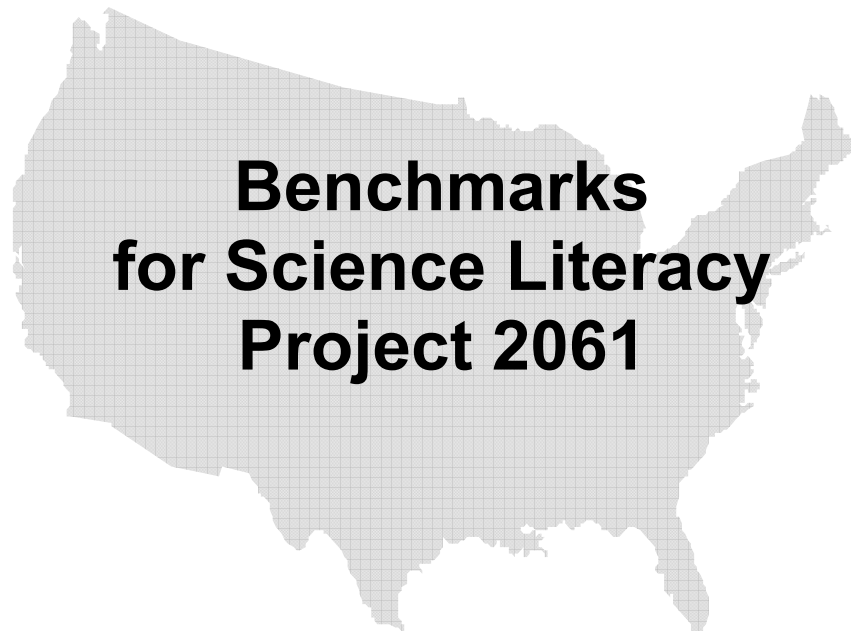




**Full Option Science System
(FOSS™)
Grades K-8**

Correlation With



**Benchmarks
for Science Literacy
Project 2061**

BENCHMARKS FOR SCIENCE LITERACY

PROJECT 2061

Grades K-8

The Nature of Science

The Physical Setting

The Living Environment

The Human Organism

Common Themes

This correlation shows representative examples of investigations and activities from the FOSS program that address the Benchmarks. A citation does not reflect all of the investigations or activities that might address a particular benchmark.

May, 2007

K-2 Benchmarks ~ The Nature of Science

NOTE: FOSS modules are inquiry-based and provide the opportunity to address the benchmarks. The fundamentals of scientific inquiry and the nature of science are embedded in all modules. Examples of activities for each benchmark are listed.

<i>BENCHMARK</i>	<i>FOSS</i>
When a science investigation is done the way it was done before, we expect to get very similar results.	<p>Wood and Paper Investigation 1, Part 3, pp. 20-23</p> <p>New Plants Investigation 2, Part 1, pp. 8-14</p> <p>Air and Weather Investigation 2, Part 2, pp. 14-19</p> <p>Pebbles, Sand and Silt Investigation 4, Parts 1, 3, pp. 8-14, 19-25</p> <p>Solids and Liquids Investigation 4, Parts 1-2, pp. 7-22</p>
Science investigations generally work the same way in different places.	<p>Animals Two by Two Investigation 1, Part 3, pp. 22-25</p> <p>Air and Weather Investigation 1, Parts 4-6, pp. 21-38</p> <p>New Plants Investigation 3, Parts 1-3, pp. 8-25</p> <p>FOSS Web Sharing Investigations</p>
People can often learn about things around them by just observing those things carefully, but sometimes they can learn more by doing something to the things and noting what happens.	<p>Wood and Paper Investigation 1, Parts 1-4, pp. 8-27</p> <p>Solids and Liquids Investigation 1, Part 1, pp. 8-10 Investigation 4, Part 1, pp. 7-16</p> <p>Pebbles, Sand, and Silt Investigation 1, Parts 1-2, pp. 8-17</p> <p>New Plants Investigation 2, Parts 1-2, pp. 8-19</p>
Tools such as thermometers, magnifiers, rulers, or balances often give more information about things than can be obtained by just observing things without their help.	<p>Animals Two by Two Investigation 4, Part 1, pp. 8-11</p> <p>Fabric Investigation 1, Part 4, pp. 20-22</p> <p>Pebbles, Sand, and Silt Investigation 1, Parts 1-2, pp. 8-17</p> <p>Air and Weather Investigation 2, Part 2, 4, pp. 14-19, 24-27</p> <p>Insects Investigation 1, Parts 1-3, pp. 8-25 Investigation 2, Parts 1-3, pp. 8-24</p>
Describing things as accurately as possible is important in science because it enables people to compare their observations with those of others.	<p>Trees Investigation 2, Parts 2-4, pp. 10-22</p> <p>Animals Two by Two Investigation 3, Parts 1-3, pp. 8-20</p> <p>Pebbles, Sand, and Silt</p>

<p>When people give different descriptions of the same thing, it is usually a good idea to make some fresh observations instead of just arguing about who is right.</p> <p>Everybody can do science and invent things and ideas.</p> <p>In doing science, it is often helpful to work with a team and to share findings with others. All team members should reach their own individual conclusions, however, about what the findings mean.</p> <p>A lot can be learned about plants and animals by observing them closely, but care must be taken to know the needs of living things and how to provide for them in the classroom.</p>	<p>Investigation 1, Part 1, pp. 8-12 Solids and Liquids Investigation 2, Part 2, pp. 15-20 Insects Investigation 1, Parts 1-2, pp. 8-21</p> <p>Wood and Paper Investigation 3, Parts 2, 4, pp. 13-17, 22-25 Balance and Motion Investigation 1, Part 2, pp. 14-18 Solids and Liquids Investigation 4, Parts 1-2, pp. 7-22 Air and Weather Investigation 1, Parts 4-5, pp. 21-33</p> <p>Wood and Paper Investigation 5, Part 3, pp. 18-21 Air and Weather Investigation 3, Parts 4-5, pp. 22-23 Solids and Liquids Investigation 1, Part 3, pp. 21-24 Pebbles, Sand, and Silt Investigation 3, Parts 3-5, pp. 16-29</p> <p>Animals Two by Two Activity 1, Parts 3-4, pp. 22-29 Solids and Liquids Investigation 4, Parts 1-2, pp. 7-22 Balance and Motion Investigation 3, Part 3, pp. 19-25 Air and Weather Investigation 2, Parts 2, 4, pp. 14-19, 24-27</p> <p>Animals Two By Two Investigation 1, Part 2, pp. 17-21 Investigation 4, Part 4, pp. 20 23 Trees Investigation 1, Part 8, pp. 35-37 New Plants Investigation 1, Part 2, pp. 13-22 Investigation 2, Part 1, pp. 8-14 Science Stories, pp. 3-7 Insects Investigation 2, Part 1, pp. 8-13 Investigation 4, Part 2, pp. 14-18 Investigation 5, Part 1, pp. 10-15</p>
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K-2 Benchmarks ~ The Physical Setting

<i>BENCHMARK</i>	<i>FOSS</i>
<p>There are more stars in the sky than anyone can easily count, but they are not scattered evenly, and they are not all the same</p>	

<p>brightness or color.</p> <p>The sun can be seen only in the daytime, but the moon can be seen sometimes at night and sometimes during the day. The sun, moon, and stars all appear to move slowly across the sky.</p> <p>The moon looks a little different every day, but looks the same again about every four weeks.</p> <p>Some events in nature have a repeating pattern. The weather changes from day to day, but things such as temperature and rain (or snow) tends to be high, low, or medium in the same months every year.</p> <p>Water can be a liquid or a solid and can go back and forth from one form to the other. If water is turned into ice and then the ice is allowed to melt, the amount of water is the same as it was before freezing.</p> <p>Water left in an open container disappears, but water in a closed container does not disappear.</p> <p>Chunks of rocks come in many sizes and shapes, from boulders to grains of sand and even smaller.</p> <p>Change is something that happens to many things.</p> <p>Animals and plants sometimes cause changes in their surroundings.</p>	<p>Air and Weather Investigation 4, Part 3, pp. 19-24</p> <p>Air and Weather Investigation 4, Part 3, pp. 19-24</p> <p>Trees Investigation 3, Part 3, 6, 9, pp. 15-18, 26-28, 35-38 Science Stories, pp. 14-23</p> <p>Air and Weather Investigation 4, Part 1-2, pp. 8-18 Science Stories, pp. 18-23</p> <p>Insects Investigation 1-5, All Parts Science Stories, pp. 22-33</p> <p>New Plants Investigation 1, Part 3, pp. 23-30</p> <p>Air and Weather Investigation 2, Science Extension, p.32 Science Stories, pp. 8-9</p> <p>Solids and Liquids Science Stories, p. 16 FOSS Web, Activity: Change It</p> <p>Solids and Liquids Investigation 2, Science Extension, p. 31 Investigation 4, Part 1, pp. 7-16 Science Stories, pp. 20-21</p> <p>Pebbles, Sand, and Silt Investigation 1, Parts 1-3, pp. 8-21 Investigation 2, Parts 1-4, pp. 8-29 Science Stories, pp. 3-7, 10-13 FOSS Web, Activity: Find Earth Materials</p> <p>Animals Two by Two Investigation 5, Parts 1-2, pp. 10-19</p> <p>Air and Weather Investigation 2, Parts 1-4, pp. 8-27</p> <p>New Plants Investigation 3, Parts 1-3, pp. 8-25</p> <p>Solids and Liquids Investigation 4, Parts 1-2, pp. 7-22 Science Stories, pp. 14-17 FOSS Web, Activity : Change It</p> <p>Animals Two by Two Science Stories, pp. 21-23</p> <p>Insects</p>
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<p>Objects can be described in terms of the materials they are made of (clay, cloth, paper, etc.) and their physical properties (color, size, shape, weight, texture, flexibility, etc.).</p> <p>Things can be done to materials to change some of their properties, but not all materials respond the same way to what is done to them.</p> <p>The sun warms the land, air and water.</p> <p>Things move in many different ways, such as straight, zigzag, round and round, back and forth, and fast and slow.</p> <p>The way to change how something is moving is to give it a push or a pull.</p>	<p>Investigation 4, Part 5, pp. 28-31 Pebbles, Sand, and Silt Science Stories, pp. 21-22</p> <p>Fabric Investigation 1, Parts 1-2, 4, pp. 6-15, 20-21 Wood and Paper Investigation 1, Parts 1-2, pp. 8-19 Solids and Liquids Investigation 1, Parts 1-2, pp. 8-21 Investigation 2, Parts 1-2, pp. 10-20 Science Stories, pp. 4-7 Pebbles, Sand, and Silt Investigation 1, Parts 1-3, pp. 8-21 Investigation 4, Parts 1, 3, pp. 8-14, 19-25</p> <p>Fabric Investigation, 2, Part 3, pp. 18-21 Wood and Paper Investigation 1, Parts 4-5, pp. 24-32 Investigation 3, Parts 2-4, pp. 13-25 Solids and Liquids Investigation 4, Parts 1-2, pp. 7-22 Science Stories, pp. 14-17, 20-21 Pebbles, Sand and Silt Investigation 1, Parts 1-2, pp. 8-17</p> <p>Trees Science Stories, pp. 14-21 Air and Weather Investigation 2, Part 2, pp. 14-19 Science Stories, p. 21 New Plants Science Stories, p. 6</p> <p>Animals Two by Two Investigation 1, Part 3, pp. 22-25 Investigation 3, Part 1, pp., 8-11 Balance and Motion Investigation 2, Parts 1-3, pp. 8-25 Investigation 3, Parts 1-3, pp. 6-25 Science Stories, pp. 22-29 Air and Weather Investigation 1, Parts 3-6, pp. 17-38, Investigation 3, Parts 1-5, pp. 8-33 Pebbles, Sand, and Silt Science Stories, pp. 10-13</p> <p>Wood and Paper Investigation 5, Part 2, pp. 12-17 Balance and Motion Investigation 2, Parts 1-2, pp. 8-19 Investigation 3, Parts 1-3, pp. 6-25 Science Stories, pp. 10-16 Air and Weather Investigation 1, Parts 4-5, pp. 21-33</p>
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Things that make sound vibrate.	Balance and Motion Science Stories, pp. 32-35
Things near the earth fall to the ground unless something holds them up.	Trees Investigation 2, Part 1, pp. 6-9 Balance and Motion Investigation 1, Parts 1-3, pp. 8-23 Investigation 2, Part 3, pp. 20-25 Science Stories, p. 13 Air and Weather Investigation 1, Part 3, pp. 17-20 Science Stories, pp. 5, 18
Magnets can be used to make some things move without being touched.	Solids and Liquids Investigation 3, Science Extension, p. 31 Balance and Motion Science Stories, pp. 8-21

K-2 Benchmarks ~ The Living Environment

<i>BENCHMARK</i>	<i>FOSS</i>
Some animals and plants are alike in the way they look and in the things they do, and others are very different from one another.	Trees Investigation , Parts 1, 3, pp. 7-14, 20-22 Science Stories, pp. 3-12 Animals Two by Two Investigation 1, Part 4, pp.26-29 Investigation 2, Parts 1, 3, pp. 9-13, 18-21 Science Stories, pp. 4-23 New Plants Investigation 3, Parts 1-3, pp. 8-25 Science Stories, pp. 22-43 Insects Investigation 1-6, All Parts Science Stories, pp. 3-15, 34-38
Plants and animals have features that help them live in different environments.	Animals Two by Two Investigation 1, Part 1, pp. 10-16 Investigation 2, Part 1, 3, pp. 9-13, 18-21 Investigation 4, Part 1, pp. 8-11 Science Stories, pp. 4-19 New Plants Science Stories, pp. 8-11, 22-43 Insects Investigation 2, Parts 1-3, pp.8-24 Investigation 3, Part 3, pp. 21-26 Investigation 5, Parts 1, 3, pp. 10-16, 20-24 Investigation 6, Parts 1-3, pp. 8-22 Science Stories, pp. 8-11, 26-33
Stories sometimes give plants and animals attributes they really do not have.	

