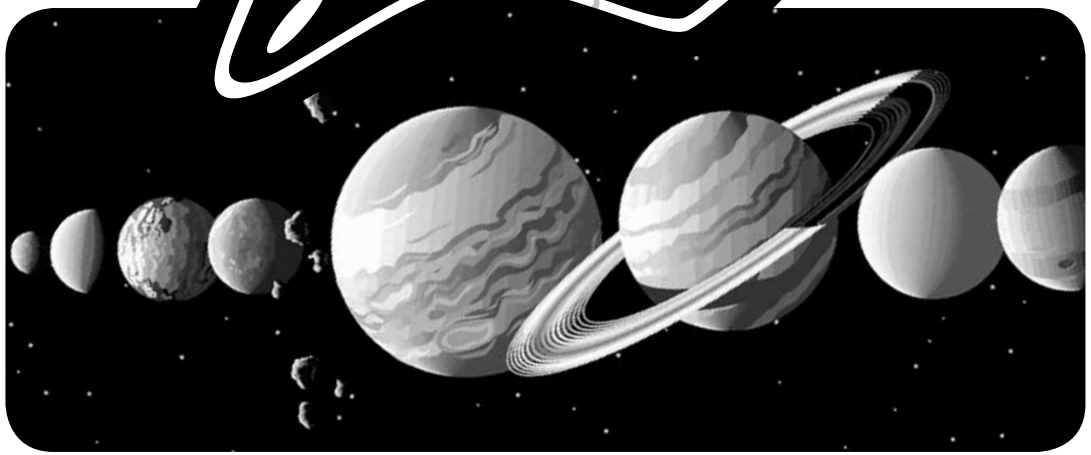
FOCUS ON SCIENCE

Planetary Systems

Basic Level



Earth Science
Earth, Sun, Moon System

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Planetary Systems

Scientific Inquiry

The central purpose of scientific inquiry is to develop explanations of natural phenomena in a continuing, creative process.

Represent, present, and defend their proposed explanations of everyday observations so that they can be understood and assessed by others.

Earth Science

The Earth and celestial phenomena can be described by principles of relative motion and perspective.

Earth's Sun is an average-sized star. The Sun is more than a million times greater in volume than Earth.

Other stars are like the Sun but are so far away that they look like points of light. Distances between stars are vast compared to distances within our solar system.

The Sun and the planets that revolve around it are the major bodies in the solar system. Other members include comets, moons, and asteroids. Earth's orbit is nearly circular.

Gravity is the force that keeps planets in orbit around the Sun and the Moon in orbit around the Earth.

Most objects in the solar system have a regular and predictable motion. These motions explain such phenomena as a day, a year, phases of the Moon, eclipses, tides, meteor showers, and comets.

The latitude/longitude coordinate system and our system of time are based on celestial observations.

Moons are seen by reflected light. Our Moon orbits Earth, while Earth orbits the Sun. The Moon's phases as observed from Earth are the result of seeing different portions of the lighted area of the Moon's surface. The phases repeat in a cyclic pattern in about one month.

The apparent motions of the Sun, Moon, planets, and stars across the sky can be explained by Earth's rotation and revolution. Earth's rotation causes the length of one day to be approximately 24 hours. This rotation also causes the Sun and Moon to appear to rise along the eastern horizon and to set along the western horizon. Earth's revolution around the Sun defines the length of the year as 365 1/4 days.

The tilt of Earth's axis of rotation and the revolution of Earth around the Sun cause seasons on Earth. The length of daylight varies depending on latitude and season.

The shape of Earth, the other planets, and stars is nearly spherical.

English Language Arts

The following is a selective listing of the literacy competencies addressed in this book.

Literacy Competencies

Word Recognition

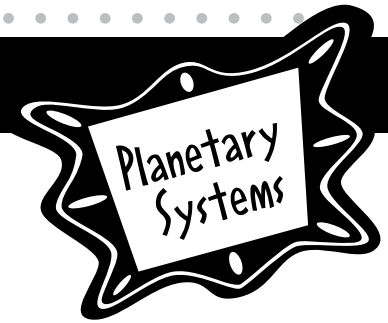
- Recognize at sight a large body of words and specialized-content vocabulary

Background Knowledge and Vocabulary

- Determine the meaning of unfamiliar vocabulary and idioms by using prior knowledge and context clues

Comprehension Strategies

- Use a variety of comprehension strategies (e.g., predicting, questioning, summarizing, visualizing, and making connections) to support understanding and response to reading



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How to Help Your Students Make the Best Use of This Book

Encourage students to develop nonfiction literacy skills by completing the Active Reader activities. Also encourage them to . . .

- Underline main ideas in paragraphs.
- Circle details that support the main ideas.
- Write down questions as they read.
- Circle key words as well as unfamiliar words.

Printing Instructions

Student Book: print pages 5–28

Assessments: print pages 31–32

Answer Key: print pages 33–36

FOCUS ON SCIENCE

Planetary Systems

What roles do forces play in the pattern and stability of the Solar System?

Long ago people thought everything in the night sky were stars. Today, we know that there are many other objects in space other than stars.

What are some of these objects? Make a list of objects that you have seen in the night sky.

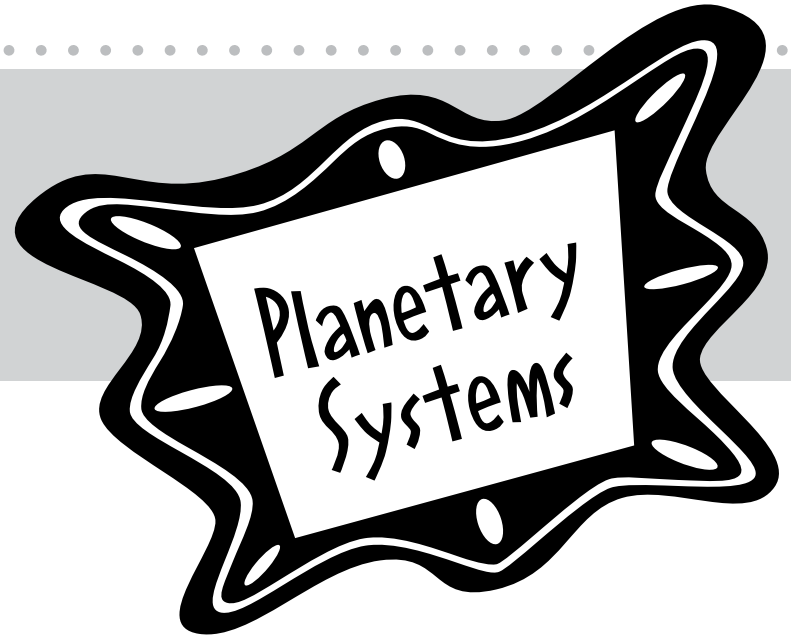


Table of Contents

Starting Points

Build Background

Use Your Knowledge

There are many objects you can see in the night sky. How do these objects beyond our atmosphere affect us every day, every month, or every year? Write a sentence or two telling how you think the things in space affect us on Earth.

Categorize

Look at the names of these objects in our planetary system. Circle the names of the planets.

Earth	Pluto	Asteroid Belt
Sun	Jupiter	Uranus
Venus	Comet	Europa
Moon	Neptune	Saturn
Mercury	Mars	Meteor

Multiple Meaning Words

The word *earth* sometimes refers to the soil under our feet and sometimes refers to the planet we live on. Usually, *earth* is capitalized when it is used as the name of the planet. Look at the sentence below. How is the word earth used? Write a sentence that uses the capitalized form of the word.

We planted seeds in the rich, brown earth of the garden.

Starting Points

Key Vocabulary

Rate Your Knowledge

The words listed below have to do with planetary systems. Some of them may be new to you. Rate your knowledge of each one by putting a check or writing a few words in the appropriate column. After completing this book, come back to this page and write the definitions of words you did not know.

