Content Review Notes for Parents and Students

Grade 4
2nd Nine Weeks
2015-2016

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: Second Nine Weeks
2015 - 2016

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 2nd 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/frameworks/science_framewks/2010/strikethrough/framewks_sci_4.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 a 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

Examples of Variables:

Question	Independent Variable (Factor that is purposely changed)	Dependent Variable (Factor that changes because of the manipulation of the independent variable)	Constants (Things that remain the same)
How much water flows through a faucet at different openings?	Water faucet opening (closed, half open, fully open)	Amount of water flowing measured in liters per minute	• The Faucet • Water pressure, or how much the water is "pushing" "Different water pressure might also cause different amounts of water to flow and different faucets may behave differently, so to insure a fair test I want to keep the water pressure and the faucet the same for each faucet opening that I test."
Does heating a cup of water allow it to dissolve more sugar?	Temperature of the water measured in degrees Centigrade	Amount of sugar that dissolves completely measured in grams	• Stirring • Type of sugar "More stirring might also increase the amount of sugar that dissolves and different sugars might dissolve in different amounts, so to insure a fair test I want to keep these variables the same for each cup of water."

Released Practice Items
Virginia Standards of Learning Grade 5 Science Test

Follow this link to find released tests:

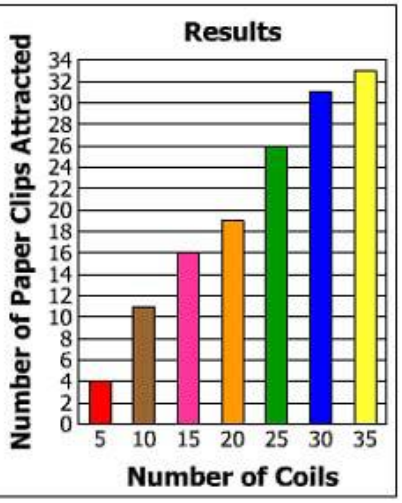
http://www.doe.virginia.gov/testing/sol/standards_docs/science/index.shtml

1.

Electromagnet Investigation

Materials:
- 1 9 volt battery
- 1 piece of insulated wire
- 1 steel nail
- 50 small paper clips

Procedure:
1. Coil the wire around the nail 5 times.
2. Attach the ends of the wire to the battery.
3. Test the electromagnet by seeing how many paper clips are attracted to it. Record results.
4. Repeat steps 1–3 with 10, 15, 20, 25, 30, and 35 coils.



A student conducted an investigation testing the strength of an electromagnet. The dependent variable in this investigation was the —

- **A** voltage of the battery
- **B** length of the insulated wire
- **C** number of paper clips attracted
- **D** number of times the wire was coiled

Standard 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;
b) changes in motion are related to force and mass;
c) friction is a force that opposes motion; and
d) moving objects have kinetic energy.

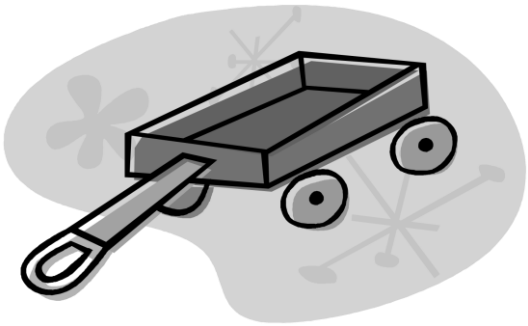
Key Terms:

Speed

- ***Speed*** describes how fast an object is moving.

Force

- A ***force*** is any push or pull that causes an object to move, stop, or change speed or direction.
- The greater the force, the greater the change in motion will be. The more massive an object, the less effect a given force will have on the object.



Friction

- **Friction** is the resistance to motion created by two objects moving against each other.
- **Friction** creates heat.

  Examples:
  1. Rubbing your hands together slowly and then faster and faster will cause them to get warmer. Why? Friction makes heat.
  2. When you push or pull the brakes on your bicycle, the brakes press against the tire. The tire rubs against the street and makes friction.

Kinetic and Potential Energy

- Energy may exist in two states: **kinetic** or **potential**.

	Kinetic Energy	**Potential Energy**
Definitions:	energy in motion	stored energy
Example: Think of bowling**.** 	When swinging the bowling ball backwards, it moves. So it's **kinetic energy.**  Swinging it forward, it's moving. So it's **kinetic energy** again. 	As you hold the bowling ball, it is storing energy. So it's **potential energy**. 

