Kindergarten Standards and Learning Activities

SCIENTIFIC THINKING AND INQUIRY

K.1. Big Idea: Scientific progress is made by asking relevant questions and conducting careful investigations.

As a basis for understanding this concept, and to address the content in this grade, students should develop their own questions about objects or events they can observe, and then perform simple investigations.

Students:

1. Describe objects accurately by drawing pictures.
2. Raise questions about the natural world and know that scientific inquiry can be used to seek answers to questions about it.
3. Gather information about objects through the use of one or more of the senses, such as sight, smell, touch, and (under supervision) taste.
4. Use magnifiers to see small features of objects.
5. Use a thermometer to measure temperature.

Examples Students share what they observe as they hold leaves or flowers and while using a magnifying glass to see the same leaves and flowers (K.1.3 and K.1.4). Students measure the temperature of the air and soil where the trees or flowers grow (K.1.5).

EARTH SCIENCE

K.2. Big Idea: Objects in the sky move in predictable patterns.

As a basis for understanding this concept,

Students:

1. Recognize that day and night repeat in a predictable pattern.
2. Recognize that seasons repeat in predictable patterns over time.
3. Know the sun, moon, and stars can be observed at certain times of the day.

Examples Students read poems about the seasons and describe the changes that occur and the conditions that are necessary when one season moves into another (K. 2.2).

Students make a class list of what they see outdoors and in the sky during the day. They make another list of things they see outdoors and in the sky at night. Students discuss the differences between the information on the day and night lists (K.2.3).

PHYSICAL SCIENCE

K.3. Big Idea: Objects can be described by their observable properties.

As a basis for under- standing this concept,

Students:

1. Recognize that objects are made of materials with particular properties, such as clay, cloth, paper, metal, etc.
2. Investigate and compare physical properties of objects (e.g., color, size, shape, weight, texture, flexibil- ity, attraction to magnets, ability to float and sink).

Examples Students build houses or dwellings from the different materials and discuss the process of construction, the benefits and the problems with using each kind of material (K.3.1).
Students add appropriate objects of different masses, sizes, shapes, weights, etc. onto their dwellings. They observe the changes those objects make to the dwellings (K.3.2).
K.4. Broad Concept: The motion of objects can be observed and measured. As a basis for understand- ing this concept,
Students:
1. Compare the position of an object in relationship to another object.
2. Explain that things move in many different ways, such as straight, zigzag, round and round, back and forth, and fast and slow.
Examples Students move marbles or balls of different sizes and masses, both on a table and in water. They explain the kinds of motion each object can have, and they describe the positions of each object (K.4.1 and K.4.2).
Students observe an ant farm and point out the ants underground, on the ground, and above the ground on the mound (K.4.2).

LIFE SCIENCE
K.5. Big Idea: Different types of plants and animals inhabit the Earth.
As a basis for under- standing this concept,
Students:
1. Know there are many different kinds of plants and animals.
2. Describe that plants and animals are alike in some ways and different in others (e.g., appearance and behavior).
Examples Students visit the zoo, or observe plants, insects, birds, and other animals that live around their school. They describe the qualities of each. They compare them to others found in another country that they observe on the Internet or in a book (K.5.1).
Students use a Venn diagram to display how animals are alike and how they are different, using information they gathered and what they observed (K.5.2).

Grade 1 Standards and Learning Activities

SCIENTIFIC THINKING AND INQUIRY
1.1. Big Idea: Scientific progress is made by asking relevant questions and conducting careful investigations.

As a basis for understanding this concept, and to address the content in this grade, students should develop their own questions and perform investigations.
Students:
1. Observe, describe, draw, and sort objects as a way of isolating and categorizing some of their properties.
2. Investigate and make observations to seek answers to questions.
3. Recognize and demonstrate what people can learn about plants and animals by observing them closely over a period of time.
4. Use tools, such as rulers and magnifiers, to investigate the world and make observations.
5. Measure the length of objects having straight edges in centimeters or non-standard units to the nearest unit.
6. Demonstrate that magnifiers help people see small features of objects.
7. Describe and compare objects in terms of number, shape, texture, size, mass, color, and motion.
8. Write brief informational descriptions of a real object, person, place, or event using information from the observations.
Examples Students use sieves of different mesh sizes to separate coarse and fine materials in a soil sample (1.1.1).
Students use physical properties of objects to sort them into two or more categories, such as by color, texture, or hardness. They change the categories to sort a new set of objects and explain the sorting rules to another student (1.1.1).
Students investigate why different plants live in the cracks of the sidewalk, on corners, in fields, and in different areas around the school (1.1.2).
Students adopt selected trees near their classroom or in their neighborhood and observe, record, and draw the seasonal changes to the trees during the school year (1.1.3).
Students select the appropriate tools to determine the temperature of a liquid; the length, height, and depth of a box; and the heaviest block out of three (1.1.4).
Students measure a pencil, a block and the edge of the table with (nonstandard) units of linked paper clips and with a ruler showing inches (1.1.5).
Students study skin, fingers, nails, and eyes of classmates with magnifiers (1.1.6).
Students identify characteristics shared by naturally occurring rocks and manmade concrete (1.1.7).
Students write a descriptive comparison of their observations of the Washington Monument and the Lincoln and Jefferson memorials (1.1.8).

EARTH SCIENCE
1.2. Big Idea: The Earth is composed of land, air, and water.

As a basis for understanding this concept,
Students:
1. Recognize and explain that water, rocks, soil, and living organisms are found on the Earth's surface.
2. Investigate and explain that air is a mixture of different gases that surrounds us and takes up space, and whose movement we feel as wind.
3. Observe and measure that the sun supplies heat and light to the Earth and is necessary for most life.
Examples Students explore different containers of soil taken from a number of areas around their school. They identify and record findings about the texture of the soil, the earthworms, soil organisms, and insects that they observe within the soil with the help of magnifiers (1.2.1).
Students design and build (with support from the teacher) tools (a wind sock and weather vane) to show wind direction (1.2.2).
Students observe the varying motion of smoke that comes from a candle that has been blown out (1.2.2).
Students test what happens when they put a windshield reflector in place and when they take it off in terms of the solar heating of a car (1.2.3).

PHYSICAL SCIENCE
1.3 Big Idea: The motion of objects can be observed, measured, and changed.

As a basis for understanding this concept,
Students:
1. Observe and describe that the way to make something move (faster or slower or in a different direction) is by giving it a push or a pull, which is called a force.
2. Explain that the greater the applied force, the greater the change in the motion of the object.
3. Demonstrate and observe that magnets supply a force that can be used to make some things move without touching them.
4. Recognize and demonstrate how things near Earth fall to the ground unless something holds them up (i.e., they are subject to the force of gravity).
Examples Students explore the different methods that can be used to make objects move on a table and under water, such as using a string to pull an object, or a ruler to push an object (1.3.1).
Students choose the most effective methods for pushing or pulling an object on a table and under water. Then, they vary the forces given to each of those methods (1.3.2).
Students play “Go Fish” with a ring magnet tied to the end of a string. Students see if they can pick up any of the objects on the floor, including paper clips, pencils, erasers, crayons, small scissors, and paper. They also try to make a chain of metal objects, picking them up one by one (1.3.3).
Students drop objects of different masses from the same height and observe how their falls are similar or different (1.3.4).