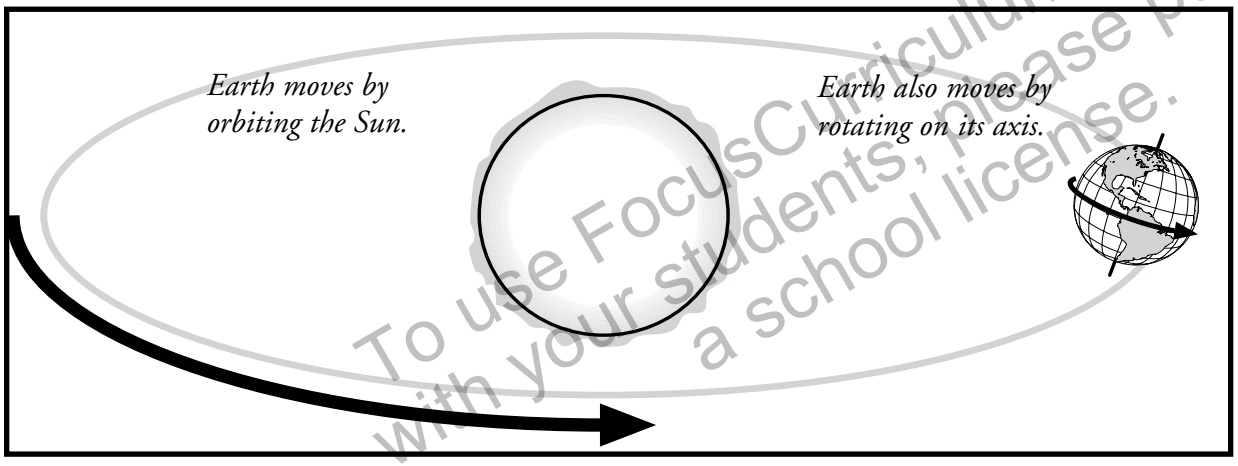
	I don't know it.	I've seen it and I think it means . . .	I know it well. It means . . .
lunar			
revolution			
rotation			
comet			
galaxy			
atmosphere			
meteor			
solar			
asteroid			
celestial			
terrestrial			
satellite			

Starting Points

Key Concepts

Our sun is a bright star at the center of our planetary system. Eight planets and their moons orbit the Sun. Earth is one of those planets. Earth is a spherical, or round, planet. It is covered mostly by water. Earth is surrounded by gases called the atmosphere. These gases hold in the air we breathe.

The Earth moves in two different ways. It rotates, or spins, on its axis. This causes night and day. Earth's rotation is from east to west. That is why the Sun appear to rise in the east and set in the west. Earth also moves is in a revolution, or orbit, around the Sun. It takes Earth one year to orbit the Sun.



Earth has one moon. It rotates on its axis just like Earth. It also orbits Earth. This moon also has an atmosphere, but it is thinner than Earth's.

The stars we see in the night sky are also suns – some with planets orbiting around them. These planets are just too far away for us to see.

ACTIVE READER

1 Recall *What are the two ways Earth moves?*

_____

_____

2 Deduce *The temperature on the surface of the Moon often reaches over 200 °F during the day, then goes down to below -200 °F at night. Why do you think the Moon has a larger temperature range than Earth?*

_____

_____

Good to Know

The planet Earth is unique in that it is the only one we have found to have liquid water, consistent temperatures, and therefore, life.

Chapter 1 Our Planetary System

FOCUS

The underlined sentences state important ideas about the composition of our planetary system. As you read, find out how the Sun, our star, is similar to and different from Earth and the other planets.

Our System

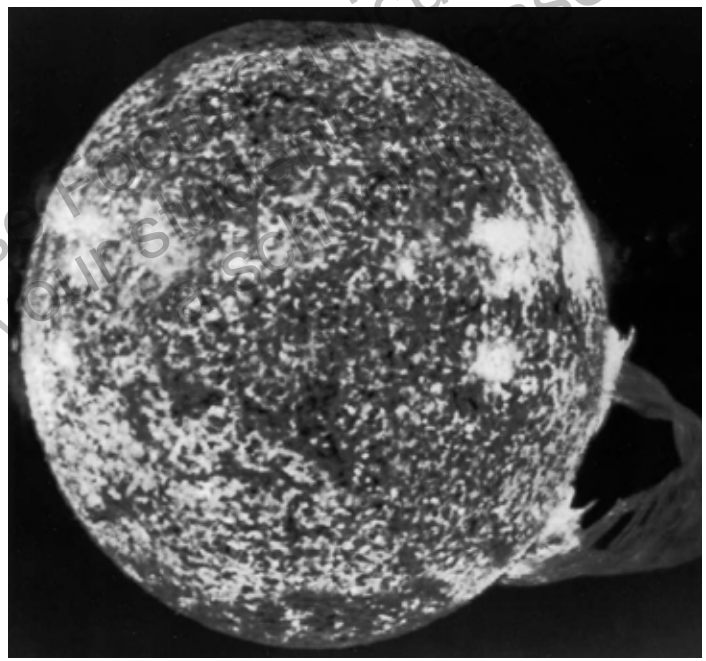
Our planetary system has many different celestial bodies. It includes one star, several planets, dwarf planets, and many moons. It also has a collection of comets, asteroids, and meteors. This may sound like our system is crowded. However, there's a lot of space between all of these.

The Sun

The sun is a star at the center of our planetary system. It is a large ball of hot gases. Its great size creates a large amount of gravity. This keeps all the objects in our system in orbit around it. It also provides light and heat to this system.

In the universe, our sun is a star in the Milky Way **galaxy**. The Milky Way contains billions of stars.

Just like a planet, the Sun rotates. Also like a planet, the Sun moves through the Milky Way in a slow orbit.



The Sun is the single star at the center of our planetary system.
Photo courtesy NASA

ACTIVE READER

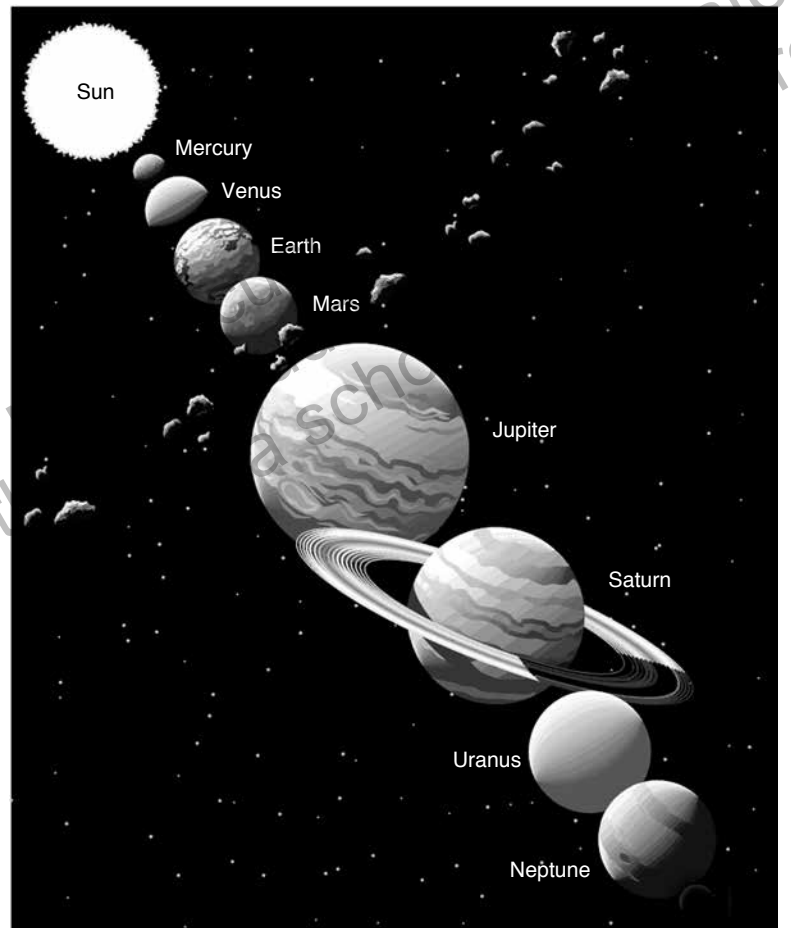
1 Summarize *What are the most important ideas about the Sun? Write a sentence to summarize what you learned.*

The Planets

A planet is a celestial body in orbit around the Sun. The four planets that are closest to the Sun, Mercury, Venus, Earth, and Mars are known as **terrestrial** planets. These planets have solid surfaces. The other four planets are called gas giants. They are much bigger. The gas giants do not have solid surfaces.

