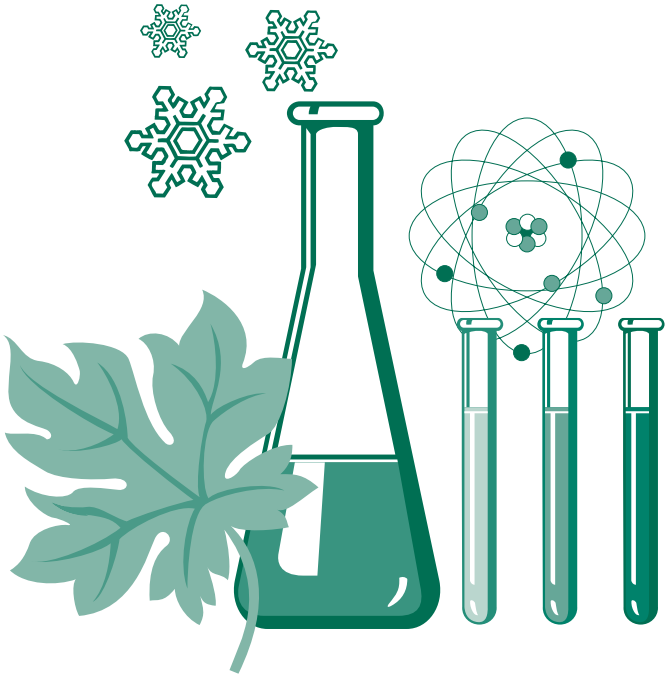

Science Standards of Learning
Curriculum Framework

Commonwealth of Virginia
Department of Education
Richmond, Virginia

Grade Five

Modified to include pacing and resources for instruction by LCPS for School Year 2008-09

Special Thanks to:

Elementary Teachers Serving on the Curriculum Committees

2008-2009 Grade 5 Science
Pacing Guide *At a Glance*

Quarter	Month	Topic	Sci SOL	Suggested number of *Lessons	Target Date for Completion
1st	Sept Oct	**Scientific Investigation†** Measurement, Scientific Method	5.1†	Ongoing	October 31, 2008
		Changing Earth‡ 1.Changes to the earth: Erosion, Weathering, Deposition 2.Plate tectonics: Volcanoes, Earthquakes, Mountain formation 3.Rock Cycle Igneous, Sedimentary, Metamorphic, Fossils	5.7‡	30	
2nd	Nov Dec Jan	**Ocean Environment** Aquatic Zones, Continental Margin, Salinity, Pressure, Currents, Tides	5.6	15	January 22, 2009
		Cells and Organization of Living Things‡ Parts of cells, 5 kingdoms, vascular/nonvascular, vertebrates/invertebrates, parts of a plant, ecology – human impact	5.5‡	15	
3rd	Jan Feb Mar	**Cells and Organization of Living Things** continued	5.5‡	15	April 3, 2009
		Structure and States of Matter Solid, liquid, gas (temperature), Parts of an atom, Formulas, Elements, compounds, Periodic table, Solution, suspension, mixtures	5.4	15	
4th	Apr May Jun	**Light** Reflection, refraction, opaque, transparent, translucent, speed of light, visible spectrum	5.3	5	June 19, 2009
		Sound Wavelength/amplitude, Pitch/frequency, Absorption, speed through mediums	5.2	5	
		Science SOL Review		20	

Science SOL Review
*A lesson is approximately 30 minutes
† Scientific Investigation, Reasoning, and Logic (Science SOL 5.1) is reinforced throughout the year in all science lessons
‡Meaningful Watershed Experience Opportunity
Essential Skills are listed with each SOL in the framework that follows.
All essential skills should be covered with the related SOL.

Introduction to Loudoun County's Science Curriculum

This Curriculum Guide and Framework is a merger of the Virginia Standards of Learning (SOL) and the Science Achievement Standards of Loudoun County Public Schools. Many sections are copies or modifications of Virginia's SOL documents. Suggestions on pacing and resources represent the professional consensus of Loudoun's teachers concerning the implementation of these standards.

Contents

K-12 Safety in the Science Classroom

In implementing the Science Standards of Learning, students must know how to follow safety guidelines, demonstrate appropriate laboratory safety techniques, and use equipment safely while working individually and in groups.

Safety must be given the highest priority in implementing the K-12 instructional program for science. Correct and safe techniques, as well as wise selection of experiments, resources, materials, and field experiences appropriate to age levels, must be carefully considered with regard to safety precautions for every instructional activity. Safe science classrooms require thorough planning, careful management, and constant monitoring of student activities. Class enrollment should not exceed the designed capacity of the room.

Teachers must be knowledgeable of the properties, use and proper disposal of all chemicals that may be judges as hazardous prior to their use in an instructional activity. Such information is referenced through the MSDS forms (Materials Safety Data Sheets). The identified precautions involving the use of goggles, gloves, aprons, and fume hoods must be followed as prescribed.

While no comprehensive list exists to cover all situations, the following should be reviewed to avoid potential safety problems. Appropriate safety procedures should be used in the following situations:

- Observing wildlife; handling living and preserved organisms; and contact with natural hazards such as poison ivy, ticks, mushrooms, insects, spiders, and snakes
- Field activities in, near, or over bodies of water
- Handling of glass tubing, sharp objects, glassware, and labware
- Natural gas burners, Bunsen burners, and other sources of flame/heat
- Hazards associated with direct sunlight (sunburn and eye damage)
- Use of extreme temperatures and cryogenic materials
- Hazardous chemicals including toxins, carcinogens, flammable and explosive materials
- Acid/base neutralization reactions/dilutions
- Production of toxic gases or situations where high pressures are generated
- Biological cultures, their appropriate disposal, and recombinant DNA
- Power equipment/motors
- High voltage/exposed wiring
- Laser beam, UV, and other radiation

The use of human body fluids or tissues is generally prohibited for classroom lab activities. Further guidance from the following sources may be taken into account:

- OSHA (Occupational Safety and Health Administration)
- ISEF (International Science and Engineering Fair Rules)
- Public health departments and local school division protocols.

For more detailed information about safety in science, consult the *LCPS Science Safety Manual*. http://www.intranet.lcps

The Role of Instructional Technology in Science Education

The use of current and emerging technologies is essential to the K-12 science instructional program.

Specifically, technology must

- Assist in improving every student's functional literacy. This includes improved communication through reading/information retrieval (the use of telecommunications), writing (word processing), organization and analysis of data (databases, spreadsheets, and graphics programs), selling one's idea (presentation software), and resource management (project management software).

- Be readily available and used regularly as an integral and ongoing part in the delivery and assessment of instruction.