LIFE SCIENCE
1.4. Big Idea: Different types of plants and animals inhabit the Earth.

As a basis for understand- ing this concept,
Students:
1. Explain that most living things need food, water, and air.
2. Observe and describe that there can be differences, such as size or markings, among the individuals within one particular plant or animal group (e.g., maple trees, zebras). Variation is a normal characteristic of many kinds of living things.
3. Observe and explain that animals eat plants and/or other animals for food.
4. Recognize that animals (including humans) and plants are living things that grow, reproduce, and need food, air, and water.
5. Identify the external features that local plants and animals have (such as those found in schoolyards or in city neighborhoods) that enable them to survive in their environment.
Examples: Students allow a plant to wilt without sunshine and water for days, and then they supply those conditions to see how the plant rejuvenates (1.4.1).
Students wipe floors or sinks with pieces of boiled potatoes. One potato is sealed in a plastic bag; the other is allowed air and moisture. They compare the growth of fungus and bacteria one week later (1.4.1).
Students compare and contrast fish in the classroom (e.g., guppies, goldfish, and betas) and display the similarities and differences on a chart (1.4.2).
Students gather diet information on various animals (e.g., lions, zebras, gorillas, seals, snakes) during a visit to the zoo and return to create a chart of what different animals eat (1.4.3).
Students choose an animal native to the Washington, DC, area (including humans) and research its habitat needs. Students make a class “big book” or a mural of what each of their chosen animals need to survive, including food, water, and shelter (1.4.4).

Grade 2 Standards and Learning Activities
SCIENTIFIC THINKING AND INQUIRY
2.1. Broad Concept: Scientific progress is made by asking relevant questions and conducting careful investigations. As a basis for understanding this concept, and to address the content in this grade, students should develop their own questions and perform investigations.
Students:
1. Describe objects as accurately as possible and compare observations with those made and reported by others.
2. Make new observations when there is disagreement among observers or among successive observations.
3. Demonstrate the ability to work with a team, but still reach and communicate one’s own conclusions about findings.
4. Use tools, such as thermometers, magnifiers, rulers, or balances, to investigate, observe, measure, design, and build things.

5. Measure objects in standard units and include units in reports of measurements with simple calculations (e.g., 3 cm + 3 cm = 6 cm).
6. Draw pictures and write brief, coherent descriptions that correctly portray key features of an object.
7. Recognize and explain that people are more likely to believe ideas when they are supported by observations.
8. Explain that some events can be predicted with near certainty, such as a sunrise and sunset, and some cannot, such as storms.
9. Explain that sometimes a person can make general discoveries about a group of objects or organisms, such as insects, plants, or rocks, by studying just a few of them, even though the group may vary in details. Understand that this is not inconsistent with the existence of biological variation.
10. Make simple line and bar graphs (e.g., track daily changes in outdoor air temperature).
Examples Student teams predict what a simple tool or object (e.g., pliers, letter opener, paperweight) might be used for by its shape and other characteristics (2.1-1).
Students measure the jumps of different students in the class with different tools (e.g., ruler, yardstick, paintbrush, pencil). They report the data, and discuss the differences between measurements with different tools (2.1-5).
Students discuss ancient myths about the movement of the sun, stars, or moon; gravity; the shape of the world. They explain the observations that might have led to the myths, and they distinguish those from observations we might make today (2.1-7).
Students design and build an ant farm. They observe how ants use their senses and how they communicate to each other the location of a food source (2.1-9).
Students record their local weather information (e.g., daily temperature, how windy it is, kind of precipitation) for two weeks. They chart the results on line graphs and bar graphs. They repeat this for another two-week interval and compare and contrast the results against the first interval (2.1-10).

GRADE 2 — Standards and Learning Activities

SCIENCE AND TECHNOLOGY

2.2. Big Idea: Although each of the human enterprises of science and technology has a character and history of its own, each is dependent on and reinforces the other.

As a basis for understanding this concept,
Students:
1. Give examples of how our lives would be different without such technologies as automobiles, computers, and electric motors.
Example Students choose a favorite technology. They report on the components of each, and/or what needed to be invented or thought of before that technology could come to be. They note the differences between past and modern technologies and ideas (2.2-1).

EARTH SCIENCE

2.3. Big Idea: Weather can be observed, measured, and described.

As a basis for understanding this concept,
Students:
1. Explain how weather patterns occur continually on Earth.
2. Explain that air temperature, humidity, wind speed and direction, and precipitation make up the weather in a particular place and time.
3. Investigate and compare weather changes from day to day and place to place.
4. Describe and chart that the temperature and amounts of rain or snow vary in the same months in each place every year.
5. Explain the difference between weather and climate.
6. Describe the differences among the various forms of precipitation (rain, snow, sleet, and hail).
7. Cite specific examples of how human beings protect themselves from adverse weather conditions through different means.
Examples: Students collect satellite pictures from a weather station or local weather Web site. They use the information to explain the patterns of change from fall to winter in terms of weather, and the position and movement of objects in the sky (2.3-1).
Students construct various weather station instruments (wind gauge, barometer, and anemometer), record data from them, and draw conclusions about what they find (2.3-2).
Students collect weather maps from the local newspaper over a two-week period. They note the effects from day to day, and hypothesize about which conditions (air temperature, humidity, wind speed, etc.) might have been responsible for changes in weather (2.3-2 and 2.3-3).
Students collect daily temperature and precipitation data at school from three city locations around the country or world. They take averages of the daily data from all

three locations. They graph the data and discuss how the long-term weather data and patterns become a climate (2.3-5).
Students describe each kind of precipitation by speaking in the first person as that kind, e.g., “As the snow [rain, hail], I ... .” Students include in their descriptions differing effects and environmental conditions for the varying kinds of precipitation (2.3-6).
Students research and describe five different homes found in varied weather regions around the world, such as the torrid, temperate, tropical, and arctic (2.3-7).
2.4. Broad Concept: The Earth’s resources can be conserved. As a basis for understanding this concept, Students:
1. Recognize and explain how certain materials — such as recycled paper, cans, and certain types of plastic containers — can be used again.
2. Explain how discarded products contribute to the problem of waste disposal and how recycling and reuse can help solve this problem.
Examples Students create colorful flowerpots and/or vases from cans and recycled containers (2.4-1).
Students explore Recycle City’s Web site (www.epa.gov/recyclecity) to track the many changes after recycling efforts have begun (2.4-1).
Students interview the school custodians or janitors about the amount, frequency, and nature of waste disposal at the school (2.4-2).

