states of matter using mass, shape and volume; describes the relationship between electricity and magnetism.
- **Earth and Space Science:** Compares observations of seasonal changes in the Sun's position.
- **Life Science:** Identifies specific differences in an individual organism and how these differences may affect individual survival and reproduction; identifies plant structures that assist in growth and reproduction.

## Grade 8

### Does Not Meet the Standards (Grade 8)

Students at this level of science succeed at few of the most fundamental science skills of the Minnesota Academic Standards. Some of the skills demonstrated may include:

- **Nature of Science and Engineering:** Identifies scientific questions; chooses an appropriate tool for an investigation; identifies variables that change and that stay the same in simple investigations.
- **Physical Science:** Identifies changes that occur when water is heated or cooled; distinguishes between mixtures and pure substances.
- **Earth and Space Science:** Identifies the oldest rock layers in sedimentary rock, identifies the location and use of major water reservoirs on the earth; recognizes that earth is composed of layers; recognizes that the Sun is our principal source of energy on Earth.
- **Life Science:** Recognizes that cells contain genes; recognizes the differences between plant and animal cells; identifies relationships among populations in a stable ecosystem.

### Partially Meets the Standards (Grade 8)

Students at this level of science partially meet the science skills of the Minnesota Academic Standards. Some of the skills demonstrated may include:

- **Nature of Science and Engineering:** Uses a measuring tool and appropriate units of measurement in an investigation; evaluates conclusions from a scientific investigation as personal opinion or scientific fact; identifies scientific questions and their appropriate methods of investigation; recognizes the importance of learning from past failures to guide designs; converts metric units.
- **Physical Science:** Recognizes that there are approximately 100 elements with different properties; identifies forces acting on an object; distinguishes between kinetic and potential energy; identifies amplitude and wavelength of waves.
- **Earth and Space Science:** Recognizes that landforms are built up and broken down by natural processes; organizes fossils based on age in sedimentary rock layers; relates tectonic motion to earthquakes; describes the properties of layers of earth; describes the transfer of water between major water reservoirs on the Earth; recognizes that the atmosphere has many layers with different properties; recognizes that the Sun is the primary force that affects weather, climate, and air and ocean currents.
- **Life Science:** Recognizes that variations exist in every population; understands the relationship between predator and prey; recognizes that genes determine inherited traits of an organism; uses anatomical structures to infer relationships between living organisms and fossils; recognizes the function of nerve and muscle cells; recognizes that viruses can interfere with normal body function; identifies human activities that change populations in stable ecosystems.

### Meets the Standards (Grade 8)

Students at this level of science meet the science skills of the Minnesota Academic Standards. Some of the skills demonstrated may include:

- **Nature of Science and Engineering:** Plans and conducts a controlled experiment; generates a scientific conclusion from an investigation; applies an engineering design process to construct a product or system; uses maps and other data sets to describe local patterns and predictions.
- **Physical Science:** Calculates density; uses atoms and molecules to describe the differences between elements and compounds; knows that the mass of an object stays the same when it changes form; describes physical and chemical changes in matter; identifies how the sum of forces on an object affects motion; calculates the speed of an object; describes different forms of energy and their transformations; describes how heat is transferred; analyzes potential and kinetic energy conversions; describes waves and their properties.
- **Earth and Space Science:** Identifies how natural processes form a variety of landforms; infers relative ages of rock sequences by interpreting successive sedimentary rock layers and their fossils; describes the effects mass and distance have on the force of gravity; recognizes the effect of the rotation and revolution of Earth on air and ocean currents, seasons, length of a day and phases of the moon; describes the formation of fossil fuels; describes the distribution of materials through the processes of the water cycle; identifies the effect of the jet stream on weather patterns.
- **Life Science:** Describes how the organ systems interact in vertebrate organisms; identifies energy changes from producers, consumers and decomposers in an ecosystem; recognizes the products of photosynthesis; understands the differences between sexual and asexual reproduction; distinguishes between inherited and acquired characteristics; describes how genetic variation can impact an organism's ability to survive; identifies how human activities impact ecosystems; recognizes the human immune system's ability to protect against foreign substances that enter the body.