- Include instrumentation oriented toward the instruction and learning of science concepts, skills, and processes. Technology, however, should not be limited to traditional instruments of science such as microscopes, labware, and data-collecting apparatus but should also include computers, robotics, interactive-optical laser discs, video-microscopes, graphing calculators, CD-ROMs, global positioning systems (GPS), probeware, on-line telecommunication, software and appropriate hardware, as well as other emerging technologies.

- Be reflected in the "instructional strategies" generally developed at the local school division level.

In most cases, the application of technology in science should remain "transparent" unless it is the actual focus of the instruction. One must expect students to "do as a scientist does" and not simply hear about science if they are truly expected to explore, explain, and apply scientific concepts, skills, and processes.

As computer/technology skills are essential components of every student's education, it is important that these skills are a shared responsibility of teachers of all disciplines and grade levels.

Internet Safety

The Internet allows students to learn from a wide variety of resources and communicate with people all over the world. Students should develop skills to recognize valid information, misinformation, biases, or propaganda. Students should know how to protect their personal information when interacting with others and about the possible consequences of online activities such as social networking, e-mail, and instant messaging.

- Students need to know that not all Internet information is valid or appropriate.
- Students should be taught specifically how to maximize the Internet's potential while protecting themselves from potential abuse.
- Internet messages and the people who send them are not always what or who they seem.
- Predators and cyberbullies anonymously use the Internet to manipulate students. Students must learn how to avoid dangerous situations and get adult help.

Cybersafety should be addressed when students research online resources or practice other skills through interactive sites. Science teachers should address underlying principles of cybersafety by reminding students that the senses are limited when communicating via the Internet or other electronic devices and that the use of reasoning and logic can extend to evaluating online situations.

Listed below are ways of integrating the teaching of internet safety with the 5th Grade Science Virginia Standards of Learning.

Remind students that the senses cannot be used in many online communications.
Five Senses Lesson
http://www.eduref.org/Virtual/Lessons/Health/Body_Systems_and_Senses/BSS0005.html
Use a blindfold to explain the five senses and point out that many senses are absent when using modern communication devices.

Great Communications Inventions *http://www.cybersmartcurriculum.org/lesson_plans/45_21.asp*
This lesson provides students the opportunity to explore modern communications technologies, including the advantages and disadvantages. Internet safety is a natural component to explore.

Remind students that personal observations and opinions may be communicated on the Internet as if they are fact.
Bias Sampling (Scientific) *http://www.sciencenetlinks.com/lessons.cfm?BenchmarkID=9&DocID=254*
This lesson focuses on techniques that can bias a seemingly scientific poll or data collection. These same techniques can be used on the Web. Students need to be aware that some Web sites may provide misleading information.

Students using graphs and spreadsheets to explore information could examine Internet cybersafety data.

Additional information about Internet safety may be found on the Virginia Department of Education's Website at
http://www.doe.virginia.gov/VDOE/Technology/OET/internet-safety-guidelines.shtml

Meaningful Watershed Educational Experiences

The "Stewardship and Community Engagement" Commitment of the *Chesapeake 2000* agreement clearly focuses on connecting individuals and groups to the Bay through their shared sense of responsibility and action. The goal of this Commitment formally engages schools as integral partners *to undertake initiatives* in helping to meet the Agreement.

Two objectives developed as part of this goal describe more specific outcomes to be achieved by the jurisdictions in promoting stewardship and assisting schools. These are:

> *Beginning with the class of 2005, provide a meaningful Bay or stream outdoor experience for every school student in the watershed before graduation from high school.*
>
> *Provide students and teachers alike with opportunities to directly participate in local restoration and protection projects, and to support stewardship efforts in schools and on school property.*

There is overwhelming consensus that knowledge and commitment build from firsthand experience, especially in the context of one's neighborhood and community. Carefully selected experiences driven by rigorous academic learning standards, engendering discovery and wonder, and nurturing a sense of community will further connect students with the watershed and help reinforce an ethic of responsible citizenship.

Defining *a Meaningful* Bay or Stream Outdoor Experience

A *meaningful* Bay or stream outdoor experience should be defined by the following.

Experiences are investigative or project oriented.

Experiences include activities where questions, problems, and issues are investigated by the collection and analysis of data, both mathematical and qualitative. Electronic technology, such as computers, probeware, and GPS equipment, is a key component of these kinds of activities and should be integrated throughout the instructional process.

The nature of these experiences is based on learning standards and should include the following kinds of activities.

- Investigative or experimental design activities where students or groups of students use equipment, take measurements, and make observations for the purpose of making interpretations and reaching conclusions.
- Project-oriented experiences, such as restoration, monitoring, and protection projects, that are problem solving in nature and involve many investigative skills.

Experiences are richly structured and based on high-quality instructional design.

Experiences are an integral part of the instructional program.

Experiences are part of a sustained activity.

Experiences consider the watershed as a system.

Experiences involve external sharing and communication.

Experiences are enhanced by natural resources personnel.

Experiences are for all students.

Experiences such as tours, gallery visits, simulations, demonstrations, or "nature walks" may be instructionally useful, but alone do not constitute a *meaningful* experience as defined here.

The preceding text contains excerpts from:
Chesapeake Bay Program Education Workgroup
STEWARDSHIP AND MEANINGFULWATERSHED EDUCATIONAL EXPERIENCES
http://www.chesapeakebay.net/pubs/doc-c2k_meaningful_bay_experience.pdf

The link in found in the Virginia Department of Education Instructional Resources for Science:
http://www.doe.virginia.gov/VDOE/Instruction/Science/

Each LCPS K-12 Science Pacing Guide indicates where the Meaningful Watershed Educational Experiences fit into the Virginia Standards of Learning. Resources for these experiences are cited in the *Resources* section of each standard.

Many of the resources are from *Lessons from the Bay* and *Virginia's Water Resources a Toolkit for Teachers*. These and other watershed resources are posted on the LCPS intranet in the Watershed Resources folder.
http://www.intranet.lcps

Investigate and Understand

Many of the standards in the Science Standards of Learning begin with the phrase "Students will investigate and understand." This phrase was chosen to communicate the range of rigorous science skills and knowledge levels imbedded in each standard. Limiting a standard to one observable behavior such as "describe" or "explain" would have narrowed the interpretation of what was intended to be a rich, highly rigorous, and inclusive content standard.

"Investigate" refers to scientific methodology and implies systematic use of the following inquiry skills:

- Observing
- Classifying and sequencing
- Communicating
- Measuring
- Predicting
- Hypothesizing
- Inferring
- Defining, controlling, and manipulating variables in experimentation
- Designing, constructing, and interpreting models
- Interpreting, analyzing, and evaluating data

"Understand" refers to various levels of knowledge application. In the Science Standards of Learning these knowledge levels include the ability to

- Recall or recognize important information, key definitions, terminology, and facts
- Explain the information in one's own words, comprehend how the information is related to other key facts, and suggest additional interpretations of its meaning or importance
- Apply the facts and principles to new problems or situations, recognizing what information is required for a particular situation, explaining new phenomena with the information, and determining when there are exceptions
- Analyze the underlying details of important facts and principles, recognizing the key relations and patterns that are not always readily visible
- Arrange and combine important information, facts, and principles to produce a new idea, plan, procedure, or product
- Make judgments about information in terms of accuracy, precision, consistency, or effectiveness.