PHYSICAL SCIENCE

2.5. Big Idea: Materials come in different states, including solids, liquids, and gases.

As a basis for understanding this concept,
Students:
1. Recognize that solids have a definite shape; liquids and gases take the shape of their containers.
2. Recognize that materials can be manipulated to change some of their properties (e.g., cooling or heating).
3. Investigate and explain that water, like many other substances, can be a liquid, a solid, or a gas, and it can transform from one state to another.
4. Explain how water can be transformed from one state to another by adding or taking away heat energy.
5. Describe when water is frozen into ice and the ice is allowed to melt, the amount of water is the same as it was at the beginning.
6. Investigate and explain how water left in an open container seems to disappear into the air (evaporation), but water in a small, closed container does not disappear.
Examples Students melt ice cubes in different kinds of containers and then freeze the water in those same containers (2.5-1 and 2.5-3).
Students design one container for each of the states of matter, taking into account what material properties are important (e.g., size, shape, flexibility, etc.) (2.5-1).
Students use modeling clay to make a small object, which is then fired in an oven. They also make ice sculptures by blowing slowly through straws, using the straws as “chisels” (2.5-2).

Students discuss what happens when they place their hands in the freezer and they cool off (i.e., heat is taken from their hands, rather than cold be “given” to them) (2.5-4). Students place equal amounts of water in same-size containers in direct sunlight, one container with a clear lid and one without. They observe the changes in the water, including the condensation of water on the inside of the covered container and level of water in both containers (2.5-6).

LIFE SCIENCE

2.6. Big Idea: Plants and animals have structures that serve different functions in growth, survival, and reproduction.

As a basis for understanding this concept,
Students:
1. Observe and identify the visible, external features of plants and animals and describe how these features help them live in different environments.
2. Observe and cite examples of how some animals and plants change their appearance as the seasons change.
Examples Students gather information from a botanical garden Web site to create a picture dictionary of the external physical differences of plants from different regions of the world, such as desert, rain forest, ocean, and plain (2.6-1).
Students make a series of drawings and explain the seasonal succession of plants in a field near the school (2.6-2).
Students research how birds and animals produce different colors of fur or feathers depending on the time of year (2.6-2).
2.7. Broad Concept: Living things depend on one another and their environment for survival. As a basis for understanding this concept,
Students:
1. Observe and describe how animals may use plants, or even other animals, for shelter and nesting.
2. Explain that food for almost all kinds of animals can be traced through a food web back to green plants.
3. Observe and explain that plants and animals both need to take in water, animals need to take in food, and green plants need light.
4. Recognize and explain that materials in nature, such as grass, twigs, sticks, and leaves, can be recycled and used again, sometimes in different forms, as birds do in making their nests.
5. Observe and describe how the local environment (water, dry land) supports a wide variety of plants and animals, some unique to the Chesapeake Bay.
6. Cite examples of how animals and plants sometimes cause changes in their surroundings. While some of these changes are easy to see, some are very small and hard to recognize, even though they can be very important.
7. Recognize that there is a vast world of living things, called microorganisms, too small to see with the unaided eye.
8. Recognize that most microorganisms do not cause disease and many are beneficial (e.g., yeasts, bacteria of the soil).

Examples Students identify different birds in the world and their nests. They make models and create a nest museum (2.7-1).
Students write and illustrate a creative story to explain the food chain to a younger brother or sister (2.7-2).
Students collect plants. They make a detailed drawing of a plant, including identifying and labeling its major structures (i.e., leaves, flowers, stems, roots, seeds). They describe the function of each (2.7–3).
Students call, interview, and invite a member of the U.S. Botanic Garden or the National Arboretum to discuss how they reuse dead plant matter (2.7-4).
Students discuss the effects of "invasive species," such as the snakehead fish or barnacles and mollusks on the bottoms of international boats (2.7-6).
Students design and build a compost bin (with support from the teacher). They use a thermometer to measure the temperature rise during composting. Students discuss where heat (energy) comes from (decomposers metabolize energy stored by producers and consumers) (2.7-7).
Students discuss the role of E coli in the human digestive system (2.7-8).
2.8. Broad Concept: Many different types of plants and animals inhabit the Earth. As a basis for understanding this concept,
Students:
1. Recognize and explain that living things are found almost everywhere in the world in habitats such as the oceans, rivers, rain forests, mountain ranges, arctic tundra, farms, cities, and other environments. Recognize that some habitats are extreme, such as the very deepest parts of the oceans or inside hot springs.
2. Recognize that the numbers and types of living things can vary greatly from place to place.
3. Give examples of the many kinds of organisms that lived in the past that are now extinct (have died out), and explain how these organisms were similar to, and others very different from, organisms that are alive today.
4. Describe that plants and animals in our city have habitats that are essential to their survival. For instance, the schoolyard is a habitat that provides the basic needs for a variety of plants and animals.
Examples: Students research "extremophiles" — single-celled microbes — that inhabit almost all areas on the planet (2.8-1).
Students discuss the environments or habitats of different regions of the planet and make a list of the advantages or adaptations that organisms would need to survive there. Make sure that microbes and plants are considered as well as animals (2.8-2).
Students visit the National Museum of Natural History and follow the numerous paths to extinction, such as the Permian extinction and the K-T event (2.8-3).
Students consider the effects on local animals and plants if they took away a certain condition, such as warm temperatures, food sources, precipitation, or sunlight hours (2.8-4).
2.9. Broad Concept: Humans have predictable life cycles. As a basis for understanding this concept, Students:
1. Recognize and discuss that people are more like one another than they are like other animals. Each type of animal is more like its relatives (family) than it is like the animals of other types (or families).

2. Explain that humans, like all living things, reproduce offspring of their own kind.
3. Observe that and describe how offspring are very much, but never exactly, like their parents and like other offspring of the same parents.
4. Recognize that people have a wide but not unlimited range of external features, such as differences in their size, shape, and color of hair, skin, and eyes.

Examples Students compare their anatomy, behavior, structure, and skills to a chimp, a mouse, a fish, and a bacterium cell. As a class, they draw a comparison chart between those organisms (2.9-1).

Students make a brief family tree and describe predominant traits that run in their families (2.9-2 and 2.9-3).

Students collect data from classmates on height, hair color, and eye color, then chart or graph the information so that the information can be organized and shared (2.9-4).