Each planet orbits the Sun in its own path. Some planets make their orbit faster than others. For example, Mercury's orbit only takes eighty-eight Earth days. Neptune takes about 165 Earth years to orbit the Sun.

Each planet also rotates. Some rotate faster than other. Some also rotate in a different direction. For example, Uranus rotates on its side. Venus turns very slowly, making one of its days in the time Earth has 243 days.



The first four of our Solar System's planets are terrestrial. The other four are gas giants.

ACTIVE READER

1 Define *What does the word* terrestrial *mean?*

_____

_____

_____

There are planets outside of our planetary system. They are called exoplanets. Because these planets are so far away, no one can see them—even with the most powerful telescopes. But astronomers have other kinds of proof they exist.

Use the Internet to learn more about how astronomers study these planets.

It's All Relative

Create a scale model of the Earth, Moon, and Sun.

1. **Collect the following:**
   - **a tape measure**
   - **1 regular size light bulb**
   - **1 pin,**
   - **a friend or two to help.**

   Use these to create a scale model of the distance of Earth from the Sun. The light bulb (held sideways) represents the Sun. The head of the pin represents Earth.
2. **Place, or have someone hold, the Sun (light bulb) in an open spot outside.**
3. **Use the tape measure to find a spot 35 feet 8 inches away. This is where Earth (the pin) should go. (Earth's moon would be the size of a period at the end of this sentence and would go about an inch from Earth.)**
4. **Sketch your findings on a separate sheet of paper. Label the celestial bodies and distances.**

FOCUS QUESTIONS

1. **Define rotation and revolution in your own words.**

   rotation: _____

   revolution: _____

2. **What are the main components of our planetary system?**

   _____

The dwarf planet Pluto used to be considered a planet, but has been downgraded to the status of dwarf planet. This object has been the subject of great controversy, spawning its own new vocabulary: "plutoid" (a type of dwarf planet) and "plutoed" (to be demoted). You can tell if an astronomy book or Web site is not up-to-date if Pluto is still included as the ninth planet.

Use the Internet to find sites that do and do not list Pluto as a planet or talk about the controversy surrounding the demotion. Then explain why you think people care so much about the status of Pluto.

FOCUS

As you read the next section, look for other objects in our planetary system besides the Sun and planets. What makes them different?

Other Celestial Bodies in Our Planetary System

Besides the major planets, the Sun's gravity holds other objects in the system as well. Astronomers have discovered several dwarf planets in our system. These small planets, such as Pluto, are round and orbit the Sun.

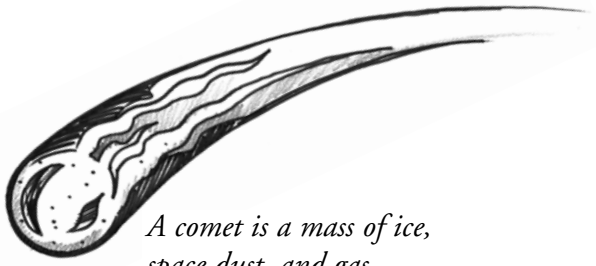
Many celestial bodies have their own moons. Moons are natural **satellites** that can orbit around a planet, a dwarf planet, or an asteroid.

Asteroids are medium-sized rocky objects orbiting the Sun. They are smaller than a planet. Scientists believe that asteroids may be bits of a planet that broke up. Others believe that they are simply rocks that never joined to form a planet.

Boulder-size space rocks or smaller are called **meteoroids**. When a meteoroid enters Earth's atmosphere, it is called a meteor. Meteors usually burn up in the atmosphere creating light. We call these "shooting" or "falling star." Any debris from the meteor that reaches Earth is called a **meteorite**.

Many comets also orbit the Sun. A comet is a mass of ice, space dust, and gas. When a comet gets close to the Sun, some of the ice melts leaving a tail.

Most asteroids are found between Mars and Jupiter.



A comet is a mass of ice, space dust, and gas.

ACTIVE READER

1 Rank *Put these celestial bodies in order by size (smallest to largest): comet, planet, asteroid, dwarf planet, Sun, meteor.*

_____

_____

_____

_____

_____

_____

_____

2 Identify *What do all things in our planetary system orbit?*

_____

_____

Planetary Research Do research to complete the chart below about each of the major planets. For size, you may wish to record the circumference, or the length around the planet at its equator. Or use a number that compares its size to Earth. In this case, represent Earth's size as 1. Smaller planets will be represented by a decimal number less than 1 and larger planets will be represented by a decimal number greater than 1.

	Size	Orbital Period (year)	Rotational Period (day)	Known Satellites (moons & rings)	Other Interesting Facts
Mercury					
Venus					
Earth					
Mars					
Jupiter					
Saturn					
Uranus					
Neptune					

FOCUS QUESTIONS

1. **How is a dwarf planet different from a planet?**

_____

_____

2. **Complete the diagram to compare and contrast facts about the Sun, planets, and comets.**

	Sun	Planets	Comets
Similarities			
Differences			

Meteors and asteroids pass by Earth all the time. Most meteors burn up when they enter Earth's atmosphere. But, if an asteroid came close to Earth, it would probably be too big to completely burn up. When an asteroid comes close, people get nervous and it becomes big news.

Search online using keywords such as near miss asteroid. List the near misses astronomers have tracked in the last few years. Write a few sentences about what could happen if an asteroid hit Earth and what scientists are thinking of doing to prevent that from happening.

Stop and Think

This page will help sum up what you have read so far.

1. What keeps the elements of our planetary system together as a system?

(1) orbits

(2) space

(3) the heat and light of the Sun

(4) the gravity of the Sun

2. What is the largest object in our planetary system?

(1) Earth

(2) Jupiter

(3) the Sun

(4) an asteroid

Use the statement below and your knowledge of science to answer question 3.

One Earth year is 365 1/4 days. One year on Jupiter takes twelve Earth years. The length of a year is different on each planet in the Solar System.

3. What determines the length of a year?

Dear Ms. Understanding,

Where do we get the "man in the Moon" legend? I can see his face when I look at the Moon every night.

Moongazing in Mamaroneck

Dear Mooney,

That's just an explanation people invented to explain what they were seeing. Actually, you're looking at craters and other natural features on the Moon's surface. It's like the game you may play while looking at clouds. People in different cultures have come up with many different pictures they could see on the Moon, including a rabbit, a crab, and a woman's silhouette. Next time you see the full Moon, look for other pictures besides the man's face. See how many you can imagine!

Ms. Understanding

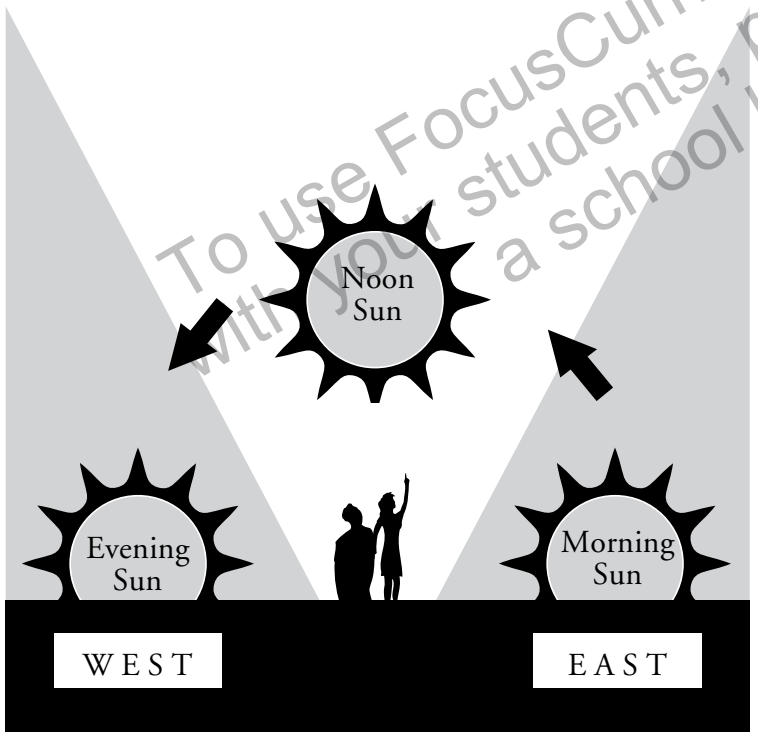
Chapter 2 Movements of the Sun, Earth, and the Moon

FOCUS Read this section to review how the movement of the planets in relation to the Sun creates days, years, and seasonal changes.