Therefore, the use of "investigate and understand" allows each content standard to become the basis for a broad range of teaching objectives, which the local school division will develop and refine to meet the intent of the Science Standards of Learning.

Science
Standards of Learning

Goals
The purpose of scientific investigation and discovery are to satisfy humankind's quest for knowledge and understanding and to preserve and enhance the quality of the human experience. Therefore, as a result of science instruction, students will be able to:

1. Develop and use an experimental design in scientific inquiry

2. Use the language of science to communicate understanding

3. Investigate phenomena using technology

4. Apply scientific concepts, skills, and processes to everyday experiences

5. Experience the richness and excitement of scientific discovery of the natural world through the historical and collaborative quest for knowledge and understanding.

6. Make informed decisions regarding contemporary issues taking into account the following:
   - public policy and legislation
   - economic costs/benefits
   - validation from scientific data and the use of scientific reasoning and logic
   - respect for living things
   - personal responsibility
   - history of scientific discovery

7. Develop scientific dispositions and habits of mind including:
   - curiosity
   - demand for verification
   - respect for logic and rational thinking
   - consideration of premises and consequences
   - respect for historical contributions
   - attention to accuracy and precision
   - patience and persistence

8. Explore science-related careers and interest.

The Science Standards of Learning are listed successively in the pages that follow. See the pacing guide for teaching sequence.

Scientific Investigation, Reasoning, and Logic
This strand represents a set of systematic inquiry skills that defines what a student should be able to do when conducting activities and investigations. Note that 25% of items on the 5th grade SOL assessment measure these skills.

Standard 5.1

The student will plan and conduct investigations in which

a) rocks, minerals, and organisms are identified using a classification key;
b) estimations of length, mass, and volume are made;
c) appropriate instruments are selected and used for making quantitative observations of length, mass, volume, and elapsed time;
d) accurate measurements are made using basic tools (thermometer, meter stick, balance, graduated cylinder);
e) data are collected, recorded, and reported using the appropriate graphical representation (graphs, charts, diagrams);
f) predictions are made using patterns, and simple graphical data are extrapolated;
g) manipulated and responding variables are identified; and
h) an understanding of the nature of science is developed and reinforced.

Understanding the Standard

The skills in standard 5.1 are intended to define the "investigate" component of all of the other fifth grade standards (5.2 – 5.7). The intent of standard 5.1 is for students to continue to develop a range of inquiry skills and achieve proficiency with those skills in the context of the concepts developed at the fifth grade. Standard 5.1 does not require a discrete unit on scientific investigation because the inquiry skills that make up the standard should be incorporated in all the other fifth grade standards. It is also intended that by developing these skills, students will achieve a greater understanding of scientific inquiry and the nature of science, and will more fully grasp the content-related concepts.

Standard 5.1

Overview	Essential Knowledge, Skills, and Processes
The concepts developed in this standard include the following: • Systematic investigations require standard measures and consistent and reliable tools. Metric measures are a standard way to make measurements and are recognized around the world. • A classification key is an important tool used to help identify objects and organisms. It consists of a branching set of choices organized in levels, with most levels of the key having two choices. Each level provides more specific descriptors, eventually leading to identification. • Systematic investigations require organized reporting of data. The way the data are displayed can make it easier to see important patterns, trends, and relationships. Bar graphs and line graphs are useful tools for reporting discrete data and continuous data, respectively. • A scientific prediction is a forecast about what *may happen* in some future situation. It is based on the application of factual information and principles, and recognition of trends and patterns.	In order to meet this standard, it is expected that students should be able to: • use classification keys to identify rocks, minerals, and organisms. • make plausible estimations of length, mass, and volume. • select and use the appropriate instruments including centimeter rulers, meter sticks, graduated cylinders, balances, and stopwatches for making basic measurements. • measure temperature, length, mass, and volume using metric measures. This includes millimeters, centimeters, meters, kilometers, grams, kilograms, milliliters, liters, and degrees Celsius. • collect, record, and report data using charts and tables and translate numerical data into bar or line graphs. • make predictions based on trends in data. This requires the recognition of patterns and trends, and determining what those trends may represent. • analyze the variables in a simple experiment and identify the manipulated (independent) and responding (dependent) variables.

Standard 5.1 (continued)

Overview	Essential Knowledge, Skills, and Processes
• Estimation is a useful tool for making approximate measures and giving general descriptions. In order to make reliable estimates, one must have experience using the particular unit. • Scientific conclusions are based both on verifiable observations (science is empirical) and inferences. • Observation is the use of senses to collect information about the environment. Inference is using prior knowledge and experience to generate conclusions about those observations.	• define/make observations and inferences. • distinguish between observations and inferences. • measure, record, identify, collect, and organize observations. Distinguish between qualitative and quantitative observations.

Standard 5.1

Resources	Teacher Notes
AIMS: "Inside Out", Critters AIMS: "Portrait of an Average Snail", Critters AIMS: "Mini-Metric Olympics", Math + Science : A Solution AIMS: "Unique U", Math + Science : A Solution AIMS: "The Big Banana Peel", Math + Science : A Solution AIMS: "Hot Foot, Cold Foot", Critters AIMS: "When It's Hot, It's Hot", Overhead and Underfoot AIMS: "Cups 'n Stuff", Hardhatting in a Geo-World AIMS: "Peddle the Metal", Hardhatting in a Geo-World AIMS: "Are You a Square?", Hardhatting in a Geo-World AIMS: "Links to Length", Hardhatting in a Geo-World Kramer, Stephen and Bond, Felicia. (1987). *How to Think Like a Scientist*. ISBN: 0-690-04565-4. Simon, Seymour. (1998). *Einstein Anderson Science Detective Series*. ISBN: 0-688-1447-0, 0-688-14433-0, 0-688-14443-8, 0-688-14445-1. *Website* – www.brainpop.com (subscription required) VA Department of Education **Lessons from the Bay**. Correlated to VA Science, Math, Language Arts, and Social Studies SOL. **http://www.pen.k12.va.us/VDOE/watershed/index.html**	

Investigations from the VA Department of Education Science Enhanced Scope and Sequence – Grade 5. **http://www.doe.virginia.gov/VDOE/EnhancedSandS/science.shtml** Correlations to VA Science SOL (AIMS and Children's Literature) found on the LCPS **intranet** at: **http://www.intranet.lcps** Standards of Learning Literature Correlation searchable database "Connections":http://www.fcps.k12.va.us/cpsapps/connections/	

Force, Motion, and Energy
This strand focuses on students understanding of what force, motion, and energy are and how the concepts are connected**.**

Standard 5.2

The student will investigate and understand how sound is transmitted and is used as a means of communication. Key concepts include

a) frequency, waves, wavelength, vibration;
b) the ability of different media (solids, liquids, and gases) to transmit sound; and
c) uses and applications (voice, sonar, animal sounds, and musical instruments).

