Study Guide

The BIG Idea

Have students read the answer to the Essential Question. Encourage them to evaluate and revise their own answers as needed.

Help Students Read

Building Vocabulary

Using Context Clues As students read "Observing the Solar System," have them look for unfamiliar words. For example, students may not know definitions for the words *constellations, heliocentric, geocentric,* or *ellipse*. Encourage them to use surrounding sentences and figures to help them understand the words. Demonstrate this procedure with the word *geocentric*.

Latin Plural Forms Explain that the word *nucleus* comes from a Latin word meaning "kernel." Explain that a kernel is a grain or seed. Ask students how the definition of the term *nucleus* relates to its Latin origin. *(Like the kernel of a nut, the nucleus is the small, solid center of a comet.)* Remind students that the plural of the word *nucleus* is *nuclei*.

Connecting Concepts

Concept Maps Help students develop one way to show how the information in this chapter is related. The solar system includes the sun; inner and outer planets; and comets, meteoroids, and asteroids. Have students brainstorm to identify the key concepts, key terms, details, and examples and then write each one on a sticky note and attach it at random on chart paper or on the board.

Tell students that this concept map will be organized in hierarchical order and will begin at the top with the key concepts. Ask students these questions to guide them to categorize the information on the sticky notes: **What is at the center of the solar system? Which planets are closest to the sun? What are some of the smaller bodies in the solar system called?** Prompt students by using connecting words or phrases, such as "includes" and "are part of" to indicate the basis for the organization of the concept map. The phrases should form a sentence between or among a set of concepts.

Answer Accept logical presentations by students.

Chapter 3 Study Guide

The BIG Idea **Structure of the Solar System** The solar system includes the sun, the planets and their moons, and smaller objects such as comets, asteroids, and meteoroids.

1 Observing the Solar System

Key Concepts

- In a geocentric system, Earth is perceived to be at the center of the revolving planets and stars. In a heliocentric system, Earth and the other planets revolve around the sun.
- Galileo's discoveries supported the heliocentric model. Kepler found that the orbit of each planet is an ellipse.
- The solar system consists of the sun, the planets and their moons, and a series of smaller objects that revolve around the sun.

Key Terms

• geocentric • heliocentric • ellipse

2 The Sun

Key Concepts

- The sun's interior consists of the core, radiation zone, and convection zone. The sun's atmosphere consists of the photosphere, chromosphere, and corona.
- Features on or just above the sun's surface include sunspots, prominences, and solar flares.

Key Terms

• core • nuclear fusion • radiation zone
• convection zone • photosphere
• chromosphere • corona • solar wind
• sunspot • prominence • solar flare

3 The Inner Planets

Key Concepts

- The four inner planets are small and dense and have rocky surfaces.
- Earth is unique in our solar system in having liquid water at its surface.
- Mercury is the smallest terrestrial planet. Venus's internal structure is similar to Earth's.
- Scientists think that a large amount of liquid water flowed on Mars's surface in the distant past.

Key Terms

• terrestrial planets • greenhouse effect

4 The Outer Planets

Key Concepts

- Jupiter, Saturn, Uranus, and Neptune are much larger and more massive than Earth.
- Jupiter is the largest and most massive planet in the solar system.
- Saturn has the most spectacular rings of any planet.
- Uranus's axis of rotation is tilted at an angle of about 90 degrees from the vertical.
- Neptune is a cold, blue planet. Its atmosphere contains visible clouds.
- Pluto has a solid surface and is much smaller and denser than the outer planets.

Key Terms

• gas giant • ring

5 Comets, Asteroids, and Meteors

Key Concepts

- Comets are loose collections of ice, dust, and small rocky particles whose orbits are usually very long, narrow ellipses.
- Most asteroids revolve around the sun between the orbits of Mars and Jupiter.
- Meteoroids come from comets or asteroids.