There is variation among individuals of one kind within a population.

Offspring are very much, but not exactly, like their parents and like one another.

Magnifiers help people see things they could not see without them.

Most living things need water, food, and air.

Animals eat plants or other animals for food and may also use plants (or even other animals) for shelter and nesting.

Animals Two by Two

Investigation 2, Part 1, pp. 9-13

Investigation 4, Part 1, pp. 8-11

New Plants

Investigation 1, Part 3, pp. 23-30

Insects

Investigation 1, Parts 1-3, pp. 8-25

Investigation 2, Parts 1-3, pp. 8-24

Investigation 6, Parts 1-2, PP. 8-17

Science Stories, pp. 36-38, 42-45

Animals Two by Two

Investigation 5, Parts, 1-2, pp. 10-14

Science Stories, pp. 20-23

FOSS Web, Activity: Find The Parent

New Plants

Investigation 1, Part 3, pp. 23-30

Insects

Investigation 1-5, All Parts

Science Stories, pp. 21-33

Animals Two by Two

Investigation 4, Part 1, pp. 8-11

Fabric

Investigation 1, Part 4, pp. 20-22

Insects

Investigation 1, Parts 1-3, pp. 8-25

Investigation 2, Parts 1-3, pp. 8-24

Investigation 5, Part 1, pp.10-15

Animals Two by Two

Investigation 1, Part 2, pp. 17-21

Investigation 4, Part 4, pp. 20-23

Trees

Investigation 1, Parts 2, 8, pp. 15-19, 35-37

New Plants

Investigation 1, Part 2, pp. 13-22

Investigation 2, Part 1, pp. 8-14

Science Stories, pp. 3-7

Insects

Investigation 1, Part 1, pp. 8-15

Investigation 3, Part 2, pp. 12-20

Investigation 4, Part 2, pp. 14-18

Animals Two by Two

Investigation 1, Part 2, pp. 17-21

Investigation 4, Part 4, pp. 20-23

Science Stories, pp. 21-23

Trees

FOSS Web, Activity: Who Lives Here

Insects

Investigation 1, Part 1, pp.8-15

Investigation 3, Parts 2-3, pp. 12-26

Investigation 4, Part 2, pp. 14-18

Science Stories, p. 6

<p>Living things are found almost everywhere in the world. There are somewhat different kinds in different places.</p> <p>Plants and animals both need to take in water, and animals need to take in food. In addition, plants need light.</p> <p>Many materials can be recycled and used again, sometimes in different forms.</p> <p>Different plants and animals have external features that help them thrive in different kinds of places.</p> <p>Some kinds of organisms that once lived on earth have completely disappeared, although they were something like others that are alive today.</p>	<p>New Plants Science Stories, pp. 23-24, 26-27, 29-30, 32-33, 35-36, 38-43</p> <p>Trees Investigation 1, Part 1, pp. 7-14 Science Stories, pp. 2-12</p> <p>Animals Two by Two Investigation 1-4, All Parts Science Stories, pp. 4-23</p> <p>New Plants Science Stories, pp. 22-39</p> <p>Insects Investigation 6, Parts 1-3, pp. 8-22 Science Stories, pp. 22-33</p> <p>Animals Two by Two Investigation 1, Part 2, pp. 17-21 Investigation 4, Part 4, pp. 20-23</p> <p>Trees Investigation 1, Part 2, 8, pp. 15-19, 35-37</p> <p>New Plants Investigation 1, Part 2, pp. 13-22 Investigation 2, Part 1, pp. 8-14 Science Stories, pp. 3-7</p> <p>Insects Investigation 1, Part 1, pp. 8-15 Investigation 3, Part 2, pp. 12-20 Investigation 4, Part 2, pp. 14-18</p> <p>Wood and Paper Investigation 4, Part 1, pp. 8-18 Science Stories, pp. 19</p> <p>New Plants Investigation 1, p. 29</p> <p>Pebbles, Sand, and Silt Investigation 3, Parts 2-5, pp. 12-29 Science Stories, pp. 16-21</p> <p>Animals Two by Two Investigation 1-4, All Parts Science Stories, pp. 4-19</p> <p>New Plants Science Stories, pp. 8-11, 22-43</p> <p>Insects Investigation 2, Parts 1-3, pp. 8-24 Investigation 3, Part 3, pp. 21-26 Investigation 5, Parts 1, 3, pp. 10-16, 20-24 Investigation 6, Parts 1-3, pp. 8-22 Science Stories pp. 8-11, 26-33</p> <p>Pebbles, Sand and Silt Science Stories, pp. 26-31</p>
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K-2 Benchmarks ~ The Human Organism

NOTE: Many of the benchmarks in this section are typically found in a health program. Examples from FOSS are listed.

<i>BENCHMARK</i>	<i>FOSS</i>
<p>People have different external features, such as the size, shape, and color of hair, skin, and eyes, but they are more like one another than like other animals.</p> <p>People need water, food, air, waste removal, and a particular range of temperatures in their environment, just as other animals do.</p> <p>People tend to live in families and communities in which individuals have different roles.</p> <p>All animals have offspring, usually with two parents involved. People may prevent some animals from producing offspring.</p> <p>A human baby grows inside its mother until its birth. Even after birth, a human baby is unable to care for itself, and its survival depends on the care it receives from adults.</p> <p>The human body has parts that help it seek, find, and take in food when it feels hunger—eyes and noses for detecting food, legs to get to it, arms to carry it away, and a mouth to eat it.</p> <p>Senses can warn individuals about danger; muscles help them to fight, hide, or get out of danger.</p> <p>The brain enables human beings to think and send messages to other body parts to help them work properly.</p> <p>People use their senses to find out about their surroundings and themselves. Different senses give different information. Sometimes a person can get different information about the same thing by moving closer to it or further away from it.</p>	<p>Animals Two by Two Investigation 5, Parts 1-2, pp. 10-19 Science Stories, pp. 20-23 FOSS Web, Activity: Find the Parent</p> <p>Insects Investigation 1-5, All Parts Science Stories, pp. 21-33</p> <p>Wood and Paper Investigation 1, Parts 1-2, pp. 8-19 Investigation 3, Part 1, pp. 8-12</p> <p>Fabric Investigation 1, Parts 1-2, pp. 6-15</p> <p>Solids and Liquids Investigation 1, Part 1, pp. 8-11 Investigation 2, Parts 1-2, pp. 10-20</p>

<p>Some of the things people do, like playing soccer, reading, and writing, must be deliberately learned. Practicing helps people to improve. How well one learns sometimes depends on how one does it and how often and how hard one tries to learn.</p> <p>People can learn from each other by telling and listening, showing and watching, and imitating what others do.</p> <p>Eating a variety of healthful foods and getting enough exercise and rest help people to stay healthy.</p> <p>Some things people take into their bodies from the environment can hurt them.</p> <p>Some diseases are caused by germs, some are not. Diseases caused by germs may be spread by people who have them. Washing one's hands with soap and water reduces the number of germs that can get into the body or that can be passed on to other people.</p> <p>People have many different feelings—sadness, joy, anger, fear, etc.—about events, themselves, and other people.</p> <p>People react to personal problems in different ways. Some ways are more likely to be helpful than others.</p> <p>Talking to someone (a friend, relative, teacher, or counselor) may help people understand their feelings and problems and what to do about them.</p>	<p>Pebbles, Sand and Silt Investigation 1, Parts 1-2, pp. 8-17 Investigation 3, Part 2, pp. 12-14</p> <p>Balance and Motion Science Stories, pp. 32-35</p> <p>Air and Weather Investigation 1, Part 1, 4, pp. 8-12, 21-26</p> <p>Air and Weather Investigation 2, Parts 2, 4, pp. 14-19, 24-27</p> <p>Balance and Motion Investigation 2, Parts 1-3, pp. 8-25</p> <p>Pebbles, Sand and Silt Investigation 3, Parts 3-5, pp. 16-29</p> <p>Wood and Paper Investigation 2, Parts 1-4, pp. 8-23</p> <p>Fabric Investigation 1, Parts 5-6, pp. 23-33</p> <p>Balance and Motion Investigation 1, Parts 1-4, pp. 8-28 Investigation 3, Parts 1-3, pp. 6-25</p> <p>Solids and Liquids Investigation 3, Parts 1-4, pp. 8-27</p>
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K-2 Benchmarks ~ Common Themes

The common themes are interwoven throughout the FOSS Modules. Some examples of modules that address the themes are listed.

<i>THEME</i>	<i>FOSS</i>
<p>SYSTEMS</p> <p>Most things are made of parts.</p> <p>Something may not work if some of its parts are missing.</p> <p>When parts are put together, they can do things that they couldn't do by themselves.</p> <p>MODELS</p> <p>Many of the toys children play with are like real things only in some ways. They are not the same size, are missing many details, or are not able to do all of the same things.</p> <p>A model of something is different from the real thing but can be used to learn something about the real thing.</p>	<p>Fabric Investigation 1, Part 4, pp. 20-22</p> <p>Pebbles, Sand, and Silt Investigation 4, Part 1, pp. 8-14</p> <p>Air and Weather Investigation 3, Parts 3-4, pp. 17-27</p> <p>Balance and Motion Investigation 2, Parts 1-2, pp. 8-19</p> <p>Wood and Paper Investigation 2, Parts 3-4, pp. 16-23</p> <p>Air and Weather Investigation 1, Parts 3, 6, pp. 17-20, 34-38 Investigation 3, Parts 2-4, pp. 17-27</p> <p>Balance and Motion Investigation 1, Part 4, pp. 24-28 Investigation 2, Parts 1-2, pp. 8-19</p> <p>Wood and Paper Investigation 2, Parts 3-4, pp. 16-23</p> <p>Balance and Motion Investigation 1, Parts 3-4, pp. 19-28 Investigation 2, Parts 1-2, pp. 8-19 Investigation 3, Parts 1-2, pp. 6-18</p> <p>Air and Weather Investigation 1, Parts 3, 6, pp. 17-20, 34-36</p> <p>Wood and Paper Investigation 5, Part 1, pp. 8-11</p> <p>Air and Weather Investigation 1, Parts 3, 6, pp. 17-20, 34-38 Investigation 3, Part 5, pp. 28-33</p> <p>Balance and Motion Investigation 2, Part 1, pp. 8-13 Investigation 3, Parts 1-2, pp. 6-18</p> <p>Wood and Paper Investigation 4, Part 1, pp. 8-13 Investigation 5, Part 1, pp. 8-11</p> <p>Trees Investigation 1, Part 4, pp. 23-24</p> <p>Air and Weather Investigation 1, Parts 3, 6, pp. 17-20, 34-38</p> <p>Pebbles, Sand and Silt Investigation 3, Part 5, pp. 24-29</p>