Understanding the Standard

This standard introduces the concept of what sound is and how sound is transmitted. The students are introduced to scientific vocabulary and the phenomena of frequency, waves, wavelength, and vibration in this standard. Students should make predictions and experiment with the transmission of sound. It is intended that students will actively develop scientific investigation, reasoning, and logic skills (5.1) in the context of the key concepts presented in this standard.

Standard 5.2

Overview	Essential Knowledge, Skills, and Processes
The concepts developed in this standard include the following: • Sound is a form of energy produced and transmitted by vibrating matter. • Sound travels in waves and can be described by the wavelength and frequency of the waves. A wave is a disturbance moving through a medium (solid, liquid, or gas). • The frequency of sound is the number of vibrations in a given unit of time. • Sound is a compression wave moving outward from its source. The wavelength of sound is the distance between two compressions. • Pitch is determined by the frequency of a vibrating object. Objects vibrating faster have a higher pitch than objects vibrating slower.	In order to meet this standard, it is expected that students should be able to: • use the basic terminology of sound to describe what sound is, how it is formed, how it affects matter, and how it travels. • create and interpret a model or diagram of a compression wave. • explain why sound waves travel only where there is matter to transmit them. • explain the relationship between frequency and pitch. • design an investigation to determine what factors affect the pitch of a vibrating object. This includes vibrating strings, rubber bands, beakers/ bottles of air and water, tubes (as in wind chimes), and other household materials. • compare and contrast sound traveling through a solid with sound traveling through the air. Explain how different media (solid, liquid, and gas) will affect the transmission of sound.

Standard 5.2 (continued)

Overview	Essential Knowledge, Skills, and Processes
• Sound travels more quickly through solids than through liquids and gases because the molecules of a solid are closer together. Sound travels slowest through gases because the molecules of gases are farthest apart. • Some animals make and hear ranges of sound vibrations different than humans can make and hear. • Musical instruments vibrate to produce sound.	• compare and contrast the sounds (voice) that humans make and hear to that of other animals. This includes bats, dogs, and whales. • compare and contrast how different kinds of musical instruments make sound. This includes string instruments, woodwinds, percussion instruments, and brass instruments.

Standard 5.2

Resources	Teacher Notes
Harcourt Science; 4th grade text has resources for light and sound AIMS: "Nature's Light and Sound Show", Electrical Connections AIMS: "Paper Cup Telephone", Primarily Physics AIMS: "Sound of Voices" , Primarily Physics AIMS: Musical Instruments, Primarily Physics AIMS: Which Way, Primarily Physics AIMS: Sound is Vibration, Primarily Physics AIMS: Musical Bottles, Primarily Physics AIMS: Traveling Sounds, Primarily Physics AIMS: Sound Energy Fact Sheet, Primarily Physics Pfeffer, Wendy. (1999). *Sounds All Around*. ISBN: 0064451771 Stille, Darlene R. (2005). *Sound*. ISBN: 0756500923 Worland, Gayle. (2004). *The Radio*. ISBN: 0736822178 Software - Science Court, by Tom Snyder Productions Laser Disc –Windows on Science; Physical Science Volume 2&3 (not available in all schools) Websites – www.brainpop.com (subscription required)- Sound ***Sound Vibrations*** ***Model Sound Wave***	

Sound Investigations ***Making Waves, Music and Noise*** Investigations from the VA Department of Education Science Enhanced Scope and Sequence – Grade 5. **http://www.doe.virginia.gov/VDOE/EnhancedSandS/science.shtml** Correlations to VA Science SOL (AIMS and Children's Literature) found on the LCPS intranet at: **http://www.intranet.lcps** Standards of Learning Literature Correlation searchable database "Connections":http://www.fcps.k12.va.us/cpsapps/connections/	

Force, Motion, and Energy

Standard 5.3

The student will investigate and understand basic characteristics of visible light and how it behaves. Key concepts include

a) the visible spectrum and light waves;
b) refraction of light through water and prisms;
c) reflection of light from reflective surfaces (mirrors);
d) opaque, transparent, and translucent; and
e) historical contributions in understanding light.

Understanding the Standard

Concepts related to light are introduced at the fifth grade level. Standard 5.3 focuses on the characteristics of visible light, tools that aid in the production and use of light, and the historical contributions of inventors and scientists. Instruction should center on the basic science concerning light energy and how we use light in our daily lives. A related science standard is 4.2, which focuses on forms of energy and provides a foundation for understanding that light is energy. It is intended that students will actively develop scientific investigation, reasoning, and logic skills (5.1) in the context of the key concepts presented in this standard.

Standard 5.3

Overview	Essential Knowledge, Skills, and Processes
The concepts developed in this standard include the following: • Visible light is a combination of several different wavelengths of light traveling together. These wavelengths are represented by the colors red, orange, yellow, green, blue, indigo, and violet. (ROYGBIV) • Light waves are characterized by their wavelengths. In the visible spectrum, red has the longest wavelength, and violet has the shortest. Wavelengths get progressively shorter from red to violet. • Light travels in waves. Compared to sound, light travels extremely fast. It takes light from the sun less than eight and a half minutes to travel 150 million kilometers to reach the Earth. • Unlike sound, light waves travel in straight paths called rays and do not need a medium through which to move. • Light travels in straight paths until it hits an object, where it bounces off (is reflected); is bent (is refracted); passes through the object (is transmitted); or is absorbed as heat.	In order to meet this standard, it is expected that students should be able to: • explain the relationships between wavelength and the color of light. Name the colors of the visible spectrum. • diagram and label a representation of a light wave (wavelength, peak, trough). • compare and contrast reflection and refraction using water, prisms, and mirrors. • explain the terms transparent, translucent, and opaque, and give an example of each.

Standard 5.3 (continued)

Overview	Essential Knowledge, Skills, and Processes
• The relative terms transparent, translucent, and opaque indicate the amount of light that passes through an object. • A prism can be used to refract visible light. When the different wavelengths of light in visible light pass through a prism, they are bent at different angles. The colors of light we see are red, orange, yellow, green, blue, indigo, and violet.	• analyze the effects of a prism on white light and describe why this occurs. Explain why a rainbow occurs.