Earth's Rotation Causes Day and Night

Every morning of every day, the Sun appears to rise in the east. It appears above you at midday. It sets in the west in the evening.

However, as you have learned, it is not the Sun's movement that creates this effect. It is the spinning of Earth on its axis that makes the Sun appear to move.



ACTIVE READER

1 Describe *What does the Sunrise and sunset look like? Describe what you see.*

At sunrise, _____

_____

_____

_____

_____

At sunset, _____

_____

_____

_____

_____

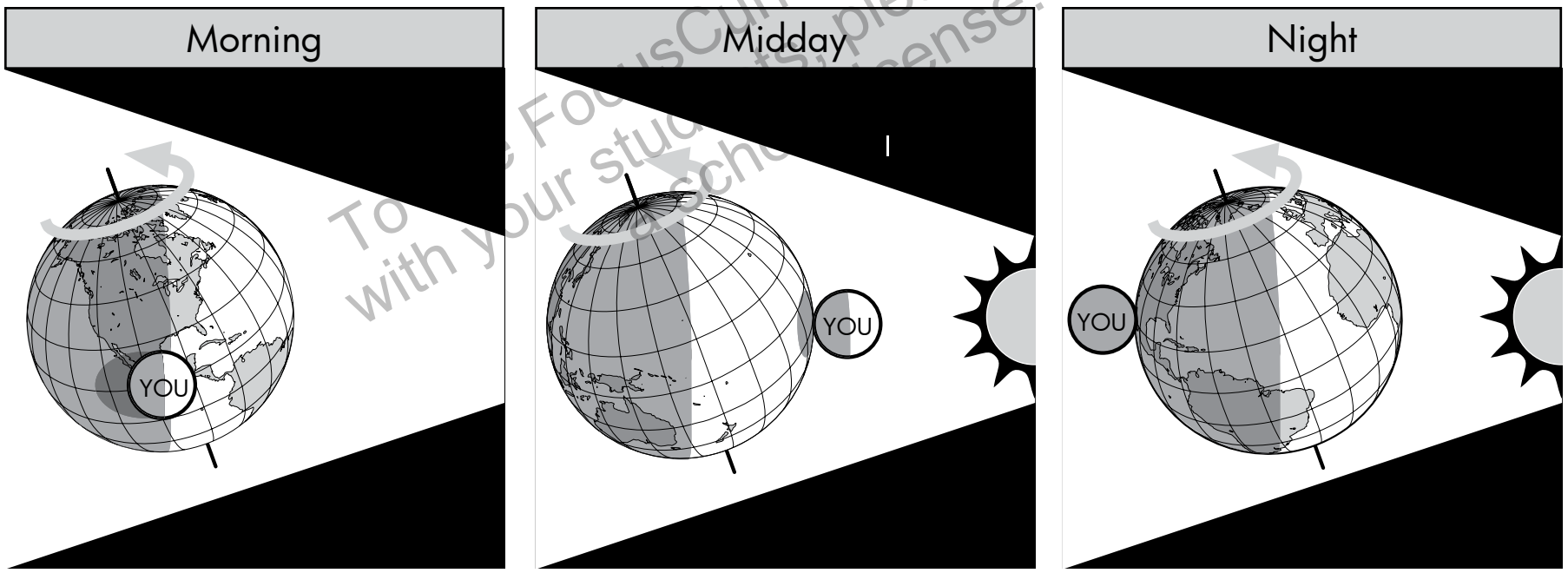
Earth's Day

If you could view Earth from a position above the North Pole, you would see that Earth spins in a counterclockwise direction around its axis. Earth's axis is an imaginary line that runs through its center. The spinning of Earth around its axis is what causes day and night.

The sun rises in the east because Earth is moving towards the east. As the spinning Earth turns us eastward towards the Sun, it becomes morning. Later at noon, the Sun appears directly over our heads in the southern sky because Earth is moving towards the south. At noon, we face the Sun. Later, Earth moves towards the west and the Sun sets. As the spinning Earth turns us away from the Sun, it becomes night.

ACTIVE READER

1 Recall *What motion causes day and night on Earth?*

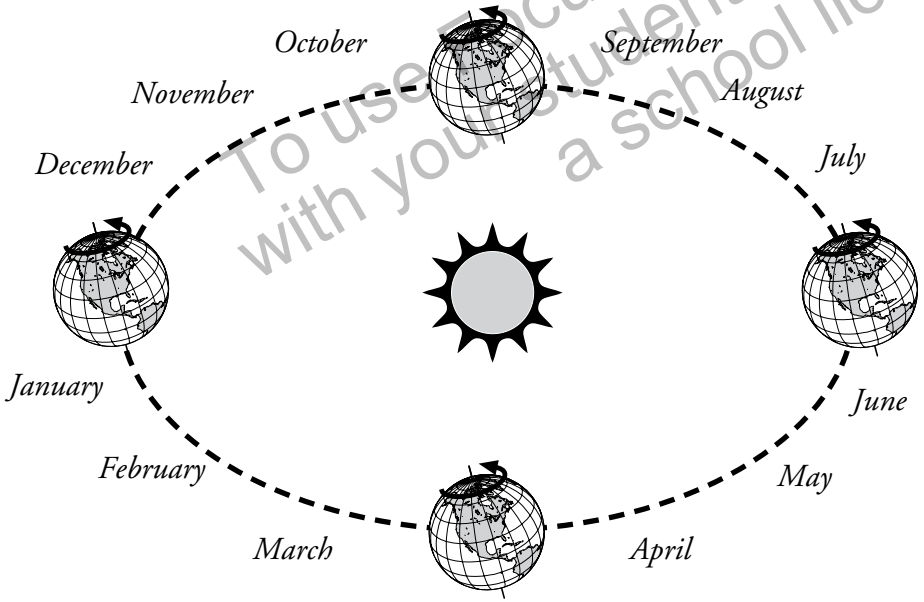


Earth's Orbit Causes Seasons

Earth spins around its axis every 24 hours. As it spins, it also orbits the Sun. It takes Earth one year to orbit the Sun.

Earth's orbit causes our change in seasons. Seasons occur because Earth's axis is tilted. This tilt causes the four seasons.

When you are at a place on Earth that tilts toward the Sun, such as New York in July, the days get longer and it gets warmer. When you are at a place that tilts away from the Sun, such as New York in January, the days get shorter and it gets cooler.



ACTIVE READER

1 Identify *What are two effects of the Earth's revolution? Circle the correct answers.*

year *day* *seasons*

2 Recall *Earth both revolves and rotates. What does it rotate around? What is another word for rotate?*

_____

_____

Web Quest

In New York, the amount of daylight we see every day changes throughout the year. At the Equator, the Sun shines every day for 12 hours, leaving 12 hours of dark. At the poles, during winter it is dark almost the entire day, while during summer it is light almost the entire day. Look online to see which areas are affected in these ways and why.

Spring

When Earth moves in its orbit to a position where the North Pole begins to tilt towards the Sun, spring begins in the Northern Hemisphere. At the same time, the South Pole begins to tilt away from the Sun. Fall, or autumn, begins in the Southern Hemisphere.

Summer

When the Earth moves along its orbit and the North Pole points towards the Sun, summer begins in the Northern Hemisphere. The sun shines directly on the Northern Hemisphere. Now, the South Pole points away from the Sun. Winter begins in the Southern Hemisphere.

Autum

When autumn begins in the Northern Hemisphere, Earth moves in its orbit to a position where the North Pole begins to tilt away from the Sun. Days become shorter and temperatures begin to drop. Spring begins in the Southern Hemisphere.

Winter

Then, Earth moves in its orbit to a position where the North Pole tilts away from the Sun. Temperatures in the Northern Hemisphere are the coldest of the year. Now, it's summer in the Southern Hemisphere.