<p>One way to describe something is to say how it is like something else.</p>	<p>Wood and Paper Investigation 2, Parts 3-4, pp. 16-23 Trees Investigation 1, Part 4, pp. 23-24 Air and Weather Investigation 1, Parts 3, 6, pp. 17-20, 34-38 Balance and Motion Investigation 1, Parts 3-4, pp. 19-28</p>
<p>CONSTANCY AND CHANGE</p> <p>Things change in some ways and stay the same in some ways.</p>	<p>Wood and Paper Investigation 4, Parts 1-2, pp. 8-18 Trees Investigation 3, Parts 6-7, pp. 26-31 Air and Weather Investigation 2, Parts 1-4, pp. 8-27 Investigation 3, Parts 2, 4, pp. 12-16, 22-26 Insects Investigation 1, Parts 1-3, pp. 8-25 Investigation 5, Parts 1-3, pp. 10-24</p>
<p>People can keep track of some things, seeing where they come from and where they go.</p>	<p>Trees Investigation 1, Part 7, pp. 31-34 Investigation 3, Part 9, pp. 35-38 Animals Two by Two Investigation 4, Part 3, pp. 16-19 Air and Weather Investigation 4, Part 3, pp. 19-21 New Plants Investigation 1, Parts 2-3, pp. 13-30 Insects Investigation 2, Parts 1-3, pp. 8-26</p>
<p>Things can change in different ways, such as in size, weight, color, and movement. Some small changes can be detected by taking measurements.</p>	<p>Trees Investigation 1, Part 7, pp. 31-34 Investigation 3, Part 9, pp. 35-38 Insects Investigation 1, Parts 1-3, pp. 8-25 New Plants Investigation 1, Part 3, pp. 22-25 Air and Weather Investigation 2, Parts 1-4, pp. 8-27</p>
<p>Some changes are so slow or so fast that they are hard to see.</p>	<p>Trees Investigation 1, Part 7, pp. 31-34 Investigation 3, Part 9, pp. 35-38 Insects Investigation 5, Parts 1-3, pp. 10-24 New Plants Investigation 1, Part 3, pp. 22-25 Air and Weather Investigation 2, Part 2, pp. 14-19</p>
<p>SCALE</p>	<p>Animals Two by Two</p>

<p>Things in nature and things people make have very different sizes, weights, ages, and speeds.</p>	<p>Investigation 2, Parts 1-4, pp. 9-24 Trees Investigation 1, Part 2, pp. 7-14 Air and Weather Investigation 1, Part 3, 6, pp. 17-20, 34-35 Investigation 3, Part 5, pp. 28-33 Pebbles, Sand and Silt Investigation 3, Part 5, pp. 24-29</p>
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3-5 Benchmarks ~ The Nature of Science

NOTE: FOSS modules are inquiry-based and provide the opportunity to address the benchmarks. The fundamentals of scientific inquiry and the nature of science are embedded in all modules. Examples of activities for each benchmark are listed.

<i>BENCHMARK</i>	<i>FOSS</i>
<p>Results of similar scientific investigations seldom turn out exactly the same. Sometimes this is because of unexpected differences in the things being investigated, sometimes because of unrealized differences in the methods used or in the circumstances in which the investigation is carried out, and sometimes just because of uncertainties in observations. It is not always easy to tell which.</p>	<p>Earth Materials Investigation 3, Parts 1-2, pp. 8-19</p> <p>Human Body Investigation 4, Part 2, pp. 17-19</p> <p>Structures of Life Investigation 1, Parts 2-3, pp. 18-33 Investigation 4, Part 3, pp. 20-24</p> <p>Food and Nutrition Investigation 1, Part 1, pp. 8-15</p> <p>Solar Energy Investigation 2, Part 2, pp. 16-24</p> <p>Variables Investigation 3, Part 2, pp. 14-19</p>
<p>Scientific investigations may take many different forms, including observing what things are like or what is happening somewhere, collecting specimens for analysis, and doing experiments. Investigations can focus on physical, biological, and social questions.</p>	<p>Physics of Sound Investigation 1, Parts 1, 3, pp. 8-15, 21-29</p> <p>Ideas and Inventions Investigation 4, Part 3, pp. 18-21</p> <p>Measurement Investigation 4, Part 2, pp. 14-17</p> <p>Environments Investigation 5, Parts 1-2, pp. 8-18</p> <p>Mixtures and Solutions Investigation 4, Parts 1-3, pp. 8-28</p> <p>Landforms Investigation 3, Part 3, pp. 20-24</p>
<p>Results of scientific investigations are seldom exactly the same, but if the differences are large, it is important to try to figure out why. One reason for following directions carefully and for keeping records of one's work is to provide information on what might have caused the differences.</p>	<p>Magnetism and Electricity Investigation 4, Part 2, pp. 14-18</p> <p>Water Investigation 3, Part 2, pp. 12-16</p> <p>Earth Materials Investigation 2, Part 2, pp. 14-21</p> <p>Models and Design Science Stories, pp. 6-9</p> <p>Landforms Investigation 2, Parts 1-2, pp. 8-22</p> <p>Solar Energy Investigation 3, Parts 1-2, pp. 8-23</p> <p>Environment Investigation 6, Parts 1-2, pp. 8-17</p>
<p>Scientists' explanations about what happens in the world come partly from what they observe, partly from what they think. Sometimes scientists have different</p>	<p>Structures of Life Science Stories, pp. 6-9</p> <p>Food and Nutrition Science Stories, pp. 34-36</p>

<p>explanations for the same set of observations. That usually leads to their making more observations to resolve the differences.</p> <p>Scientists do not pay much attention to claims about how something they know works unless the claims are backed up with evidence that can be confirmed and with a logical argument.</p> <p>Science is an adventure that people everywhere can take part in, as they have for many centuries.</p> <p>Clear communication is an essential part of doing science. It enables scientists to inform others about their work, expose their ideas to criticism by other scientists, and stay informed about scientific discoveries around the world.</p> <p>Doing science involves many different kinds of work and engages men and women of all ages and backgrounds.</p>	<p>Models and Design Science Stories, pp. 4-7</p> <p>Ideas and Inventions Investigation 3, Part 2, pp.14-17</p> <p>Physics of Sound Investigation 2, Part 2, pp. 13-19</p> <p>Human Body Investigation 4, Part 2. 17-19</p> <p>Variables Investigation 3, Parts 3-4, pp. 20-27 Science Stories, pp. 12-14, 34-37</p> <p>Mixtures and Solutions Investigation 4, Parts 1-3, pp. 8-24 :</p> <p>Water Science Stories, pp. 24-26</p> <p>Magnetism and Electricity Science Stories, pp. 12-23</p> <p>Mixtures and Solutions Science Stories, pp. 5, 9, 10, 24, 29-31</p> <p>Variables Science Stories, pp. 8-9, 12-14</p> <p>Food and Nutrition Science Stories, pp. 26, 34-35</p> <p>Physics of Sound Investigation 4, Part 2, pp. 10-20</p> <p>Human Body Investigation 4, Part 4, pp. 25-29</p> <p>Measurements Investigation 4, Part 2, pp. 14-17</p> <p>Mixtures and Solutions Investigation 4, Part 4, pp. 25-28</p> <p>Solar Energy Investigation 4, Part 4, pp. 29-33</p> <p>Environments Investigation 2, Part 4, pp. 26-30</p> <p>Measurement Science Stories, pp. 14-15</p> <p>Ideas and Inventions Science Stories, pp. 17-22</p> <p>Human Body Science Stories,, pp. 22-24</p> <p>Magnetism and Electricity FOSS Web: Careers</p> <p>Solar Energy Science Stories, p. 34</p> <p>Variables Science Stories, pp. 3-6</p> <p>Models and Design Science Stories, pp. 10-16</p>
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3-5 Benchmarks ~ The Physical Setting

<i>BENCHMARK</i>	<i>FOSS</i>
<p>The patterns of stars in the sky stay the same. Although they appear to move across the sky nightly, and different stars can be seen in different seasons.</p>	<p>Ideas and Inventions Science Stories, p. 37</p>
<p>Telescopes magnify the appearance of some distant objects in the sky, including the moon and the planets. The number of stars that can be seen through telescopes is dramatically greater than can be seen by the unaided eye.</p>	<p>Ideas and Inventions Science Stories, p. 38 Models and Designs Science Stories, pp. 9-10 Solar Energy Science Stories, p.15</p>
<p>Planets change their positions against the background of stars.</p>	<p>Ideas and Inventions Science Stories, p. 37 Models and Designs Science Stories, pp. 5-6</p>
<p>The earth is one of several planets that orbit the sun, and the moon orbits around the earth.</p>	<p>Ideas and Inventions Science Stories, p. 37 Models and Design Science Stories, pp. 5-9 Solar Energy Science Stories, pp. 40-43 FOSS Web Picture: Solar System</p>
<p>Stars are like the sun, some being smaller and some larger, but so far away that they look like points of light.</p>	<p>Solar Energy Science Stories, pp. 1, 40</p>
<p>Things on or near the earth are pulled toward it by the earth's gravity.</p>	<p>Models and Design Science Stories, p. 10 Solar Energy Science Stories, pp. 43-44</p>
<p>Like all planets and stars, the earth is approximately spherical in shape. The rotation of the earth on its axis every 24 hours produces the night-and -day cycle. To people on earth, this turning of the planet makes it seem as though the sun, moon, planets, and stars are orbiting the earth once a day.</p>	<p>Solar Energy Science Stories, pp. 1-2, 40</p>
<p>When liquid water disappears, it turns into a gas (vapor) in the air and can reappear as a liquid when cooled, or as a solid if cooled below the freezing point of water. Clouds and fog are made of tiny droplets of water.</p>	<p>Water Investigation 3, Parts.1-4, pp. 8-26 Science Stories, pp. 13-16 FOSS Web, Activity: Evaporation Solar Energy Science Stories, pp. 22-25</p>

