

Kindergarten

Scientific Investigation, Reasoning, and Logic

- K.1 The student will conduct investigations in which
- basic properties of objects are identified by direct observation;
 - observations are made from multiple positions to achieve different perspectives;
 - objects are described both pictorially and verbally;
 - a question is developed from one or more observations;
 - an unseen member in a sequence of objects is predicted; and
 - unusual or unexpected results in an activity are recognized.

Force, Motion, and Energy

- K.3 The student will investigate and understand that magnets have an effect on some materials, make some things move without touching them, and have useful applications. Key concepts include
- attraction/nonattraction, push/pull, attract/repel, and metal/nonmetal; and
 - useful applications.

Earth Patterns, Cycles and Change

- K.8 The student will investigate and understand simple patterns in his/her daily life. Key concepts include
- weather observations;
- K.9 The student will investigate and understand that change occurs over time and rates may be fast or slow. Key concepts include
- natural and human-made things may change over time; and
 - changes can be noted and measured.

First Grade

Scientific Investigation, Reasoning, and Logic

- 1.1 The student will conduct investigations in which
- simple tools are used to enhance observations;
 - objects or events are classified and arranged according to attributes or properties;
 - observations and data are communicated orally and with simple graphs, pictures, written statements, and numbers;
 - predictions are based on patterns of observation rather than random guesses;
 - simple experiments are conducted to answer questions; and
 - inferences are made and conclusions are drawn about familiar objects and events.

Force, Motion, and Energy

- 1.2 The student will investigate and understand that moving objects exhibit different kinds of motion. Key concepts include
- objects may have straight, circular, and back-and-forth motions;
 - objects may vibrate and produce sound; and
 - pushes or pulls can change the movement of an object.

Second Grade

Scientific Investigation, Reasoning, and Logic

- 2.1 The student will conduct investigations in which
- observations are repeated to ensure accuracy; and
 - unexpected or unusual quantitative data are recognized.

Interrelationships in Earth/Space Systems

- 2.6 The student will investigate and understand basic types, changes, and patterns of weather. Key concepts include
- temperature, wind, precipitation, drought, flood, and storms; and
 - the uses and importance of measuring and recording weather data.

Earth Patterns, Cycles, and Change

- 2.7 The student will investigate and understand that weather and seasonal changes affect plants, animals, and their surroundings. Key concepts include
- effects on growth and behavior of living things (migration, hibernation, camouflage, adaptation, dormancy); and
 - weathering and erosion of the land surface.

Third Grade

Scientific Investigation, Reasoning, and Logic

- 3.1 The student will plan and conduct investigations in which
- predictions and observations are made;
 - questions are developed to formulate hypotheses;
 - inferences are made and conclusions are drawn; and
 - natural events are sequenced chronologically.

Earth Patterns, Cycles, and Change

- 3.8 The student will investigate and understand basic patterns and cycles occurring in nature. Key concepts include patterns of natural events (day and night, seasonal changes, phases of the moon, and tides).

Resources

- 3.10 The student will investigate and understand that natural events and human influences can affect the survival of species. Key concepts include the effects of fire, flood, disease, and erosion on organisms.

Fourth Grade

Scientific Investigation, Reasoning, and Logic

- 4.1 The student will plan and conduct investigations in which hypotheses are formulated based on cause-and-effect relationships.

Force, Motion, and Energy

- 4.2 The student will investigate and understand characteristics and interaction of moving objects. Key concepts include
- a) motion is described by an object's direction and speed; and
 - b) forces cause changes in motion.

Interrelationships in Earth/Space Systems

- 4.6 The student will investigate and understand how weather conditions and phenomena occur and can be predicted. Key concepts include
- a) weather measurements and meteorological tools (air pressure – barometer, wind speed – anemometer, rainfall – rain gauge, and temperature – thermometer); and
 - b) weather phenomena (fronts, clouds, and storms).

Fifth Grade

Scientific Investigation, Reasoning, and Logic

- 5.1 The student will plan and conduct investigations in which an understanding of the nature of science is developed and reinforced.

Earth Patterns, Cycles, and Change

- 5.7 The student will investigate and understand how the Earth's surface is constantly changing. Key concepts include weathering and erosion.

Sixth Grade

Scientific Investigation, Reasoning, and Logic

- 6.1 The student will plan and conduct investigations in which
- a) data are collected, recorded, analyzed, and reported using appropriate metric measurements; and
 - b) understanding of the nature of science is developed and reinforced.