### Exceeds the Standards (Grade 8)

Students at this level of science exceed the science skills of the Minnesota Academic Standards. Some of the skills demonstrated very consistently may include:

- **Nature of Science and Engineering:** Uses appropriate measurements, graphs and analysis to describe global natural and designed systems; recognizes how economic, political, social and ethical expectations influence engineering design solutions and scientific investigations.
- **Physical Science:** Explains an object's motion using graphs; relates light wave lengths to specific colors; understands the relationships of frequency to wavelength; explains density using the particle model of matter.
- **Earth and Space Science:** Identifies how the structure of the atmosphere affects energy absorption; analyzes the effects of pressure systems on wind direction and weather conditions.
- **Life Science:** Explains how the living and nonliving factors influence the number of populations an ecosystem can support; explains the flow of energy through an ecosystem.

## High School

### Does Not Meet the Standards (High School)

Students at this level of science succeed at few of the most fundamental science skills of the Minnesota Academic Standards. Some of the skills demonstrated may include:

- **Nature of Science and Engineering:** Determines the appropriate safety procedures for a scientific investigation; understands what a hypothesis is; identifies the benefits of using scientific models.
- **Life Science:** Understands that photosynthesis converts light energy into chemical energy; identifies how competition for resources affects population growth; recognizes the primary function of DNA; identifies how air quality affects personal health.

### Partially Meets the Standards (High School)

Students at this level of science partially meet the science skills of the Minnesota Academic Standards. Some of the skills demonstrated may include:

- **Nature of Science and Engineering:** Identifies sources of error in an investigation; understands that engineering designs are continually checked so that they can be improved; recognizes that scientific knowledge occurs in steps that build on prior knowledge; selects appropriate graphical representations to communicate results; identifies a scientific hypothesis.
- **Life Science:** Uses words to describe the process of photosynthesis; identifies DNA, genes and chromosomes; matches base pairs of DNA; recognizes characteristics of sexual and asexual reproduction; recognizes that genetic variation is essential for natural selection to occur; identifies the ecological risks and benefits of changing a natural ecosystem by human activity; identifies inputs and expected outputs of simple natural and designed systems; understands how organisms respond to changes in the environment; recognizes that the human body produces antibodies to fight disease; uses homologous structures to show evolutionary relationships among species.

### Meets the Standards (High School)

Students at this level of science meet the science skills of the Minnesota Academic Standards. Some of the skills demonstrated may include:

- **Nature of Science and Engineering:** Describes how changes in scientific knowledge usually builds on earlier knowledge; explains how bias might influence how research is done and the interpretation of data; recognizes that risk analysis is used to evaluate consequences of an engineered solution; evaluates possible solutions to an engineering problem at a local and regional level; uses appropriate numeric, or graphical representations to communicate a scientific idea; suggests ways to improve data collection; designs and conducts an experiment to test a hypothesis.
- **Life Science:** Explains how cell parts and processes respond to environmental factors and their functions in respiration, reproduction and photosynthesis; identifies primary functions of

some biological molecules; describes the role of DNA and RNA in assembling protein molecules; recognizes how internal and external factors affect biological systems; explains how energy is transferred among organisms in an ecosystem; uses equations to differentiate between photosynthesis and respiration; uses Mendel's laws of segregation and independent assortment to explain variations in a species; uses the principles of natural selection to explain the differential survival of offspring; uses a variety of evidence to show evolutionary relationships; describes the economic and social risks and benefits of changing a natural ecosystem by human activity; understands how the human body responds to external and internal factors.

### Exceeds the Standards (High School)

Students at this level of science exceed the science skills of the Minnesota Academic Standards. Some of the skills demonstrated very consistently may include:

- **Nature of Science and Engineering:** Formulates a hypothesis and conducts an experiment to test this hypothesis; supports a conclusion with evidence from the investigation; develops possible solutions to an engineering problem in a global context.
- **Life Science:** Recognizes structures of biological molecules; describes and differentiates between the processes of replication, transcription and translation of nucleic acids; understands the consequences of human activity on living organisms and ecosystems; describes matter transformations and the dissipation of energy as heat in a natural ecosystem.