<p>Air is a substance that surrounds us, takes up space, and whose movements we feel as wind.</p> <p>Waves, wind, water, and ice shape and reshape the earth's land surface by eroding rock and soil in some areas and depositing them in other areas, sometimes in seasonal layers.</p> <p>Rock is composed of different combinations of minerals. Smaller rocks come from the breakage and weathering of bedrock and larger rocks. Soil is made partly from weathered rock, partly from plant remains-and also contains many living organisms.</p> <p>Heating and cooling cause changes in the properties of materials. Many kinds of changes occur faster under hotter conditions.</p> <p>No matter how parts of an object are assembled, the weight of the whole object made is always the same as the sum of the parts; and when a thing is broken into parts, the parts have the same total weight as the original thing.</p> <p>Materials may be composed of parts that are too small to be seen without magnification.</p> <p>When a new material is made by combining two or more materials, it has properties that are different from the original materials. For that reason, a lot of different materials can be made from a small number of basic kinds of materials.</p> <p>Things that give off light often also give off</p>	<p>Solar Energy Science Stories, pp. 2, 18-20, 22-24 FOSS Web, Movie: Wind</p> <p>Mixtures and Solutions Science Stories, pp. 20-22</p> <p>Earth Materials Science Stories, pp.5-7</p> <p>Landforms Investigation 2, Parts 1-2, pp. 8-22 Investigation 3, Parts 1-3, pp. 8-24 Science Stories, pp. 15-17, 25-29</p> <p>Earth Materials Investigation 1, Parts 1-3, pp. 8-29 Investigation 2, Part 1, pp. 8-13 Investigation 4, Part 1, pp. 8-13 Science Stories, pp. 1-7, 30, 35 FOSS Web Activity: Rock Database</p> <p>Water Investigation 2, Part 3, pp. 19-24 Investigation 3, Part 4, pp. 21-26</p> <p>Measurement Investigation 4, Part 2, pp. 14-17 Science Stories, pp. 22-23</p> <p>Mixtures and Solutions Investigation 1, Part 2, pp. 16-20</p> <p>Earth Materials Investigation 3, Parts 1-2, pp. 8-19 Science Stories, p. 3</p> <p>Measurement Science Stories, pp. 31-32</p> <p>Ideas and Inventions Science Stories, p. 14</p> <p>Mixtures and Solutions Investigation 1, Parts 2-3, pp. 16-24 Investigation 4, Parts 1-3, pp. 8-24 Science Stories, pp. 3-4, 25-28</p> <p>Measurements Science Stories, pp. 31-32</p> <p>Mixtures and Solutions Investigation 4, Parts 1-3, pp. 8-24 Science Stories, pp. 23-24, 26-28</p> <p>Food and Nutrition Investigation 2, Parts 1-3, pp. 8-25</p> <p>Measurements</p>
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<p>heat. Heat is produced by mechanical and electrical machines, and any time one thing rubs against something else.</p> <p>When warmer things are put with cooler ones, the warm ones lose heat and the cool ones gain it until they are all at the same temperature. A warmer object can warm a cooler one by contact or at a distance.</p> <p>Some materials conduct heat much better than others. Poor conductors can reduce heat loss.</p> <p>Changes in speed or direction of motion are caused by forces. The greater the force is, the greater the change in motion will be. The more massive an object is, the less effect a given force will have.</p> <p>How fast things move differs greatly. Some things are so slow that their journey takes a long time; others move too fast for people to even see them.</p>	<p>Science Stories, p. 33</p> <p>Magnetism and Electricity Investigation 2, Part 1, pp. 8-13 Science Stories, pp 17-18, 33 FOSS Web, Movie: How a Light Bulb Works</p> <p>Solar Energy Investigation 2, Parts 1-2, pp. 8-24 Investigation 3, Parts 1-2, pp. 8-23 Science Stories, pp. 1-4, 12-13, 16-17, 29-31</p> <p>Water Investigation 2, Part 3, pp. 19-24</p> <p>Measurement Investigation 4, Part 1, pp. 8-13</p> <p>Solar Energy Investigation 2, Parts 1-2, pp. 8-24 Investigation 3, Parts 1-2, pp. 8-23 Investigation 4, Parts 1-3, pp. 8-28</p> <p>Solar Energy Investigation 2, Part 2, pp. 16-24 Investigation 3, Part 1, pp. 8-16</p> <p>Physic of Sound Investigation 3, Parts 1-2, pp. 8-19</p> <p>Structures of Life Investigation 4, Part 3, pp. 20-24</p> <p>Models and Designs Investigation 3, Parts 1-3, pp. 8-23 Investigation 4, Parts 1-2, pp. 6-15 Science Stories, pp. 37-43, 48-55</p> <p>Variables Investigation 3, Parts 1-2, pp. 8-19 Investigation 4, Parts 1-3, pp. 8-23 Science Stories, pp. 15-17, 32-33</p> <p>Levers and Pulleys Investigation 1, Parts 2-3, pp.18-28 Investigation 3, Parts 1-2, pp. 8-20 Science Stories, pp. 5-17, 23-25</p> <p>Ideas and Inventions Investigation 3, Parts 1-2, pp. 8-17</p> <p>Structures of Life Investigation 4, Part 3, pp. 20-24</p> <p>Water Science Stories, p. 8</p> <p>Physics of Sound Science Stories, pp. 19-20</p> <p>Landforms Science Stories , pp. 26-27</p> <p>Environments Investigation 3, Parts 1-3, pp. 8-22</p> <p>Models and Designs Science Stories, pp.46-47</p> <p>Solar Energy Science Stories, p. 9</p>
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<p>The earth's gravity pulls any object toward it without touching it.</p> <p>Without touching them, a magnet pulls on all things made of iron and either pushes or pulls on other magnets.</p> <p>Without touching them, material that has been electrically charged pulls on all other materials and may either push or pull other charged materials.</p>	<p>Measurements Investigation 2, Parts 1-3, pp. 8-24</p> <p>Physics of Sound Investigation 1, Part 1, pp. 8-15</p> <p>Variables Investigation 1, Parts 1-3, pp. 8-27</p> <p>Models and Designs Science Stories, pp. 10, 40-41</p> <p>Solar Energy Science Stories, pp. 43-44</p> <p>Magnetism and Electricity Investigation 1, Parts 1-4, pp. 8-34 Investigation 4, Parts 1-3, pp. 8-22 Science Stories, pp. 1-9 FOSS Web, Activity: Electromagnet</p> <p>Magnetism and Electricity Science Stories, pp. 10-11</p>
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3-5 Benchmarks ~ The Living Environment

<i>BENCHMARK</i>	<i>FOSS</i>
<p>A great variety of kinds of living things can be sorted into groups in many ways using various features to decide which things belong to which group.</p> <p>Features used for grouping depend on the purpose of the grouping.</p> <p>Some likenesses between children and parents, such as eye color in human beings, or fruit or flower color in plants, are inherited. Other likenesses, such as people's table manners or carpentry skills, are learned.</p> <p>For offspring to resemble their parents, there must be a reliable way to transfer information from one generation to the next.</p> <p>Some living things consist of a single cell. Like familiar organisms, they need food, water, and</p>	<p>Structures of Life Investigation 4, Part 2, pp. 14-19 Science Stories, pp. 17-18, 41-42</p> <p>Environments Science Stories, pp. 18-20</p> <p>Structures of Life Investigation 4, Part 2, pp. 14-19 Science Stories, p. 3, 41-42</p> <p>Human Body Science Stories, p. 11</p> <p>Environments Science Stories, pp. 18-20</p> <p>Ideas and Inventions Science Stories, pp.15-16</p> <p>Structures of Life Science Stories, pp. 6-9, 41-42</p> <p>Ideas and Inventions Science Stories, pp. 14-15</p> <p>Structures of Life Science Stories, pp. 6-9</p> <p>Food and Nutrition Science Stories, p.41</p>

<p>air; a way to dispose of waste; and an environment they can live in.</p> <p>Microscopes make it possible to see that living things are made mostly of cells. Some organisms are made of a collection of similar cells that benefit from cooperating. Some organisms' cells vary greatly in appearance and perform very different roles in the organism.</p> <p>For any particular environment, some kinds of plants and animals survive well, some survive less well, and some cannot survive at all.</p> <p>Insects and various other organisms depend on dead plant and animal material for food.</p> <p>Organisms interact with one another in various ways besides providing food. Many plants depend on animals for carrying their pollen to other plants or for dispersing their seeds.</p> <p>Changes in an organism's habitat are sometimes beneficial to it and sometimes harmful.</p> <p>Most microorganisms do not cause disease, and many are beneficial.</p> <p>Almost all kinds of animals' food can be traced back to plants.</p> <p>Some source of "energy" is needed for all organisms to stay alive and grow.</p> <p>Over the whole earth, organisms are growing, dying, and decaying, and new organisms are being produced by the old ones.</p>	<p>Human Body Science Stories, pp. 4, 28-29</p> <p>Food and Nutrition Science Stories, pp. 41-42</p> <p>Structures of Life Science Stories, pp. 4-5, 22-34</p> <p>Environments Investigation 3, Parts 1-3, pp. 8-22 Investigation 5, Parts 1-3, pp. 8-22 Investigation 6, Parts 1-2, pp. 8-17 Science Stories, pp. 1-17, 27-35, 38-41</p> <p>Structures of Life Science Stories, p. 18</p> <p>Environments Science Stories, pp. 11, 18-19, 22, 40-41</p> <p>Structures of Life Science Stories, p. 3, 35-36</p> <p>Environments Science Stories, pp. 3-5, 53-55 FOSS Web Activity: Virtual Aquarium</p> <p>Structures of Life Science Stories, pp. 35-36</p> <p>Environments Investigation 3, Parts 1-3, pp. 8-22 Investigation 5, Parts 1-3, pp. 8-22 Investigation 6, Parts 1-2, pp. 8-17 Science Stories, pp. 35-36, 43-45, 49-52</p> <p>Environments Science Stories, pp. 40-41</p> <p>Structures of Life Science Stories, p. 43</p> <p>Environments Investigation 4, Part 3, pp. 19-22 Science Stories, pp. 28, 31, 33, 39-41, 43-45</p> <p>Structures of Life Science Stories, p. 43</p> <p>Environments Science Stories, pp. 28, 31, 33, 39-41</p> <p>Structures of Life Science Stories, pp. 17-21 FOSS Web, Activity: Life Cycles</p> <p>Environments</p>
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<p>Individuals of the same kind differ in their characteristics, and sometimes the differences give individuals an advantage in surviving and reproducing.</p> <p>Fossils can be compared to one another and to living organisms according to their similarities and differences. Some organisms that lived long ago are similar to existing organisms, but some are quite different.</p>	<p>Science Stories, pp. 19, 22</p> <p>Environments Investigation 3, Parts 1-3, pp. 8-22 Science Stories, pp. 5-6, 12-17, 32-33</p> <p>Structures of Life Science Stories, pp. 45-47</p> <p>Earth Materials Science Stories, p. 4 FOSS Web Pictures: Fossils</p> <p>Models and Design Science Stories, pp. 13-16</p>
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3-5 Benchmarks ~ The Human Organism

NOTE: Many of the benchmarks in this section are typically found in a health program. Examples from FOSS are listed.

<i>BENCHMARK</i>	<i>FOSS</i>
<p>Unlike in human beings, behavior in insects and many other species is determined almost entirely by biological inheritance.</p> <p>Human beings have made tools and machines to sense and do things that they could not otherwise sense or do at all, or as quickly, or as well.</p> <p>Artifacts and preserved remains provide some evidence of the physical characteristics and possible behavior of human beings who lived a very long time ago.</p> <p>It takes about 9 months for a human embryo to develop. Embryos are nourished by the mother, so substances she takes in will affect how well or poorly the baby develops.</p> <p>Human beings live longer than most other animals, but all living things die.</p>	<p>Structures of Life Science Stories, pp. 20-21, 24</p> <p>Environments Investigation 2, Parts 2-3, pp. 16-25 Science Stories, pp. 3-4, 6, 15, 17</p> <p>Human Body Science Stories, pp. 5-7</p> <p>Measurement Science Stories, pp. 21-23</p> <p>Ideas and Inventions Science Stories, pp. 19-20, 22</p> <p>Magnetism and Electricity Science Stories, pp. 24-25</p> <p>Human Body Science Stories, pp. 21-24</p> <p>Earth Materials Science Stories, pp. 24-26</p> <p>Human Body Science Stories, pp. 21-24</p> <p>Structures of Life Science Stories, p. 18</p> <p>Environments Science Stories, pp. 40-41</p>

<p>There is a usual sequence of physical and mental development among human beings, although individuals differ in exactly when they learn things.</p> <p>People are usually able to have children before they are able to care for them properly.</p> <p>From food, people obtain energy and materials for body repair and growth. The undigestible parts of food are eliminated.</p> <p>By breathing, people take in the oxygen they need to live.</p> <p>Skin protects the body from harmful substances and other organisms and from drying out.</p> <p>The brain gets signals from all parts of the body telling what is going on there. The brain also sends signals to parts of the body to influence what they do.</p> <p>Human beings have different interests, motivations, skills, and talents.</p> <p>Human beings can use the memory of their past experiences to make judgements about new situations.</p> <p>Many skills can be practiced until they become automatic. If the right skills are practiced, performance may improve.</p> <p>Human beings tend to repeat behaviors that feel good or have pleasant consequences and avoid behaviors that feel bad or have unpleasant consequences.</p> <p>Learning means using what one already knows to make sense out of new experiences or information, not just storing the new information in one's head.</p> <p>Food provides energy and materials for growth and repair of body parts. Vitamins and minerals, present in small amounts in foods,</p>	<p>Food and Nutrition Science Stories, pp. 1-4, 21-25, 48-49</p> <p>Structures of Life Science Stories, pp. 18, 43</p> <p>Human Body Science Stories, pp. 28-29</p> <p>Food and Nutrition Science Stories, p. 20</p> <p>Measurement Science Stories, pp. 14-15</p> <p>Ideas and Inventions Science Stories, pp. 1-3</p> <p>Variables Science Stories, pp. 21-28</p> <p>Human Body Science Stories, pp. 17-18</p> <p>Magnetism and Electricity Science Stories, pp. 3-4, 12-13, 21-23</p> <p>Mixtures and Solutions Science Stories, pp. 33-35</p> <p>Human Body Investigation 4, Part 2, pp. 17-19 Science Stories, p. 26</p> <p>Human Body Science Stories, pp. 25-26</p> <p>Food and Nutrition</p>
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are essential to keep everything working well. As people grow up, the amounts and kinds of food and exercise needed by the body may change.

Tobacco, alcohol, other drugs, and certain poisons in the environment (pesticides, lead) can harm human beings and other living things.