Grade 3 Standards and Learning Activities

SCIENTIFIC THINKING AND INQUIRY

3.1. Big Idea: Scientific progress is made by asking relevant questions and conducting careful investigations.

As a basis for understanding this concept, and to address the content in this grade, students should develop their own questions and perform investigations.
Students:
1. Recognize and explain that when a scientific investigation is repeated, carefully and under the same conditions, a similar (but not necessarily identical) result is expected.
2. Participate in different types of guided scientific investigations (related to content in this grade), such as observing objects and events and collecting specimens for analysis, including longer-term investigations that take place over several days, weeks, or months.
3. Keep and report records of investigations and observations using tools, such as journals, charts, graphs, and computers.
4. Discuss the results of investigations and consider the explanations of others.
5. Demonstrate the ability to work cooperatively while respecting the ideas of others and communicating one's own conclusions about findings.
6. Measure and mix dry and liquid materials in prescribed amounts, following reasonable safety precautions.
7. Keep a notebook that describes ongoing observations and that is still understandable weeks or months later.
8. Appropriately use simple tools — such as clamps, rulers, scissors, and hand lenses, as well as other technology (e.g., calculators and computers) — to help solve problems.
9. Make sketches and write descriptions to aid in explaining procedures or ideas.
10. Ask, "How do you know?" in appropriate situations, and attempt reasonable answers when others ask the same question.
11. Explain that one way to make sense of something is to think of how it compares to something more familiar (e.g., vibrations of an object in air such as a tuning fork, a plucked string of a string instrument, human vocal cords).
Examples Students blow up balloons of different sizes with different amounts of air. They repeat several trials to predict the trajectory of the balloons when let go. They construct an obstacle course to direct the moving balloon through a designated target area (3.1.1, 3.1.3, 3.1.8, and 3.1.10).
Students maintain a log of the height, appearance, and colors of plants that grow from seeds (3.1.2 and 3.1.3).
Students design a lever, putting unequal weights on the ends of a balance board. They find ways to restore the balance by moving the fulcrum, keeping each weight in the same place. Discuss what happens (3.1.4).
Students follow directions to seed and plant different specimens of plant life, which would need different kinds of soil and amounts of sunlight and water. They record the necessary procedures and care for their own plants over time (3.1.6 and 3.1.7).

Students draw and describe the movement of marbles or billiard balls that hit one another (3.1.9).

SCIENCE AND TECHNOLOGY

3.2. Big Idea: Although each of these human enterprises of science and technology has a character and history of its own, each is dependent on and reinforces the other.

As a basis for understanding this concept,
Students:
1. Define technology as the application of human ingenuity and skill to the solution of practical problems (e.g., typewriter, computer).
2. Identify and demonstrate how an invention can be used in different ways, such as a radio or a cell phone that can be used to receive both information and entertainment.
3. Construct something to perform a task, by using commonly available materials, such as paper, cardboard, wood, plastic, or metal, or by using existing objects.
Examples Students design, make, and fly kites, modifying the kites so that they fly higher, maneuver more easily, or achieve other goals (3.2.1).
Students choose one machine and report what the components of that machine are. They ask how those components came to be or what needed to be thought for those parts and pieces to be needed or necessary (3.2.1).
Students discuss the history of the cell phone, light bulb, needle, computer, knife, clock, or cup (3.2.2).
Students design and construct a telephone (prototype) using a variety of materials (e.g., paper cups, string, tin cans, and wire). They determine which prototype works best and discuss possible reasons why (3.2.3).

EARTH SCIENCE

3.3. Big Idea: Objects in the sky move in regular and predictable patterns.

As a basis for understanding this concept,
Students:
1. Observe and describe the apparent motion of the sun and moon over a time span of one day.
2. Using a globe, demonstrate how the Earth rotates on its axis every 24 hours, producing the night- and-day cycle.
3. Observe and describe how there are more stars in the sky than anyone can easily count, but they are not spaced or spread evenly.
4. Observe and describe that the sun can be seen only in the daytime; the moon can be seen sometimes at night and sometimes during the day.
5. Observe and describe the changes that occur in the observable shape of the moon over the course of a month (i.e., the moon looks a little different every day, but looks the same again about every four weeks).
6. Demonstrate and describe that sunlight can be blocked to create shadows, and the direction and length of shadows vary at different times of day.

Examples Students design and build a sundial (with support from the teacher) and use it to determine the time of day. They explore how accurate it is over time and determine the conditions under which the sundial does and does not work (3.3.1).
Students collect the weather pages from the local newspaper for a two-week or four-week
period, noting the times of sunset and sunrise. They chart those times and their changes on a sphere (3.3.2).
Students visit a planetarium. In class, they make a chalk dot model of stars and create their own constellations by connecting the random dots into patterns (3.3.3).
Students record the observable shape of the moon from personal or computer resources for two months. Then students design and create a calendar that illustrates the phases of the moon (3.3.5).
Students go to a playground to observe changes in objects' shadows at different times during the course of a day. They outline, measure, and record the length of the shadows, and they explain the variations (3.3.6).

PHYSICAL SCIENCE

3.4. Big Idea: Energy takes many forms and has many sources.

As a basis for understanding these concepts,
Students:
1. Recognize that energy is needed to carry out almost any kind of change.
2. Describe basic forms of energy, including mechanical (kinetic and potential), light, sound, heat, chemical, nuclear, and electrical.
3. Recognize that energy can be transformed from one form to another.
4. Describe how people use electricity or the chemical energy from burning fuels, such as wood, oil, coal, or natural gas, to obtain heat energy for doing tasks, such as cooking their food and warming their houses.
5. Investigate and describe how moving air and water (carriers of kinetic energy, the energy of motion) can be used to run machines like windmills and waterwheels.
6. Demonstrate that things that make sound do so by vibrating objects, such as vocal cords and musical instruments. Describe that the sound travels as a vibration through the air.
Examples Students blow into a tube inserted into water that has paper floating in it. Then they talk into the tube. They discuss the different kinds of energy that are created, the kinds of changes the energy made, and where the energy went (3.4.1).
Students investigate heat and friction by rubbing or mixing substances and materials together. They take note that sound and light do not create the same effects (3.4.2).
Students fry an egg or make toast. They discuss how heat energy changes the food and provides chemical energy to those who eat it (3.4.3).
Students design and build a simple roller coaster for a toy car (with help from the teacher) to demonstrate how energy changes from one form to another (3.4.3).
Students conduct a survey of students' energy use at home and select an appropriate way to display the comparative data (3.4.4).

Students make milk carton waterwheels to simulate a life-size model of the same (3.4.5).
Students make a musical instrument out of commonly found materials. They explain the relationship between its sound and shape. They use the instrument in air and under water, and they note the kinds of sounds and vibrations produced (3.4.6).