Standard 5.3

Resources	Teacher Notes
Harcourt Science; 4th grade text has resources for light and sound AIMS: "Light Energy Fact Sheet", Primarily Physics AIMS: "Prism Power t", Primarily Physics AIMS: "Light Sources", Primarily Physics AIMS: "Just Passing Through", Primarily Physics AIMS Book: Ray's Reflections Livingston, Myra Cohn. (1992). *Light & Shadow*. ISBN: 0823409317 Stille, Darlene R. (2005). *Light*. ISBN: 1592962211 *Video* – Bill Nye: Light and Optics *Laser Disc* Windows on Science - Physical Science Volume 2&3 (not available in all schools) Prisms, Lens and Light Kit available for loan from the Smithsonian Naturalist Center in Leesburg. 703.779.9714 ***Let's Make Waves*** ***Enlightening Explorations*** ***Reflections and Refraction***	

The Rainbow Connection Investigations from the VA Department of Education Science Enhanced Scope and Sequence – Grade 5. **http://www.doe.virginia.gov/VDOE/EnhancedSandS/science.shtml** Correlations to VA Science SOL (AIMS and Children's Literature) found on the LCPS intranet at: **http://www.intranet.lcps** Standards of Learning Literature Correlation searchable database "Connections":http://www.fcps.k12.va.us/cpsapps/connections/ **Optics for Kids** **http://www.opticalres.com/kidoptx_f.html**	

Matter
This strand focuses on the description, physical properties, and basic structure of matter**.**

Standard 5.4

The student will investigate and understand that matter is anything that has mass; takes up space; and occurs as a solid, liquid, or gas. Key concepts include

a) atoms, elements, molecules, and compounds;
b) mixtures including solutions; and
c) effect of heat on the states of matter.

Understanding the Standard

This standard incorporates various characteristics of matter such as mass, volume, and the effect of heat on the three states of matter. Instruction should center on the basic structure of matter and how it behaves. This standard builds on standard 3.3, which provides a basis for understanding the structure of matter. It is intended that students will actively develop scientific investigation, reasoning, and logic skills (5.1) in the context of the key concepts presented in this standard.

Standard 5.4

Overview	Essential Knowledge, Skills, and Processes
The concepts developed in this standard include the following: • All matter – regardless of its size, shape, or color – is made of particles (atoms and molecules) that are too small to be seen with the unaided eye. • There are over 100 known elements that make up all matter. The smallest part of an element is an atom. • When two or more elements combine to form a new substance, it is called a compound. There are many different types of compounds, because atoms of elements combine in many different ways (and in different whole number ratios) to form different compounds. Examples include water (H_2O) and table salt (NaCl). The smallest part of a compound is a molecule. • A mixture is a combination of two or more substances that do not lose their identifying characteristics when combined. A solution is a mixture in which one substance dissolves in another. • As its temperature increases, many kinds of matter change from a solid to a liquid to a gas. As its temperature decreases, that matter changes from a gas to a liquid to a solid.	In order to meet this standard, it is expected that students should be able to: • construct and interpret models of atoms, molecules, elements, and compounds. • design an investigation to determine how heat affects the states of matter (of water). Include in the design how information will be recorded, what measures will be made, what instruments will be used, and how the data will be graphed. • construct and interpret a sequence of models (diagrams) showing the activity of molecules in all three states of matter. • compare and contrast: mixtures and solutions; elements and compounds; and atoms and molecules.

Standard 5.4

Resources	Teacher Notes
Harcourt Science; Unit E chapter 2 http://www.harcourtschool.com/activity/mixture/mixture.html AIMS Resource Book: Chemistry Matters Cobb, Vicki and Enik, Ted. (1990). *Why Can't You Unscramble an Egg?* ISBN: 0-525-67293-1. Geisel, Theodore. (1949). *Bartholomew and the Oobleck*. ISBN: 0394800753. Wick, Walter. (1997). *A Drop of Water*. ISBN: 0590221973. Zoehfeld, Kathleen and Meisel, Paul (I). (1998). *What Is the World Made Of? All About Solids, Liquids, and Gases.* ISBN: 0-329-07907-7. *Video* Bill Nye the Science Guy, Atoms; Chemical Reactions and Phases of Matter Chemistry Essential, Matter: Form and Substance in the Universe *Laser Disc* – Windows on Science, Physical Science Volume 1 (not available in all schools) *Website* – www.brainpop.com (school subscription required)- States of Matter, States of Matter Advanced, Changing States of Matter, Periodic Table, Atoms	

What's the Matter? ***Molecular Motion in the Three States of Matter*** ***Does Air Take Up Space?*** ***Things are Heating Up*** ***All Mixed Up*** Investigations from the VA Department of Education Science Enhanced Scope and Sequence – Grade 5. **http://www.doe.virginia.gov/VDOE/EnhancedSandS/science.shtml** ***Wetlands: Here all Year?*** VA Department of Education **Lessons from the Bay**. Correlated to VA Science, Math, Language Arts, and Social Studies SOL. **http://www.pen.k12.va.us/VDOE/watershed/index.html** Correlations to VA Science SOL (AIMS and Children's Literature) found on the LCPS **intranet** at: http://www.intranet.lcps Standards of Learning Literature Correlation searchable database "Connections":http://www.fcps.k12.va.us/cpsapps/connections/	

Living Systems
This strand builds from basic to more complex understandings of a system, both at the ecosystem level and at the level of the cell**.**

Standard 5.5

The student will investigate and understand that organisms are made of cells and have distinguishing characteristics. Key concepts include

a) basic cell structures and functions;
b) kingdoms of living things;
c) vascular and nonvascular plants; and
d) vertebrates and invertebrates.

Meaningful Watershed Experience Opportunity

Understanding the Standard

This standard emphasizes the major categories of living things and builds on science standards 2.4 and 4.4. The use of a microscope may be applied to the study of plants, animals, and cells. It is intended that students will actively develop scientific investigation, reasoning, and logic skills (5.1) in the context of the key concepts presented in this standard.

Standard 5.5

Overview	Essential Knowledge, Skills, and Processes
The concepts developed in this standard include the following: • Living things are made of cells. Cells carry out all life processes. New cells come from existing cells. Cells are too small to be seen with the eye alone. Using a microscope many parts of a cell can be seen. • Though plant and animal cells are similar, they are also different in shape and in some of their parts. Plant cells tend to be rectangular. Animal cells tend to be spherical and at times irregular. • Organisms that share similar characteristics can be organized into groups in order to help understand similarities and differences. • Living things can be categorized into kingdoms: monerans protists, fungi, plants, and animals. • Plants can be categorized as vascular (which have special tissues to transport food and water such as trees and flowering plants) and nonvascular (which do not have tissues to transport food and water such as moss). Most plants are vascular. • Animals can be categorized as vertebrates (with backbones) or invertebrates (without backbones).	In order to meet this standard, it is expected that students should be able to: • draw, label, and describe the essential structures and functions of plant and animal cells. (For plants include the nucleus, cell wall, cell membrane, vacuole, chloroplasts, and cytoplasm. For animals include the nucleus, cell membrane, vacuole, and cytoplasm.) • design an investigation to make observations of cells. • compare and contrast plant and animal cells, and identify their major parts and functions. • compare and contrast the distinguishing characteristics of the kingdoms of organisms. • group organisms into categories using their characteristics: living things (kingdoms), plants (vascular and nonvascular plants), and animals (vertebrates or invertebrates). Name and describe two common examples of each group.

