Science
Review Notes
for
Parents and Students

Grade 4
4th Nine Weeks
2017-2018

SUFFOLK
PUBLIC SCHOOLS

Note: Fourth Grade material is tested on the Fifth Grade Standards of Learning test. Released questions in this review packet may refer to the Fifth Grade Standards of Learning test.

Science Review Notes
for Parents and Students
Grade 4 Science: Fourth Nine Weeks
2017-2018

This resource is intended to be a guide for parents and students to improve content knowledge and understanding. The information below is detailed information about the Standards of Learning taught during the 4ᵗʰ grading period and comes from the *Science Standards of Learning Curriculum Framework,* Grade 4 issued by the Virginia Department of Education. The Curriculum Framework in its entirety can be found at the following website.

http://www.doe.virginia.gov/testing/sol/standards_docs/science/k-6/stds_science4.pdf

Standard 4.1

The student will demonstrate an understanding of scientific reasoning, logic, and the nature of science by planning and conducting investigations in which

a) distinctions are made among observations, conclusions, inferences, and predictions;
b) objects or events are classified and arranged according to characteristics or properties;
c) appropriate instruments are selected and used to measure length, mass, volume, and temperature in metric units;
d) appropriate instruments are selected and used to measure elapsed time;
e) predictions and inferences are made, and conclusions are drawn based on data from a variety of sources;
f) independent and dependent variables are identified;
g) constants in an experimental situation are identified;
h) hypotheses are developed as cause and effect relationships;
i) data are collected, recorded, analyzed, and displayed using bar and basic line graphs;
j) numerical data that are contradictory or unusual in experimental results are recognized;
k) data are communicated with simple graphs, pictures, written statements, and numbers;
l) models are constructed to clarify explanations, demonstrate relationships, and solve needs; and
m) current applications are used to reinforce science concepts.

Overview

The skills described in standard 4.1 are intended to define the "investigate" component of all of the other fourth-grade standards. The intent of standard 4.1 is that students will continue to develop a range of inquiry skills, achieve proficiency with those skills in the context of the concepts developed at the fourth-grade level, and strengthen their understanding of the nature of science. It is also intended that by developing these skills, students will achieve greater understanding of scientific inquiry and the nature of science as well as more fully grasp the content-related concepts.

- The nature of science refers to the foundational concepts that govern the way scientists formulate explanations about the natural world. The nature of science includes the following concepts:
  a) the natural world is understandable;
  b) science is based on evidence, both observational and experimental;
  c) science is a blend of logic and innovation;
  d) scientific ideas are durable yet subject to change as new data are collected;
  e) science is a complex social endeavor

- Science assumes that the natural world is understandable. Scientific inquiry can provide explanations about nature. This expands students' thinking from just knowledge of facts to understanding how facts are relevant to everyday life.

- Science demands evidence. Scientists develop their ideas based on evidence and they change their ideas when new evidence becomes available or the old evidence is viewed in a different way.

- An **observation** is what you see, feel, taste, hear, or smell. Scientists construct knowledge from observations and inferences, not observations alone. To communicate an observation accurately, one must provide a clear description of exactly what is observed and nothing more. Those conducting investigations need to understand the difference between what is seen and what inferences, conclusions, or interpretations can be drawn from the observation.

- An **inference** is a tentative explanation based on background knowledge and available data.

- A **scientific prediction** tells what may happen in some future situation. It is based on the application of scientific principles and factual information.

- Accurate observations and evidence are necessary to draw realistic and plausible conclusions. A **conclusion** is a summary statement based on the results of an investigation.

- **Conclusions** are drawn by making judgments after considering all the information you have gathered. Conclusions are based on details and facts.

- **Elapsed time** is the amount of time that has passed between two given times.

- An **experiment** is a fair test driven by a hypothesis. A fair test is one in which only one variable is compared.

- A **hypothesis** is a prediction about the relationship between variables. A hypothesis is an educated guess/prediction about what will happen based on what you already know and what you have already learned from your research. It must be worded so that it is "testable."

- In order to conduct an experiment, one must recognize all of the **potential variables** or changes that can affect its outcome.

- An **independent variable** is the factor in an experiment that is altered by the experimenter. The independent variable is purposely changed or manipulated.

- A **dependent variable** is the factor in an experiment that changes as a result of the manipulation of the independent variable.

- The **constants** in an experiment are those things that are purposefully not changed and remain the same throughout the experiment.

- In science, it is important that experiments and the observations recorded are **repeatable**.