If germs are able to get inside one's body, they may keep it from working properly. For defense against germs, the human body has tears, saliva, skin, some blood cells, and stomach secretions. A healthy body can fight most germs that do get inside. However, there are some germs that interfere with the body's defenses.

There are some diseases that human beings can catch only once. After they've recovered they don't get sick from them again. There are many diseases that can be prevented by vaccination, so that people don't catch them even once.

Different individuals handle their feelings differently, and sometimes they have different feelings in the same situation.

Often human beings don't understand why others act the way they do, and sometimes they don't understand their own behavior and feelings.

Physical health can affect people's emotional well-being
And vice—versa.

One way to respond to a strong feeling, either pleasant or unpleasant, is to think about what caused it and then consider whether to seek out or avoid similar situations.

Investigation 4, Part 1, pp. 8-15
Science Stories, pp. 1-4, 21-25
FOSS Web Activity: What's for Dinner

Environments

Science Stories, pp. 35-37

Mixtures and Solutions

Science Stories, pp. 2, 21-22

CONSTANCY AND CHANGE

Some feature of things may stay the same even when other features change. Some patterns look the same when they are shifted over, or turned, or reflected, or seen from different directions.

Things change in steady, repetitive, or irregular ways or sometimes in more than one way at a time. Often the best way to tell which kinds of change are happening is to make a table or graph of measurements.

SCALE

Almost anything has limits on how big or small it can be.

Finding out what the biggest and the smallest possible values of something are is often as revealing as knowing what the usual value is.

Variables

Investigation 1, Parts 2-3, pp. 16-27

Landforms

Investigation 1, Parts 1-3, pp. 8-24

Solar Energy

Investigation 2, Parts 1-2, pp. 8-24

Human Body

Investigation 3, Parts 1-3, pp. 8-21

Magnetism and Electricity

Investigation 3, Parts 1-2, pp. 10-21

Investigation 4, Parts 2-3, pp. 14-22

Ideas and Inventions

Investigation 4, Parts 2-3, pp. 14-21

Variables

Investigation 1, Parts 1-3, pp. 8-27

Landforms

Investigation 2, Parts 1-2, pp. 8-22

Magnetism and Electricity

Investigation 4, Part 2, pp. 14-18

Measurement

Investigation 4, Part 2, pp. 14-17

Variables

Investigation 1, Parts 2-3, pp. 16-27

Solar Energy

Investigation 2, Parts 1-2, pp. 8-24

Levers and Pulleys

Investigation 1, Parts 2-3, pp. 18-28

Structures of Life

Investigation 2, Part 3, pp. 18-22

Measurement

Investigation , Part 1, pp. 8-15

Human Body

Investigation 4, Part 3, pp. 20-24

Mixtures and Solutions

Investigation 2, Parts 1-3, pp. 8-25

Variables

Investigation 2, Parts 1-3, pp. 8-23

Environments

Investigation 3, Parts 1-3, pp. 8-22

Measurement

Science Stories, p. 21

Earth Materials

Investigation 2, Part 2, pp. 14-21

Science Stories, p. 30

Physics of Sound

Science Stories, pp. 11, 14

Environments

Investigation 3, Parts 1-3, pp. 8-22

	<p>Food and Nutrition Science Stories, pp. 34-36</p> <p>Mixtures and Solutions Science Stories, pp. 25-27</p>
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6-8 Benchmarks ~ The Nature of Science

NOTE: FOSS modules are inquiry-based and provide the opportunity to address the benchmarks. The fundamentals of scientific inquiry and the nature of science are embedded in all modules. Examples of activities for each benchmark are listed.

<i>BENCHMARK</i>	<i>FOSS</i>
<p>When similar investigations give different results, the scientific challenge is to judge whether the differences are trivial or significant, and it often takes further studies to decide. Even with similar results, scientists may wait until an investigation has been repeated many times before accepting the results as correct.</p>	<p>Variables Investigation 3, Part 2, pp. 14-19 Science Stories, pp. 3-5</p> <p>Models and Design Science Stories, pp. 6-8</p> <p>Diversity of Life Investigation 8, Part 2, pp. 244-252</p> <p>Force and Motion Investigation 2, Part 3, pp. 89-99</p> <p>Chemical Interactions Investigation 7, Part 2, pp. 210-214</p>
<p>Scientific knowledge is subject to modification as new information challenges prevailing theories and as a new theory leads to looking at old observations in a new way.</p>	<p>Variables Science Stories, pp. 4-5</p> <p>Models and Design Science Stories, pp. 6-9</p> <p>Mixtures and Solutions Science Stories, pp. 32-36</p> <p>Planetary Science Resources, pp. 59-62, 67-68</p> <p>Earth History Resources, pp. 61, 83-84</p> <p>Populations and Ecosystems Resources, pp. 46-55</p>
<p>Some scientific knowledge is very old and yet is still applicable today.</p>	<p>Food and Nutrition Science Stories, pp. 24-25</p> <p>Models and Designs Science Stories, pp. 6-9</p> <p>Mixtures and Solutions Science Stories, pp. 3-6, 32-36</p> <p>Planetary Science Resources, pp. 52-53</p> <p>Earth History Resources, pp. 83-84</p>
<p>Some matters cannot be examined usefully in a scientific way. Among them are matters that by their nature cannot be tested objectively and those that are essentially matters of morality. Science can sometimes be used to inform ethical decisions by identifying the likely consequences of particular actions but cannot be used to establish that some action is either moral or immoral.</p>	

Scientists differ greatly in what phenomena they study and how they go about their work. Although there is no fixed set of steps that all scientists follow, scientific investigations usually involve the collection of relevant evidence, the use of logical reasoning, and the application of imagination in devising hypotheses and explanations to make sense of the collected evidence.

If more than one variable changes at the same time in an experiment, the outcome of the experiment may not be clearly attributable to any one of the variables. It may not always be possible to prevent outside variables from influencing the outcome of an investigation (or even to identify all of the variables), but collaboration among investigators can often lead to research designs that are able to deal with such situations.

What people expect to observe often affects what they actually do observe. Strong beliefs about what should happen in particular circumstances can prevent them from detecting other results. Scientists know about this danger to objectivity and take steps to try and avoid it when designing investigations and examining data. One safeguard is to have different investigators conduct independent studies of the same questions.

Important contributions to the advancement of science, mathematics, and technology have been made by different kinds of people, in different cultures at different times.

Until recently, women and racial minorities, because of restrictions on their education and employment opportunities, were essentially left out of much of the formal work of the science establishment; the remarkable few who overcame those obstacles were even then likely to have their work disregarded by the science establishment.

Variables

Science Stories, pp. 1-5, 7, 34-37

Food and Nutrition

Science Stories, pp. 24-25, 34-36

Planetary Science

Resources, pp. 67-68, 71-73

Earth History

Resources, pp.64-67, 75

Force and Motion

Resources, pp. 50-51

Variables

Investigation 1, Parts 1-2, pp. 8-22

Investigation 3, Parts 1-3, pp. 8-23

Science Stories, pp. 34-37

Landforms

Investigation 3, Parts 1-3, pp. 8-24

Solar Energy

Investigation 3, Parts 1-2, pp. 8-23

Diversity of Life

Investigation 8, Part 2, pp. 244-252

Force and Motion

Investigation 2, Part 3, pp. 89-99

Variables

Science Stories, pp. 34-37

Models and Designs

Science Stories, pp. 6-7

Human Brain and Senses

Resources, pp. 52-53

CD, Games: Illusions

Planetary Science

Resources, pp. 59-62

Variables

Science Stories, pp. 4-6, 8-9, 12-14

Mixtures and Solutions

Science Stories, pp. 5, 9, 10, 34-36

Chemical Interactions

Resources, pp. 7-8

Planetary Science

Resources, pp. 52-53

Populations and Ecosystems

Resources, pp. 46-52

Mixtures and Solutions

Science Stories, pp. 29-31, 36

Solar Energy

Science Stories, p. 34

Variables

Science Stories, pp. 5-6

Chemical Interactions

Resources, pp. 7-8, 82

<p>No matter who does science and mathematics or invents things, or when or where they do it, the knowledge and technology that result can eventually become available to everyone in the world.</p> <p>Scientists are employed by colleges and universities, business and industry, hospitals, and many government agencies. Their places of work include offices, classrooms, laboratories, farms, factories, and natural field settings ranging from space to the ocean floor.</p> <p>In research involving human subjects, the ethics of science require that potential subjects be fully informed about the risks and benefits associated with the research and of their right to refuse to participate. Science ethics also demand that scientists must not knowingly subject coworkers, students, the neighborhood, or the community to health or property risks without their prior knowledge and consent. Because animals cannot make informed choices, special care must be taken in using them in scientific research.</p>	<p>Models and Design Science Stories, pp. 44-47</p> <p>Mixtures and Solutions Science Stories, pp. 43-45</p> <p>Solar Energy Science Stories, pp. 29-39</p> <p>Planetary Science Resources, pp. 52-53</p> <p>Earth History Resources, pp. 83-85</p> <p>Force and Motion Resources, pp. 50-52</p> <p>Landforms Science Stories, pp. 13-14 FOSS Web Careers</p> <p>Solar Energy Science Stories, pp. 34</p> <p>Planetary Science Resources, pp. 71-73</p> <p>Earth History Resources, pp. 98-99</p> <p>Chemical Interactions Resources, pp. 81-85</p>
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6-8 Benchmarks ~ The Physical Setting

<i>BENCHMARK</i>	<i>FOSS</i>
<p>The sun is a medium-sized star located near the edge of a disk-shaped galaxy of stars, part of which can be seen as a glowing band of light that spans the sky on a very clear night. The universe contains many billions of galaxies, and each galaxy contains many billions of stars. To the naked eye, even the closest of these galaxies is no more than a dim, fuzzy spot.</p> <p>The sun is many thousands of times closer to</p>	<p>Solar Energy CD, Notebooks, Sun Science Stories, pp. 1, 40</p> <p>Planetary Science Resources, pp. 84, 100</p> <p>Solar Energy</p>

the earth than any other star. Light from the sun takes a few minutes to reach the earth, but light from the nearest star takes a few years to arrive. The trip to that star would take the fastest rocket thousands of years. Some distant galaxies are so far away that their light takes several billion years to reach the earth. People on earth, therefore, see them as they were long ago in the past.

Nine planets of very different size, composition, and surface features move around the sun in nearly circular orbits. Some planets have great variety of moons and even flat rings of rock and ice particles orbiting around them. Some of these planets and moons show evidence of geologic activity. The earth is orbited by one moon, many artificial satellites, and debris.

Large numbers of chunks of rock orbit the sun. Some of those that the earth meets in its yearly orbit around the sun glow and disintegrate from friction as they plunge through the atmosphere-and sometimes impact the ground. Other chunks of rocks mixed with ice have long, off-center orbits that carry them close to the sun, where the sun's radiation (of light and particles) boils off frozen material from their surfaces and pushes it into a long, illuminated tail.

We live on a relatively small planet, the third from the sun in the only system of planets definitely known to exist (although other, similar systems may be discovered in the universe).

The earth is mostly rock. Three-fourths of its surface is covered by a relatively thin layer of water (some of it frozen) and the entire planet is surrounded by a relatively thin blanket of air. It is the only body in the solar system that appears able to support life. The other planets have compositions and conditions very different from the earth's.

Everything on or anywhere near the earth is pulled toward the earth's center by gravitational force.