Standard 5.5

Resources	Teacher Notes
Harcourt Science; Unit A, Chapters 1, 2, 3, 4 AIMS: "The Cell as a Factory", Magnificent Microworld Adventures AIMS: "Onion Rings", Magnificent Microworld Adventures AIMS: "Model of a Cell", The Budding Botanist. AIMS: "Bake Cell", The Budding Botanist AIMS: "Herb and Woody", The Budding Botanist AIMS: Animal Antics", Critters AIMS: "Jumping Jack", Magnificent Microworld Adventures AIMS: "Pickle Jar Aquarium", Magnificent Microworld Adventures Life Science Activities for the Elementary Classroom (KSAM) Level 4-6 – Gelatin Cells; The Great Wall of Protection; Cheek to Cheek; The Naked Egg *Laser Disc* – Windows on Science, Life Science Volume 1 (Not available in all schools) *Websites* – www.brainpop.com (subscription required)- Cell Structures, Cell Specialization, Six Kingdoms, Protists, Bacteria Videos: Bill Nye: The Human Body Eyewitness Videos: Life, Tree, Insect, Fish, Mammal, Amphibian, Reptile Use the QX3 Computer Microscope (There are good slides that come with the software.)	

Dichotomous Key with unknowns Kit available for loan from the Smithsonian Naturalist Center in Leesburg. 703.779.9714 ***Classifying*** ***The Animal Kingdom: Invertebrates*** ***The Animal Kingdom: Vertebrates*** ***Tubes for the Move*** Investigations from the VA Department of Education Science Enhanced Scope and Sequence – Grade 5. **http://www.doe.virginia.gov/VDOE/EnhancedSandS/science.shtml** ***Native vs. Non-native Species: Who Will Win?*** ***Stream Creatures: Clues to Stream Health*** ***Grasses, Grasses Everywhere*** VA Department of Education **Lessons from the Bay**. Correlated to VA Science, Math, Language Arts, and Social Studies SOL. **http://www.pen.k12.va.us/VDOE/watershed/index.html** Correlations to VA Science SOL (AIMS and Children's Literature) found on the LCPS **intranet** at: **http://www.intranet.lcps** Standards of Learning Literature Correlation searchable database "Connections":http://www.fcps.k12.va.us/cpsapps/connections/	

Interrelationships in Earth/Space Systems
This strand focuses on student understanding of how Earth systems are connected, and how the Earth interacts with other members of the solar system.

Standard 5.6

The student will investigate and understand characteristics of the ocean environment. Key concepts include

a) geological characteristics (continental shelf, slope, rise);
b) physical characteristics (depth, salinity, major currents); and
c) biological characteristics (ecosystems).

Understanding the Standard

This standard extends the study of ecosystems to the ocean environment. It focuses on the major descriptive characteristics of oceans. Among the concepts are the geological characteristics of the ocean floor, the physical characteristics of ocean water, and the ecological characteristics of communities of marine organisms. Connections can be made to standards 5.2, 5.3, 5.4, 5.5, and 5.7. It is intended that students will actively develop scientific investigation, reasoning, and logic skills (5.1) in the context of the key concepts presented in this standard.

Standard 5.6

Overview	Essential Knowledge, Skills, and Processes
The concepts developed in this standard include the following: • Oceans cover about 70% of the surface of the Earth. • Important features of the ocean floor near the continents are the continental shelf, the continental slope, and the continental rise. These areas are covered with thick layers of sediments (sand, mud, rocks). • The depth of the ocean varies. Ocean trenches are very deep, and the continental shelf is relatively shallow. • Ocean water is a complex mixture of gases (air) and dissolved solids (salts, especially sodium chloride). Marine organisms are dependent on dissolved gases for survival. The salinity of ocean water varies in some places depending on rates of evaporation and runoff from nearby land. • The **basic motions** of ocean water are the waves, ocean currents, and tides. • Ocean currents, including the Gulf Stream, are caused by wind patterns and the differences in water densities (due to salinity and temperature	In order to meet this standard, it is expected that students should be able to: • explain key terminology related to the ocean environment. • create and interpret a model of the ocean floor, and label and describe each of the major features. • research and describe the variation in depths associated with ocean features including the continental shelf, slope, rise, the abyssal plain, and ocean trenches. • design an investigation (including models and simulations) related to physical characteristics of the ocean environment (depth, salinity, formation of waves and currents such as the Gulf Stream). • interpret graphical data related to physical characteristics of ocean. • explain the formation of ocean currents, and describe and locate the Gulf Stream. • design an investigation (including models and simulations) related to biologic characteristics of the ocean environment (ecological relationships).

Standard 5.6 (continued)

Overview	Essential Knowledge, Skills, and Processes
differences). Ocean currents affect the mixing of ocean waters. This can affect plant and animal populations. Currents also affect navigation routes. • As the depth of ocean water increases, the temperature decreases, the pressure increases, and the amount of light decreases. These factors influence the type of life forms that are present at a given depth. • Plant-like plankton (phytoplankton) produce much of the Earth's oxygen and serve as the base of the ocean ecosystem. Plankton flourish in areas where nutrient-rich water upwells from the deep. Phytoplankton are eaten by animal-like plankton, swimming organisms, and those things that live on the ocean bottom.	• interpret graphical data related to the biological characteristics of ocean , such as number of organism vs. depth of water. • analyze how the physical (depth, salinity, and temperature) characteristics of the ocean affect where marine organism can live. • create and interpret a model of a basic marine food web including floating organisms (plankton), swimming organisms, and organisms living on the ocean bottom.