LIFE SCIENCE

3.5. Big Ideas: Plants and animals can be classified according to the physical characteristics that they share.

As a basis for understanding this concept,
Students:
1. Demonstrate that a great variety of living things can be sorted into groups in many ways using various properties, such as how they look, where they live, and how they act, in order to decide which things belong to which group.
2. Explain that characteristics used for classification depend on the purpose of the grouping.
Examples: Student teams research information on where animals live, how animals act, and how they look to create an "Animal Jeopardy" Game (3.5.1).
After investigating animal body coverings through photographs, videos, and children's literature, students construct a chart showing which animals have fur, which have feathers, which have scales, which have shells, and which have bare skin (3.5.2).
3.6. Broad Concept: Plants and animals have predictable life cycles. As a basis for understanding this concept,
Students:
1. Recognize that plants and animals go through predictable life cycles that include birth, growth, development, reproduction, and death.
2. Describe the life cycle of some living things, such as the frog and butterfly, including how they go through striking changes of body shape and function as they go through metamorphosis.
3. Compare and contrast how life cycles vary for different living things.
Examples Students plant five different kinds of seeds including radish, rye grass, zinnias, Wisconsin Fast plants, and lima beans. They compare and contrast their life cycles over time from shortest to longest (3.6.1).
Students observe, monitor, and record through drawings the changes in the life cycle of an insect such as a butterfly (3.6.2).
Students create life cycle wheels for a human, cat, guppy, mealworm, frog, and bacterium cell to show differences (3.6.3).
3.7. Broad Concept: Humans have a variety of mechanisms to stay healthy. As a basis for understanding this concept,
Students:
1. Explain that people need water, food, air, waste removal, and a particular range of temperatures, just as other animals do, although different animals can tolerate very different ranges of temperature and other features of their surroundings.

2. Explain that eating a variety of healthful foods and getting enough exercise and rest help people stay healthy.
3. Explain that some things people take into their bodies from the environment can hurt them, and give examples of such things.
4. Recognize that food provides energy as well as materials for growth, maintenance, and repair of body parts.
5. Recognize that vitamins and minerals are substances required by the body in small amounts to synthesize essential substances and carry out essential processes.
6. Describe how, as a person matures, the amounts and kinds of food and exercise needed by the body change.

Examples Students compare and contrast reptiles to humans as they relate to their ability to withstand external temperatures of day and night. They describe what humans might need to do to survive in very hot or very cold temperatures (3.7.1).

Students make a poster to communicate effective nutrition and health habits, using foods from their customary diets based on www.nutritiondata.com (3.7.2).

Students interview family members about their sleep, exercise, and eating routines (3.7.2).

Students cover a piece of white cardboard with Vaseline and place the cardboard outside in an open but protected place. A week later, they look at the materials that have collected on the board during the week for evidence of dirt and pollution (3.7.3).

Students trace the path of food, from the mouth to excretion, on some model or drawing of the human body. Along the way, they identify the parts of the body that can use energy for maintenance and repair. They identify which of their body parts are growing (3.7.4).

Students read labels of vitamin bottles and make a chart comparing what each vitamin is supposed to do. They compare that information with research found on www.nutritiondata.com (3.7.5).

Students compare the breakfast, lunch, and dinner meals that they eat with the breakfast, lunch, and dinner meals of a newborn baby. They distinguish the kinds of activities that predominate eachstage of life and discuss the amounts of energy needed to do them (3.7.6).

Grade 4 Standards and Learning Activities

SCIENTIFIC THINKING AND INQUIRY

4.1. Big Idea: Scientific progress is made by asking relevant questions and conducting careful investigations.

As a basis for understanding this concept, and to address the content in this grade, students should develop their own questions and perform investigations.
Students:
1. Recognize and describe how results of similar scientific investigations may turn out differently due to inconsistencies in methods, materials, or observations, or the limitations of the tools used.
2. Explain that clear communication is an essential part of the process of scientific inquiry because it enables scientists to inform others about their work, to expose their ideas to evaluation by other scientists, and to allow scientists to stay informed about scientific discoveries around the world.
3. Use numerical data to describe and compare objects and events.
4. Write descriptions of investigations by using observations as support for explanations.
5. Support statements with ideas and data found in print and electronic media, identify and evaluate the sources used, and expect others to do the same.
6. Identify better reasons for believing something rather than citing comments such as, “Everybody knows that,” “I just know,” or “Because they say,” and discount such reasons when given by others.
7. Explain how scientific thinking can be distorted by strong feelings, and explain why and when it is appropriate or necessary to separate emotions from the reasoning process.
Examples: Students make a poster of charts and graphs to communicate effective nutrition and health habits (4.1.3).
Students investigate the nutritional value of cafeteria food and compare with snack foods.
Students make recommendations to improve the selection of food in vending machines in terms of its healthiness. They write up their procedures and conclusions (4.1.4).
Students evaluate some medical Q&A advice in the newspaper, TV news, or Internet sites. They compare the different kinds of advice for a particular medical concern and discuss ways to determine how they are true and how they are effective (4.1.5).
Students select an endangered plant or animal, collect information from reference books, decide whether the plant or animal should be saved or allowed to disappear and why, separating emotions from the reasoning process (4.1.6 and 4.1.7).

SCIENCE AND TECHNOLOGY

4.2. Big Idea: Although each of the human enterprises of science and technology has a character and history of its own, each is dependent on and reinforces the other.

As a basis for understanding this concept,
Students:
1. Demonstrate how scientific tools, such as microscopes, telescopes, and cameras, can be used to gather accurate information for making scientific comparisons of objects and events.
2. Discuss and give examples of how technologies, such as computers and medical X-rays, have improved the lives of people.
3. Describe how human beings have made tools and machines, such as X-ray cameras, microscopes, satellites, and computers, to observe and do things that they could not otherwise sense or do at all, or as quickly or efficiently.
4. Make simple and safe electrical circuits with a battery and various plugs, sockets, and terminals.
Examples: Students design and make their own tools: a microscope (using a magnifying glass), a camera (using an oatmeal box to create a pinhole container), and a telescope (using a series of lenses). Students identify and examine objects that they believe they could study by using their tools (4.2.1).
Students interview a nurse, doctor, or medical technician. They ask the professional to relate stories about their use of technology in medical cases (4.2.2).
Students use a Web site (www.heartsite.com) to examine a wide range of medical uses of technology. They interview family members about their familiarity with such uses (4.2.2).

EARTH SCIENCE

4.3. Big Ideas: Waves, wind, water, and ice shape and reshape the Earth's land surface.
As a basis for understanding this concept,
Students:
1. Explain how waves, wind, water, and glacial ice shape and reshape Earth's land surface by eroding rock and soil in some areas and depositing them in other areas.
2. Explain how the surface of the Earth changes over various time scales due to processes, such as erosion and weathering, landslides, volcanic eruptions, earthquakes, and mountain building.
Examples: Students make their own model landscape, using clay as the foundation, which they cover with dirt, grass, and rocks. They allow an ice cube to melt, moving along model hills, to simulate glaciation and a spray bottle to simulate precipitation (4.3.1).
Students draw a before-and-after picture of their changed landscape, noting the directions and causes of the changes (4.3.2).
4.4. Big Idea: The properties of rocks and minerals reflect the processes that formed them.
As a basis for understanding this concept,
Students:
1. Define a mineral as a naturally occurring, crystalline inorganic solid substance. Recognize that each mineral has its own characteristic properties (e.g., quartz, mica).

