<table>
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<th>Day</th>
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<td>SI (1A) Demonstrate Safe Practices</td>
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</table>
(1) **Scientific investigation and reasoning.** The student, for at least 40% of instructional time, conducts laboratory and field investigations following safety procedures and environmentally appropriate and ethical practices. The student is expected to: (A) demonstrate safe practices during laboratory and field investigations as outlined in the Texas Safety Standards;

**STANDARD REVIEW**

Science is exciting and fun, but it can also be dangerous. So, don’t take any chances! Always follow your teacher’s instructions, and don’t take shortcuts—even when you think there is no danger in doing so. Before starting an experiment, get your teacher’s permission, and read the lab procedures carefully. Pay particular attention to safety information and caution statements.

The pictures below are the safety symbols used in many science labs. Get to know these symbols and their meanings. This is important! If you are still unsure about what a safety symbol means, ask your teacher.

![Safety Symbols]

Sometimes accidents can happen even when safety guidelines are followed. If an accident does occur, inform your teacher immediately regardless of how minor you think the accident is. Be prepared to help your teacher in case of an emergency. Know the locations of the nearest fire alarms and any other safety equipment, such as fire blankets and eyewash fountains, as identified by your teacher, and know the procedures for using the equipment. If you see someone who is not following proper safety rules, tell your teacher immediately.
STANDARD PRACTICE

1. Why does your teacher need to know right away when an accident has happened in the lab?
   - A. so someone can be punished
   - B. to keep the whole class safe
   - C. only teachers know how to fix what went wrong
   - D. so accident forms can be filled out

2. What is the first thing you should do in the event of an accident in the laboratory?
   - A. Call the emergency operator.
   - B. Set off the nearest fire alarm.
   - C. Inform your teacher immediately.
   - D. Decide whether it is minor or major.

3. The directions for a lab include the safety icons shown above. What do these icons mean?
   - A. You should be careful.
   - B. You are going into the laboratory.
   - C. You should wash your hands first.
   - D. You should wear safety goggles, a lab apron, and gloves during the lab.
(1) **Scientific investigation and reasoning.** The student, for at least 40% of instructional time, conducts laboratory and field investigations, following safety procedures and environmentally appropriate and ethical practices. The student is expected to (B) practice appropriate use and conservation of resources, including disposal, reuse, or recycling of materials.

**STANDARD REVIEW**

Always look for conservation and recycling opportunities in the laboratory. You can conserve resources, such as water and energy. You can also reuse or recycle some materials. The energy we use to run equipment and to run our computers comes from natural resources. The way in which we choose to use energy on a daily basis affects the availability of the natural resources. Most of the natural resources that provide us with energy are nonrenewable resources. So, if we don’t limit our use of energy now, the resources may not be available in the future. One way to conserve energy in the laboratory is to turn off and unplug any electronic lab equipment when it is not in use.

You can conserve water by using only as much water as you need. For example, avoid leaving the faucet running while rinsing out containers in the lab. Conserving resources also means taking care of the resources even when you are not using them directly. For example, it is important to keep lakes, rivers, and other environmental water resources free of pollution. Polluted lakes and rivers can affect the quality of the water people depend on for drinking, cooking, and bathing. Polluted water can harm fish. It can also harm soil and the plants that grow in the soil. Animals, including humans, that depend on the soil to find or grow food can also be affected by pollution. When doing experiments in the laboratory, dispose of chemicals appropriately—do not dump them into the sink. Place chemical wastes only into approved waste containers. When doing experiments in the field, be careful not to harm the environment in any way.

Some laboratory equipment can be reused. Other materials used in a laboratory can be recycled. For example, you should place paper products and batteries in the proper recycling receptacles. Items made of cardboard, plastic, or aluminum can also often be recycled.
1 The science fair was held in a community auditorium. After the fair was over, Jill could not find a recycling container for cardboard she no longer needed. What is most likely the reason?

A Usually, cardboard cannot be recycled.
B So far, there is no use for recycled cardboard.
C No one has set up a recycling program at the auditorium.
D This community does not need to recycle its used products.

2 During an experiment, students added various amounts of fertilizer to water samples. They were studying how fertilizer runoff from farm fields affected nearby water sources. After the experiment was completed, what was the best way to dispose of the water samples?

A Pour them on soil outside the school.
B Pour them on soil near water sources.
C Pour them into a sink in the laboratory.
D Pour them into a chemical waste container in the laboratory.