Think about a roller coaster for a moment.

When is there the most potential energy?

When is there the most kinetic energy?

<u>Potential energy</u> is stored energy. When the roller coaster reaches the top, it has the most stored energy.

As the roller coaster goes down the hill, it is releasing the energy. This is <u>kinetic energy.</u>

Released Practice Items
Virginia Standards of Learning Grade 5 Science Test

Follow this link to find practice items:

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

SOL 4.2 Students will investigate and understand characteristics and interaction of moving objects.

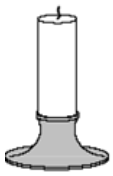
Note: The answers are shaded in gray.

1. When a coin is dropped, it falls to the ground. As the coin falls, it loses potential energy and gains what kind of energy?

A Kinetic
B Chemical
C Electrical
D Solar

2. Which of these best shows kinetic energy?

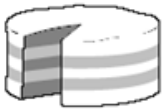
A



B

C

D



Standard 4.3

The student will investigate and understand the characteristics of electricity. Key concepts include:

a) conductors and insulators;
b) basic circuits (open/closed, parallel/series);
c) static electricity;
d) the ability of electrical energy to be transformed into light and motion, and to produce heat;
e) simple electromagnets and magnetism; and
f) historical contributions in understanding electricity.

Key Terms:

Conductor

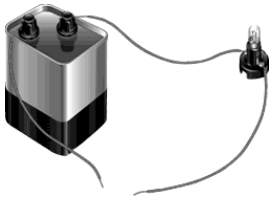
- Electrical energy moves through materials that are ***conductors*** (metals).
  Examples: nails, paperclip


Insulator

- ***Insulators*** (rubber, plastic, wood) do not conduct electricity well.


Open circuit

- Open circuits prevent the movement of electrical energy.



Note: The circuit is open and the light is off!

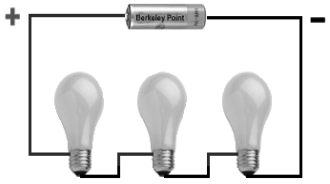
Closed circuit

- Closed circuits allow the movement of electrical energy.

Note: The circuit is closed and the light is on!

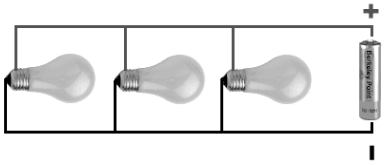
Series Circuit

- In a series circuit, there is only one pathway for the current.



Parallel Circuit

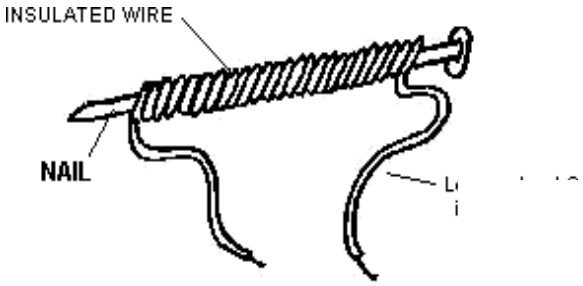
- In a parallel circuit, there are two or more pathways for the current to flow.



Electromagnet

- A current flowing through a wire creates a magnetic field. Wrapping a wire around certain iron-bearing metals (iron nail) creates a closed circuit. This is an example of a simple electromagnet.
- Electromagnets are in doorbells, speakers, telephones, and almost every motor.

  Below is an example of an electromagnet before it is connected to a battery. Once the loose ends are attached to the battery terminals then it will act as an electromagnet and can pick up material such as a paperclip.



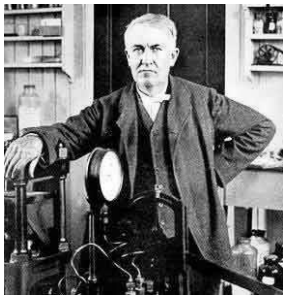
Static electricity

- Rubbing certain materials together creates static electricity.

  Try rubbing a blown up balloon on your head. What happened? Did it create static electricity?

- ***Lightning*** is the discharge of static electricity in the atmosphere.

People to Know



Thomas Edison
1847-1931

Thomas Edison invented the light bulb.

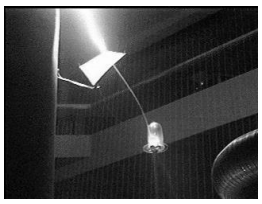
Inventor, Thomas Alva Edison, influenced modern life through inventions such as the incandescent light bulb, the phonograph, and the motion picture camera.

