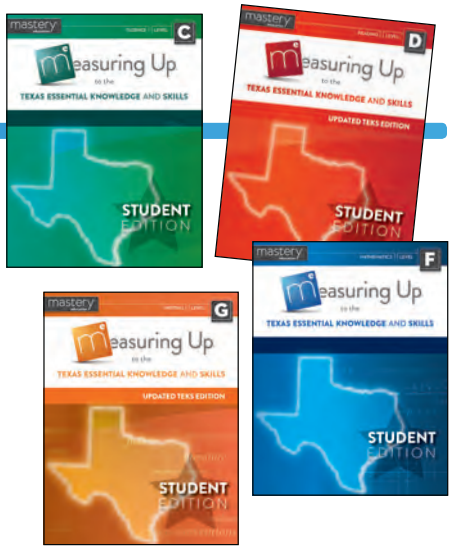
Measuring Up to the TEKS Sample Pack

Science | Grade 4 | Lessons 9, 30, 32



The sample pack features:

- 3 full student lessons with complete Teacher Edition lessons
- 1 full Table of Contents for your grade level
- Lesson Correlations

Developed to meet the rigor of the TEKS, ***Measuring Up*** employs support for using and applying critical thinking skills with direct standards instruction that elevate and engage student thinking.

TEKS-based lessons feature introductions that set students up for success with:

- Academic Vocabulary
- Step-by-Step Problem Solving
- Demonstrate Higher-Order Thinking Skills
- Multi-Step and Dual-Coded Questions
- Focus on Financial Literacy

Guided Instruction and Independent Learning strengthen learning with:

- Deep thinking prompts
- Collaborative learning
- Self-evaluation
- Demonstration of problem-solving logic
- Application of higher-order thinking

Flexible design meets the needs of whole- or small-group instruction. Use for:

- Introducing TEKS
- Reinforcement
- Intervention
- Saturday Program
- Before or After School

Extend learning with online digital resources!

Measuring Up Live 2.0 blends instructional print resources with online, dynamic assessment and practice. Meet the needs of all students for standards mastery with resources that pinpoint student needs with customized practice.

Lesson 9

How Can I Use Evidence to Analyze My Theories?

TEKS 4.3(A) Analyze, evaluate, and critique scientific explanations by using evidence, logical reasoning, and experimental and observational testing.

Understand the TEKS

Use scientific evidence and information to judge how correct a scientific explanation is.

Words to Know
theory
hypothesis
support
empirical evidence
logical reasoning

A **theory** is an explanation of observations in nature.

A **hypothesis** is an educated guess for an answer to a question that can be tested.

Observations **support** a theory when they make it seem true.

Empirical evidence is data collected through personal observation or experience that can prove that a hypothesis is correct or incorrect.

Logical reasoning is a way of thinking that uses information to draw conclusions.

Guided Instruction

Read the following information and answer the questions.

You probably have many ideas about the world. You might also ask many questions. Sometimes, you might try to answer your questions and explain how the world works. Information you collect this way is called **empirical evidence**. By doing this, you are acting like a scientist. To try to answer a question, a scientist states a **hypothesis**. A hypothesis is an educated guess based on facts and observations.

Once you have a hypothesis, you need to try to find out if it is true. You can test it by doing experiments. Sometimes, the results of an experiment show that a hypothesis is wrong. This can still teach you something! Scientists often learn a lot when they find out a hypothesis is wrong.

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The data from your experiment might show that your hypothesis is correct. However, one test might not be enough. Sometimes, different scientists do the same experiment. They might test the hypothesis again and again. Testing a hypothesis many times can help you be sure you have not made any mistakes.

Sometimes, many scientists agree that a hypothesis is correct. The hypothesis might then become a theory. A theory explains why something happens in nature. For example, one theory explains how stars form. Another theory explains how types of animals and plants change over time. Most theories are very detailed. The work of many scientists is used to develop a theory.

You are learning new things all the time and so are scientists. Sometimes, new data **support** the scientists' theories. A **theory** is the conclusion that scientists draw about a subject based on the information available at the time. Theories often change as technology improves and more data are collected. Data might make the theory seem true.

People should evaluate the scientific process, the data, and the conclusions drawn to decide if they are based on **logical reasoning**. If new data show a theory is wrong, the scientists have to change it. They might change the theory a little bit or a lot. Sometimes, scientists keep finding information that says their theories are wrong. Then they might have to start over with a new theory.

1. On what is a hypothesis based?

_____

2. How many times might a hypothesis be tested?

_____

3. What is a theory?

_____

_____

4. What does it mean if new data support a theory?

_____

_____

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Critical Thinking

Answer the following questions.

1. What do scientists do if data show that a theory is wrong?

2. What is the difference between an idea and a theory?

3. Scientists have a theory about what makes up matter. What does this theory tell us?

4. Which is more likely to be true—a hypothesis or a theory? Why?

5. What would scientists need to do if they discovered data that showed that Earth is more than 4.5 billion years old?

★ Practice

DIRECTIONS Read each question. Then circle the letter for the correct answer.

1 What does a theory do?

A It provides new data.

B It becomes a hypothesis.

C It becomes a conclusion.

D It explains observations in nature.

---

2 You have a hypothesis that pill bugs prefer dark places to light places. However, the data from your experiment do not support your hypothesis. What should you do first?

F Change the data.

G Change the question.

H Change the conclusion.

J Change your hypothesis.

---

3 A scientist finds evidence of a plant that lived in the time of the dinosaurs. No one has ever seen this plant growing. What is true about the new evidence?

A It must be incorrect.

B It suggests the plant is extinct.

C It proves why dinosaurs are now extinct.

D It means scientists should change their idea about adaptations.