Key Terms

• comet • coma • nucleus • Kuiper belt
• Oort cloud • asteroid • asteroid belt
• meteoroid • meteor • meteorite

6 Is There Life Beyond Earth?

Key Concepts

- Earth has liquid water and a suitable temperature range and atmosphere for life.
- Scientists hypothesize that Mars may have once had the conditions for life to exist.
- If there is liquid water on Europa, there might also be life.

Key Term • extraterrestrial life

All in One Teaching Resources

- Key Terms Review: *The Solar System*
- Connecting Concepts: *The Solar System*

Review and Assessment

Go Online PHSchool.com
For: Self-Assessment
Visit: PHSchool.com
Web Code: cfa-5030

Organizing Information

Comparing and Contrasting Fill in the graphic organizer to compare and contrast the geocentric system and the heliocentric system. (For more on Comparing and Contrasting, see the Skills Handbook.)

Feature	Geocentric System	Heliocentric System
Object at center	Earth	a. ___?___
Objects that move around center	Planets and sun	b. ___?___
Proposed by	c. ___?___	Copernicus
Supporters	Ptolemy	d. ___?___

Reviewing Key Terms

Choose the letter of the best answer.

1. Copernicus thought that the solar system was
   a. an ellipse.
   b. a constellation.
   c. geocentric.
   d. heliocentric.
2. The part of the sun where nuclear fusion occurs is the
   a. photosphere.
   b. core.
   c. chromosphere.
   d. corona.
3. Pluto is a(n)
   a. inner planet.
   b. terrestrial planet.
   c. dwarf planet.
   d. gas giant.
4. The region between Mars and Jupiter where many rocky objects are found is the
   a. asteroid belt.
   b. Oort cloud.
   c. convection zone.
   d. Kuiper belt.
5. A meteoroid that reaches Earth's surface is called a(n)
   a. comet.
   b. meteorite.
   c. meteor.
   d. asteroid.

If the statement is true, write *true*. If it is false, change the underlined word or words to make the statement true.

6. The shape of the orbit of each planet is a(n) ellipse.
7. Prominences are regions of cooler gases on the sun.
8. The trapping of heat by a planet's atmosphere is called nuclear fusion.
9. All the terrestrial planets are surrounded by rings.
10. The solid inner core of a comet is its coma.

Writing in Science

News Report Imagine you are on a mission to explore the solar system. Write a brief news report telling the story of your trip from Earth to another terrestrial planet and to a gas giant. Include a description of each planet.

Discovery Channel School
The Solar System
Video Preview
Video Field Trip
▶ Video Assessment

Go Online PHSchool.com
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Visit: PHSchool.com
Web Code: cfa-5030

Students can take an online practice test that is automatically scored.

All in One Teaching Resources

- Transparency J34
- Chapter Test
- Performance Assessment Teacher Notes
- Performance Assessment Teacher Worksheet
- Performance Assessment Scoring Rubric

***ExamView*® Computer Test Bank CD-ROM**

Review and Assessment

Organizing Information

a. Sun **b.** Planets **c.** Early Greek astronomers **d.** Brahe, Kepler, Galileo

Reviewing Key Terms

1. d **2.** b **3.** c **4.** a **5.** b
6. true
7. Sunspots
8. the greenhouse effect
9. gas giants
10. nucleus

Writing in Science

Writing Skill Description

Scoring Rubric

4 Exceeds criteria by including an accurate description of a gas giant, a terrestrial planet, and the trip in a lively, informative, and interesting manner
3 Meets all criteria by including required descriptions, but is not interesting
2 Includes accurate description of either a gas giant or a terrestrial planet and of the trip
1 Includes inaccurate information or is incomplete

Discovery Channel School Video Assessment

The Solar System

Show the Video Assessment to review chapter content and as a prompt for the writing assignment. Discussion question: **What makes Earth unique among the other planets in our solar system?** *(Earth is the only planet that supports life as we know it. It is the only planet with liquid water at its surface.)*

Checking Concepts

11. Tycho observed the planets and recorded planetary data over a period of 20 years. Kepler used Tycho's data to determine the true shape of planetary orbits.