- There are two different types of data – **qualitative and quantitative**. **Qualitative data** deal with descriptions and data that can be observed, but not measured. **Quantitative data** are data that can be counted or measured and the results can be recorded using numbers. Quantitative data can be represented visually in graphs and charts. Quantitative data defines whereas qualitative data describes. Quantitative data are more valuable in science because they allow direct comparisons between observations made by different people or at different times.

Example of Qualitative vs. Quantitative Data	
Main Street Elementary School Science Club	
Qualitative	**Quantitative**
- Friendly - Likes science - Positive about school	- 10 fourth-grade students and 12 fifth-grade students - 14 girls, 8 boys - 92 percent participated in the division wide science fair last year

Independent Variables vs. Constant Variables

Example #1

Saul and Haileigh were conducting an experiment. They wanted to know which glue was the best. They bought four different types of glue. Saul cut 4 stars and glued one star on a piece of white paper. For each star, they used a different type of glue. Each time they used 5 ml of glue.

Read the statements below. Tell if the statement is a <u>constant</u> or an <u>independent variable</u>.

1. Saul cut 4 stars out of the same paper and glued them on 4 pieces of the same kind of white paper.
2. For each star, they used a different type of glue.
3. Each time they used 5 ml of glue.

Example #2

Leontre and Amber were conducting an investigation to understand how leaves affect the process of photosynthesis. They each planted a bean seed in the same kind of soil and in the same type of cups. Leontre was responsible for plant #1. He watered his plant every other day with ¼ of a cup of water. Amber was responsible for plant #2. She watered her plant every other day with ¼ of a cup of water. As her plant grew, she cut off the leaves. After 10 days they compared their plants to see if the plant grew at the same rate.

Read the statements below. Tell if the statement is a <u>constant</u> or an <u>independent variable</u>.

4. They each planted a bean seed in the same kind of soil in separate cups.
5. They watered their plants every other day with ¼ of a cup of water.
6. As Amber's plant grew, she cut off the leaves.

*Look on page 15 for the answers to both examples above.

Standard 4.6
The student will investigate and understand how weather conditions and phenomena occur and can be predicted. Key concepts include

a) weather phenomena;

b) weather measurements and meteorological tools; and

c) use of weather measurements and weather phenomena to make weather predictions.

Overview

This standard focuses on weather conditions and a more technical understanding of the tools and methods used to forecast future atmospheric conditions.

Temperature is the measure of the amount of thermal energy in the atmosphere.

Air pressure is due to the weight of the air and is determined by several factors including the temperature of the air.

A **front** is the boundary between air masses of different temperature and humidity.

Cirrus, stratus, cumulus, and **cumulo-nimbus clouds** are associated with certain weather conditions.

Cumulus clouds are fluffy and white with flat bottoms. They usually indicate fair weather. However, when they get larger and darker on the bottom, they become cumulo-nimbus clouds. **Cumulo-nimbus clouds** may produce thunderstorms.

Stratus clouds are smooth, gray clouds that cover the whole sky (block out direct sunlight). Light rain and drizzle are usually associated with stratus clouds.

Cirrus clouds are feathery clouds. They are associated with fair weather. Cirrus clouds often indicate that rain or snow will fall within several hours.

Extreme atmospheric conditions create various kinds of storms such as thunderstorms, hurricanes, and tornadoes.

Different atmospheric conditions create different types of precipitation.

Meteorologists gather data by using a variety of instruments.

Meteorologists use data to predict weather patterns.

A **barometer** measures air pressure.

An **anemometer** measures wind speed.

A **rain gauge** measures the amount of precipitation.

A **thermometer** measures the temperature of the air.

Fronts

There are two kinds of fronts that meteorologists look at to forecast the weather.

COLD FRONT	WARM FRONT
A cold front is formed when a cold air mass pushes into a warm air mass	A warm front is formed when a warm air mass pushes into a cold air mass
Often produces thunderstorms	Sometimes produces light rain

California →   ← Virginia

Look at this map of the United States? What is the forecast for Virginia?
The "**H**" indicates high pressure or *heavenly* weather. There aren't any fronts nearby. So it should be a nice day in Virginia.   How about Northern California?

Clouds

There are four basic types of clouds. They are formed by warm air rising from the earth into the air. As the warm air rises it carries water vapor in it from the surface of lakes, oceans, ponds, and other bodies of water. The water vapor then cools down and changes into droplets of water or ice crystals. The droplets of water attach themselves to small pieces of dust and dirt floating in the air. Once a lot of droplets join together, a cloud is formed. If the water droplets become too large and heavy, they fall to the ground. Clouds come in different sizes, shapes and even colors. (white, light gray, dark gray) Clouds help meteorologists predict the weather.