4 If you want to test an idea, what should you make first?

F A law

G A theory

H A hypothesis

J A conclusion

---

5 Which is true about a theory?

A A theory can never be changed.

B A theory can turn into a hypothesis.

C A theory is very general and vague.

D A theory might be altered with new information.

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★ Assessment

DIRECTIONS Read each question. Then circle the letter for the correct answer.

1 A student is trying to determine the temperature at which beans sprout the fastest. The student has collected data such as temperature, sprout height, size of bean, and number of days to sprouting. What is this data called?

A Hypothesis

B Theory

C Logical reasoning

D Empirical evidence

---

2 A scientist forms a conclusion that a plant was not native to a desert because of the shape and size of its leaves. What did this scientist use to base this conclusion?

F A law

G A hypothesis

H Logical reasoning

J Support for a theory

---

3 What work is most often only carried out by scientists?

A Testing hypotheses

B Developing theories

C Using logical reasoning

D Collecting empirical evidence

4 You think that lemon juice will lower the boiling point of water. However, your evidence and data do not support this hypothesis. What could you do?

F Turn your hypothesis into a theory.

G Change your data to match your hypothesis.

H Test your hypothesis again to see if there was a mistake.

J Ignore your data and use logical reasoning to form a conclusion.

---

5 You think that bean plants grown from green seeds grow faster than those grown from yellow seeds. What is this thought called?

A A hypothesis

B Solid theory

C A conclusion

D Empirical evidence

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Lesson 30

Why Is Soil Important?

TEKS 4.7(A) Examine properties of soils, including color and texture, capacity to retain water, and ability to support the growth of plants.

Understand the TEKS

You can learn about the different properties of soil and why soil is an important material.

Words to Know
soil
texture
humus
decomposer

Soil is loose weathered material on Earth's surface in which plants can grow.

The **texture** of soil refers to how it feels and the size of its rock particles.

Humus is decayed plant and animal matter found in soil.

Decomposers are living things that break down dead plant and animal matter.

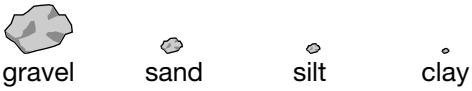
Guided Instruction

Read the following information and answer the questions.

Soil is one of Earth's most valuable materials. Grass, trees, and other plants use soil to grow. Animals also use soil because they use plants for food and for shelter. Without soil, most plants would likely not exist on Earth.

Soil is made mostly of weathered rocks and minerals. It forms as rock is broken down and mixed with other materials. The other materials include dead plant and animal matter, air, and water.

An important property of soil is its **texture**. One part of soil texture is the size of the particles that make up the soil. The largest particles are gravel. Gravel is any rock particle that is 2 millimeters across or larger. Next in size are particles of sand. They are much smaller than gravel. Silt is even smaller than sand. The smallest soil particles are clay. They are too small to be seen without a microscope. The diagram below compares the sizes of soil particles. The particles have been enlarged so they can be seen easily.



Soil texture is important for plant growth. Empty spaces between soil particles hold air and water. If soil is made mostly of larger particles, like gravel or sand, its texture is very coarse. Coarse soil does not hold water well, and plants might not be able to get the water they need. Soils made mostly of clay particles have a very fine texture with tiny spaces. Water can get trapped in the spaces, and plants can drown or water will not go through the clay. Soils that are made up of equal parts of sand, silt, and clay have a good texture for growing most plants. Water can drain through the soil, but some water is held in place.

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Another important property of soil is the amount of **humus** it contains. Humus is made up of once-living bits of plant and animal matter. Humus contains lots of plant nutrients and helps hold water. Plants need these nutrients and water to grow. Loam is a rich soil in which humus is mixed with sand and clay.

Small living things called **decomposers** live in soil. The earthworm is one example of a decomposer. Decomposers create humus by breaking down the remains of dead plants and animals. Burrowing insects mix the humus into the soil as they move.

1. What materials are found in soil?

2. What is soil texture?

3. What is humus made of?

4. Why are decomposers important to soil?

5. Why is soil important to plants and animals?

6. Why is good soil texture important for plant growth?

7. How does humus make soil good for plants?

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Critical Thinking

Read the paragraph, study the table, and answer the questions.

Two students worked together on a science project. They wanted to test the textures of three different soils. They placed each sample of soil in a funnel with filter paper. Then they placed a beaker below the funnel. The students poured 250 milliliters of water into the funnel. They collected and measured the amount of water that moved through the soil in five minutes. They recorded their data in the table.

Soil Sample	Amount of Water Collected (mL) in 5 minutes
A	100
B	245
C	15

1. Describe the texture and particles of soil sample C.

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2. Which soil sample likely contained a lot of gravel? Explain.

3. Which soil sample probably has the best texture for most plants? Explain.

4. What could the students do to improve the texture of the soil sample B?

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★ Practice

DIRECTIONS Read each question. Then circle the letter for the correct answer.

1 In general, soil is made mostly of which material?

- **A** Water
- **B** Air
- **C** Broken-down rocks
- **D** Dead plant material

2 Which soil particle is the smallest?

- **F** Gravel
- **G** Clay
- **H** Silt
- **J** Sand

3 What are living things that break down dead plants and animals called?

- **A** Humus
- **B** Waste producers
- **C** Decomposers
- **D** Nutrients

4 What type of soil is best for most plant growth?

- **F** Soil that is mostly sand
- **G** Soil that is mostly sand with humus
- **H** Soil that is a mixture of silt and clay with little humus
- **J** Soil that is an even mixture of sand, silt, and clay with humus

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★ Assessment

DIRECTIONS Read each question. Then circle the letter for the correct answer.