Science Stories, p. 1
Planetary Science
CD, Notebook: Sun

Models and Design
Science Stories, pp. 7, 9
Solar Energy
Science Stories, pp. 40-43
Planetary Science
Investigation 10, Part 2, pp. 318-322
Resources, pp. 63-65, 84-89
CD Notebook: Solar System

Solar Energy
Science Stories, p. 43
Planetary Science
Resources, pp. 87-89, 101-103

Models and Design
Science Stories, pp. 7, 9
Solar Energy
Science Stories, p. 42
Planetary Science
Investigation 10, Part 2, pp. 318-322
Resources, p. 86
CD, Notebook: Earth

Solar Energy
Science Stories, p. 42
Planetary Science
Investigation 1, Part 3, pp. 49-52
Resources, p. 86
CD, Notebook: Earth
Weather and Water
Resources, pp. 8-11

Models and Design
Science Stories, p. 10, 40-41
Solar Energy
Science Stories, pp. 43-44
Planetary Science
Resources, pp. 69-70, 84

<p>Because the earth turns daily on an axis that is tilted relative to the plane of the earth's yearly orbit around the sun, sunlight falls more intensely on different parts of the earth during the year. The difference in heating of the earth's surface produces the planet's seasons and weather patterns.</p> <p>The moon's orbit around the earth once in about 28 days changes what part of the moon is lighted by the sun and how much of that part can be seen from the earth-the phases of the moon.</p> <p>Climates have sometimes changed abruptly in the past as a result of changes in the earth's crust, such as volcanic eruptions or impacts of huge rocks from space. Even relatively small changes in atmospheric or ocean content can have widespread effects on climate if the change lasts long enough.</p> <p>The cycling of water in and out of the atmosphere plays an important role in determining climatic patterns. Water evaporates from the surface of the earth, rises and cools, condenses into rain or snow, and falls again to the surface. The water falling on land collects in rivers and lakes, soil, and porous layers of rock, and much of it flows back into the ocean.</p> <p>Fresh water, limited in supply, is essential for life and also for most industrial processes. Rivers, lakes, and groundwater can be depleted or polluted, becoming unavailable or unsuitable for life.</p> <p>Heat energy carried by ocean currents has a strong influence on climate around the world.</p> <p>Some minerals are very rare and some exist in great quantities, but-for practical purposes-the ability to recover them is just as important as their abundance. As minerals are depleted, obtaining them becomes more difficult. Recycling and the development of substitutes can reduce the rate of depletion but may also be costly.</p> <p>The benefits of the earth's resources-such as fresh water, air, soil, and trees-can be</p>	<p>Force and Motion Investigation 7, Part1, pp. 256-261 Resources, pp. 67-69</p> <p>Solar Energy Science Stories, p. 2</p> <p>Weather and Water Investigation 3, Parts 2-3, pp. 97-102 Resources, pp. 17-19 CD, Cycles: Seasons</p> <p>Planetary Science Investigation 4, Part 1, pp. 120-125 Investigation 9, Parts 1-4, pp. 283-301 Resources, p. 32 CD, Lunar Calendar</p> <p>Planetary Science Resources, pp. 67-68</p> <p>Solar Energy Science Stories, pp. 2, 23-2</p> <p>Weather and Water Investigation 7, Parts 1-2, pp. 232-243 CD, Cycles: Water Cycle</p> <p>Landforms Science Stories, pp. 13-14, 18-21</p> <p>Weather and Water Resources, p.45-47</p> <p>Solar Energy Science Stories, pp. 23-24</p> <p>Landforms Science Stories, pp. 43-44</p>
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reduced by using them wastefully or by deliberately or inadvertently destroying them. The atmosphere and the ocean have limited capacity to absorb wastes and recycle materials naturally. Cleaning up polluted air, water, or soil or restoring depleted soil, forests, or fishing grounds can be very difficult.

The interior of the earth is hot. Heat flow and movement of material within the earth cause earthquakes and volcanic eruptions and create mountains and ocean basins. Gas and dust from large volcanoes can change the atmosphere.

Some changes in the earth's surface are abrupt (such as earthquakes and volcanic eruptions) while other changes happen very slowly (such as uplift and wearing down of mountains). The earth's surface is shaped in part by the motions of water and wind over very long times, which act to level mountain ranges.

Sediments of sand and smaller particles (sometimes containing the remains of organisms) are gradually buried and are cemented together by dissolved minerals to form solid rock again.

Sedimentary rock buried deep enough may be reformed by pressure and heat, perhaps melting and recrystallizing into different kinds of rock. These re-formed rock layers may be forced up again to become land surfaces and even mountains. Subsequently, this new rock too will erode. Rock bears evidence of the minerals, temperatures, and forces that created it.

Thousands of layers of sedimentary rock confirm the long history of the changing surface of the earth and the changing life forms whose remains are found in successive layers. The youngest layers are not always found on top, because of folding, breaking, and uplift of layers.

Although weathered rock is the basic component of soil, the composition and texture of soil and its fertility and resistance to erosion are greatly influenced by plant roots and debris, bacteria, fungi, worms, insects,

Mixtures and Solutions

Science Stories, pp. 21-22

Earth History

Resources, pp. 57, 64-67

Weather and Water

Investigation 9, Part 4, pp. 315-318

Resources, pp. 63-66

Landforms

Science Stories, pp. 23-25

Earth History

Resources, pp. 100-103

CD Earth Processes: Volcanoes

Landforms

Investigation 2, Parts 1-2, pp. 8-22

Investigation 3, Parts 1-2, pp. 8-19

Science Stories, pp. 15-17, 22-29

Earth History

Investigation 3, Part 4, pp. 108-111

Investigation 4, Parts 3-4, pp. 138-149

Resources, pp. 102-103

CD, Earth Processes

Earth History

Investigation 4, Parts 5-6, pp. 150-162

Investigation 5, Parts 1, 3, pp. 175-178, 183-187

Resources, pp. 70-71, 94

CD Geology Lab

Earth History

Investigation 8, Parts 1-2, pp. 254-265

Resources, pp. 95-97

CD, Geology Lab

Models and Design

Science Stories, pp. 11-16

Earth History

Investigation 6, Parts 3-4, pp. 215-224

Investigation 7, Parts 1-2, pp. 234-243

Resources, pp. 73-79

CD, Time Room

Earth History

Investigation 4, Part 1, pp. 127-131

rodents, and other organisms.

Human activities, such as reducing the amount of forest cover, increasing the amount and variety of chemicals released into the atmosphere, and intensive farming, have changed the earth's land, oceans, and atmosphere. Some of these changes have decreased the capacity of the environment to support some life forms.

All matter is made up of atoms, which are far too small to be seen directly through a microscope. The atoms of any element are alike but different from atoms of other elements. Atoms may stick together in well-defined molecules or may be packed together in large arrays. Different arrangements of atoms into groups compose all substances.

Equal volumes of different substances usually have different weights.

Atoms and molecules are perpetually in motion. Increased temperature means greater average energy of motion, so most substances expand when heated. In solids, the atoms are closely locked in position and can only vibrate. In liquids, the atoms or molecules have higher energy, are more loosely connected, and can slide past one another; some molecules may get enough energy to escape into a gas. In gases, the atoms or molecules have still more energy and are free of one another except during occasional collisions.

The temperature and acidity of a solution influence reaction rates. Many substances dissolve in water, which may greatly facilitate reactions between them.

Scientific ideas about elements were borrowed from some Greek philosopher of 2,000 years earlier, who believed that everything was made from four basic substances: air, earth, fire, and water. It was the combination of these "elements" in different proportions that gave other

Landforms

Science Stories, pp. 13-14, 35-37, 39-40

Earth History

Resources, pp. 64-67

Populations and Ecosystems

Investigation 7, pp. 210-215

Resources, pp. 31-40

Weather and Water

Investigation 9, Part 4, pp. 315-318

Resources, pp. 63-66

Mixtures and Solutions

Science Stories, pp. 3-6, 25-28

Chemical Interactions

Investigation 9, Part 1, pp. 280-287

Resources, pp. 14-15, 64-67

Video: Atoms and Molecules

Variables

Science Stories, pp. 10-11

Weather and Water

Investigation 5, Part 1, pp. 152-162

Resources, pp. 27-31

Planetary Science

Investigation 8, Parts 3-4, pp. 260-270

Chemical Interactions

Investigation 4, Parts 1-3, pp. 122-141

Resources, pp. 18-37

CD, Particles in Solids, Liquids, and Gases

Weather and Water

Investigation 4, Part 2, pp. 131-139

Resources, pp. 22-26

CD, Matter and Energy: Molecules in Solids, Liquids, and Gases.

Mixtures and Solutions

Science Stories, p. 24

Mixtures and Solutions

Science Stories, pp. 3-6, 32-42

Chemical Interactions

Investigation 2, Parts 1-2, pp. 70-80

Resources, pp. 3-13

substances their observable properties. The Greeks were wrong about those four, but now over 100 different elements have been identified, some rare and some plentiful, out of which everything is made. Because most elements tend to combine with others, few elements are found in their pure form.

There are groups of elements that have similar properties, including highly reactive metals, less-reactive metals, highly reactive nonmetals (such as chlorine, fluorine, and oxygen), and some almost completely nonreactive gases (such as helium and neon). An especially important kind of reaction between substances involves combination of oxygen with something else—as in burning or rusting. Some elements don't fit into any of the categories; among them are carbon and hydrogen, essential elements of living matter.

No matter how substances within a closed system interact with one another, or how they combine or break apart, the total weight of the system remains the same. The idea of atoms explains the conservation of matter. If the number of atoms stays the same no matter how they are rearranged, then their total mass stays the same.

Energy cannot be created or destroyed, but only changed from one form into another.

Most of what goes on in the universe—from exploding stars and biological growth to the operation of machines and the motion of people—involves some form of energy being transformed into another. Energy in the form of heat is almost always one of the products of an energy transformation.

Mixtures and Solutions

Science Stories, pp. 3, 37-42

Chemical Interactions

Investigation 10, Part 2, pp. 330-336

Resources, pp. 4-6

CD, Periodic Table

Mixtures and Solutions

Investigation 1, Part 2, pp. 16-20

Chemical Interactions

Investigation 9, Part 2, pp. 288-297

Resources, pp. 63-67, 71

Solar Energy

Science Stories, pp. 1-3, 29-31, 38-39

FOSS Web, Activity: Solar Road Race

Variables

Investigation 3, Parts 1-2, pp. 8-19

Food and Nutrition

Science Stories, p. 43

Electronics

Investigation 1, Parts 1-3, pp. 55-70

Resources, pp. 1-2, 12-13

CD, Workbench

Force and Motion

Investigation 1, Part 1, pp. 47-56

Solar Energy

Science Stories, pp. 1-3, 29-31, 35-37

Variables

Investigation 3, Part 1, pp. 8-19

Electronics

Investigation 1, Parts 1-3, pp. 55-70

Resources, pp. 1-2

Force and Motion

Investigation 1, Part 1, pp. 47-56

Populations and Ecosystems

Resources, pp. 14-15

Heat can be transferred through materials by the collisions of atoms or across space by radiation. If the material is fluid, currents will be set up in it that will aid the transfer of heat.

Energy appears in different forms. Heat energy is in the disorderly motion of molecules; chemical energy is in the arrangement of atoms; mechanical energy is in moving bodies or in elastically distorted shapes; gravitational energy is in the separation of mutually attracting masses.

Light from the sun is made up of a mixture of many different colors of light, even though to the eye the light looks almost white. Other things that give off or reflect light have a different mix of colors.

Something can be “seen” when light waves emitted or reflected by it enter the eye—just as something can be “heard” when sound waves from it enter the ear.

An unbalanced force acting on an object changes its speed or direction of motion, or both. If the force acts toward a single center, the object’s path may curve into orbit around the center.