Four Basic Cloud Types

Stratus	Cumulus	Cumulonimbus	Cirrus
They are smooth, gray clouds that cover the whole sky and block out direct sunlight.	They are fluffy and white with flat bottoms.	Large cloud that is dark on the bottom.	They are feathery clouds.
Light rain and drizzle are usually associated with stratus clouds.	They are associated with fair weather.	They are associated with thunderstorms.	They are associated with fair weather and often indicate that rain or snow will fall within several hours.

Types of Storms

	Thunderstorm	Hurricane	Tornado
Characteristics	Strong winds, heavy rain, thunder, and lightning	Form over water and are the largest storms on Earth. High winds 70-150 mph. Giant ocean waves are formed, heavy rain, severe flooding	Often form without warning; a column of warm air begins to spin upward forming a funnel cloud. It is smaller than a hurricane, but one of the most violent. Wind speeds can reach 300 mph.

Four Basic Weather Tools

Barometer	Anemometer	Rain gauge	Thermometer
Measures air pressure, used to predict rain or sun **Low pressure L**ousy weather, rain, storms **High pressure H**eavenly weather, blue skies and sunshine	Measures wind speed	an instrument that measures the amount of precipitation (rainfall)	an instrument that measures temperature (thermal energy)

Practice Test Items

Follow this link to find practice tests:

http://www.doe.virginia.gov/testing/sol/practice_items/science/guides/gr_5_science.pdf
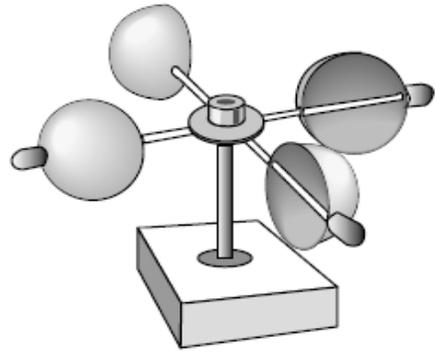

1.

Usually, cumulonimbus clouds are associated with weather that is —

A dry
B stormy
C fair
D foggy

2.

If this device was placed outside, it could be used to show —

A changes in temperature
B the amount of rainfall
C changes in humidity
D the speed of the wind

3.

Certain storms form over water near the equator, usually between the months of June and November. Warm, moist air rises quickly over the ocean, causing a strong, whirling storm with high winds and heavy rains. This type of storm is known as a —

A   tornado
B   hurricane
C   blizzard
D   sandstorm

4.

°Celsius
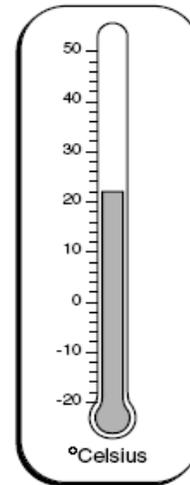
The picture shows a thermometer in a room. What is the temperature of this room?

A   19°C
B   20°C
C   21°C
D   22°C

Standard 4.9

The student will investigate and understand important Virginia natural resources. Key concepts include:

a) watershed and water resources;
b) animals and plants;
c) minerals, rocks, ores, and energy sources; and
d) forests, soil, and land.

Overview

Virginia has a rich variety of natural resources. These provide the raw materials for our daily lives and sustain our economy. Natural resources are finite and must be used wisely to ensure their continued availability. This concept of natural resources is introduced in 1.8 (1st grade). It is intended that students will actively develop and utilize scientific investigation, reasoning, and logic skills (4.1) in the context of the key concepts presented in this standard.

Virginia's Natural Resources

- Virginia is rich in a wide variety of natural resources, including forests, arable (farmable) land, coal, sand and aggregate (rocks), wildlife, aquatic organisms, clean water and air, and beautiful scenery.

- Virginia's water resources include groundwater, lakes, reservoirs, rivers, bays and the Atlantic Ocean.

> **Groundwater -**water that is found beneath Earth's surface
> **River -**a large natural stream of fresh water flowing along a definite path, usually into the sea or ocean. Example: James River
> **Lake -** a body of water entirely surrounded by land and unconnected to the sea except by rivers or streams. Example: Silver Lake
> **Reservoir -** natural or artificial lake or large tank used for collecting and storing water. Example: King William Reservoir
> **Bay -** is a wide indentation in a shoreline having deep water that is surrounded by land on three sides. Example: Chesapeake Bay
> **Ocean –** is a very large body of salt water. There are five oceans on Earth. Example: Atlantic Ocean

What is a watershed?