1 Which material will increase the amount of humus in soil?

A Rotting leaves

B Weathered rocks

C Water

D Minerals

---

2 Which kind of soil can hold so much water that it can drown plants?

F Sand

G Clay

H Silt

J Gravel

3 What would likely happen without soil?

A Animals would migrate to a new place.

B Plants would not exist.

C Erosion would increase.

D Water would not be good to drink.

---

4 Which sentence best describes soil particles?

F Soil particles vary in size.

G Soil particles all look alike.

H Soil particles are all very tiny.

J Soil particles must be enlarged to see.

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Lesson 32

How Does the Sun Affect Earth's Seasons?

TEKS 4.8(C) Collect and analyze data to identify sequences and predict patterns of change in shadows, seasons, and the observable appearance of the moon over time.

Understand the TEKS

You can learn about the sun and how it interacts with Earth.

The **sun** is a medium-sized star and the star that is closest to Earth.

The **Northern Hemisphere** of Earth is the area north of the equator.

The **Southern Hemisphere** of Earth is the area south of the equator.

The **equator** is an imaginary circle halfway between the North Pole and South Pole.

Words to Know
sun
Northern Hemisphere
Southern Hemisphere
equator

Guided Instruction

Read the following information and answer the questions.

All the planets, including Earth, revolve around the star we call the **sun**. Heat from the sun reaches Earth from about 150 million km away. The sun's heat makes Earth warm enough to support life. Different amounts of sunlight received by Earth give us the seasons.

Earth is divided into two sections. They are called the **Northern Hemisphere** and the **Southern Hemisphere**. These two sections are separated by an imaginary circle around Earth called the **equator**. It is halfway between the North Pole and South Pole. The image shows the way that Earth is divided into sections. The United States is located in the Northern Hemisphere.

Earth rotates on its axis as it revolves around the sun. However, Earth's axis does not run in a straight up-and-down line. It is tilted, or turned, slightly on its side. Because of this tilt, some parts of Earth get more sunlight than other parts at any one time. The tilting of Earth's axis is what gives us the four seasons of the year.

It takes Earth twelve months, or one year, to revolve around the sun. During the six months that the North Pole is titled toward the sun, the Northern Hemisphere gets more sunlight than the Southern Hemisphere. People living in the Northern Hemisphere experience the warmer seasons of late spring, summer, and early fall during this time. People living in the Southern Hemisphere, however, experience the colder seasons of late fall, winter, and early spring. The Northern Hemisphere experiences these colder seasons in the six months that the North Pole is titled away from the sun.

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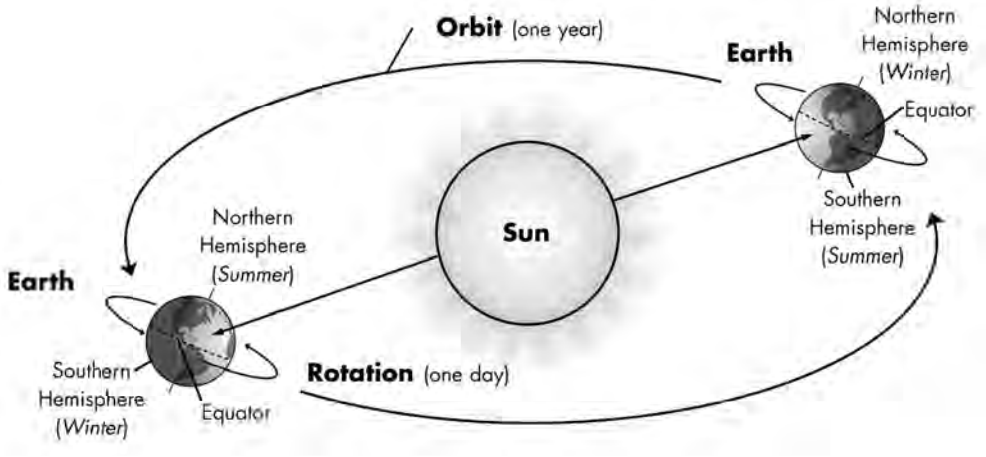


1. What revolves around the sun?

_____

2. Where is the equator?

_____

3. Is the United States located in the Northern Hemisphere or the Southern Hemisphere?

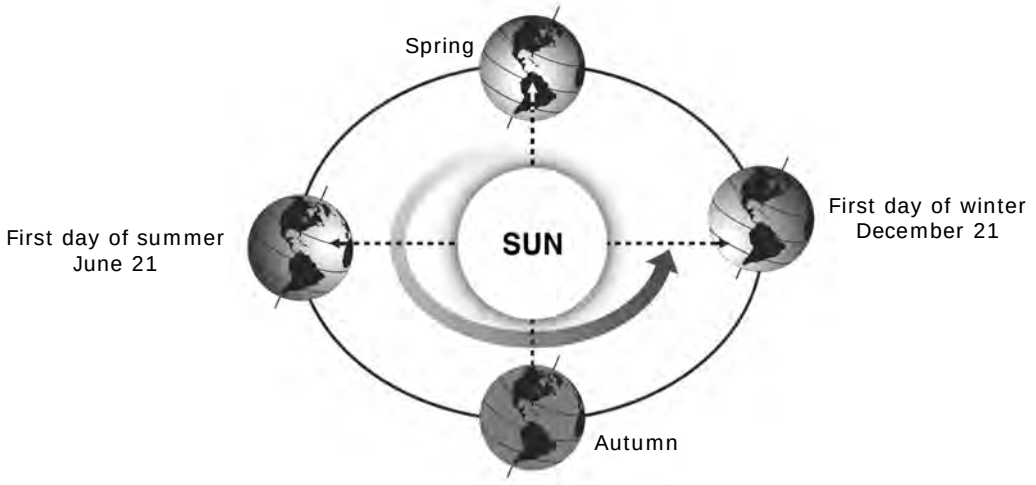
_____

4. Which hemisphere gets more sunlight when the North Pole is titled toward the sun?

_____

Critical Thinking

Look at the drawing showing seasons in the Northern Hemisphere. Then read the paragraph and answer the questions.