Force, Motion, and Energy

- 6.3 The student will investigate and understand the role of solar energy in driving most natural processes within the atmosphere, the hydrosphere, and on the Earth's surface. Key concepts include
- a) the motion of the atmosphere and the oceans;
 - b) cloud formation; and
 - c) the role of heat energy in weather-related phenomena including thunderstorms and hurricanes.

Matter

- 6.6 The student will investigate and understand the properties of air and the structure and dynamics of the Earth's atmosphere. Key concepts include
- a) air pressure, temperature, and humidity;
 - b) natural and human-caused changes to the atmosphere;
 - c) the relationship of atmospheric measures and weather conditions; and
 - d) basic information from weather maps including fronts, systems, and basic measurements.

Life Science

- LS.1 The student will plan and conduct investigations in which
- a) models are constructed to illustrate and explain phenomena;
 - b) sources of experimental error are identified;
 - c) interpretations from a set of data are evaluated and defended; and
 - d) an understanding of the nature of science is developed and reinforced.

Physical Science

- PS.1 The student will plan and conduct investigations in which
- a) research skills are utilized using a variety of resources;
 - b) valid conclusions are made after analyzing data;
 - c) research methods are used to investigate practical problems and questions; and
 - d) an understanding of the nature of science is developed and reinforced.

Earth Science

- ES.1 The student will plan and conduct investigations in which
- a) technologies including computers, probeware, and global positioning systems (GPS), are used to collect, analyze, and report data and to demonstrate concepts and simulate experimental conditions; and
 - b) a scientific viewpoint is constructed and defended (the nature of science).
- ES.2 The student will demonstrate scientific reasoning and logic by
- a) analyzing how science explains and predicts the interactions and dynamics of complex Earth systems;
 - b) recognizing that evidence is required to evaluate hypotheses and explanations;
 - c) comparing different scientific explanations for a set of observations about the Earth;
 - d) explaining that observation and logic are essential for reaching a conclusion; and
 - e) evaluating evidence for scientific theories.
- ES.3 The student will investigate and understand how to read and interpret maps, globes, models, charts, and imagery. Key concepts include
- a) maps (bathymetric, geologic, topographic, and weather); and
 - b) imagery (aerial photography and satellite images).
- ES.13 The student will investigate and understand that energy transfer between the sun and the Earth and its atmosphere drives weather and climate on Earth. Key concepts include
- a) observation and collection of weather data;
 - b) prediction of weather patterns;
 - c) severe weather occurrences, such as tornadoes, hurricanes, and major storms; and
 - d) weather phenomena and the factors that affect climate including radiation and convection.

Biology

- BIO.1 The student will plan and conduct investigations in which
- a) alternative scientific explanations and models are recognized and analyzed; and
 - b) a scientific viewpoint is constructed and defended (the nature of science).

Tornado Alley (K-12)
Virginia Standards of Learning

BIO.9 The student will investigate and understand dynamic equilibria within populations, communities, and ecosystems. Key concepts include the effects of natural events and human activities on ecosystems.

Chemistry

CH.1 The student will investigate and understand that experiments in which variables are measured, analyzed, and evaluated produce observations and verifiable data. Key concepts include construction and defense of a scientific viewpoint (the nature of science).

Physics

PH.1 The student will plan and conduct investigations in which

- a) the components of a system are defined;
- b) instruments are selected and used to extend observations and measurements of mass, volume, temperature, heat exchange, energy transformations, motion, fields, and electric charge;
- c) information is recorded and presented in an organized format;
- d) the limitations of the experimental apparatus and design are recognized; and
- e) appropriate technology including computers, graphing calculators, and probeware, is used for gathering and analyzing data and communicating results.

PH.3 The student will investigate and understand how to demonstrate scientific reasoning and logic. Key concepts include

- a) analysis of how science explains and predicts relationships;
- b) examination of how new discoveries result in modification of existing theories or establishment of new paradigms; and
- c) construction and defense of a scientific viewpoint (the nature of science).

PH.4 The student will investigate and understand how applications of physics affect the world. Key concepts include

- a) examples from the real world; and
- b) exploration of the roles and contributions of science and technology.

World Geography

WG.2 The student will analyze how selected physical and ecological processes shape the Earth's surface by

- a) identifying regional climatic patterns and weather phenomena and their effects on people and places;
- b) describing how humans influence the environment and are influenced by it;
- c) explaining how technology affects one's ability to modify the environment and adapt to it.

WG.3 The student will apply the concept of a region by

- a) explaining how characteristics of regions have led to regional labels;
- b) explaining how regional landscapes reflect the physical environment and the cultural characteristics of their inhabitants;
- c) analyzing how cultural characteristics, including the world's major languages, ethnicities, and religions, link or divide regions.