2. Describe the physical properties of minerals, including hardness, color, luster, cleavage, and streak, and recognize that one mineral can be distinguished from another by use of a simplified key.
3. Recognize and describe that most rock is composed of different combinations of one or more minerals.
4. Explain how weathering breaks rocks up into smaller pieces. Recognize that these pieces may be many sizes and shapes, from jagged boulders to smooth grains of sand and even smaller.
5. Describe the different layers of the Earth, including the crust, mantle, and core.
6. Define the three categories of rocks (metamorphic, igneous, and sedimentary) based on how they are formed from older rocks.
7. Explain how soil is made partly from rock weathered by water and wind, and partly from decomposition of plant and animal remains, and that it contains many living organisms.
8. Describe the different properties of soil, including its color, texture (size of particles), and ability to retain water and support the growth of plants.
Examples Students devise their own classification scheme for common classroom objects: pens, books, people, etc. (4.4.1).
Students create a class rock collection to display in the classroom. They break, crack, grind, and soak specimens of each variety they find, using magnifiers to locate different sorts of materials in the rocks (4.4.3).
Students melt separate ice cubes with heat, table salt, and water. They examine the different effects of each of those conditions (4.4.4).
Students build a model of the planet, including convection currents in the mantle, as well as plates for the crust. They wrap a small metal ball in another 4 inches of rubber bands, and then they cover that ball with about eight overlapping sheets of aluminum foil (4.4.5).
Students compare pictures of different rock types and hypothesize about the kinds of conditions necessary for their formation using the Web site cln.org/themes/rocks_minerals.html (4.4.6).
Students observe different soil samples using a hand lens to observe color and texture. (4.4.7 and 4.4.8).

PHYSICAL SCIENCE

4.5. Big Idea: Energy and matter have multiple forms and can be changed from one form to another.

As a basis for understanding this concept,
Students:
1. Explain that energy comes from the sun in the form of visible light and other radiation we cannot see without special instruments, but some of what we cannot see we can feel as heating (infrared radiation), and some can cause sunburn (ultraviolet radiation).
2. Investigate and describe how light travels through empty space or a transparent medium in a straight line until it strikes an object, and, if the object is transparent, the light will bend (refract) at the interface.

3. Explain when light strikes a surface, it can be reflected, scattered, refracted, and/or absorbed.
4. Observe and explain that when one object rubs against another (such as one's hands rubbing together) the kinetic energy (energy of motion) is transformed into heat energy.
5. Recognize that heat energy can be absorbed or given off by both living and nonliving things.
6. Explain that energy in fossil fuels comes originally from the energy of sunlight used by plants that grew a long time ago.
Examples Students examine computer pictures of the sun's radiation in different wavelengths using the Web site www.classzone.com/books/earth_science/terc/content/visualizations/ es2601/es2601page01.cfm?chapter_no=26 (4.5.1).
Students discuss the phenomenon of a "bent" pencil placed in a clear glass container filled with water (4.5.2).
Students shine a flashlight through a lens onto an object that is covered in aluminum foil. They note the reflection from the aluminum foil, the refraction from the lens, the scattering on the wrinkled aluminum foil, and the absorption of that light by their eyes (4.5.2 and 4.5.3).
Students examine how they feel when they sit in warm weather and sunshine and after they complete more strenuous exercise. They compare the absorption and release of heat energy (4.5.5).
Students take an "energy" journey. They pretend they are photons of light that come from the sun, onto a plant, eaten by a dinosaur, which was eaten by another dinosaur. They explain their "energy" journey into forming molecules that made the dinosaur live, move, die, decompose, and reform into a fossil fuel (4.5.6).
4.6. Broad Concept: Electricity and magnetism are related phenomena that have many useful applications in everyday life. As a basis for understanding this concept, Students:
1. Recognize that some materials are electrical conductors and others are electrical insulators.
2. Demonstrate that magnets attract objects made of iron and a few other substances (called magnetic materials), but they do not attract objects made of most other substances.
3. Investigate and describe that a magnet does not have to touch an object made of magnetic material to exert a force on it.
4. Describe that magnets have poles; unlike poles of two magnets attract each other while like poles repel.
5. Explain how an electrically charged object does not have to touch another object to exert a force — called the electrostatic force — on it.
6. Recognize that there are two types of electric charge: positive and negative.
7. Explain that if two electrically charged objects are near each other, each will exert an attractive or repulsive force on the other. Describe that like charges repel each other and unlike charges attract each other.
8. In spite of some similarities, explain how the electrostatic force and the magnetic force are not the same thing.

9. Explain that electric current can flow only if there is a complete closed loop of conducting material (called a circuit) for it to flow through. Know that a switch is a device for opening and closing a circuit.
10. Explain how electrical energy can be used to produce light, heat energy, motion (kinetic energy), or sound energy.
Examples: Students observe the static electricity caused by rubbing a wood, glass, rubber, and metal rod with a piece of cloth. They rub a blown-up balloon on their hair. They run a comb through their hair. They note the effect of holding these objects close to a thin stream of water running from a faucet (4.6.1 and 4.6.5).
Over a large piece of paper, students maneuver staples, paper clips, pins, pencils, and erasers into position by bringing one or more magnets closer to the objects. They draw the direction of the movement on the paper beneath (4.6.2).
Students place a magnet underneath a piece of cardboard to determine whether there is a magnetic force through the material to move an object (4.6.3).
Students maneuver one magnet with another into a target location (4.6.4). Students examine the structure of a dead lightbulb (4.6.9). Students discuss the anatomy of a computer and its use of electrical energy (4.6.10).

LIFE SCIENCE

4.7. Big Idea: All organisms need energy and matter to live and grow.

As a basis for understanding this concept,
Students:
1. Explain that organisms interact with one another in various ways, such as providing food, pollination, and seed dispersal.
2. Observe and recognize that some source of energy is needed for all organisms to stay alive and grow.
3. Describe how energy derived from the sun is used by green plants to produce chemical energy in the form of sugars (photosynthesis), and this energy is transferred along a food chain from producers (plants) to consumers to decomposers.
4. Observe and explain that most plants produce far more seeds than actually grow into new plants.
5. Describe the structures in plants (leaves, roots, flowers, stem, bark, wood) that are responsible for food production, support, water transport, growth, and protection.
6. Describe the many beneficial attributes of plants, including trees, in improving and sustaining an urban environment.
7. Explain how in all environments, organisms grow, die, and decay, as new organisms are produced by the older ones.
8. Recognize that there are many kinds, and vast numbers, of living things too small to see with the naked eye called microorganisms, but they can be easily seen with the aid of various kinds of microscopes.
9. Explain how dead plants and animals are the food source for many microorganisms.
10. Investigate the Chesapeake Bay watershed and wetlands, and describe how they support a wide variety of plant and animal life that interact with other living and nonliving things.