As Earth revolves around the sun, Earth's axis is tilted toward or away from the sun. In the Northern Hemisphere, the first day of summer occurs when Earth's axis is tilted most toward the sun. It occurs on or around June 21. This day has the greatest number of daylight hours. The first day of winter occurs on or around December 21. On this day, Earth's axis is tilted farthest away from the sun. This day has the fewest hours of daylight.

1. In which hemisphere is the United States located?

2. What causes the seasons?

3. What seasons occur in the Northern Hemisphere when the North Pole is tilted away from the sun?

4. On what date are you most likely to go to bed while it is still light outside? Explain.

5. When does the Northern Hemisphere experience the fewest hours of sunlight?

6. When the Northern Hemisphere is having summer, what season is the Southern Hemisphere having? Why?

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★ Practice

DIRECTIONS Read each question. Then circle the letter for the correct answer.

1 What is the imaginary circle around Earth that is halfway between the North Pole and the South Pole?

A Tilt

B Axis

C Equator

D Northern Hemisphere

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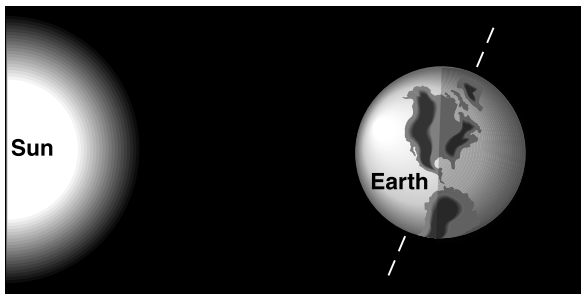
2 In the image, the Northern Hemisphere is tilted away from the sun more than any other time of the year.



What season is it in the Northern Hemisphere?

F Spring

G Summer

H Autumn

J Winter

3 Which of the following causes the seasons?

A The sun's rotation

B The tilt of the Earth's axis

C The rising and setting of the sun

D The summer solstice

---

4 Which season begins with the fewest hours of daylight?

F Winter

G Spring

H Summer

J Fall

---

5 Suppose daylight lasted for thirteen hours on June 21. How many hours of nighttime would occur on that day?

A One

B Ten

C Eleven

D Nine

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★ Assessment

DIRECTIONS Read each question. Then circle the letter for the correct answer.

1 What are the names of the two sections that make up the Earth?

- **A** Atmosphere and crust
- **B** Northern Hemisphere and Southern Hemisphere
- **C** Spring and summer
- **D** South Pole and North Pole

2 When it is summer in Texas, which part of Earth is closest to the sun?

- **F** Southern Hemisphere
- **G** Equator
- **H** South Pole
- **J** Northern Hemisphere

3 How would life on Earth be different if Earth's axis were not tilted?

- **A** The moon would not have phases.
- **B** There would be no seasons.
- **C** The year would be longer.
- **D** Daylight would last 24 hours everywhere on Earth.

4 Which of the following revolves around the Earth?

- **F** The North Star
- **G** The planets
- **H** The sun
- **J** The moon

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Teacher Edition

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Measuring Up®

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Unit 5 What Tools Does Nature Provide Organisms to Survive?

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Unit 8 How Does Water Change the Earth?

Unit 9 What Affects the Surface of the Earth?

Unit 10 Why Are the Sun and Moon Important to Earth?

Measuring Up Supplements

Practice Tests

These assessments, written to match the STAAR® blueprints, will help students prepare for the rigor of the STAAR® and are included as blackline masters in the Teacher Edition. They are also available in *Measuring Up Insight®.*

Measuring Up Insight

This Web-based formative assessment program allows teachers to administer pre-made tests (including the STAAR®-emulating Practice Tests), and create and assign custom tests. Analytic reports help monitor student results and customize instruction, review, and remediation.

Measuring Up MyQuest®

Student-centered, standards-based Web-based drill with integrated games makes mastering the TEKS fun. Optional linking to Insight makes practice purposeful.

Lesson Correlation to the Revised TEKS

This worktext is customized to the *Texas Essential Knowledge and Skills* and will help you prepare for the *State of Texas Assessments of Academic Readiness (STAAR®)* in Science.