A watershed is an area over which surface water (and the material it carries) flows to a single collection place. Within the state of Virginia there are nine distinct watersheds. These nine are part of the **Chesapeake Bay Watershed** which covers approximately half of Virginia's land area. The other two major watershed systems are the Gulf of Mexico and the North Carolina Sounds.

What is the difference between a house address and a watershed address?

A mailing address lists a house number, street, town, and state, conveying a location based upon man-made boundaries. A watershed address lists the streams, rivers, and bay to identify a location based upon the flow of water across a watershed. Both addresses list information in order from local to global. Depending on the path water takes to reach the bay, a watershed address may be long or short. Here are examples of both:

Mailing Address

Lake Anna State Park
6800 Lawyers Road
Spotsylvania, Virginia 22553

Watershed Address

Drainage ditch
Unnamed stream
Pigeon Run
Lake Anna
North Anna River
Pamunkey River
York River
Chesapeake Bay

"We All Live Downstream"

- Students may wonder where water goes after it flows down the street during a heavy rainstorm.
- Water travels over and through the land.
- Sewage treatment plants, homes, commercial, residential developments, farms, and factories all have an impact on water quality.

Virginia has a great variety of plant and animal resources.
- One of the greatest negative impacts on resources, results from conditions that contribute to increased runoff, sediment, and nutrient levels in the water. Increased runoff causes erosion and flooding of waterways.
- The rapid water picks up and spreads pollutants.
- Erosion of exposed soil contributes sediment to the water.
- The most effective method of reducing erosion-causing runoff and pollutants entering the water is the maintenance of vegetation along the riverbank.
- Vegetation serves as a natural filter, slowing the flow of runoff and holding the soil in place.
- Vegetation also shades the waterway and prevents the water from reaching unhealthy temperature levels.
- Farmers who practice no-till farming and/or contour plowing help to reduce runoff and erosion.
- Developers who maintain a vegetated buffer along waterways help to reduce the potential runoff of pollutants and sediment.
- Contractors who use retaining fences also reduce the level of runoff and erosion.

- Natural and cultivated forests are a widespread resource in Virginia.

Virginia's Mineral Resources:

Where do minerals come from? They are mined from the earth.

What minerals can be found in Virginia? Some of Virginia's important minerals include limestone, granite, sand, gravel, and coal. Coal is the most important mineral resource in the state.

Why are they important? Many of Virginia's industries and individuals depend on the mineral resources of our state. Some of these include the transportation industry, various manufacturers, farmers, artisans, scientists, the construction industry, and the mining industry.

Are they renewable or nonrenewable? Coal, for example, is nonrenewable. Once it is used, it is gone forever. Therefore, we must use our resources wisely.

- Virginia's soil and land support a great variety of life, provide space for many economic activities, and offer a variety of recreational opportunities.

Practice Test Items
Virginia Standards of Learning Grade 5 Science Test

Follow this link to find practice tests:

http://www.doe.virginia.gov/testing/sol/practice_items/index.shtml#science

1. **A Virginia natural resource important to the state's economy, as well as a primary source of energy, is –**

   A. oil
   B. steel
   C. coal
   D. limestone

2. **Which is the best action to help protect water resources in Virginia?**

   A. Dispose of pet waste in a stream.
   B. Rinse spilled gasoline with a hose.
   C. Organize a river cleanup program.
   D. Put hazardous waste in with house trash.

3. **Which of these is an important natural resource of the Chesapeake Bay?**

A. Elk

C. Coal

B. Shellfish

D. Pine Trees
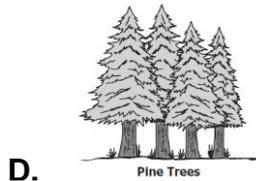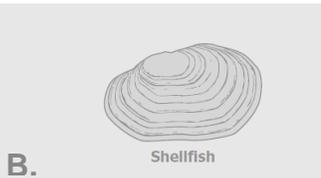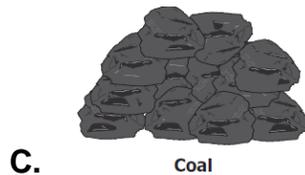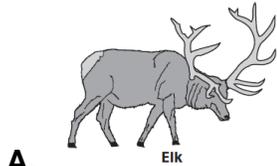
Answer Key to problems on page 5:

1. Constant
2. Independent
3. Constant
4. Constant
5. Constant
6. Independent

Observation **4.1**	An observation is what you see, feel, taste, hear, or smell in an experiment.
Inference **4.1**	An inference is a tentative explanation based on background knowledge and available data.
Prediction **4.1**	A prediction tells what may happen in some future situation. It is based on the application of scientific principles and factual information.
Conclusions **4.1**	Conclusions are drawn by making judgments after considering all the information you have gathered. Conclusions are based on details and facts.
Elapsed Time **4.1**	Elapsed time is the amount of time that has passed between two given times.
Experiment **4.1**	An experiment is a fair test driven by a hypothesis. A fair test is one in which only one variable is compared.