Examples: Students cut up and eat oranges, watermelons, cucumbers, or tomatoes. They discuss the space and conditions needed for all those seeds to grow and thrive (4.7.4).
Students plant bean seeds in soil and vary the amount of water given to certain plants to observe water transport through their roots (4.7.5).
Students build a model of a riparian buffer (a stretch of plants that runs between a stream and land), which can absorb materials that would have entered the water. They make model hills of clay and use astroturf or Velcro as the buffer (4.7.6).
Students bury a dead insect or plant. They note the position, and dig up the remains for examination every two weeks (4.7.7).
Students examine stream water samples, as well as swabbed saliva from the inside of student mouths, using a microscope. Students use the cell magnification on www.cellsalive.com/howbig.htm to help them understand the scale (4.7.8).
Students build a compost bin and record observations over time (4.7.9).
4.8. Broad Concept: Humans have a variety of mechanisms to combat disease. As a basis for understanding this concept,
Students:
1. Describe that human beings have body systems very similar to those of other animals, especially other mammals (warm-blooded vertebrate animals that have, in the female, milk-secreting organs for feeding the young).
2. Explain that some diseases are caused by germs (harmful microorganisms such as some bacteria and viruses) and some are not, and those caused by microorganisms may be spread to other people.
3. Explain that disease-bearing microorganisms, called pathogens, can enter the body and interfere with the proper function of various parts of the body.
4. Recognize that there are beneficial microorganisms, such as normal intestinal flora.
5. Explain that washing hands with soap and water reduces the number of pathogens that can get into the body or that can be passed on to other people.
6. Describe the body's defenses against pathogens, including tears, saliva, skin, some types of white blood cells, stomach secretions, and an internal system of chemical testing.
7. Explain that a healthy body can fight most invasive pathogens; however, some interfere with the body's defenses.
8. Identify diseases that human beings can usually catch only once because their bodies build up an immunity to them.
9. Recognize that vaccines can prevent some diseases so that people do not catch them at all.
Examples: Students use an interactive Internet site to solve medical mysteries and prevent the spread of infectious diseases (medmyst.rice.edu/html/mission1.html) (4.8.2, 4.8.3, 4.8.6, and 4.8.7).
Students simulate how germs are spread through a sneeze: They lightly dust a desk with powder.
Students discuss the number and kinds of touches that area would receive in one day and where that powder could travel in one day in school (4.8.5).
Students discuss the causes and symptoms of their allergies and research the external response system (4.8.6).

Students research different vaccinations (www.cdc.gov) and check out which vaccinations they had. They compare their experience of health care with that of children in other parts of the world (4.8.9).
Students interview older family members about their medical history (4.8.9).

Grade 5 Science

Scientific Thinking and Inquiry, Science and Technology, Earth Science, Physical Science, and Life Science remain the fundamental principles of this rearticulation.

Scientific progress is made by asking relevant questions and conducting careful investigations. As a basis for understanding this concept, and to address the content in this grade, students should have the opportunity to develop their own questions.

As part of the scientific process, students should have the opportunity to experiment, investigate, and problem solve and should keep a notebook to record observations. Other activities should be encouraged to develop a sound understanding of content.

Students should observe:
a)Stars and identify ones that are unusually bright, and others that have unusual colors, such as red or blue.
b)That some organisms consist of a single cell that needs an environment that can supply food,
water, sometimes oxygen, and a way to dispose of waste. (Some single-celled organisms are
anaerobes.)
c)That some organisms are made of a collection of similar cells that benefit from cooperating.
Students should investigate:
a)That when liquid water evaporates, it turns into a gas (vapor) mixed into the air, and can condense and reappear as a liquid when cooled or as a solid (ice) if cooled below the freezing
point of water.
b)That heating and cooling cause changes in the properties of substances. For example, liquid water can turn into steam by boiling, and liquid water can turn into ice by freezing.
c)How some materials conduct heat much better than others, and poor conductors (insulators) can be used to reduce heat loss or gain.
d)That unbalanced forces cause changes in the speed and/or direction of motion of an object (acceleration).
e) That the greater the net force, F, applied to a body, the greater its acceleration, a.

Science and Technology

Standard 1 Scientific Thinking
Students should be encouraged to think scientifically: as a basis for developing this set of skills, and to address the content in this grade, Students should perform investigations.
As a consequence Students should be able to :

5.1.1. Evaluate the validity of claims based on the amount and quality of the evidence cited. 5.1.2. Explain that predictions can be based on what is known about the past, assuming that conditions are similar.
5.1.3. Realize and explain why predictions may be more accurate if they are based on large collections of similar events for statistical accuracy. 5.1.4. Determine area and volume of rectangular shapes from linear dimensions, using the expressions A = l x w and V = l x w x h.
5.1.5. Understand how plotting data on a number line helps in seeing where the data lie, including the outliers.

Standard 2 Inquiry
Science is based on Inquiry: as a basis for understanding the concepts of Scientific Inquiry Students should be encouraged to develop their own questions in a Scientific context. Students should be able to :
5.2.1. Recognize and describe how results of similar scientific investigations may turn out differently because of inconsistencies in methods, materials, and observations, or because of limitations of the precision of the instruments used. 5.2.2. Be able to distinguish inferences from actual observations.
5.2.3. Write instructions that others can follow to carry out an investigation. 5.2.4. Read and follow step-by-step instructions when learning new investigations. 5.2.5. Identify the controlled variable and at least one independent variable in a scientific investigation, when appropriate. 5.2.6. Explain the distortion inherent in using only a portion of the data collected to describe the whole. Understand that it is sometimes acceptable to discard data.
Standard 3 Technology

Technology provides tools for Scientific Inquiry: Students should be exposed to technology and should use technology in their investigations. Students should be able to :
5.3.1. Give examples of technology, such as telescopes, microscopes, and cameras, that enable scientists and others to observe things that are too small or too far away to be seen without them and to study the motion of objects that are moving very rapidly or are hardly moving. 5.3.2. Give examples of advances in technology that have positively and/or negatively affected society. 5.3.3. Give examples of materials not present in nature that have become available because of science and technology, such as cloth, metal alloys, plastic, ceramics, and concrete.

Earth and Space Science

Standard 4 Space Science
Students will be introduced to Space Science: Students should have an appreciation for our solar system and the concept that there are other similar and dissimilar systems in space. Students should be able to :
5.4.1. Describe that, like all planets and stars, the Earth is approximately spherical in shape. 5.4.2. Observe how telescopes are used both to magnify images of distant

objects in the sky, including the moon and the planets, and to gather enough light from very dim objects to make them visible.
5.4.3. Observe and describe that stars vary in size, but they are so far away that they look like points of light.