Solar Energy

Investigation 2, Part 2, pp. 16-24
Investigation 3, Parts 1-2, pp. 8-23
Science Stories, pp. 1-3, 29-31, 35-37

Weather and Water

Investigation 4, Part 2, pp. 131-139
Investigation 5, Parts 2-3, pp. 163-174
Resources, pp. 22-26

CD, Conduction Through Metals

Chemical Interactions

Investigation 5, Part 2, pp. 159-164
Resources, pp. 24-27, 32-36
CD, Energy Transfer by Collision

Models and Design

Investigation 2, Parts 1-2, pp. 8-21
Science Stories, pp. 25-26, 37-43

Variables

Investigation 3, Parts 1-3, pp. 8-23

Solar Energy

Investigation 2, Part 1, pp. 8-15
Science Stories, pp. 1-3, 29-31, 35-37

Electronics

Investigation 1, Parts 1-3, pp. 55-70
Resources, pp. 12-13

Force and Motion

Investigation 1, Part 1, pp. 47-56

Chemical Interactions

Investigation 4, Parts 1-3, pp. 122-141
Resources, pp. 38-41

Weather and Water

Investigation 4, Parts 1-2, pp. 121-139
Resources, pp. 22-26

CD, Matter and Energy: Heat and Energy

Variables

Science Stories, pp. 4-5

Solar Energy

Science Stories, p. 4

Human Brain and Senses

Investigation 2, Parts 1-3, pp. 67-83
Investigation 3, Part 3, pp. 106-110
Resources, pp. 36-37, 65
CD, Cow Eye Dissection

Levers and Pulleys

Investigation 3, Parts 1-2, pp. 8-20
Science Stories, pp. 2-3, 7-9, 12-13, 16-17

Variables

Investigation 3, Parts 1-3, pp. 8-23

Models and Design

Investigation 4, Parts 1-2, pp. 8-20

Force and Motion

<p>Vibrations in materials set up wavelike disturbances that spread away from the source. Sound and earthquake waves are examples. These and other waves move at different speeds in different materials.</p> <p>Human eyes respond to only a narrow range of wavelengths of electromagnetic radiation—visible light. Differences of wavelength within that range are perceived as differences in color.</p> <p>Every object exerts gravitational force on every other object. The force depends on how much mass the objects have and on how far apart they are. The force is hard to detect unless at least one of the objects has a lot of mass.</p> <p>The sun’s gravitational pull holds the earth and other planets in their orbits; just as the planets’ gravitational pull keeps their moons in orbit around them.</p> <p>Electric currents and magnets can exert a force on each other.</p>	<p>Investigation 1, Part 1, pp. 47-56 Investigation 2, Part 3, pp. 89-99 Investigation 6, Parts 1-4, pp. 218-245 Investigation 8, Part 1, pp. 284-293 Resources, pp. 50-51, 70-74</p> <p>Planetary Science Resources, p. 99 Human Brain and Senses CD, How the Ear Works</p> <p>Human Brain and Senses Investigation 4, Part 2, pp. 129-135</p> <p>Models and Design Science Stories, p. 10, 40-41 Force and Motion Investigation 7, Parts 1-3, pp. 256-272 Resources, pp. 62-66</p> <p>Solar Energy Science Stories, pp. 43-44 Planetary Science Resources, pp. 69-70, 84-85, 97-100 Force and Motion Resources, pp. 67-69</p> <p>Models and Design Investigation 2, Parts 1-3, pp. 8-24 Science Stories, pp. 41-42</p>
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6-8 Benchmarks ~ The Living Environment

<i>BENCHMARK</i>	<i>FOSS</i>
<p>One of the most general distinctions among organisms is between plants, which use sunlight to make their own food, and animals, which consume energy-rich foods. Some kinds of organisms, many of them microscopic, cannot be neatly classified as either plants or animals.</p> <p>Animals and plants have a great variety of</p>	<p>Environments Science Stories, pp. 39-41 Solar Energy Science Stories, pp. 1-2 Diversity of Life Investigation 10, Part 1, pp. 302-310 Resources, p. 36-37, 65-70 Populations and Ecosystems Investigation 5, Part 2, pp. 151-155 Resources, pp. 14-15</p> <p>Environments</p>

<p>body plans and internal structures that contribute to their being able to make or find food.</p> <p>Similarities among organisms are found in internal anatomical features, which can be used to infer the degree of relatedness among organisms. In classifying organisms, biologists consider details of internal and external structures to be more important than behavior or general appearance.</p> <p>For sexually reproducing organisms, a species comprises all organisms that can mate with one another to produce fertile offspring.</p> <p>All organisms, including the human species, are part of and depend on two main interconnected global food webs, One includes microscopic ocean plants, the animals that feed on them, and finally the animals that feed on those animals. The other web includes land plants, the animals that feed on them, and so forth. The cycles continue indefinitely because organisms decompose after death to return food material to the environment.</p> <p>In some kinds of organisms, all the genes come from a single parent, whereas in organisms that have sexes, typically half of the genes come from each parent.</p> <p>In sexual reproduction, a single specialized cell from a female merges with a specialized cell from a male. As the fertilized egg, carrying genetic information from each parent, multiplies to form the complete organism with about a trillion cells, the same genetic information is copied in each cell.</p> <p>New varieties of cultivated plants and domestic animals have resulted from selective breeding for particular traits.</p> <p>All living things are composed of cells, from</p>	<p>Investigation 2, Part 2, pp. 11-21 Investigation 5, Part 2, pp. 14-18 Science Stories, pp. 1-8, 16-18 Diversity of Life Investigation 2, Part 3, pp. 85-91 Investigation 3, Parts 1-3, pp. 102-122 Investigation 8, Part 1, pp. 239-243 Investigation 9, Part 1, pp. 273-277 Resources, pp. 51-59 FOSS Web, Database</p> <p>Environments Science Stories, pp. 18-20 Diversity of Life Investigation 9, Part 1, pp. 273-277 Resources, pp. 55-59, 65-70</p> <p>Populations and Ecosystems Resources, p. 5</p> <p>Environments Science Stories, pp. 38-41 Populations and Ecosystems Investigation 4, Part 2, pp. 122-129 Resources, pp. 19-20</p> <p>Diversity of Life Investigation 9, Parts 3-4, pp. 274-291 Resources, pp. 26, 43-44 Populations and Ecosystems Resources, pp. 53-54</p> <p>Diversity of Life Investigation 7, Part 1, pp. 218-223 Resources, pp. 40-44 Populations and Ecosystems Investigation 9, Part 3, pp. 274-296 Resources, pp. 50-55</p> <p>Environments Science Stories, pp. 47-48 Populations and Ecosystems Resources, pp. 58-59</p> <p>Food and Nutrition</p>
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<p>just one to millions, whose details usually are visible only through a microscope. Different body tissues and organs are made up of different kinds of cells. The cells in similar tissues and organs in other animals are similar to those in human beings but different somewhat from cells found in plants.</p> <p>Cells continually divide to make more cells for growth and repair. Various organs and tissues function to serve the needs of cells for food, air, and waste removal.</p> <p>Within cells, many of the basic functions of organisms—such as extracting energy from food and getting rid of waste—are carried out. The way in which cells function is similar in all living organisms.</p> <p>About two thirds of the weight of the cells is accounted for by water, which gives cells many of their properties.</p> <p>In all environments—freshwater, marine, forest, desert, grassland, mountains, and others—organisms with similar needs may compete with one another for resources, including food, space, water, air, and shelter. In any particular environment, the growth and survival of organisms depend on the physical conditions.</p> <p>Two types of organisms may interact with one another in several ways. They may be in a producer/consumer, predator/ prey, or parasite/host relationship. Or one organism may scavenge or decompose another. Relationships may be competitive or mutually beneficial. Some species have become so adapted to each other that neither could survive without the other.</p> <p>Food provides molecules that serve as fuel and building material for all organisms. Plants use the energy from light to make sugars from carbon dioxide and water. This food can be used immediately or stored for later use. Organisms that eat plants break down the</p>	<p>Science Stories, pp. 41-42, 44-50 Diversity of Life Investigation 3, Parts 1-3, pp. 102-122 Investigation 4, Parts 1-2, pp. 133-141 Resources, pp. 24-30, 65-68 CD, Cells and the Ribbon of Life</p> <p>FOSS provides the opportunity to address this benchmark. See below: Food and Nutrition Science Stories, pp. 44-50 Diversity of Life Investigation 4, Part 2, pp. 137-141 Resources, pp. 27-30 Populations and Ecosystems Resources, pp. 53-54</p> <p>Food and Nutrition Science Stories, pp. 41-42 Diversity of Life Investigation 4, Parts 1-2, pp. 133-141 Resources, pp. 24-30</p> <p>FOSS provides the opportunity to address this benchmark. See below: Diversity of Life Resources, pp. 29-30</p> <p>Environments Investigation 3, Parts 1-3, pp. 8-27 Investigation 6, Parts 1-2, pp. 8-16 Science Stories, pp. 9-17, 43-45 FOSS Web, Activity: Virtual Aquarium Populations and Ecosystems Investigation 3, Part 3, pp. 103-107 Investigation 4, Parts 1-2, pp. 119-129 Investigation 6, Parts 2-3, pp. 187-197 Resources, pp. 22-29</p> <p>Environments Science Stories, pp. 6, 19, 27-28, 40-41, 53-55 Diversity of Life Investigation 7, Part 2, pp. 224-227 Resources, pp. 42, 46, 52 Populations and Ecosystems Investigation 4, Part 2, pp. 122-129 Resources, pp. 17-21, 25-29</p> <p>Environments Science Stories, pp. 27-28, 38-41 Food and Nutrition Science Stories, p. 43 Populations and Ecosystems Investigation 4, Part 2, pp. 122-129</p>
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<p>plant structures to produce the materials and energy they need to survive. Then they are consumed by other organisms.</p> <p>Over a long time, matter is transferred from one organism to another repeatedly and between organisms and their physical environment. As in all materials systems, the total amount of matter remains constant, even though its form and location change.</p> <p>Energy can change from one form to another in living things. Animals get energy from oxidizing their food, releasing some of its energy as heat. Almost all food energy comes originally from sunlight.</p> <p>Small differences between parents and offspring can accumulate (through selective breeding) in successive generations so that descendants are very different from their ancestors.</p> <p>Individual organisms with certain traits are more likely than others to survive and have offspring. Changes in environmental conditions can affect the survival of individuals organisms and entire species.</p> <p>Many thousands of layers of sedimentary rock provide evidence for the long history of the earth and for the long history of changing life forms whose remains are found in the rocks. More recently deposited rock layers are more likely to contain fossils resembling existing species.</p>	<p>Investigation 5, Parts 1-4, pp. 142-169 Resources, pp. 14-21 CD, Mono Lake Food Web Diversity of Life Resources, pp. 36-37</p> <p>Environments Science Stories, pp.38-41 Populations and Ecosystems Investigation 4, Part 2, pp. 122-129 Resources, pp. 17-21</p> <p>Environments Science Stories, pp. 28, 39-41 Populations and Ecosystems Investigation 5, Parts 1-4, pp. 142-169 Resources, pp. 14-16, 19-21 Diversity of Life Resources, pp. 36-37</p> <p>Environments Science Stories, pp. 47-48 Populations and Ecosystems Investigation 10, Parts 1-3, pp. 302-317 Resources, pp. 58-61</p> <p>Environments Investigation 5, Part 2, pp. 14-17 Science Stories, pp. 11-17 Diversity of Life Investigation 7, Part 2, pp. 224-229 Resources, pp. 46-50 Populations and Ecosystems Investigation 8, Parts 1-2, pp. 228-243 Investigation 10, Parts 1-3, pp. 302-317 Resources, pp. 58-61 Video: Voyage to the Galapagos</p> <p>Models and Designs Science Stories, pp. 11-16 Earth History Investigation 6, Part 3, pp. 215-219 Investigation 7, Parts 1-2, pp. 234-243 Resources, pp. 73-79, 83-86</p>
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6-8 Benchmarks ~ The Human Organism

NOTE: Many of the benchmarks in this section are typically found in a health program. Examples from FOSS are listed.

<i>BENCHMARK</i>	<i>FOSS</i>
<p>Like other animals, human beings have body systems for obtaining and providing energy, defense, reproduction, and the coordination of body functions.</p> <p>Human beings have many similarities and differences. The similarities make it possible for human beings to reproduce and to donate blood and organs to one another throughout the world. Their differences enable them to create diverse social and cultural arrangements and to solve problems in a variety of ways.</p> <p>Artifacts and preserved remains provide some evidence of the physical characteristics and possible behavior of human beings who lived a very long time ago.</p> <p>Fertilization occurs when sperm cells from a male’s testes are deposited near an egg cell from the female’s ovary, and one of the sperm cells enters the egg cell. Most of the time, by chance or design, a sperm never arrives or an egg isn’t available.</p> <p>Contraception measures may incapacitate sperm, block their way to the egg, prevent the release of eggs, or prevent the fertilized egg from implanting successfully.</p> <p>Following fertilization, cell divisions produce a small cluster of cells that then differentiate by appearance and function to form the basic tissues of an embryo. During the first three months of pregnancy, organs begin to form. During the second three months, all organs and body features develop. During the last three months, the organs and features mature enough to function well after birth. Patterns of human development are similar to those of other vertebrates.</p> <p>The developing embryo—and later the newborn infant—encounters many risks from faults in its genes, its mother’s inadequate diet, her cigarette smoking or use of alcohol or</p>	<p>Food and Nutrition Science Stories, pp. 6-9, 44-50</p> <p>Human Brain and Senses Resources, pp. 59-74 CD Brain and Senses</p> <p>Food and Nutrition Science Stories, pp. 6-9, 44-50</p> <p>Human Brain and Senses Resources, pp. 29-30, 36-38, 63-74</p> <p>Populations and Ecosystems Resources, pp. 53-54</p>

other drugs, or from infection. Inadequate child care may lead to lower physical and mental ability.