FOCUS QUESTIONS

1. **What kind of movement creates a day?**

   _____

2. **What kind of movement creates a year?**

   _____

3. **What causes the seasons?**

   _____

ACTIVE READER

1 Identify *"Hemisphere" means half of a ball. Which divides the Northern Hemisphere from the Southern Hemisphere on Earth?*

a) the Equator
b) longitude
c) the Prime Meridian

2 Decide *Are the Northern and Southern Hemispheres ever in the same season. If so, when?*

a) yes, in the spring and fall
b) yes, in the summer
c) no, never

Good to Know

The Earth and Moon have an effect on each other. The Moon reflects sunlight to Earth at night. It also causes tides. Earth keeps the Moon in orbit around itself. Thus the Moon orbits both Earth and the Sun.

FOCUS

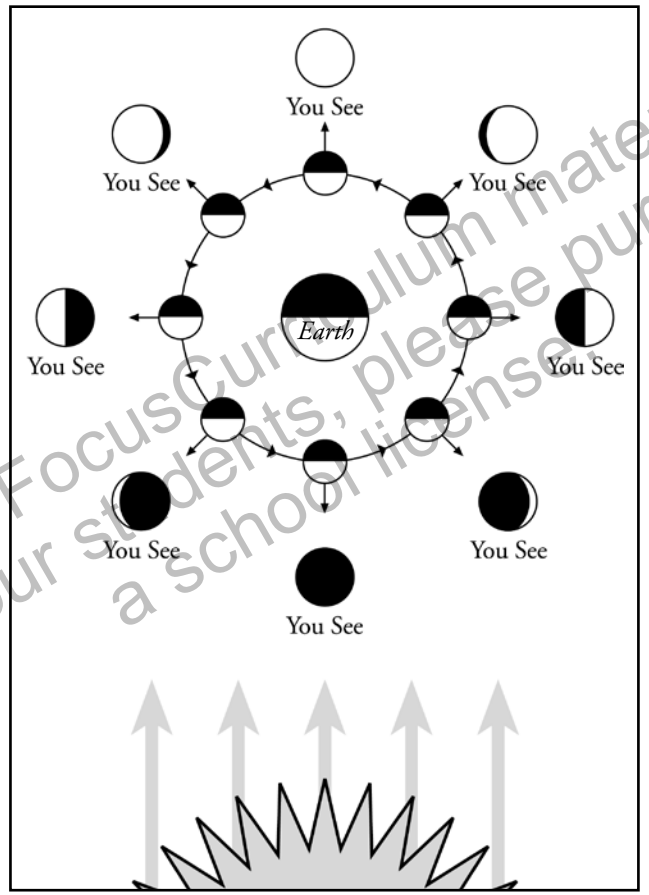
Read this section to learn how the movement of the Moon creates phases that we see from Earth.

Movement of the Moon

Many planets have moons—some even have more than one. We call our moon "the Moon." While Earth is orbiting the Sun, the Moon is orbiting Earth. It can be seen at night because it reflects light from the Sun.

Phases of the Moon

Our moon appears with a different face at different times of the month. The changing views of the Moon are known as phases. Although the Moon is always half-lit by the sun, we on Earth only see the lit part that is facing our location.



The sun illuminates half of the Moon at all times. But the portion of the brightened face of the Moon that we can see from Earth changes as the Moon orbits Earth.

ACTIVE READER

1 Apply *Why don't we see a full moon all the time even though the Sun always lights half of the Moon's surface?*

a) because Earth's shadow gets in the way
b) because the part that is lit is not always facing us
c) because sometimes we see the Moon when it is night there

Web Quest

Moons have been given names by astronomers as they are discovered. Some names are female, some are male, and some are neither. People from different cultures call moons different names. Research online to discover some of the various names of moons in our Solar System.

The moon goes through phases every 29 days, or about 4 weeks. That is the amount of time it takes the Moon to circle Earth.

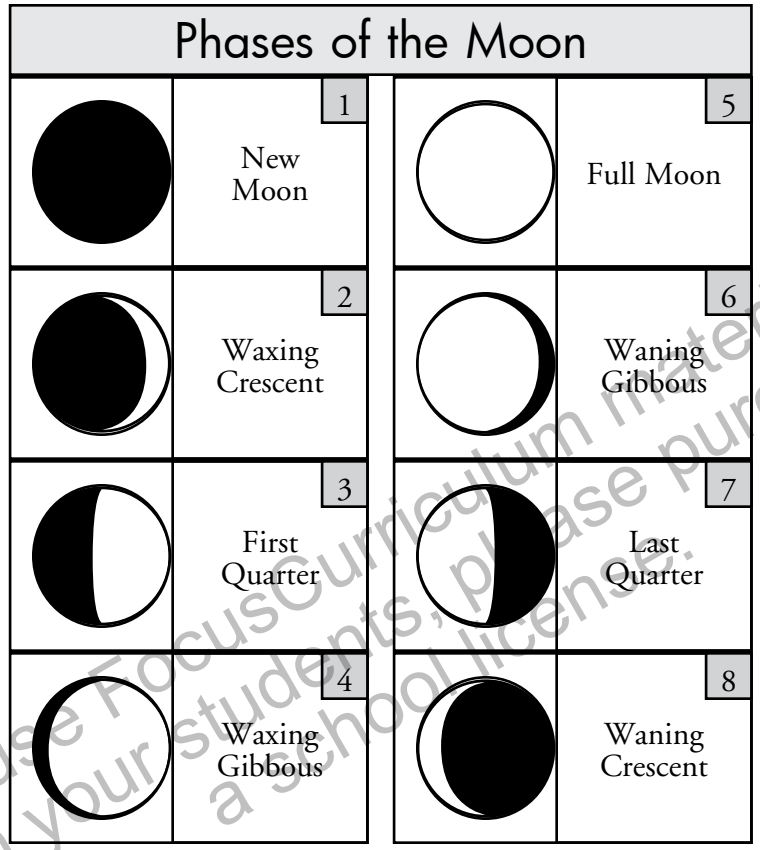
New Moon—The Moon is between Earth and the Sun, so no sunlight can be seen reflecting off the Moon during this phase.

Crescent Moon—Crescent means "curved shape." That is what the Moon looks like during this phase.

Quarter Moon—The moon looks like half of a circle during this phase.

Gibbous Moon—A gibbous moon is almost, but not quite, a full circle.

Full Moon—When the Moon is full it looks like a complete circle.



After the Moon reaches the full phase, the phases continue in reverse order. The Moon enters its gibbous phase, then the quarter moon phase, next comes the crescent phase, and finally the new moon phase where the cycle begins again.

ACTIVE READER

1 Infer *"Gibbous" means "humpbacked." Why is this term appropriate for a moon phase?*

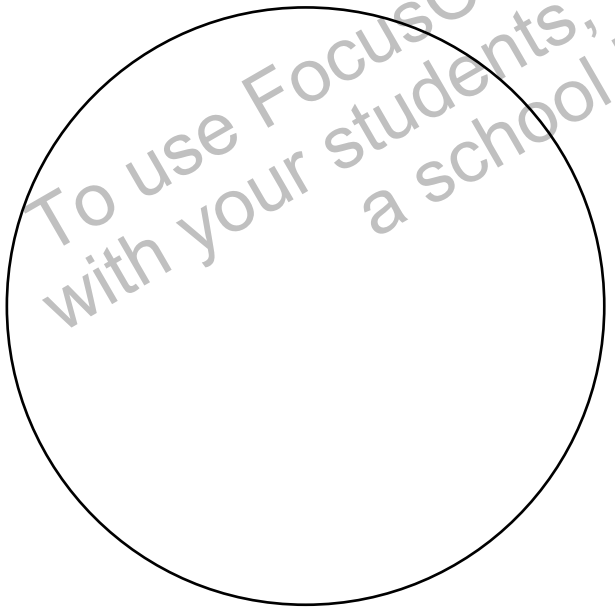
Web Quest

Research online to find out the current phase of the Moon. Often calendars and news sites will use icons such as the ones on this page. Find out when the next full and new moons will be.

FOCUS QUESTIONS

1. Label the Moon phases below.

2. Go out on the next clear night. Draw the Moon as you see it below. What phase is it in?



Good to Know

Many people think that the phases of the Moon are created by Earth's shadow. This is wrong. The rare times Earth creates a shadow on the Moon, a lunar eclipse happens. Although Earth and its moon are very much tied together, travelling through the system, the phases are created only by our views of it from our location at the time.