Standard 5 Earth Science

Students will be introduced to Earth Science: Students should relate to the earth as a planet in our solar system. Students should be able to :
5.5.1. Describe the Earth as part of a system called the solar system, which includes the sun (a star), planets, comets, asteroids, and many moons. 5.5.2. Recognize that the Earth is the third planet from the sun in our solar system. 5.5.3. Demonstrate how the Earth orbits the sun in a year's time, and Earth rotates on its axis about once every 24 hours.
5.5.4. Explain that the alternation between day and night and the apparent movement of the sun, moon, and stars across the sky depend on the rotation of the Earth on its axis.
5.5.5. Explain that the air around us is matter and has weight (a force) and exerts pressure; explain that air pressure varies a little from place to place and from time to time.
5.5.6. Describe that winds blow from areas of higher pressure to areas of lower pressure. 5.5.7. Explain how global patterns, such as the jet stream and ocean currents, influence local weather and climate in ways that can be measured in terms of temperature, pressure, wind direction and speed, and amounts of precipitation.

Standard 6 Water Cycle

Students will be introduced to the movement of Water through the Water Cycle and develop an understanding of the physical properties of Water: Students should be able to :
5.6.1. Describe that when liquid water evaporates, it turns into a gas (vapor) mixed into the air, and can condense and reappear as a liquid when cooled or as a solid (ice) if cooled below the freezing point of water. 5.6.2. Explain how water moves in air masses from one place to another in the form of clouds, fog, or as invisible water vapor, and falls to the Earth as rain, hail, sleet, or snow. 5.6.3. Describe that clouds are made of tiny droplets of water or ice crystals. 5.6.4. Explain that water on Earth cycles through different forms and in different locations (e.g., underground water and vapor in the atmosphere). 5.6.5. Using maps and globes, recognize that the Earth's oceans are all connected as one body of water that covers about three-quarters of the Earth's surface.

Physical Science

Standard 7 Matter

Students will be introduced to concepts of Matter: Students should be able to :
5.7.1. Recognize that all matter is made of small particles called atoms, which are too small to see with our eyes; describe how atoms may combine to form molecules or crystalline solids (compounds). 5.7.2. Recognize that there are more than 100 different kinds of atoms (each called an element), which are displayed on the periodic table of the elements.
5.7.3. Explain that all matter is made up of an element, a compound, or mixtures of elements and compounds.

Standard 8 Heat and Energy

Students will be introduced to concepts of Heat and Energy: Students should be able to :
5.8.1. Describe that heating and cooling cause changes in the properties of substances. For example, liquid water can turn into steam by boiling, and liquid water can turn into ice by freezing. 5.8.2. Explain that many kinds of chemical changes occur faster at higher temperatures.
5.8.3. Explain that when a warm object and a cool one are placed in contact, heat flows from the warmer object to the cooler one until they are both at the same temperature. Know that heat transfer can also occur at a distance by radiation. 5.8.4 Describe how some materials conduct heat much better than others, and poor conductors (insulators) can be used to reduce heat loss or gain.

Standard 9 Forces and Motion

Students will be introduced to concepts of Forces and Motion. Students should be able to :
5.9.1. Explain that objects can move with a very wide range of speeds, with some moving very slowly and some moving too quickly for people to see them. 5.9.2. Demonstrate that if the forces acting on an object are balanced so that the net force is zero, the object will remain at rest if it is initially at rest or will maintain a constant speed and direction if it is initially moving.
5.9.3. Describe that unbalanced forces cause changes in the speed and/or direction of motion of an object (acceleration). 5.9.4. Describe that, for an object moving in a straight line, acceleration, a, is the change in velocity, v, divided by the time, t, that change takes ($a = v \div t$).
5.9.5. Describe that the greater the net force, F, applied to a body, the greater its acceleration, a. Describe that the greater the mass, m, of an object, the smaller the acceleration produced by a given force. 5.9.6. Demonstrate and explain that things on or near Earth are pulled toward Earth's center by the gravitational force that Earth exerts on them.

Life Science

Standard 10 Cell Biology

Students will be introduced to concepts of Cell Biology and appreciate the function of the cell as the smallest sub-unit of living organisms. Students should be able to :

5.10.1. Describe that some organisms consist of a single cell that needs an environment that can supply food, water, sometimes oxygen, and a way to dispose of waste. (Some single-celled organisms are anaerobes.) 5.10.2. Explain that some organisms are made of a collection of similar cells that benefit from cooperating. 5.10.3. Explain that in complex organisms such as humans, cells can have a very wide variety of forms and perform very different roles (e.g., nerve cells, muscle cells, and fat cells).

Standard 11 Inheritance

Students will be introduced to concepts of Inheritance in living organisms and learn about the importance of reliable inheritance mechanism in organisms. Students should be able to :

5.11.1. Explain why there must be a reliable way to transfer information from one generation to the next in order for offspring to resemble their parents. 5.11.2. List some characteristics of plants and animals that are fully inherited (e.g., form of flower, shape of leaves) and others that are affected by the climate or environmental conditions (e.g., browning of leaves from too much sun, language spoken).

Standard 12 Adaptation and Survival

Students will learn about Adaptation and Survival and its importance to the continuity of life. Students should be able to :

5.12.1. Explain that in any particular environment, some kinds of plants and animals survive well, some do not survive as well, and some cannot survive at all. 5.12.2. Identify organisms that are not native to the Washington, DC, area and how they undergo changes to increase their chance of survival in the area.

5.12.3. Explain how organisms can cause changes in their environment to ensure survival, and these changes may affect the ecosystem (the living and nonliving components of the environment). 5.12.4. Explain that organisms fit enough to survive in a particular environment will typically produce offspring fit enough to survive and reproduce in that particular environment. Over time, these inherited characteristics are carried as the predominant forms (e.g., adaptations such as shape of beak, length of neck, shape of teeth). 5.12.5. Explain how changes in an organism's habitat are sometimes beneficial and sometimes harmful, and how changes in the environment (drought, cold) have caused some plants and animals to die, migrate, or become extinct. 5.12.6. Explain that many plants and animals can survive harsh environments because of seasonal behaviors (e.g., in winter, some trees shed leaves, some animals hibernate). 5.12.7. Recognize that some animal behaviors are instinctive (e.g., turtles burying their eggs, human infants crying when hungry) and others learned (e.g., a wolf's hunting skills, humans' ability to build fires for warmth). 5.12.8. Describe well-defined plant behaviors, such as the way seedlings' stems grow toward light and their roots grow downward in response to gravity. 5.12.9. Examine the information that fossils provide us about living things that inhabited the Earth in the distant past, and describe how they can be compared both to one another and to living organisms according to their similarities and differences. 5.12.10. Recognize and describe how artifacts and

preserved remains provide some evidence of the physical characteristics and possible behaviors of human beings and their ancestors who lived long ago.