Texas Essential Knowledge and Skills	*Measuring Up* Lessons
TEKS 4.1 Scientific investigation and reasoning. The student conducts classroom and outdoor investigations, following home and school safety procedures and environmentally appropriate and ethical practices. The student is expected to:	
(A) demonstrate safe practices and the use of safety equipment as described in the TEA-approved safety standards during classroom and outdoor investigations using safety equipment, including safety goggles and gloves, as appropriate	1
(B) make informed choices in the use and conservation of natural resources and reusing and recycling of materials such as paper, aluminum, glass, cans, and plastic	2
TEKS 4.2 Scientific investigation and reasoning. The student uses scientific practices during laboratory and outdoor investigations. The student is expected to:	
(A) plan and implement descriptive investigations, including asking well-defined questions, making inferences, and selecting and using appropriate equipment or technology to answer his/her questions	3, U1 Inv
(B) collect and record data by observing and measuring, using the metric system, and using descriptive words and numerals such as labeled drawings, writing, and concept maps	4, 5, U1 Inv, U2 Inv
(C) construct simple tables, charts, bar graphs, and maps using tools and current technology to organize, examine, and evaluate data	7, 8, U2 Inv
(D) analyze data and interpret patterns to construct reasonable explanations from data that can be observed and measured	4, U1 Inv
(E) perform repeated investigations to increase the reliability of results	6
(F) communicate valid, oral, and written results supported by data	4, U1 Inv
TEKS 4.3 Scientific investigation and reasoning. The student uses critical thinking and scientific problem solving to make informed decisions. The student is expected to:	
(A) analyze, evaluate, and critique scientific explanations by using evidence, logical reasoning, and experimental and observational testing	9
(B) represent the natural world using models such as the water cycle and stream tables and identify their limitations, including accuracy and size	10
(C) connect grade-level appropriate science concepts with the history of science, science careers, and contributions of scientists	11, U3 Inv, U10 Inv
TEKS 4.4 Scientific investigation and reasoning. The student knows how to use a variety of tools, materials, equipment, and models to conduct science inquiry. The student is expected to:	
(A) collect, record, and analyze information using tools, including calculators, microscopes, cameras, computers, hand lenses, metric rulers, Celsius thermometers, mirrors, spring scales, balances, graduated cylinders, beakers, hot plates, meter sticks, magnets, collecting nets, and notebooks; timing devices, and materials to support observation of habitats of organisms such as terrariums and aquariums	5, 6, 7, 8, U2 Inv
TEKS 4.5 Matter and energy. The student knows that matter has measurable physical properties and those properties determine how matter is classified, changed, and used. The student is expected to:	
(A) measure, compare, and contrast physical properties of matter, including mass, volume, states (solid, liquid, gas), temperature, magnetism, and the ability to sink or float	18, 19, 20, U6 Inv
(B) compare and contrast a variety of mixtures, including solutions	18

U = Unit Inv = Investigation

Texas Essential Knowledge and Skills	*Measuring Up* Lessons
TEKS 4.6 Force, motion, and energy. The student knows that energy exists in many forms and can be observed in cycles, patterns, and systems. The student is expected to:	
(A) differentiate among forms of energy, including mechanical, sound, electrical, light, and thermal	21
(B) differentiate between conductors and insulators of thermal and electrical energy	24
(C) demonstrate that electricity travels in a closed path, creating an electrical circuit	22, 23
(D) design a descriptive investigation to explore the effect of force on an object such as a push or a pull, gravity, friction, or magnetism	25, U7 Inv
TEKS 4.7 Earth and space. The students know that Earth consists of useful resources and its surface is constantly changing. The student is expected to:	
(A) examine properties of soils, including color and texture, capacity to retain water, and ability to support the growth of plants	30, U9 Inv
(B) observe and identify slow changes to Earth's surface caused by weathering, erosion, and deposition from water, wind, and ice	28, 29, U9 Inv
(C) identify and classify Earth's renewable resources, including air, plants, water, and animals; and nonrenewable resources, including coal, oil, and natural gas; and the importance of conservation	2
TEKS 4.8 Earth and space. The student knows that there are recognizable patterns in the natural world and among the Sun, Earth, and Moon system. The student is expected to:	
(A) measure, record, and predict changes in weather predictions	27
(B) describe and illustrate the continuous movement of water above and on the surface of Earth through the water cycle and explain the role of the Sun as a major source of energy in this process	26, 28, U8 Inv
(C) collect and analyze data to identify sequences and predict patterns of change in shadows, seasons, and the observable appearance of the Moon over time	31, 32, U10 Inv
TEKS 4.9 Organisms and environments. The student knows and understands that living organisms within an ecosystem interact with one another and with their environment. The student is expected to:	
(A) investigate that most producers need sunlight, water, and carbon dioxide to make their own food, while consumers are dependent on other organisms for food	12, U4 Inv
(B) describe the flow of energy through food webs, beginning with the Sun, and predict how changes in the ecosystem affect the food web	13, U4 Inv
TEKS 4.10 Organisms and environments. The student knows that organisms undergo similar life processes and have structures and behaviors that help them survive within their environment. The student is expected to:	
(A) explore and describe examples of traits that are inherited from parents to offspring, such as eye color and shapes of leaves and behaviors that are learned such as reading a book and a wolf pack teaching their pups to hunt effectively	14, 15, 17
(B) explore, illustrate, and compare life cycles in living organisms such as beetles, crickets, radishes, or lima beans	16, U5 Inv

U = Unit Inv = Investigation

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Lesson 9

How Can I Use Evidence to Analyze My Theories?

TEKS 4.3(A) Analyze, evaluate, and critique scientific explanations by using evidence, logical reasoning, and experimental and observational testing.

Understand the TEKS

Use scientific evidence and information to judge how correct a scientific explanation is.

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Empirical evidence is data collected through personal observation or experience that can prove that a hypothesis is correct or incorrect.

Logical reasoning is a way of thinking that uses information to draw conclusions.

Guided Instruction

Read the following information and answer the questions.

You probably have many ideas about the world. You might also ask many questions. Sometimes, you might try to answer your questions and explain how the world works. Information you collect this way is called **empirical evidence**. By doing this, you are acting like a scientist. To try to answer a question, a scientist states a **hypothesis**. A hypothesis is an educated guess based on facts and observations.

Once you have a hypothesis, you need to try to find out if it is true. You can test it by doing experiments. Sometimes, the results of an experiment show that a hypothesis is wrong. This can still teach you something! Scientists often learn a lot when they find out a hypothesis is wrong.

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The data from your experiment might show that your hypothesis is correct. However, one test might not be enough. Sometimes, different scientists do the same experiment. They might test the hypothesis again and again. Testing a hypothesis many times can help you be sure you have not made any mistakes.

Sometimes, many scientists agree that a hypothesis is correct. The hypothesis might then become a theory. A theory explains why something happens in nature. For example, one theory explains how stars form. Another theory explains how types of animals and plants change over time. Most theories are very detailed. The work of many scientists is used to develop a theory.