Good to Know

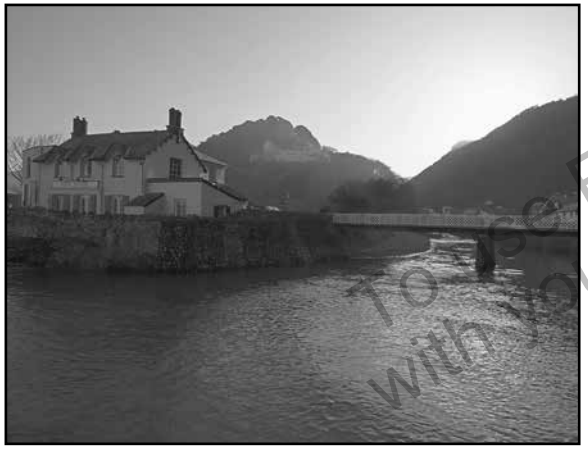
The best time to stargaze is during the new moon, because the sky is darker. Darker skies allow for more stars to be visible.

FOCUS The next section of this chapter discusses how our moon affects tides and eclipses on Earth. Read to find out how the Moon may influence your life.

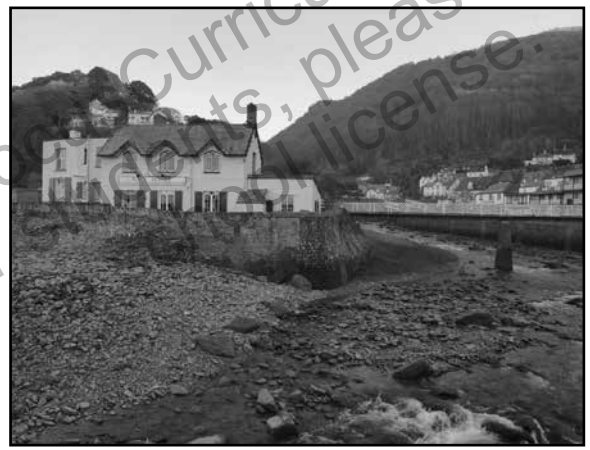
Tides

Gravity keeps the Moon in orbit around Earth. However, the Moon's gravity also pulls on Earth. This can be seen by tides in the ocean. Tides are the rising and falling of large bodies of water.

The Moon's gravity pulls on Earth's water as Earth spins. This pulls the water toward a coast when the Moon is overhead. If the Sun is also close, the pull becomes even stronger. Later, when the Moon has moved away, the gravitational force pulls the water away. This leaves the coast at low tide.



High tide



Low tide

Any coastal area has tides: two times during the day when the water is especially high and two times when the water is especially low.

ACTIVE READER

1 Analyze *What happens to the tides if the Moon is overhead, but the Sun is not?*

_____

_____

_____

_____

_____

2 Evaluate *Who would find it important to know if it is high tide or low tide?*

_____

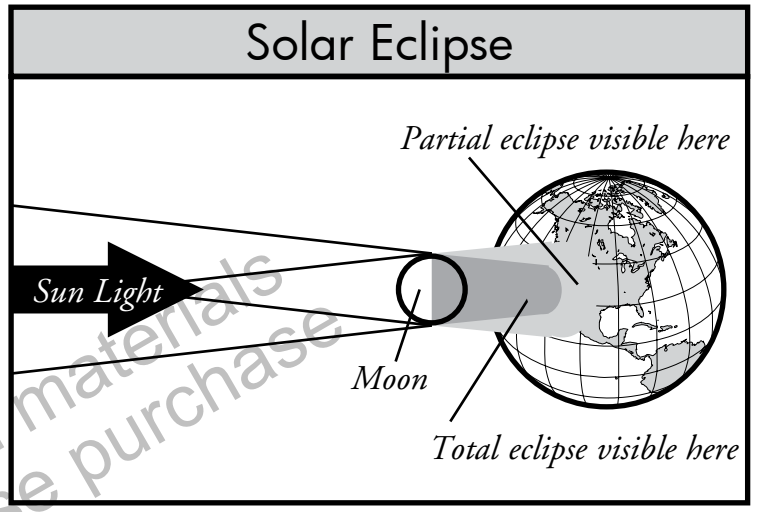
_____

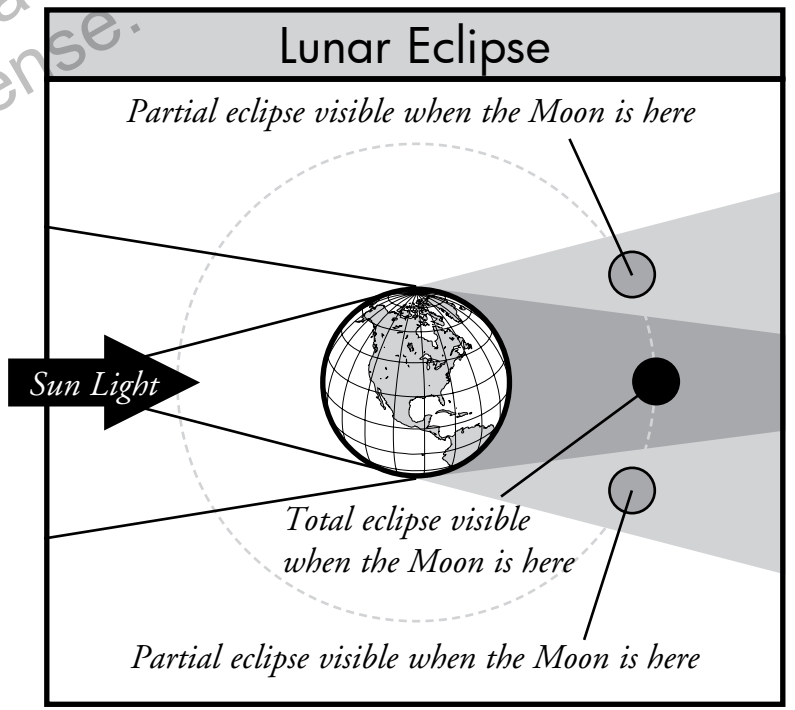
Web Quest Find a Web site that predicts the tides at an ocean beach. When would be the best time today to go look for shells on the beach? When would be a good time to launch a boat?

Eclipses

An eclipse occurs when the Sun's light is blocked. There are two different types of eclipses: solar eclipses and lunar eclipses.

During a solar eclipse the Moon blocks the Sun's light. During a lunar eclipse, Earth blocks the Sun's light from reflecting off the Moon.





FOCUS QUESTIONS

1. What three heavenly bodies are always involved in an eclipse?

_____

_____

_____

2. Why are the tides constantly moving in and out?

Ⓐ The wind is always pushing the water from one coast to another.

Ⓑ Because the Moon is constantly orbiting the Earth.

Ⓒ Because the Moon is always in a different phase.

Ⓓ Because the Sun lights up only half of the Moon.

Stop and Think

This page will help sum up what you have read so far.

1. Which event is caused by the revolution of Earth around the Sun?

(1) one day
(2) one year
(3) an eclipse
(4) the seasons

2. Which event is caused by the rotation of Earth on its axis?

(1) one day
(2) one year
(3) an eclipse
(4) the seasons

Use your knowledge of science to answer questions 3 and 4.

3. What is one thing the Moon and Earth have in common?

_____

_____

_____

4. What is one thing about the Moon and the Earth that makes them different?

_____

_____

_____

Dear Ms. Understanding,

I heard once that when it is winter here in New York, Australia and Argentina are having their summer. How can that be? I thought that we were further from the Sun during the winter anyway.

At a Loss in Albion

Dear Atta,

Actually we're closer to the Sun during our winter – while the southern hemisphere has their summer. But not by much because our orbit is almost completely round. What actually makes the difference in season is our tilted axis, that imaginary pole going through the center of the Earth. During our winter, New York – and the rest of the Northern Hemisphere – is tilted away from the Sun, putting the Southern Hemisphere that much closer. As Earth moves around the Sun, the Sun's rays hit more directly whichever part of Earth is tilted toward it, heating it up more.