During Edison's lifetime, he acquired 1,093 patents, and marketed many of his inventions to the public.

Edison used to say, "Genius was 1 percent inspiration and 99 percent perspiration." He believed that inventing useful products offered everyone the opportunity for fame and fortune while benefiting society.

Benjamin Franklin
1706-1790

Benjamin Franklin is known for his interest in electricity.



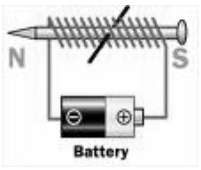
Ben Franklin suspected that lightning was an electrical current in nature, and he wanted to see if he was right.

One way to test his idea would be to see if the lightning would pass through metal. Franklin decided to use a metal key and looked around for a way to get the key up near the lightning. As you probably already know, Franklin used a child's toy, a kite.

Franklin's famous stormy kite flight in June of 1752 led him to develop many of the terms that we still use today when we talk about electricity: battery, conductor, condenser, charge, discharge, uncharged, negative, minus, plus, electric shock, and electrician.

Michael Faraday
1791-1867

Michael Faraday discovered the electromagnet.



Michael Faraday's major contributions were in the fields of chemistry and electricity. Although he became recognized as the Father of Modern Chemistry and discovered benzene, he is probably best noted for his work in the field of electricity and magnetism.

His idea was to discover how to make electricity from a magnetic field. In 1831, he was able to produce electricity by moving a magnet inside a wire coil.

By making electricity via mechanical means. He discovered that a magnetic force can alter light - a concept now known as the Faraday Effect.

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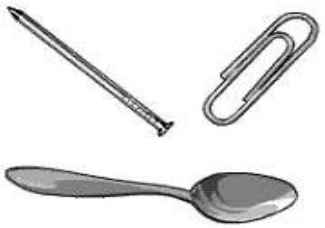
Note: Answers are shaded in gray.

1. A bar magnet is placed on the table, and a sheet of blank paper is placed over the magnet. What could be sprinkled over the paper to show the magnetic field of the bar magnet?

A Salt
B Iron Filings
C Sand
D Soil

2.

Household Objects

Group 1	Group 2
	

Which of these statements correctly describes these household objects as conductors or insulators?

A Group 1 objects are conductors because they force electricity to flow in the opposite direction.

B Group 1 objects are conductors because electrical energy can flow easily through them.

C Group 2 objects are insulators because electrical energy can move around them.

D Group 2 objects are insulators because electricity is attracted to them.

3.

Benjamin Franklin conducted this famous experiment that showed lightning was —

A a movement of air molecules
B a magnetic field
C an electrical discharge
D a glowing chemical

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

hypothesis **4.1**	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."
independent variable **4.1**	The factor in an experiment that is altered by the experimenter; it is purposely changed or manipulated.
dependent variable **4.1**	The factor in an experiment that changes as a result of the manipulation of the independent variable.
constants **4.1**	Those things in an experiment that are purposefully not changed and remain the same throughout the experiment.
quantitative data **4.1**	Data that can be counted or measured and the results can be recorded using numbers.
qualitative data **4.1**	Data that deals with descriptions, and data that can be observed, but not measured precisely.

potential energy **4.2**	Potential energy is energy that is stored.
kinetic energy **4.2**	Kinetic energy is energy of motion.
force **4.2**	A force is any push or pull that causes an object to move, stop, or change speed or direction.
speed **4.2**	Speed describes how fast an object is moving.
friction **4.2**	Friction is the resistant to motion created by two objects moving against each other.
electromagnet **4.3**	An electromagnet is a temporary magnet made by coiling wire around an iron core.
circuit **4.3**	A circuit is a pathway for the flow of electricity.
closed circuit **4.3**	A closed circuit is a circuit without interruption, providing a continuous path through which a current can flow.
open circuit **4.3**	An open circuit is a circuit that will not allow electricity to flow.

conductor **4.3**	A conductor is a material that easily allows the flow of electricity.
insulator **4.3**	An insulator is a material through which electric current DOES NOT pass easily.
series circuit **4.3**	A series circuit is formed when there is only one pathway for the electric current to flow.
parallel circuit **4.3**	A parallel circuit is formed when there are two or more pathways for the electric current to flow.
electrical energy **4.3**	Electrical energy is the energy associated with electric charges. It can be transformed into light or motion and can produce thermal energy.
static electricity **4.3**	Static electricity is electricity produced by friction.