You are learning new things all the time and so are scientists. Sometimes, new data **support** the scientists' theories. A **theory** is the conclusion that scientists draw about a subject based on the information available at the time. Theories often change as technology improves and more data are collected. Data might make the theory seem true.

People should evaluate the scientific process, the data, and the conclusions drawn to decide if they are based on **logical reasoning**. If new data show a theory is wrong, the scientists have to change it. They might change the theory a little bit or a lot. Sometimes, scientists keep finding information that says their theories are wrong. Then they might have to start over with a new theory.

1. On what is a hypothesis based?

facts and observations

2. How many times might a hypothesis be tested?

It might be tested many times.

3. What is a theory?

a statement that explains why something happens in nature

4. What does it mean if new data support a theory?

The data make the theory seem true.

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Critical Thinking

Answer the following questions.

1. What do scientists do if data show that a theory is wrong?

They either change the theory or develop a new theory.

2. What is the difference between an idea and a theory?

A theory is based on data from experiments, but an idea is not.

3. Scientists have a theory about what makes up matter. What does this theory tell us?

It gives us an explanation of the makeup of matter.

4. Which is more likely to be true—a hypothesis or a theory? Why?

a theory because it is based on a lot of data and observations

5. What would scientists need to do if they discovered data that showed that Earth is more than 4.5 billion years old?

They would need to change their theory.

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★ Practice

DIRECTIONS Read each question. Then circle the letter for the correct answer.

1 What does a theory do?

A It provides new data.

B It becomes a hypothesis.

C It becomes a conclusion.

(D) It explains observations in nature.

[TEKS 4.3(A), DOK 1]

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2 You have a hypothesis that pill bugs prefer dark places to light places. However, the data from your experiment do not support your hypothesis. What should you do first?

F Change the data.

G Change the question.

H Change the conclusion.

(J) Change your hypothesis.

[TEKS 4.3(A), DOK 3]

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3 A scientist finds evidence of a plant that lived in the time of the dinosaurs. No one has ever seen this plant growing. What is true about the new evidence?

A It must be incorrect.

(B) It suggests the plant is extinct.

C It proves why dinosaurs are now extinct.

D It means scientists should change their idea about adaptations.

[TEKS 4.3(A), DOK 3]

4 If you want to test an idea, what should you make first?

F A law

G A theory

(H) A hypothesis

J A conclusion

[TEKS 4.3(A), DOK 3]

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5 Which is true about a theory?

A A theory can never be changed.

B A theory can turn into a hypothesis.

C A theory is very general and vague.

(D) A theory might be altered with new information.

[TEKS 4.3(A), DOK 2]

★ Assessment

DIRECTIONS Read each question. Then circle the letter for the correct answer.

1 A student is trying to determine the temperature at which beans sprout the fastest. The student has collected data such as temperature, sprout height, size of bean, and number of days to sprouting. What is this data called?

A Hypothesis

B Theory

C Logical reasoning

(D) Empirical evidence

[TEKS 4.3(A), DOK 1]

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2 A scientist forms a conclusion that a plant was not native to a desert because of the shape and size of its leaves. What did this scientist use to base this conclusion?

F A law

G A hypothesis

(H) Logical reasoning

J Support for a theory

[TEKS 4.3(A), DOK 2]

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3 What work is most often only carried out by scientists?

A Testing hypotheses

(B) Developing theories

C Using logical reasoning

D Collecting empirical evidence

[TEKS 4.3(A), DOK 3]

4 You think that lemon juice will lower the boiling point of water. However, your evidence and data do not support this hypothesis. What could you do?

F Turn your hypothesis into a theory.

G Change your data to match your hypothesis.

(H) Test your hypothesis again to see if there was a mistake.

J Ignore your data and use logical reasoning to form a conclusion.

[TEKS 4.3(A), DOK 3]

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5 You think that bean plants grown from green seeds grow faster than those grown from yellow seeds. What is this thought called?

(A) A hypothesis

B Solid theory

C A conclusion

D Empirical evidence

[TEKS 4.3(A), DOK 3]

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Lesson 30

Why Is Soil Important?

TEKS 4.7(A) Examine properties of soils, including color and texture, capacity to retain water, and ability to support the growth of plants.

Understand the TEKS

You can learn about the different properties of soil and why soil is an important material.

Words to Know
soil
texture
humus
decomposer

Soil is loose weathered material on Earth's surface in which plants can grow.

The **texture** of soil refers to how it feels and the size of its rock particles.

Humus is decayed plant and animal matter found in soil.

Decomposers are living things that break down dead plant and animal matter.

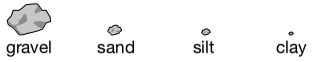
Guided Instruction

Read the following information and answer the questions.

Soil is one of Earth's most valuable materials. Grass, trees, and other plants use soil to grow. Animals also use soil because they use plants for food and for shelter. Without soil, most plants would likely not exist on Earth.

Soil is made mostly of weathered rocks and minerals. It forms as rock is broken down and mixed with other materials. The other materials include dead plant and animal matter, air, and water.

An important property of soil is its **texture**. One part of soil texture is the size of the particles that make up the soil. The largest particles are gravel. Gravel is any rock particle that is 2 millimeters across or larger. Next in size are particles of sand. They are much smaller than gravel. Silt is even smaller than sand. The smallest soil particles are clay. They are too small to be seen without a microscope. The diagram below compares the sizes of soil particles. The particles have been enlarged so they can be seen easily.