12. The solar wind is a stream of electrically charged particles that emanate from the sun.

13. Mercury's mass is small, so its gravity is weak. Mercury is so hot that gases easily escape from its weak gravity.

14. Mars's atmosphere is thin. However, Venus is entirely covered by thick clouds.

15. There are regions on Mars's surface that look as if they had been formed by ancient streams, lakes, or floods. There are also huge canyons and features that look like the remains of ancient coastlines. Also, the *Spirit* and *Opportunity* rovers found rocks and surface features that were clearly formed by liquid water.

Math Practice

16. about 21,330 km

17. about 71,500 km

Review and Assessment

Checking Concepts

11. Describe the contributions Tycho Brahe and Johannes Kepler made to modern astronomy.

12. What is the solar wind?

13. Why does Mercury have very little atmosphere?

14. Why can astronomers see the surface of Mars clearly but not the surface of Venus?

15. What evidence do astronomers have that water once flowed on Mars?

Math Practice

16. Circumference Mars has a radius of 3,397 km at its equator. Find its circumference.

17. Circumference Jupiter has a circumference of about 449,000 km at its equator. Calculate its radius.

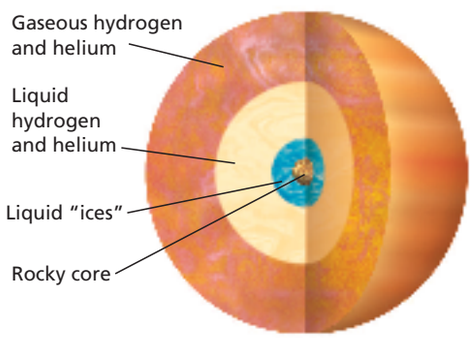
Thinking Critically

18. Applying Concepts Explain why Venus is hotter than it would be if it had no atmosphere.

19. Predicting Do you think astronomers have found all of the moons of the outer planets? Explain.

20. Comparing and Contrasting Compare and contrast comets, asteroids, and meteoroids.

21. Classifying Look at the diagram below. Do you think it represents the structure of a terrestrial planet or a gas giant? Explain.

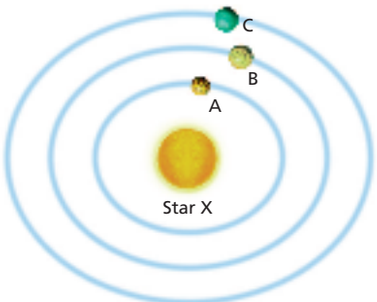


22. Making Generalizations Why would the discovery of liquid water on another planet be important?

Applying Skills

Use the diagram of an imaginary, newly discovered planetary system around Star X to answer Questions 23–25.

The periods of revolution of planets A, B, and C are 75 Earth days, 200 Earth days, and 300 Earth days.



23. Interpreting Data Which planet in this new planetary system revolves around Star X in the shortest amount of time?

24. Making Models In 150 days, how far will each planet have revolved around Star X? Copy the diagram and sketch the positions of the three planets to find out. How far will each planet have revolved around Star X in 400 days? Sketch their positions.

25. Drawing Conclusions Can Planet C ever be closer to Planet A than to Planet B? Study your drawings to figure this out.

Lab zone Chapter Project

Performance Assessment Present your scale models of the solar system. Display your data tables showing how you did the calculations and how you checked them for accuracy.

Lab zone Chapter Project

Performance Assessment All distances in the models should have been scaled by a constant amount to make them manageable. Students could have checked their numbers by multiplying the scaled numbers by the reciprocal of their scaling factor to see whether they obtained the correct planet sizes.

Reflect and Record Students might change the scale and present the model in a very large area in order to make the smallest planets visible. Students will reflect that it was difficult to find a scale to compare both the sizes of the planets and the sun and the distances between the planets and the sun.