Hypothesis 4.1	A hypothesis is an educated guess/prediction about what will happen based on what you already know and what you have already learned from your research. It must be worded so that it is "testable."
Independent Variable 4.1	An independent variable is a factor in an experiment that is altered by the experimenter; it is purposely changed or manipulated.
Dependent Variable 4.1	A dependent variable is the factor in an experiment that changes as a result of the manipulation of the independent variable.
Constants 4.1	Constants are those things in an experiment that are purposefully not changed and remain the same throughout the experiment.
Quantitative Data 4.1	Quantitative data are data that can be counted or measured and the results can be recorded using numbers.
Qualitative Data 4.1	Qualitative data are data that deals with descriptions and data that can be observed.
Celsius Thermometer 4.1	A Celsius thermometer is used to measure temperature in degrees Celsius.

Kilograms 4.1	Kilograms equal 1000 grams.
Centimeter 4.1	A centimeter is a metric unit of length equal to one hundredth of a meter.
Meter 4.1	A meter is a basic unit of length in the metric system.
Kilometer 4.1	A kilometer is a length of 1,000 meters.

rain gauge 4.6	A rain gauge is a tool that measures precipitation.
thermometer 4.6	A thermometer is a tool that measures the temperature of the air.
temperature 4.6	Temperature is the measure of the amount of thermal energy in the atmosphere.
weather phenomena 4.6	A weather phenomenon is a very unusual weather event.
hurricane 4.6	A hurricane is a large tropical storm that forms over warm oceans and whose winds can have a speed of up to 150 miles per hour.
tornadoes 4.6	A tornado is a powerful column of winds spiraling around a center of low atmospheric pressure. It looks like a large black funnel hanging down from a storm cloud. The narrow end will move over the earth, whipping back and forth like a tail.
thunderstorms 4.6	A thunderstorm is a storm with thunder and lightning and typically includes heavy rain or hail.
stratus clouds 4.6	Stratus clouds are smooth gray clouds that cover the whole sky; light rain and drizzle are usually associated with stratus clouds.

cirrus clouds 4.6	Cirrus clouds are feathery clouds associated with fair weather.
cumulus clouds 4.6	Cumulus clouds are fluffy white clouds with flat bottoms. They indicate fair weather.
cumulo-nimbus clouds 4.6	Cumulus-nimbus clouds are cumulus clouds that get larger and darker in the bottom. They produce thunderstorms.
meteorologist 4.6	A meteorologist is a person who gathers data by using a variety of instruments to predict weather patterns.
air pressure 4.6	Air pressure is the weight of the air determined by many factors including the temperature of the air.
barometer 4.6	A barometer is a tool used to measure air pressure.
river 4.9	A river is a large natural stream of fresh water flowing along a definite path, usually into a sea or ocean.
lake 4.9	A lake is a body of water entirely surrounded by land and unconnected to the sea.
reservoir 4.9	A reservoir is a natural or artificial lake or large tank used for collecting and storing water.

bay 4.9	A bay is a wide indentation in a shore line having deep water that is surrounded by land on three sides.
ocean 4.9	An ocean is a very large body of salt water.
groundwater 4.9	Groundwater is water that is found beneath Earth's surface.
watershed 4.9	A watershed is an area over which surface water and the materials it carries flows to a single collection place.
watershed address 4.9	A watershed address lists the streams, rivers, and bay to identify a location based upon the flow of water across a watershed.
minerals 4.9	Minerals are items mined from Earth. They include limestone, granite, sand, gravel, and coal.

nonrenewable resources 4.9	Nonrenewable resources are resources that are gone forever once it is used up. Examples: coal, oil, natural gas
renewable resources 4.9	Renewable resources are resources that we will always have. Examples: sunlight, water, wind

cultivated forests 4.9	Cultivated forests are forests that have been planted by humans.
natural forests 4.9	Natural forests are forests that grew and were renewed by spreading seeds and spores.
natural resources 4.9	Natural resources are resources that can be found in nature. Example: trees
human-made resources 4.9	Human-made resources are resources that are made by humans. Example: houses