3 Which suggestion is an example of protecting a resource that you are not using directly?

A Use only the amount of tap water you really need.
B Turn a sheet of paper over and use the back of it.
C Do not pour leftover paint into a drain that runs into a creek.
D Place aluminum cans and glass containers into the approved recycling containers.
SI.2.A

(2) **Scientific investigation and reasoning.** The student uses scientific inquiry methods during laboratory and field investigations. The student is expected to (A) plan and implement comparative and descriptive investigations by making observations, asking well-defined questions, and using appropriate equipment and technology.

**STANDARD REVIEW**

Before you begin an investigation, you must define what you are studying. For example, you might ask, “What factors cause seedlings to grow the best?” However, you will have trouble answering this vague question. Instead, you need to limit and define what you want to know. Here are several well-defined questions that you might ask:

- How does the amount of available light affect seedling growth?
- How does the amount of water in the soil affect growth?
- How does acid rain affect the growth and health of seedlings?

A key method of gathering information in science is by making observations. For example, you could observe and record how something looks, smells, sounds, or feels. (Do not taste anything in the lab unless your teacher suggests it.) How an object looks might include its size, shape, parts, texture, and color. Often you can include measurements in your observations. A metric ruler can be used to measure the height of the seedlings. You could also use graph paper to make a scale drawing of them. As the seedlings grow, you could add daily observations and drawings. You might grow seedlings under different conditions, such as darkness, dim light, and bright light, and use a control sample of seedlings. In time, you could use a graph to compare the results under each condition.

Your observations could go beyond the height of the seedlings. After examining an entire object, scientists often look carefully at details. A wide range of tools can help in these observations. For example, a hand lens or microscope could allow you to study each seedling’s leaves. Thermometers can show the temperature at which the seedlings are growing. At the end of the study, a pan balance can measure the amount of matter in a seedling (its mass) or the amount of fertilizer you might add to the soil. A graduated cylinder could measure the volume of the water you water the plants with. A computer can help you create a graph to display your findings.

First, however, you must decide on the question you want to answer. After defining your question, you are ready to choose the appropriate tools and technology. They will help you gather the correct data needed to answer your question.
SI.2.A

STANDARD PRACTICE

1 Which of these research questions is well defined enough to test with an experiment?

A Do finches behave differently on hot days?
B How much do birds eat in different types of weather?
C Do finches eat more birdseed when the air temperature increases?
D How does air temperature affect birds?

2 Which of these is an observation which could be graphed?

A The seedlings grew best in daylight.
B The seedling grew much taller overnight.
C Putting two seedlings in one pot seemed to crowd them.
D By day 5, the seedlings growing in dim light were 4 mm tall.

3 Which tool would be most appropriate to measure how much a bird eats in one day?

A metric ruler
B pan balance
C thermometer
D graduated cylinder
(2) **Scientific investigation and reasoning.** The student uses scientific inquiry methods during laboratory and field investigations. The student is expected to: (B) design and implement experimental investigations by making observations, asking well-defined questions, formulating testable hypotheses, and using appropriate equipment and technology;

**STANDARD REVIEW**

When people do scientific experiments, they try to shed light on the unknown or figure out how the world works. In order to get answers, scientists start with a puzzling question. Then they try to answer their question. A hypothesis is a possible answer to a scientific question. Scientists test their hypotheses by doing an experiment.

Not all hypotheses are useful. A good hypothesis is one that can be tested, regardless of whether or not it addresses the question totally. Hypotheses are important if they lead to studies that teach something, even if those hypotheses turn out not to be correct. Different scientists can have different answers to the same question even after looking at the same clues.

One way to test a hypothesis is to do a controlled experiment. A controlled experiment compares the results from a control group with the results from experimental groups. The groups are the same except for one factor.

This factor is called a variable. The results of the experiment will show the effect of the variable. In an experiment to test the effect of acid rain on plant growth, the control group would be watered with normal rain water. The experimental group would be watered with acid rain.
SI.2.B

STANDARD PRACTICE

1. Which part of the scientific process does not have to be accurate to be useful?
   A. hypothesis  
   B. procedure  
   C. analysis  
   D. safe practices

2. Which hypothesis cannot be tested with an experiment?
   A. Nonliving things do not grow and develop.  
   B. Lipids do not mix with water.  
   C. Plant cells contain DNA.  
   D. Dogs are better than cats.