Ms. Understanding

Glossary

asteroid – a huge space rock

atmosphere – the gases around a planet

celestial – having to do with the sky or the heavens

comet – a mass of ice, space dust, and gas with a tail

constellations – groupings of stars

density – the quantity or mass of something

exoplanet – a planet outside of our planetary system

galaxy – a collection of many billions of stars

lunar– having to do with the Moon

meteor – a meteoroid that burns up within Earth's atmosphere creating a "shooting star"

meteorite – a meteor that does not burn up completely and whose remnant lands on the Earth's surface

meteoroid – a small space rock

radius – any straight line that extends from the center to the outside of a circle or sphere

revolution – to move around

rotation – to spin

satellite – something that orbits another heavenly body

solar – having to do with the Sun

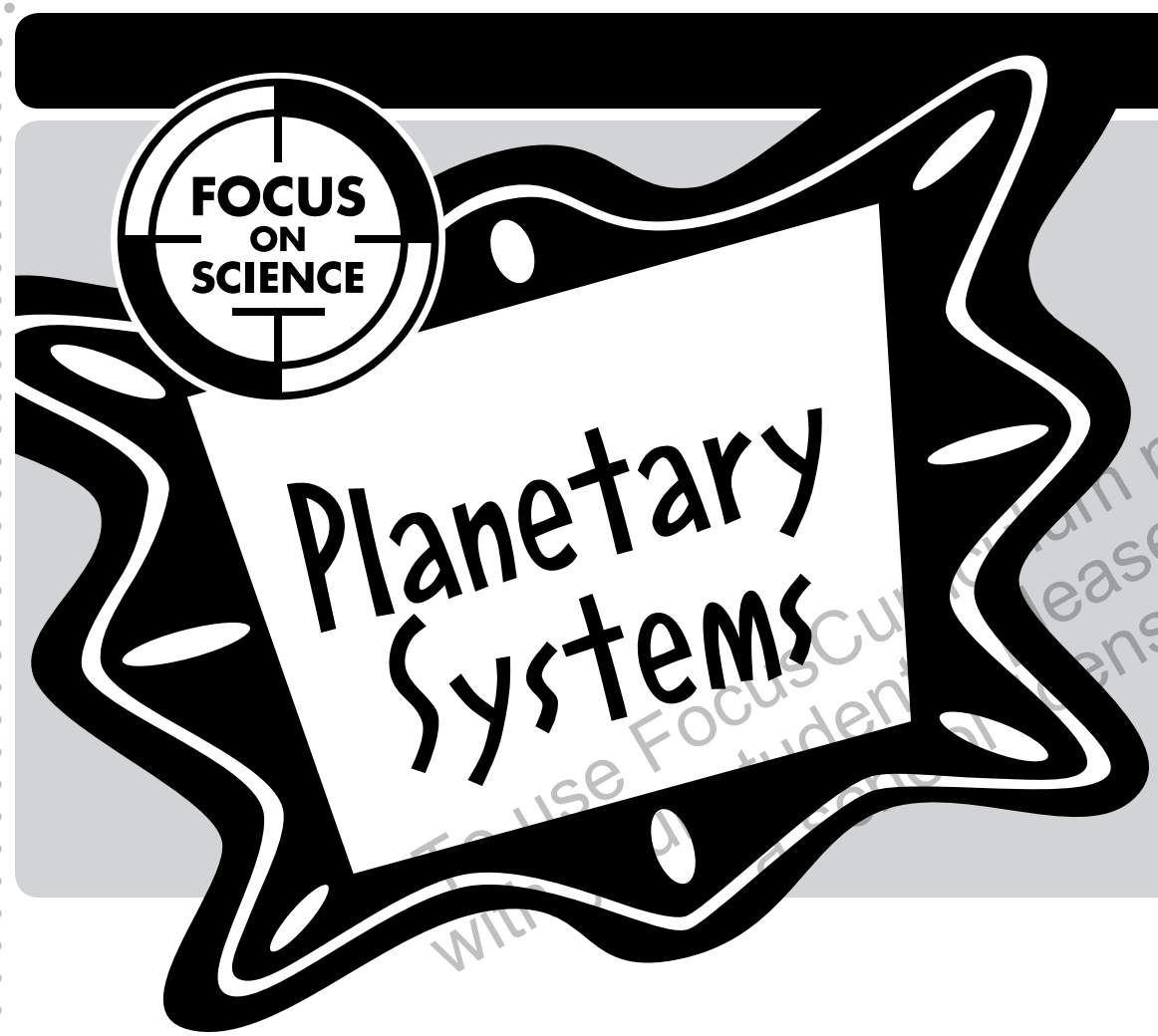
spherical – anything that is shaped like a ball

sun/star – a glowing ball of hot gases

terrestrial – having solid surfaces

wane – to gradually become smaller

wax – to gradually become larger

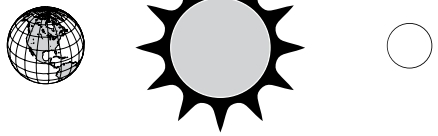


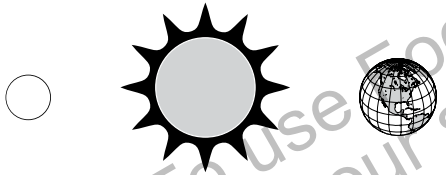
Assessments

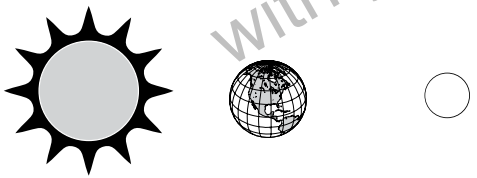
Check Understanding

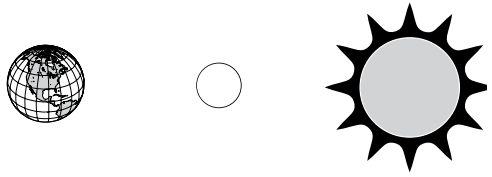
In the Answer Document on this page, mark your answer in the row of circles for each question by filling in the circle that has the same number as the answer you have chosen.

1. Which diagram shows the relative position of Earth, the Sun, and the Moon during a new moon?

A. 

B. 

C. 

D. 

2. What causes one celestial object to orbit another?

   (1) gravity
   (2) its moons
   (3) magnetism
   (4) its revolution

3. Which of the following objects is the largest in a planetary system?

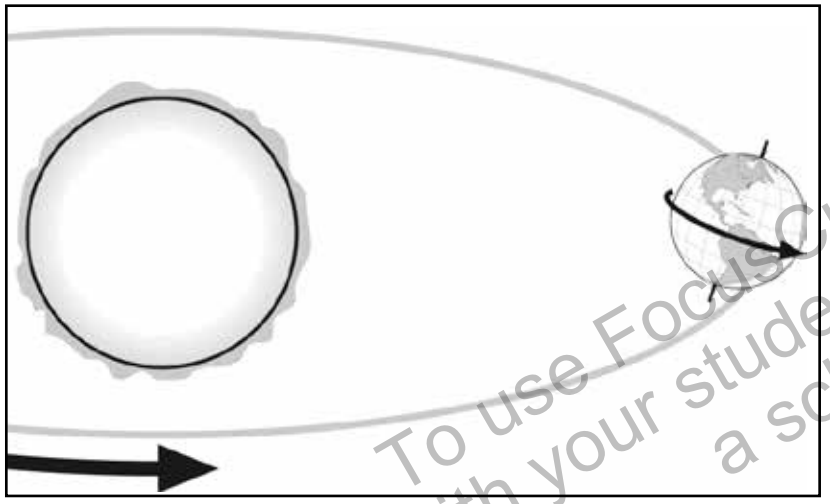
   (1) a planet
   (2) a comet
   (3) an asteroid
   (4) a star