Various body changes occur as adults age. Muscles and joints become less flexible, bones and muscles loss mass, energy levels diminish, and senses become less acute. Women stop releasing eggs and hence can no longer reproduce. The length and quality of human life are influenced by many factors, including sanitation, diet, medical care, sex, genes, environmental conditions, and personal health behaviors.

Organs and organ systems are composed of cells and help to provide all cells with basic needs.

For the body to use food for energy and building materials, the food must first be digested into molecules that are absorbed and transported to cells.

To burn food for the release of energy stored in it, oxygen must be supplied to cells, and carbon dioxide removed. Lungs take in oxygen for the combustion of food and they eliminate the carbon dioxide produced. The urinary system disposes of dissolved waste molecules, the intestinal tract removes solid wastes, and the skin and lungs rid the body of heat energy. The circulatory system moves all these substances to or from cells where they are needed or produced, responding to changing demands.

Specialized cells and the molecules they produce identify and destroy microbes that get inside the body.

Hormones are chemicals from glands that affect other body parts. They are involved in helping the body respond to danger and in regulating human growth, development, and reproduction.

Interactions among the senses, nerves, and brain make possible the learning that enables human beings to cope with changes in their environment.

Food and Nutrition

Science Stories, pp. 44-50

Human Brain and Senses

Investigation 8, Parts 1 and 2, pp. 240-252

Resources, pp. 63-74

Food and Nutrition

Science Stories, pp. 6-9, 44-50

Food and Nutrition

Science Stories, pp. 6-9, 44-50

Food and Nutrition

Science Stories, pp. 16-19

Food and Nutrition

Science Stories, p. 20

Human Brain and Senses

Investigation 8 Parts 1-2, pp. 240-252

Investigation 9, Part 1, pp. 26-269

Resources, pp. 55-78

CD, Brain and Senses

Some animal species are limited to a repertoire of genetically determined behaviors; others have more complex brains and can learn a wide variety of behaviors. All behavior is affected by both inheritance and experience.

The level of skill a person can reach in any particular activity depends on innate abilities, the amount of practice, and the use of appropriate learning technologies.

Human beings can detect a tremendous range of visual and olfactory stimuli. The strongest stimulus they can tolerate may be more than a trillion times as intense as the weakest they can detect. Still, there are many kinds of signals in the world that people cannot detect directly.

Attending closely to any one input of information usually reduces the ability to attend to others at the same time.

Learning often results from two perceptions or actions occurring at about the same time. The more often the same combination occurs, the stronger the mental connection between them is likely to be. Occasionally a single vivid experience will connect two things permanently in people's minds.

Language and tools enable human beings to learn complicated and varied things from others.

The amount of food energy (calories) a person requires varies with body weight, age, sex, activity level, and natural body efficiency. Regular exercise is important to maintain a healthy heart/lung system, good muscle tone, and bone strength.

Toxic substances, some dietary habits, and some personal behavior may be bad for one's health. Some effects show up right away, others may not show up for years. Avoiding toxic substances, such as tobacco, and

Environments

Investigation 2, Part 2-3, pp. 16-25
Science Stories, pp. 3-4, 15

Variables

Science Stories, pp. 5-6
Human Brain and Senses
Investigation 1, Part 3, pp. 48-54
Investigation 8, Part 1, pp. 240-245
Resources, pp. 25-26

Food and Nutrition

Science Stories, pp. 27-29

Environments

Science Stories, pp. 23-26

Variables

Science Stories, pp. 34-37

Human Brain and Senses

Resources, pp. 25-26

Food and Nutrition

Science Stories, pp. 2-4, 27-33

Solar Energy

Science Stories, pp. 12-15

Food and Nutrition

Science Stories, pp. 1-4, 24-25, 34-36

Human Brain and Senses

<p>changing dietary habits to reduce the intake of such things as animal fat increases the chances of living longer.</p> <p>Viruses, bacteria, fungi, and parasites may infect the human body and interfere with normal body functions. A person can catch a cold many times because there are many varieties of cold viruses that cause similar symptoms.</p> <p>White blood cells engulf invaders or produce antibodies that attack them or mark them for killing by other white cells. The antibodies produced will remain and can fight off subsequent invaders of the same kind.</p> <p>The environment may contain dangerous levels of substances that are harmful to human beings. Therefore, the good health of individuals requires monitoring the soil, air, and water and taking steps to keep them safe.</p> <p>Individuals differ greatly in their ability to cope with stressful situations. Both external and internal conditions (chemistry, personal history, values) influence how people behave.</p> <p>Often people react to mental distress by denying that they have any problem. Sometimes they don't know why they feel the way they do, but with help they can sometimes uncover the reasons.</p>	<p>Resources, p. 66</p> <p>Diversity of Life Resources, pp. 65-69</p> <p>Environments Science Stories, pp. 36-37 Mixtures and Solutions Science Stories, pp. 21-22</p> <p>Human Brain and Senses Resources, pp. 25-27</p>
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6-8 Benchmarks ~ Common Themes

The common themes are interwoven throughout the FOSS Modules. Some examples of modules that address the themes are listed.

<i>THEME</i>	<i>FOSS</i>
<p>SYSTEMS</p> <p>A system can include processes as well as things.</p>	<p>Landforms Investigation 2, Parts 1-2, pp. 8-22 Variables Investigation 3, Parts 1-3, pp. 8-23 Models and Designs</p>

Thinking about things as systems means looking for how every part relates to others. The output from one part of a system (which can include material, energy, or information) can become the input to other parts. Such feedback can serve to control what goes on in the system as a whole.

Any system is usually connected to other systems, both internally and externally. Thus a system may be thought of as containing subsystems and as being a subsystem of a larger system.

MODELS

Models are often used to think about processes that happen too slowly, too quickly, or on too small a scale to observe directly, or that are too vast to be changed deliberately, or that are potentially dangerous.

Investigation 2, Parts 1-3, pp. 8-24
Science Stories, pp. 37-43

Human Brain and Senses

Investigation 2, Parts 2-3, pp. 73-83
Resources, pp. 63-74

Electronics

Investigation 1, Parts 1-4, pp. 55-75

Force and Motion

Investigation 1, Part 1, pp. 47-56

Landforms

Investigation 2, Parts 1-2, pp. 8-22

Variables

Investigation 3, Parts 1-3, pp. 8-23

Models and Designs

Investigation 2, Parts 1-3, pp. 8-24
Science Stories, pp. 37-43

Human Brain and Senses

Investigation 2, Parts 2-3, pp. 73-83
Resources, pp. 63-74

Electronics

Investigation 1, Parts 1-4, pp. 55-75

Force and Motion

Investigation 1, Part 1, pp. 47-56

Food and Nutrition

Science Stories, pp. 6-8, 44-50

Models and Designs

Investigation 2, Parts 1-3, pp. 8-24

Levers and Pulleys

Investigation 3, Parts 1-2, pp. 8-20

Human Brain and Senses

Investigation 2, Parts 2-3, pp. 73-83
Resources, pp. 63-74

Electronics

Investigation 1, Parts 1-4, pp. 55-75
Resources, pp. 1-2

Force and Motion

Investigation 1, Part 1, pp. 47-56
Resources, pp. 41-49

Environments

FOSS Web, Activity: Virtual Aquarium

Landforms

Investigation 1, Parts 1-3, pp. 8-24
Investigation 2, Parts 1-2, pp. 8-22

Models and Designs

Investigation 2, Parts 1-3, pp. 8-24
Investigation 3, Parts 1-2, pp. 8-19

Earth History

Investigation 6, Part 3, pp. 215-219

Weather and Water

Investigation 3, Part 2, pp. 97-102

Planetary Science

<p>Mathematical models can be displayed on a computer and then modified to see what happens.</p> <p>Different models can be used to represent the same thing. What kind of model to use and how complex it should be depends on its purpose. The usefulness of a model may be limited if it is too simple or if it is needlessly complicated. Choosing a useful model is one of the instances in which intuition and creativity come into play in science, mathematics, and engineering.</p> <p>CONSTANCY AND CHANGE</p> <p>Physical and biological systems tend to change until they become stable and then remain that way unless their surroundings change.</p> <p>A system may stay the same because nothing is happening or because things are happening but exactly counterbalance one another.</p> <p>Many systems contain feedback mechanisms that serve to keep changes within specified limits.</p>	<p>Investigation 5, Parts 2-3, pp. 158-167</p> <p>FOSS provides the opportunity to address this benchmark. See below:</p> <p>Variables Investigation 1, Parts 2-3, pp. 16-27</p> <p>Force and Motion Investigation 5, Parts 2-3, pp. 177-193 Investigation 8, Part 1, pp. 284-293</p> <p>Variables Investigation 3, Parts 1-3, pp. 8-23</p> <p>Landforms Investigation 1, Parts 1-3, pp. 8-24 Investigation 4, Parts 1-3, pp. 8-24</p> <p>Models and Designs Investigation 4, Parts 1-2, pp. 6-15</p> <p>Human Brain and Senses Investigation 3, Part 3, pp. 106-110</p> <p>Weather and Water Investigation 3, Part 2, pp. 97-102</p> <p>Planetary Science Investigation 9, Part 2, , pp. 288-292</p> <p>Mixtures and Solutions Investigation 4, Part 3, pp. 20-24</p> <p>Variables Investigation 1, Parts 1-2, pp. 8-22</p> <p>Levers and Pulleys Investigation 2, Parts 1-2, pp. 8-22</p> <p>Chemical Interactions Investigation 5, Part 1, pp. 153-158 Investigation 6, pp. 178-187</p> <p>Weather and Water Investigation 4, Part 2, pp. 131-137</p> <p>Populations and Ecosystems Investigation 3, Part 3, pp. 103-107</p> <p>Levers and Pulleys Investigation 1, Parts 2-3, pp. 18-28</p> <p>Environments Investigation 4, Part 2, pp. 13-18</p> <p>Electronics Investigation 1, Part 4, pp. 71-75</p> <p>Force and Motion Investigation 6, Part 1, pp. 218-228</p> <p>Human Brain and Senses Investigation 3, Part 3, pp. 106-110</p> <p>Human Brain and Senses Investigation 3, Part 3, pp. 106-110 Investigation 8, Parts 1-2, pp. 240-252</p> <p>Electronics Investigation 9, Part 2, pp. 290-297</p>
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Symbolic equations can be used to summarize how the quantity of something changes over time or in response to other changes.

Symmetry (or the lack of it) may determine properties on many objects, from molecules and crystals to organisms and designed structures.

Cycles, such as the seasons or body temperature, can be described by their cycle length or frequency, what their highest and lowest values are, and when these values occur. Different cycles range from many thousands of years down to less than a billionth of a second.

SCALE

Properties of systems that depend on volume, such as capacity and weight, change out of proportion to properties that depend on area, such as strength or surface processes.

As the complexity of any system increases, gaining an understanding of it depends increasingly on summaries, such as averages and ranges, and on descriptions of typical examples of the system.

Levers and Pulleys

Investigation 1, Parts 2-3, pp. 18-28

Investigation 3, Parts 1-2, pp. 8-20

Electronics

Investigation 8, Part 4, pp. 265-271

Force and Motion

Investigation 2, Part 3, pp. 73-83

Mixtures and Solutions

Investigation 2, Part 4, pp. 26-28

Environments

Science Stories, p. 18

Human Brain and Senses

Investigation 2, Parts 2-3, pp. 73-83

Electronics

Investigation 1, Part 3, pp. 66-70

Weather and Water

Investigation 3, Parts 1-2, pp. 93-102

Planetary Science

Investigation 3, Part 2, pp. 94-98

Investigation 9, Parts 1-4, pp. 283-301

Mixtures and Solutions

Investigation 4, Parts 1, 3, pp. 8-15, 20-24

Weather and Water

Investigation 5, Part 1, pp. 153-162

Chemical Interactions

Investigation 6, pp. 178-187

Investigation 10, Part 1, pp. 323-329

Models and Designs

Investigation 3, Parts 1-2, pp. 8-19

Solar Energy

Investigation 4, Parts 1-3, pp. 8-28

Electronics

Investigation 1, Parts 1-4, pp. 55-75

Weather and Water

Investigation 3, Parts 1-3, pp. 93-110

Chemical Interactions

Investigation 6, pp. 178-187