3. Scientists are conducting research to find out the strength of a brand new medicine. In an experiment with two groups of people, the people in each group received one of two different amounts of the medicine. The people in one group received twice the amount of medicine that the people in the other group received. In this experiment, what does the amount of medicine represent?
   A. the experimental group  
   B. the control  
   C. the variable  
   D. the control group

4. An environmental scientist suspects that acid precipitation is beginning to affect the pH of certain lakes in Texas. What is the best way to test this hypothesis?
   A. Do library research on the harmful effects of acid precipitation in lakes.  
   B. Test how acidic water and neutral water affect plants native to Texas.  
   C. Count the number of water-plant species found in a Texas lake.  
   D. Collect lake-water samples and test the pH of each sample.
**SI.2.C**

(2) **Scientific investigation and reasoning.** The student uses scientific inquiry methods during laboratory and field investigations. The student is expected to: (C) collect and record data using the International System of Units (SI) and qualitative means such as labeled drawings, writing, and graphic organizers;

**STANDARD REVIEW**

A very important part of science is keeping honest, clear, and accurate records of observations. Any information you gather through your senses is an observation. Observations can take many forms. They may be measurements of length, volume, time, or speed or of how loud or soft a sound is. They may describe the color or shape of an organism. Or they may record the behavior of organisms in an area. The range of observations a scientist can make is endless. But no matter what observations reveal, they are useful only if they are accurately made and recorded. Scientists use many standard tools and methods to make and record observations. These tools and methods ensure that observations are repeatable and reliable.

Today, most scientists and almost all countries use the International System of Units (also called SI, or Système International d’Unités). One advantage of using SI measurements is that it helps scientists share and compare their observations and results. Another advantage of SI units is that almost all units are based on the number 10, which makes conversions from one unit to another easier. The table below contains commonly used SI units for length, volume, mass, and temperature.

<table>
<thead>
<tr>
<th><strong>Common SI Units and Conversions</strong></th>
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<tbody>
<tr>
<td><strong>Length</strong></td>
</tr>
<tr>
<td>meter (m)</td>
</tr>
<tr>
<td>kilometer (km)</td>
</tr>
<tr>
<td>decimeter (dm)</td>
</tr>
<tr>
<td>centimeter (cm)</td>
</tr>
<tr>
<td>millimeter (mm)</td>
</tr>
<tr>
<td>micrometer (μm)</td>
</tr>
<tr>
<td>nanometer (nm)</td>
</tr>
<tr>
<td><strong>Volume</strong></td>
</tr>
<tr>
<td>cubic meter (m³)</td>
</tr>
<tr>
<td>cubic centimeter (cm³)</td>
</tr>
<tr>
<td>liter (L)</td>
</tr>
<tr>
<td>milliliter (mL)</td>
</tr>
<tr>
<td><strong>Mass</strong></td>
</tr>
<tr>
<td>kilogram (kg)</td>
</tr>
<tr>
<td>gram (g)</td>
</tr>
<tr>
<td>milligram (mg)</td>
</tr>
<tr>
<td><strong>Temperature</strong></td>
</tr>
<tr>
<td>kelvin (K)</td>
</tr>
<tr>
<td>Celsius (°C)</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

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SI.2.C

STANDARD PRACTICE

1. It is important that research results are always recorded
   A. quietly.
   B. accurately and clearly.
   C. in blue ink.
   D. unless they are wrong.

2. Which of the following is not an SI unit?
   A. cubic meter
   B. second
   C. pound
   D. degrees Celsius

3. Which of these is the most appropriate SI unit for measuring a chemical to place in a test tube during a lab experiment?
   A. ounce
   B. gram
   C. kilogram
   D. pound

4. A pencil measures 14 cm long. How many millimeters long is it?
Middle School Science
2019 - 2020
6th Grade

Five Day
Week 2 Instruction

Texas Assessment Review and Practice (TARP)
Houghton Mifflin Harcourt
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<td>SI (2D) Construct tables and graphs to organize data and identify patterns</td>
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<td>2</td>
<td>SI (2E) Analyze data to formulate reasonable explanations and predict trends</td>
</tr>
<tr>
<td>3</td>
<td>SI (3A) Analyze, evaluate, and critique scientific explanations by using empirical evidence so as to encourage critical thinking</td>
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<tr>
<td>4</td>
<td>SI (3B) Use models to represent aspects of the natural world</td>
</tr>
<tr>
<td>5</td>
<td>SI (3C) Identify advantages and limitations of models</td>
</tr>
</tbody>
</table>
(2) **Scientific investigation and reasoning.** The student uses scientific inquiry methods during laboratory and field investigations. The student is expected to (D) construct tables and graphs, using repeated trials and means, to organize data and identify patterns.