Answer Document

1.	①	②	③	④		3.	①	②	③	④
2.	①	②	③	④						

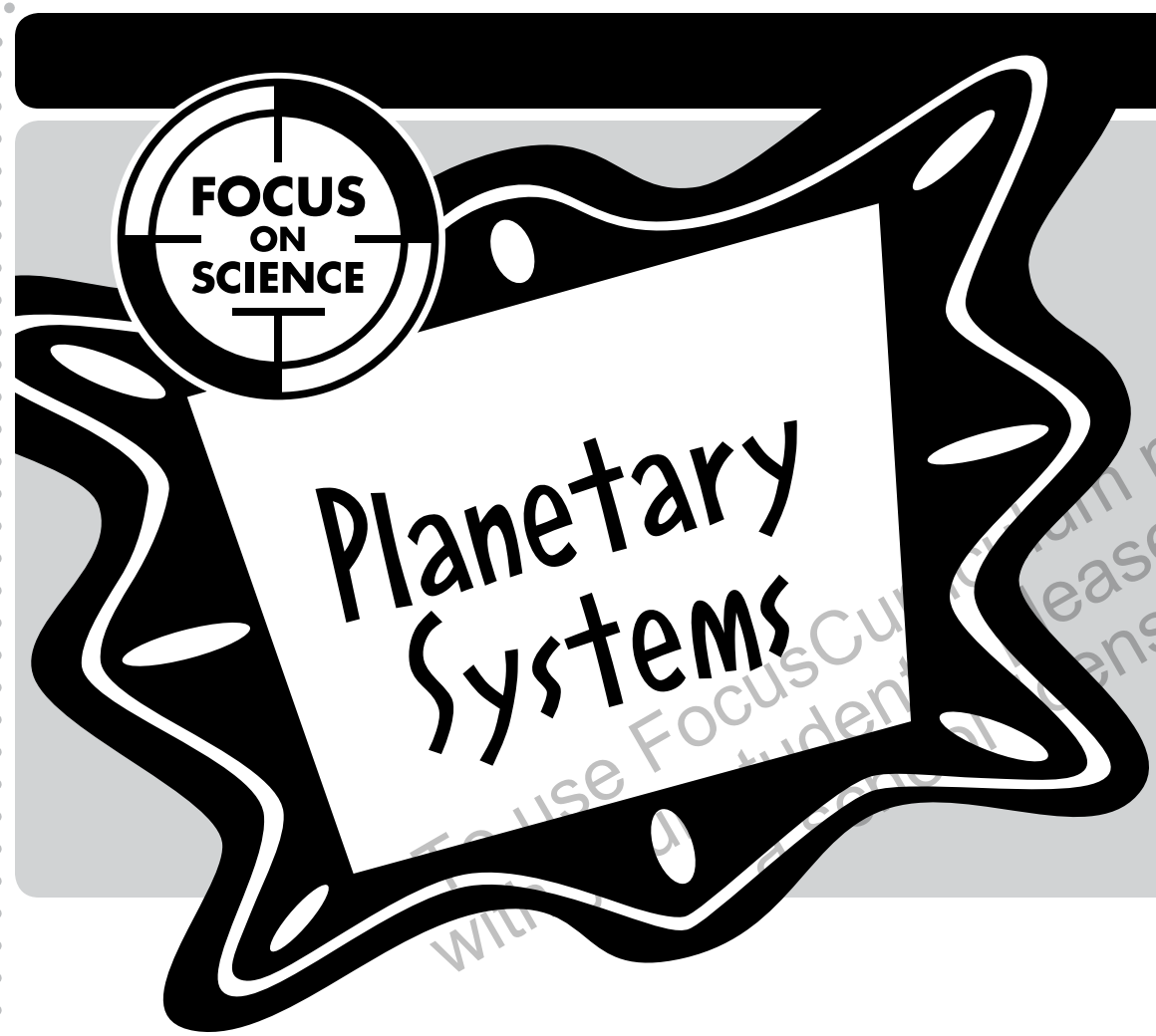
Check Understanding

The illustration below shows North America in the Northern Hemisphere and South America in the Southern Hemisphere. Use the illustration and your knowledge of science to answer questions 4 and 5.



4. What is the approximate time of day where you live as shown in the illustration.? Will it soon be morning or evening in North America? Explain how the illustration shows this.

5. What season is it in North America? Explain how the illustration shows this.



Answer Key

Answer Key

Page 8: Starting Points: Build Background
Use Your Knowledge: Sample answer: The sun provides heat and light, giving us day and life. That along with the Moon has a gravitational pull, keeping us in orbit. This gives us seasons.
Categorize: Circle: Earth, Venus, Mercury, Jupiter, Neptune, Mars, Uranus, Saturn
Multiple Meaning Words: Sentences will vary, but should use the word Earth in the planetary sense.

Page 9: Starting Points: Key Vocabulary
Rate Your Knowledge: Answers will vary according to the student's prior knowledge.

Page 10: Starting Points: Key Concepts
Active Reader: 1. revolution/orbit and rotation; 2. b) Its atmosphere is so thin, it doesn't hold air or heat.

Page 11: Chapter 1
Active Reader: 1.The sun is at the center of the solar system and its force of gravity keeps other objects in the system in orbit around it.

Page 12: Chapter 1
Active Reader: 1. having a solid surface

Page 13: Chapter 1
Hands On Science: It's All Relative:
Responses will vary.
Focus Questions: 1. rotation: to spin on an axis, revolution: to orbit or go around something else; 2. the Sun, planets, space, dwarf planets, moons, asteroids, and other smaller bodies

Page 14: Chapter 1
Active Reader: 1. meteor, asteroid, comet, dwarf planet, planet, sun; 2. b) the Sun

Answer Key

Page 15: Chapter 1
Think Like a Scientist: Planetary Research

	Size (relative to Earth)	Orbital period (year)	Rotational period (day)	Known Satellites (moons/rings)	Other interesting facts
Mercury	0.38	88 days	59 days	no	Named after a god that was fast.
Venus	0.95	224 days	243 days	no	Rotates west to east, its year is shorter than its day.
Earth	1	365 days	1 day	1 moon	Axial tilt accounts for changes in climate throughout the planet.
Mars	0.53	687 days	1.03 days	2 moons	Is called the "Red Planet" because of its color.
Jupiter	11.21	12 years	10 hours	63 moons, rings	The largest planet in our system, its largest moon (Ganymede) is bigger than Mercury, its Great Red Spot in its atmosphere is a storm.
Saturn	9.45	30 years	10.6 hours	61 moons, rings	Its largest moon (Titan) is the only one in the system known to have an atmosphere.
Uranus	4.01	84 years	17.25 hours	27 moons, rings	Rotates top to bottom.
Neptune	3.88	165 years	16 hours	13 moons, rings	Discovered by prediction, rather than observation, named for the god of the sea

Answer Key

Page 16: Chapter 1
Focus Questions: 1. A dwarf planet shares its orbit with neighboring space objects such as asteroids.; 2.Sample answers include: Similarities: in orbit, in our planetary system, can be made of gases. Differences: rotate, have satellites, is a star, creates its own light and heat, may be terrestrial, may have life, has a tail, can become an asteroid

Page 17: Chapter 1
Stop and Think: 1. (4); 2. (3); 3. The length of a year is determined by how long it takes a planet to revolve around the Sun.

Page 18: Chapter 2
Active Reader: 1. Answers will vary but should indicate the Sun low in the east horizon in the morning and low in the west horizon at night.

Page 19: Chapter 2
Active Reader: 1. rotation around Earth's axis

Page 20: Chapter 2
Active Reader: 1. Circle: year, seasons; 2. d) spin

Page 21: Chapter 2
Active Reader: 1. a) the Equator, 2. c) no, never.
Focus Questions: 1. the rotation of Earth on its axis 2. the revolution of Earth in orbit around the Sun 3. the tilt of Earth on its axis as it revolves around the Sun

Page 22: Chapter 2
Active Reader: 1. b) because the part that is lit is not always facing us.

Page 23: Chapter 2
Active Reader: 1. Sample answer: because the Moon looks humpbacked at that phase.

Page 24: Chapter 2
Focus Questions: 1. full moon, waxing crescent, last quarter, new moon; 2. Answers will vary.

Page 25: Chapter 2
Active Reader: 1. The tide will not be as strong or as high. 2. Sample answer: boaters, fishermen, the Navy, and oceanographers

Page 26: Chapter 2
Focus Questions: 1. the Sun, moon, and Earth, 2. Because Earth is always rotating and the Moon is always moving around it.

Page 27: Chapter 2
Stop and Think
1. (2); 2. (1); 3. Possible answers: Both are spherical, rotate, revolve, have days and nights.; 4. Possible answers: Earth is bigger, has more mass. The Moon revolves around both the Sun and Earth.

Page 31: Assessment
1. (3); 2. (1); 3. (4)

Page 32: Assessment
4. It is daytime. It will soon by evening. The illustration shows North America facing the Sun. The Earth is turning counterclockwise away from the Sun.; 5. It is winter in North America. The illustration shows North America tilted away from the Sun.