Soil texture is important for plant growth. Empty spaces between soil particles hold air and water. If soil is made mostly of larger particles, like gravel or sand, its texture is very coarse. Coarse soil does not hold water well, and plants might not be able to get the water they need. Soils made mostly of clay particles have a very fine texture with tiny spaces. Water can get trapped in the spaces, and plants can drown or water will not go through the clay. Soils that are made up of equal parts of sand, silt, and clay have a good texture for growing most plants. Water can drain through the soil, but some water is held in place.

Another important property of soil is the amount of **humus** it contains. Humus is made up of once-living bits of plant and animal matter. Humus contains lots of plant nutrients and helps hold water. Plants need these nutrients and water to grow. Loam is a rich soil in which humus is mixed with sand and clay.

Small living things called **decomposers** live in soil. The earthworm is one example of a decomposer. Decomposers create humus by breaking down the remains of dead plants and animals. Burrowing insects mix the humus into the soil as they move.

1. What materials are found in soil?
   weathered rock and minerals, dead plant and animal matter, air, and water
2. What is soil texture?
   how the soil feels and the size of its particles
3. What is humus made of?
   dead plant and animal matter
4. Why are decomposers important to soil?
   They break down the remains of dead plants and animals into plant nutrients.
5. Why is soil important to plants and animals?
   Plants use soil to grow. Animals need plants for food and shelter.
6. Why is good soil texture important for plant growth?
   Good soil texture allows plants to get the right amount of water.
7. How does humus make soil good for plants?
   It adds plant nutrients to soil. These nutrients help plants grow.

Critical Thinking

Read the paragraph, study the table, and answer the questions.

Two students worked together on a science project. They wanted to test the textures of three different soils. They placed each sample of soil in a funnel with filter paper. Then they placed a beaker below the funnel. The students poured 250 milliliters of water into the funnel. They collected and measured the amount of water that moved through the soil in five minutes. They recorded their data in the table.

Soil Sample	Amount of Water Collected (mL) in 5 minutes
A	100
B	245
C	15

1. Describe the texture and particles of soil sample C.

Soil sample C has a very fine texture because most of the water did not move through the soil sample. The sample held most of the water. Its particles are very small. It is probably clay.

2. Which soil sample likely contained a lot of gravel? Explain.

Soil sample B most likely contained gravel. A lot of water moved through sample B. Gravel has lots of spaces, so water moves through it easily.

3. Which soil sample probably has the best texture for most plants? Explain.

Soil sample A has the best texture for plants. Some water moved through, but some of the water was held in the soil, giving the roots a chance to absorb the water.

4. What could the students do to improve the texture of the soil sample B?

Adding and mixing in smaller soil particles, like sand or silt, could improve the texture.

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★ Practice

DIRECTIONS Read each question. Then circle the letter for the correct answer.

1 In general, soil is made mostly of which material?

A Water
B Air
C Broken-down rocks
D Dead plant material

[TEKS 4.7(A), DOK 1]

2 Which soil particle is the smallest?

F Gravel
G Clay
H Silt
J Sand

[TEKS 4.7(A), DOK 1]

3 What are living things that break down dead plants and animals called?

A Humus
B Waste producers
C Decomposers
D Nutrients

[TEKS 4.7(A), DOK 1]

4 What type of soil is best for most plant growth?

F Soil that is mostly sand
G Soil that is mostly sand with humus
H Soil that is a mixture of silt and clay with little humus
J Soil that is an even mixture of sand, silt, and clay with humus

[TEKS 4.7(A), DOK 3]

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★ Assessment

DIRECTIONS Read each question. Then circle the letter for the correct answer.

1 Which material will increase the amount of humus in soil?

A Rotting leaves
B Weathered rocks
C Water
D Minerals

[TEKS 4.7(A), DOK 3]

2 Which kind of soil can hold so much water that it can drown plants?

F Sand
G Clay
H Silt
J Gravel

[TEKS 4.7(A), DOK 3]

3 What would likely happen without soil?

A Animals would migrate to a new place.
B Plants would not exist.
C Erosion would increase.
D Water would not be good to drink.

[TEKS 4.7(A), DOK 2]

4 Which sentence best describes soil particles?

F Soil particles vary in size.
G Soil particles all look alike.
H Soil particles are all very tiny.
J Soil particles must be enlarged to see.

[TEKS 4.7(A), DOK 2]

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Lesson 32

How Does the Sun Affect Earth's Seasons?

TEKS 4.8(C) Collect and analyze data to identify sequences and predict patterns of change in shadows, seasons, and the observable appearance of the moon over time.

Understand the TEKS

You can learn about the sun and how it interacts with Earth.

The **sun** is a medium-sized star and the star that is closest to Earth.

The **Northern Hemisphere** of Earth is the area north of the equator.

The **Southern Hemisphere** of Earth is the area south of the equator.

The **equator** is an imaginary circle halfway between the North Pole and South Pole.

Words to Know
sun
Northern Hemisphere
Southern Hemisphere
equator

Guided Instruction

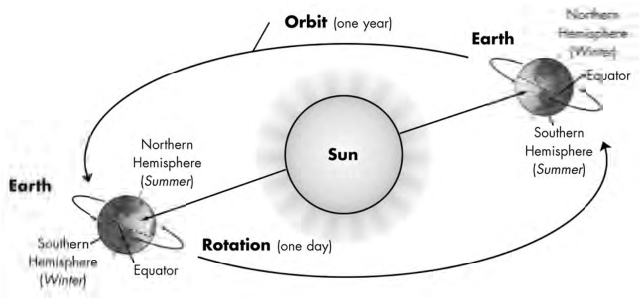
Read the following information and answer the questions.

All the planets, including Earth, revolve around the star we call the **sun**. Heat from the sun reaches Earth from about 150 million km away. The sun's heat makes Earth warm enough to support life. Different amounts of sunlight received by Earth give us the seasons.