**STANDARD REVIEW**

After scientists have collected their data, they organize it into tables, charts, or graphs in order to look for trends and identify relationships among the variables. These visuals can help show new information or information that was not very clear at the time of collection.

For example, the data in a single row or column in a table identifies a variable in an investigation. That variable is identified in the row or column label. Both independent and dependent variables are presented in a way that shows the relationship between the two more clearly. In the table below, the values in the first column are temperatures in degrees Celsius. Temperature is the independent variable in this experiment because it is the variable that was controlled directly by the investigator. The growth rate of the bacteria is the independent variable. You can tell by looking at the table that changes to the independent variable (temperature) caused changes to the dependent variable (bacterial growth rates).

<table>
<thead>
<tr>
<th>Temperature (°C)</th>
<th>Minutes to double bacterial population</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>130</td>
</tr>
<tr>
<td>20</td>
<td>60</td>
</tr>
<tr>
<td>30</td>
<td>29</td>
</tr>
<tr>
<td>40</td>
<td>19</td>
</tr>
<tr>
<td>50</td>
<td>No growth</td>
</tr>
</tbody>
</table>

A line graph allows you to see trends over time or over changes in another independent variable. A line graph shows a continuous relationship between the two variables. That is, each datum point on a line graph is related in some way to the data points before and after it. For example, in this line graph, the slant of the line, a line drawn that best fits the upward curve data points, shows the rate of growth. A steeper upward slant represents a greater rate of hair growth [over time].

Calculating the mean can also help analyze data more thoroughly. An average, or mean, simplifies a set of numbers into a single number that approximates the value of the set. To find the mean for a set of values, add each value and divide the sum by the number of values in the set. For example, the sum of 36, 37, 38, 36, 36, 33, 35, and 37 is 288. There are 8 values in the set. The mean is 288 divided by 8, which is 36.
1 Examine the line graph on the previous page. During which period was the rate of hair growth the greatest?

A from Day 0 to Day 30
B from Day 60 to Day 90
C from Day 90 to Day 120
D from Day 120 to Day 150

2 Why is it important for scientists to conduct repeated trials in an experiment?

A Repeated trials produce larger data tables.
B Repeated trials show that the results are reliable.
C Repeated trials let scientists choose the best results.
D Repeated trials are not important in scientific investigations.

3 Based on the graph above, what conclusion can you make about the human population?

A It changes very slowly over time.
B Population growth rate has increased sharply in the last 150 years.
C Most of the people in the world live in cities.
D From 1850 to 2000, the population increased by 4 billion people.
SI.2.E

(2) **Scientific investigation and reasoning.** The student uses scientific inquiry methods during laboratory and field investigations. The student is expected to (E) analyze data to formulate reasonable explanations, communicate valid conclusions supported by the data, and predict trends.

**STANDARD REVIEW**

Once scientists finish their tests, they must analyze their data and results to formulate explanations. Scientists often make graphs and tables to organize and summarize their data. Analysis also includes comparing new data with known information to discover what new information the new data provides.

After carefully analyzing the data and results of their tests, scientists must determine whether their results support their hypothesis. The conclusion is an interpretation of the results and how they compare to the original ideas of the hypothesis. If a scientist concludes that the results support the hypothesis, the conclusion may suggest questions for further study that are based on the supported hypothesis. Hypotheses are valuable even if they turn out to be unsupported by data and results. If a hypothesis is not supported by the results, scientists may repeat the investigation to check for errors. Or they may ask new questions and form new hypotheses.

The work of David D. Gillette, a scientist who studies fossils, shows how data can be analyzed and can lead to a conclusion. Gillette examined some bones found by hikers in New Mexico in 1979. He could tell they were the bones of a dinosaur, but he didn’t know what kind of dinosaur. Gillette took hundreds of measurements of the dinosaur bones. He analyzed the data by comparing his measurements with those of bones from known dinosaurs. He also visited museums and talked with other scientists. When Gillette analyzed his data and results, he found that the bones of the mystery dinosaur did not match the bones of any known dinosaur. The bones were either too large or too different in shape. Based on all his studies, Gillette concluded that the bones found in New Mexico were indeed from an unknown type of dinosaur. Gillette estimated that the dinosaur was probably 33 meters long and weighed between 13 and 20 tons. The creature certainly fit the name Gillette gave it—*Seismosaurus hallorum*, the “earth shaker.”
1 Based on the graph above, what is a valid conclusion about hot water usage?