Standardized Test Prep

Test-Taking Tip

Interpreting a Data Table

When answering a question that is related to a data table, read the headings of the columns and rows to see how the data is organized. Think about the relationship between the columns and rows. For example, the table shown before Question 3 gives data about period of rotation, period of revolution, and average distance from the sun (column headings) for five planets (row headings). Do not spend much time trying to examine all the data, because you may not need total understanding to answer the questions.

Sample Question

Which of the following conclusions about planets is supported by information in the table?

A As distance from the sun increases, period of rotation increases.
B As distance from the sun increases, period of revolution increases.
C As distance from the sun increases, period of revolution decreases.
D There is no relationship between distance from the sun and period of revolution.

Answer

The correct answer is **B**. The table shows that planets' periods of revolution increase the farther they are from the sun. There is no relationship between a planet's distance from the sun and its period of rotation.

Choose the letter of the best answer.

1. What characteristic do all of the inner planets share?
A They are larger and more massive than the sun.
B They have thick atmospheres of hydrogen and helium.
C They have rocky surfaces.
D They each have many moons.

2. Mercury has a daytime temperature of about 430° C and a nighttime temperature below –170° C. What is the best explanation?
F Mercury has a greenhouse effect.
G Global warming is occurring on Mercury.
H Mercury is the closest planet to the sun.
J Mercury has no real atmosphere.

The table below shows data for five planets in our solar system. Use the table and your knowledge of science to answer Questions 3–5.

Planet	Period of Rotation (Earth days)	Period of Revolution (Earth years)	Average Distance From the Sun (million km)
Mars	1.03	1.9	228
Jupiter	0.41	12	779
Saturn	0.45	29	1,434
Uranus	0.72	84	2,873
Neptune	0.67	164	4,495

3. Which of these planets' orbits is farthest from Earth's orbit?
A Mars **B** Jupiter
C Uranus **D** Neptune

4. Which planet has a "day" that is most similar in length to a day on Earth?
F Mars **G** Jupiter
H Uranus **J** Neptune

5. Light takes about 8 minutes and 20 seconds to travel from the sun to Earth, 150 million kilometers away. About how long does it take light to travel from the sun to Jupiter?
A 10 minutes **B** 25 minutes
C 43 minutes **D** 112 minutes

Constructed Response

6. Describe three major differences between the terrestrial planets and the gas giants.

Thinking Critically

18. Venus's atmosphere creates a greenhouse effect that traps heat energy from the sun.

19. No; many new moons have been discovered in recent years through improved technology. Many additional small moons are likely to be discovered.

20. Comets are loose collections of ice, dust, and small rocky particles. They usually have long, narrow elliptical orbits. Asteroids are small, rocky space objects often found in orbit between Mars and Jupiter. Meteoroids are chunks of rock or dust in space.

21. It represents a gas giant. Its overall structure and composition resemble those of Jupiter. (It is actually Saturn.)

22. Because water is essential to life on Earth, the presence of water on another planet increases the possibility that life may be found there.

Applying Skills

23. Planet A revolves around Star X in the shortest amount of time.

24. In 150 days, Planet A will have revolved around Star X twice. Planet B will have completed three quarters of one revolution. Planet C will have completed only one half of one revolution. In 400 days, Planet A will have completed five and one-third revolutions. Planet B will have completed two revolutions. Planet C will have completed one and one-third revolutions.

25. Yes, Planets A and C could be on one side of the star and B on the other. After 300 days, Planets A and C are where they began, on the same side of Star X, but Planet B is on the opposite side of the star.

Standardized Test Prep

1. C **2.** J **3.** D **4.** F **5.** C

6. The gas giants are much larger and more massive than the terrestrial planets. The gas giants are much farther from the sun and thus typically have lower temperatures. The terrestrial planets have rocky surfaces while the gas giants are composed mainly of hydrogen and helium. Also, each of the gas giants is surrounded by rings and has many moons. None of the terrestrial planets has rings and none have more than two moons.