Standard 5.6

Resources	Teacher Notes
Harcourt Science; Unit C, Chapter 4 AIMS: "Salty Water", Off the Wall Science AIMS: "The Egg in Water", Off the Wall Science AIMS: "Salty Change", Down to Earth AIMS: "Hot and Cold Water", Off the Wall Science AIMS: "Sea Stars", Magnificent Microworld Adventures Kurlansky, Mark and Schindler, S. D. (2001). *The Cod's Tale*. Economics, exploration, and ocean life are all integrated into the story of how fishing for cod led to the exploration of North America, contributed to the slave trade, and resulted in the depletion of fish harvests. ISBN: 0-399-23476-4. *Laser Disc* – Windows on Science, Earth Science Volume I (not available in all schools) *Websites* – www.brainpop.com (subscription required)- Ocean Floor, Ocean Currents, Underwater World *Magazine* – Kids Discover: Oceans *Video* National Geographic: Deep Sea Dive Amazing Planet Video: Creatures of the Deep Eyewitness Video: Oceans Software – Ocean Rescue from Tom Snyder Productions ***The Ocean Floor*** ***Salty Sea***	

Going Up, Going Down ***Life in the Food Chain*** Investigations from the VA Department of Education Science Enhanced Scope and Sequence – Grade 5. **http://www.doe.virginia.gov/VDOE/EnhancedSandS/science.shtml** ***Captain John Smith's Chesapeake Bay*** VA Department of Education **Lessons from the Bay**. Correlated to VA Science, Math, Language Arts, and Social Studies SOL. **http://www.pen.k12.va.us/VDOE/watershed/index.html** Correlations to VA Science SOL (AIMS and Children's Literature) found on the LCPS **intranet** at: **http://www.intranet.lcps** Ocean Food Webs **http://oceanlink.island.net/biodiversity/foodweb/foodweb.html** Standards of Learning Literature Correlation searchable database "Connections":http://www.fcps.k12.va.us/cpsapps/connections/	

Earth Patterns, Cycles, and Change
This strand focuses on student understanding of patterns in nature, natural cycles, and changes that occur, both quickly and over time.

Standard 5.7

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

a) the rock cycle including the identification of rock types;
b) Earth history and fossil evidence;
c) the basic structure of the Earth's interior;
d) plate tectonics (earthquakes and volcanoes);
e) weathering and erosion; and
f) human impact.

Meaningful Watershed Experience Opportunity

Understanding the Standard

This standard focuses on the constantly changing nature of the Earth's surface and builds on concepts learned in standards 4.6 and 4.8. Among the important ideas presented in this standard are the rock cycle, fossil evidence of change over time, energy from within the Earth that drives tectonic plate movement, shifting tectonic plates that cause earthquakes and volcanoes, weathering and erosion, and human interaction with the Earth's surface. This standard can be related to several ideas found in science standard 5.6. It is intended that students will actively develop scientific investigation, reasoning, and logic skills (5.1) in the context of the key concepts presented in this standard.

Standard 5.7

Overview	Essential Knowledge, Skills, and Processes
The concepts developed in this standard include the following: • Rocks move and change over time due to heat and pressure within the Earth and **weathering** and **erosion** at the surface. These and other processes constantly change rock from one type to another. • Rocks have properties that can be observed, tested, and described. Composition, grain size and textural features, color, and the presence of fossils help with identification. Classification keys (5.1) can aid this process. • Depending on how rocks are formed, they are classified as **sedimentary** (layers of sediment cemented together), **igneous** (melting and cooling, lava and magma), and **metamorphic** (changed by heat and pressure). • Scientific evidence indicates the Earth is very ancient (approximately 4.6 billion years old). The age of many rocks can be determined very reliably. Fossils provide information about life and conditions of the past.	In order to meet this standard, it is expected that students should be able to: • apply basic terminology (underlined in overview) to explain how the Earth surface is constantly changing. • draw and label the rock cycle and describe the major processes and rock types involved. • compare and contrast the origin of igneous, sedimentary, and metamorphic rocks. • identify rock samples (granite, gneiss, slate, limestone, shale, sandstone, and coal) using a rock classification key. • make plausible inferences about changes in the Earth over time based on fossil evidence. This includes the presence of fossils of organisms in sedimentary rocks of Virginia (the Appalachians, Piedmont, and Coastal Plain/Tidewater). • describe the structure of Earth in terms of its major layers (crust, mantle, and inner and outer cores) and how the Earth's interior affects the surface.

Standard 5.7 (continued)

Overview	Essential Knowledge, Skills, and Processes
• Scientific evidence indicates that the Earth is composed of four concentric layers (crust, mantle, inner core, and outer core), each with its own distinct characteristics. The outer two layers are composed primarily of rocky material. The innermost layers are composed mostly of iron and nickel. Pressure and temperature increase with depth beneath the surface. • The Earth's heat energy causes movement of material within the Earth. Large continent-sized blocks, (plates) move slowly about the Earth's surface, driven by that heat. • Most earthquakes and volcanoes are located at the boundary of the plates (faults). Plates can move together (convergent boundaries), apart (divergent boundaries), or slip past each other horizontally (sliding boundaries, also called strike-slip or transform boundaries). • Geological features in the oceans (including trenches and mid-ocean ridges) and on the continents (mountain ranges, including the Appalachian Mountains) are caused by current and past plate movements.	• differentiate among the three types of plate tectonic boundaries (divergent, convergent, and sliding boundaries) and how these relate to the changing surface of the Earth and the ocean floor (5.6). • compare and contrast the origin of earthquakes and volcanoes and how they affect the Earth's surface. • design an investigation to locate, chart, and report weathering and erosion at home and on the school grounds. Create a plan to solve erosion problems that may be found. • differentiate between weathering and erosion. • design an investigation to determine the amount and kinds of weathered rock material found in soil. • describe how people change the Earth's surface and how negative changes can be controlled.

Standard 5.7 (continued)

Overview	Essential Knowledge, Skills, and Processes
• Rocks and other materials on the Earth's surface are constantly being broken down both chemically and physically. The products of weathering include clay, sand, rock fragments, and soluble substances. Weathered rock material can be moved by water and wind and deposited as sediment. • Humans have varying degrees of impact on the Earth's surface through their everyday activities. With careful planning, the impact on the land can be controlled.	

Standard 5.7

Resources	Teacher Notes
Harcourt Science; Unit C, Chapters 1, 2, 3 AIMS: "Peanut Butter and Jelly Geology", Overhead and Underfoot AIMS: "Sands of Time", Down to Earth AIMS: "What's Inside", Primarily Earth AIMS: "Volcanoes", Primarily Earth AIMS: "Quaking Earth", Primarily Earth AIMS: "Continental Drift Theory", Finding Your Bearings [Teacher/student background information] AIMS: "Drifting Apart", Finding Your Bearings AIMS: "Agent Erosion", Primarily Earth AIMS: "Ice Breakers", Primarily Earth AIMS: "What on Earth Can We Do?", Down to Earth Cole, Joanna. (1987). *The Magic School Bus Inside the Earth*. (Magic School Bus series). ISBN: 0590407597. Wollard, Kathy and Soloman, Debra (I). (1993). *How Come? Planet Earth.* ISBN: 1563053241. *Laser Disc* – Windows on Science, Earth Science Volume I (not available at every school) *Websites* – www.brainpop.com (subscription required)- Erosion, Glaciers, Weathering, Earth's Structure, Volcano, Earthquakes, Fossils, Plate Tectonics, Rock Cycle, Types of Rocks	