A  We need to recycle more of the hot water we use.
B  Most hot water is used by people, not by appliances.
C  People should take fewer baths and more showers.
D  Washing clothes by hand would save about one-fourth of the hot water we use.

2 A science class is having bug races. On the graph above, a student recorded how far a bug traveled in 10 s. What can you conclude about this bug?

A  It traveled at a steady pace.
B  Its speed increased over time.
C  Its speed decreased over time.
D  It stopped several times in 10 s.
### Worldwide Earthquake Frequency

<table>
<thead>
<tr>
<th>Description</th>
<th>Magnitude</th>
<th>Yearly Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Great</td>
<td>8.0+</td>
<td>1</td>
</tr>
<tr>
<td>Major</td>
<td>7.0–7.9</td>
<td>18</td>
</tr>
<tr>
<td>Strong</td>
<td>6.0–6.9</td>
<td>120</td>
</tr>
<tr>
<td>Moderate</td>
<td>5.0–5.9</td>
<td>800</td>
</tr>
</tbody>
</table>

3. This table summarizes the frequency of several types of earthquakes. Based on this data, how many major earthquakes would you expect in a two-year period?
(3) **Scientific investigation and reasoning.** The student uses critical thinking, scientific reasoning, and problem solving to make informed decisions, and the student knows the contributions of relevant scientists. The student is expected to (A) in all fields of science, analyze, evaluate, and critique scientific explanations by using empirical evidence, logical reasoning, and experimental and observational testing, including examining all sides of scientific evidence of those scientific explanations, so as to encourage critical thinking by the student.

**STANDARD REVIEW**

For centuries, people watched the sun rise in the east every morning. They watched it cross the sky and set in the west every evening. To a casual observer, the sun seemed to revolve around Earth. The stars and planets also seemed to move across the sky, and so it was thought they also must revolve around Earth. In fact, there was a time when most people believed that the entire universe revolved around Earth.

Yet the planets kept “wandering” out of their orbits around Earth. Early models of the solar system required many adjustments to account for this. In time, some scientists concluded that the sun and moon revolve around Earth. However, it was also thought that the planets and the rest of the stars revolved around the sun. Diagrams of the solar system became more and more complex. Back then, it was not easy to explain how the solar system was organized.

By the sixteenth and seventeenth centuries, there had been advancements in the field of astronomy. Galileo made improvements to the telescope that made it more powerful. After studying the skies, Galileo and other scientists concluded that only our moon revolves around Earth.

Today we know how our solar system is organized. Every day, our understanding of it expands. This understanding is based on evidence and direct observation. In all areas of our lives, we now demand evidence and sound reasoning to support new theories. Ideas are tested and retested to make sure they are logical and valid.

Now people of all ages are encouraged to use critical thinking in all areas of their lives. We question what we see and hear. We ask, “How do you know that?” Questioning and testing ideas means that we are able to gather accurate information and insights about the world around us.
1. Which question would be best studied with a scientific investigation?
   A. Do insects have blood?
   B. Is vegetarianism better than meat eating?
   C. Is country music more enjoyable than hip-hop music?
   D. Should all students be required to wear uniforms to school?

2. Which source is most likely to offer reliable information or evidence?
   A. a presentation by the author of a new book
   B. an article published by a scientific magazine
   C. an article written by the leader of a political party
   D. a blog by someone new to a field of study

3. On a radio talk show, you hear a statement that indicates that eating too many apples can harm your digestive tract and cause ulcers. After doing some critical thinking, which action will you take?
   A. I will eat fewer apples to avoid getting ulcers.
   B. I will stop eating apples entirely. Better safe than sorry!
   C. I will eat more apples, because that statement is probably wrong.
   D. I will do some research before changing my diet based on information in a talk show.
SI.3.B

(3) **Scientific investigation and reasoning.** The student uses critical thinking, scientific reasoning, and problem solving to make informed decisions, and the student knows the contributions of relevant scientists. The student is expected to (B) use models to represent aspects of the natural world, such as a model of Earth’s layers.

**STANDARD REVIEW**

Some objects, such as active volcanoes, are too big and dangerous to study close up. Instead, scientists make models of different kinds of volcanoes. The models show the parts of the volcanoes and how they interact. Models include drawings in two dimensions and objects in three dimensions. For example, a three-dimensional model of a volcano might be made of colored clay.

We often make models of objects or processes that we cannot study directly. For instance, we cannot see Earth’s layers or core. No hole could be deep enough to expose them. Still, scientists have gathered much information about these layers. They have used this information to create models of Earth’s interior. The layers of the model are in the same proportion as the actual layers of Earth. In this way, the model shows us the relative thickness of each of Earth’s layers.