Earth is divided into two sections. They are called the **Northern Hemisphere** and the **Southern Hemisphere**. These two sections are separated by an imaginary circle around Earth called the **equator**. It is halfway between the North Pole and South Pole. The image shows the way that Earth is divided into sections. The United States is located in the Northern Hemisphere.

Earth rotates on its axis as it revolves around the sun. However, Earth's axis does not run in a straight up-and-down line. It is tilted, or turned, slightly on its side. Because of this tilt, some parts of Earth get more sunlight than other parts at any one time. The tilting of Earth's axis is what gives us the four seasons of the year.

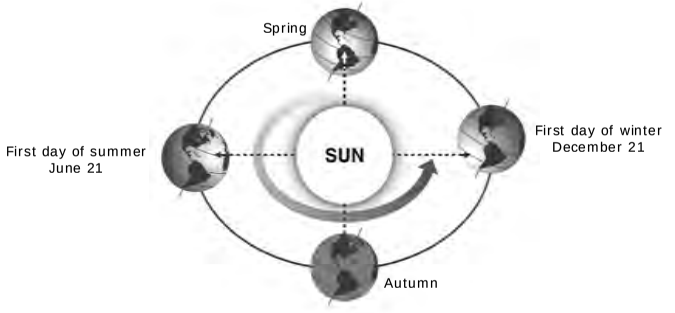
It takes Earth twelve months, or one year, to revolve around the sun. During the six months that the North Pole is titled toward the sun, the Northern Hemisphere gets more sunlight than the Southern Hemisphere. People living in the Northern Hemisphere experience the warmer seasons of late spring, summer, and early fall during this time. People living in the Southern Hemisphere, however, experience the colder seasons of late fall, winter, and early spring. The Northern Hemisphere experiences these colder seasons in the six months that the North Pole is titled away from the sun.



1. What revolves around the sun?
   All the planets
2. Where is the equator?
   Halfway between the North Pole and the South Pole
3. Is the United States located in the Northern Hemisphere or the Southern Hemisphere?
   Northern Hemisphere
4. Which hemisphere gets more sunlight when the North Pole is titled toward the sun?
   Northern Hemisphere

Critical Thinking

Look at the drawing showing seasons in the Northern Hemisphere. Then read the paragraph and answer the questions.



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As Earth revolves around the sun, Earth's axis is tilted toward or away from the sun. In the Northern Hemisphere, the first day of summer occurs when Earth's axis is tilted most toward the sun. It occurs on or around June 21. This day has the greatest number of daylight hours. The first day of winter occurs on or around December 21. On this day, Earth's axis is tilted farthest away from the sun. This day has the fewest hours of daylight.

1. In which hemisphere is the United States located?

The United States is located in the Northern Hemisphere.

2. What causes the seasons?

The tilt of Earth's axis causes the seasons.

3. What seasons occur in the Northern Hemisphere when the North Pole is tilted away from the sun?

Late fall, winter, and early spring occur when the North Pole is tilted away from the sun.

4. On what date are you most likely to go to bed while it is still light outside? Explain.

On June 21, the Northern Hemisphere receives the greatest number of daylight hours. It may still be light outside at bedtime on this day.

5. When does the Northern Hemisphere experience the fewest hours of sunlight?

It is the first day of winter, which is around December 21.

6. When the Northern Hemisphere is having summer, what season is the Southern Hemisphere having? Why?

It is having winter because the Southern Hemisphere is tilted away from the sun.

★ Practice

DIRECTIONS Read each question. Then circle the letter for the correct answer.

1 What is the imaginary circle around Earth that is halfway between the North Pole and the South Pole?

A Tilt

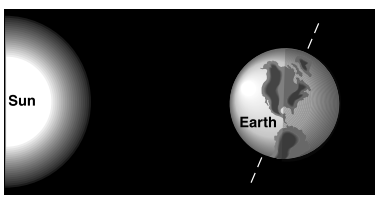
B Axis

(C) Equator

D Northern Hemisphere

[TEKS 4.8(C), DOK 1]

2 In the image, the Northern Hemisphere is tilted away from the sun more than any other time of the year.



What season is it in the Northern Hemisphere?

F Spring

G Summer

H Autumn

(J) Winter

[TEKS 4.8(C), DOK 2]

3 Which of the following causes the seasons?

A The sun's rotation

(B) The tilt of the Earth's axis

C The rising and setting of the sun

D The summer solstice

[TEKS 4.8(C), DOK 2]

4 Which season begins with the fewest hours of daylight?

(F) Winter

G Spring

H Summer

J Fall

[TEKS 4.8(C), DOK 1]

5 Suppose daylight lasted for thirteen hours on June 21. How many hours of nighttime would occur on that day?

A One

B Ten

(C) Eleven

D Nine

[TEKS 4.8(C), DOK 3]

★ Assessment

DIRECTIONS Read each question. Then circle the letter for the correct answer.

1 What are the names of the two sections that make up the Earth?

A Atmosphere and crust

(**B**) Northern Hemisphere and Southern Hemisphere

C Spring and summer

D South Pole and North Pole

[TEKS 4.8(C), DOK 1]

2 When it is summer in Texas, which part of Earth is closest to the sun?

F Southern Hemisphere

G Equator

H South Pole

(**J**) Northern Hemisphere

[TEKS 4.8(C), DOK 3]

3 How would life on Earth be different if Earth's axis were not tilted?

A The moon would not have phases.

(**B**) There would be no seasons.

C The year would be longer.

D Daylight would last 24 hours everywhere on Earth.

[TEKS 4.8(C), DOK 3]

4 Which of the following revolves around the Earth?

F The North Star

G The planets

H The sun

(**J**) The moon

[TEKS 4.8(C), DOK 2]

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