Magazine – Kids Discover: Earth; Volcanoes; Earthquakes; Rocks *Video* – Educational Videos, Inc. Landforms 1 (for grades K-3_ National Geographic Video Volcano *Nature's Inferno* Eyewitness Video: Volcanoes; Rocks and Minerals Bill Nye the Science Guy: Earth's Crust Magic School Bus, Blows Its Top Amazing Planet: Explosive Earth Field Trip - Rock and Mineral Program at the Smithsonian Naturalist Center in Leesburg. 703.779.9714 (Luck Stone Kits can also be borrowed.) ***The Layers of the Earth*** ***Plate Tectonics*** ***The Evidence Is In*** ***Weathering and Erosion*** ***What Kind of Weathered Rock Have You Found?*** ***The Rock Cycle*** ***Rocky Road*** ***Do Rocks Absorb Water?*** Investigations from the VA Department of Education Science Enhanced Scope and Sequence – Grade 5. **http://www.doe.virginia.gov/VDOE/EnhancedSandS/science.shtml** ***A River Runs Through It*** ***Riparian Buffers*** ***Captain John Smith's Chesapeake Bay*** ***Succession & Forest Habitats*** ***Journey of a Raindrop to the Chesapeake Bay*** ***Does It Soak Right In?***	

Types of Pollution ***Stream Creatures: Clues to Stream Health*** ***Muddying the Waters*** ***Grasses, Grasses Everywhere*** VA Department of Education **Lessons from the Bay**. Correlated to VA Science, Math, Language Arts, and Social Studies SOL. http://www.pen.k12.va.us/VDOE/watershed/index.html Correlations to VA Science SOL (AIMS and Children's Literature) found on the LCPS intranet at: **http://www.intranet.lcps** Standards of Learning Literature Correlation searchable database "Connections":http://www.fcps.k12.va.us/cpsapps/connections/	

5th grade Science - Focal Points

Scientific Investigation – 5.1

- Classification keys/ dichotomous keys
- Estimate length, mass, volume
- Use thermometer, meter stick, balance, graduated cylinder for making quantitative observations and accurate measurements of length, mass, volume, and elapsed time
- Plan and conduct investigations (scientific method)
- Collect, record, organize, & report data
- Represent data in graph form
- Use patterns & graphical data to make Predictions
- Identify and analyze manipulated variables (independent) and responding variables (dependent)
- Distinguish between observations and inferences
- Distinguish between qualitative and quantitative observations

Sound – 5.2

- Sound travels in waves
- Parts of a wave – compressions (label & interpret diagram, wavelength, frequency
- Transmission of sound through different medias (solids, liquids, gases) –vacuum
- Waves (sound) vs. rays (light)
- Pitch/frequency, vibrations
- Hearing ranges (compare/contrast)
- Uses and applications (musical instruments, voice/hearing, sonar, animal sounds)
- Sound-form of energy
- Sound production
- Absorption

Light – 5.3

- Visible light spectrum, ROYGBIV
- Light waves, wavelength
- Light travels in a straight line
- Reflection, refraction, absorption, transmission
- Opaque, transparent, translucent
- Historical contributions in understanding light
- Speed of light, & speed/ distance it travels from the sun
- Diagram and label light wave (wavelength, peak, trough)
- Prisms (refract light)

Structure and States of Matter – 5.4

- Atoms, molecules, elements, compounds
- Mixtures, solutions, suspensions
- Effect of heat on states of matter
- Construct/interpret models
- Solids, liquids, gases
- Chemical/ physical changes
- Basic formulas
- Evaporation, condensation, sublimation, melting, freezing, boiling

Cells and Organization of Living Things– 5.5

- Basic cell structure and functions
- Carry out life processes
- Make up all living things
- Compare/contrast plant & animal cells
- Examine cells using a microscope
- Five kingdoms of all living things
- Vascular and non-vascular plants, parts of a plant
- Vertebrates and invertebrates
- Compare/contrast organisms
- Classification (similarities/differences)

Ocean Environment – 5.6

- Geological characteristics: continental slope, shelf, rise, trench, abyssal plain, mid-ocean ridge, aquatic zones
- Physical characteristics: basic motions (current, waves, tides), depth, salinity, Gulf Stream, pressure
- Biological characteristics: ecosystem, marine organisms, food web/chain

Changing Earth – 5.7

- Rock cycle
- Identify rock types: igneous, metamorphic, sedimentary
- Earth's History, fossil evidence
- Earth's interior structure
- Plate tectonics (volcanoes, earthquakes, mountain formation)
- Boundaries: convergent, divergent, transform, slip/sliding, fault
- Weathering, erosion, deposition
- Human impact

4th grade Science - Focal Points

(The 5th Grade Science SOL Test covers 4th and 5th grade standards. The 4th grade focal points are for reference.)

Scientific Investigation – 4.1

- Observations, conclusions, inferences and predictions
- Experimental design – hypothesis and variables
- Classify and analyze objects, measurements, data
- Measurements of distance, volume, mass and temperature
- Display data, interpret and make predictions from graphs, charts, tables
- Identify contradictory experimental results

VA Natural Resources – 4.8

- Watershed and water resources
- Chesapeake Bay
- Mineral & energy resources
- Importance of forests
- Plant and animal resources
- Soil and land use in Virginia

Earth, Moon & Sun System– 4.7

- Revolution (years)
- Rotation (days)
- Seasons – tilt of the earth
- Phases of the moon
- Sun, Moon, Earth system (relative size, position, age & makeup)
- NASA Apollo Missions
- Contributions of Aristotle, Ptolemy, Copernicus, Galileo

Weather – 4.6

- Meteorological tools & measurements
  Air pressure – barometer
  Wind speed – anemometer
  Rainfall – rain gauge
  Temperature – thermometer
- Fronts (warm, cold, stationary)
- Clouds (cirrus, cumulus, stratus, nimbus)
- Storms (thunderstorms, tornadoes, hurricanes)

Forces, Motion & Energy – 4.2

- Motion – speed and direction
- Measurement of an object's position over time
- Force – causes a change of motion
- Friction
- Kinetic and potential energy

Electricity & Magnetism – 4.3

- Conductors and insulators
- Circuits (open/closed; parallel/series)
- Static electricity
- Transformation of electrical energy into heat, light, and mechanical energy
- Electromagnets and magnetism
- Historical contributions (Faraday, Edison, Franklin)

Ecosystems – 4.5

- Structural adaptations
- Behavioral adaptations
- Organization of communities
- Flow of energy through food webs
- Habitats and niches
- Life Cycles
- Influence of human activity

Plant Anatomy and Life Processes– 4.4

- Plant structures (leaves, stems, roots, flowers)
- Processes and structures involved with reproduction (pollination, stamen, pistil, sepal, embryo, spore, seed)
- Photosynthesis (sunlight, chlorophyll, water, carbon dioxide, oxygen and sugar)
- Dormancy