Some parts of our natural world are extremely small. We cannot see them without a powerful microscope. However, we can make bigger-than-life models of tiny bacteria, for example. We can use the models to compare different kinds of bacteria. Models can also teach us more about our own bodies. For example, you might have seen a model of our circulatory system. It can show the differences among arteries, veins, and capillaries. Using a model, we can compare their width, shape, and wall thickness.

Models can be bigger or smaller than the object they represent. Yet, to be truly useful, they must be in the same proportion as that object. Let’s say you are making a model of Earth’s layers. You decide that 100 km will equal 1 mm in your model. Thus, a layer that is 2,000 km wide will be 20 mm wide in your model. Models must be accurate. If not, they will be misleading.

Computers can create models, too. Some computer models can predict the spread of a disease. Others can show the probable path of a hurricane. Computers can also create three-dimensional models. For example, some computer models show how heat or freezing affects food. Information gained from these models helps protect and improve our food supply and distribution.
1. What makes this model of a hurricane more valuable than a photograph of a real hurricane?
   A. The model shows where hurricanes form.
   B. The model shows the speed and path of wind in a hurricane.
   C. The model shows the different categories of hurricanes.
   D. The model shows what happens when a hurricane moves over land.

2. Why must a model of a hurricane be in the same proportions as a real hurricane?
   A. to show that a hurricane is about 800 km wide
   B. to show that the eye of a hurricane is in the center
   C. to show that a hurricane is more than 15,000 m tall
   D. to allow accurate comparisons of hurricane width and height

3. Assume that 100 kilometers is equal to 1 centimeter on the diagram of a hurricane shown above. If you wanted to enlarge the diagram to twice its current size, how many centimeters wide would the new diagram need to be?
SI.3.C

(3) **Scientific investigation and reasoning.** The student uses critical thinking, scientific reasoning, and problem solving to make informed decisions, and the student knows the contributions of relevant scientists. The student is expected to (C) identify advantages and limitations of models such as size, scale, properties, and materials.

**STANDARD REVIEW**

A model is a representation of an object or a system. Models are used in science to help explain how something works or to describe how something is structured. Models can also be used to make predictions or to explain observations. However, models have limitations. A model is never exactly like the real thing—if it were, it would no longer be a model. There are many kinds of scientific models. Some examples include physical models, mathematical models, and conceptual models.

**Physical Models**

A plastic skeleton is an example of a physical model. Many physical models look like the thing they model. However, a limitation of the model of a skeleton is that it is not alive and thus doesn’t act exactly like a human body. But the model is useful for understanding how the body works. Other physical models may look and act more like or less like the thing they represent. Scientists often use the model that is simplest to use but that still serves their purpose.

**Mathematical Models**

A mathematical model may be made up of numbers, equations, or other forms of data. Some mathematical models are simple and can be used easily. A Punnett square is a model of how traits may be passed from parents to offspring. Using this model, scientists can predict how often certain traits will appear in the offspring of certain parents. Computers are very useful for creating and manipulating mathematical models. They make fewer mistakes and can keep track of more variables than a human can. But a computer model can be incorrect in many ways. The more complex a model is, the more carefully scientists must build the model.

**Conceptual Models**

The third type of model is the conceptual model. Some conceptual models represent systems of ideas. Others compare unfamiliar things with familiar things. These comparisons help explain unfamiliar ideas. A phylogenetic tree is a conceptual model. Scientists also use conceptual models to classify behaviors of animals. Scientists can then predict how an animal might respond to a certain action based on the behaviors that have already been observed.
SI.3.C

STANDARD PRACTICE

1 What is a limitation of using a plastic skeleton as a model of the human body?
   A It cannot show the shapes of the bones.
   B It cannot show how the bones connect.
   C It cannot be broken down into its parts.
   D It cannot show how bone tissue repairs after a fracture.

2 What is a limitation of using layers of clay to show how an earthquake occurs?
   A Clay does not have the same properties as soil and rock.
   B Different colors of clay can show the layers in Earth’s crust.
   C The layers of clay are in the same proportions as the layers in Earth’s crust.
   D This model shows a process that cannot be viewed directly in nature.

3 What is a limitation of this food web model?
   A It has too much information for one model.
   B The diagram is not complex enough to be useful.
   C It cannot show every possible feeding relationship within the ecosystem.
   D The model should be three-dimensional in order to be accurate.