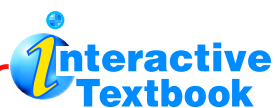


# Study Guide



- Interactive Student Edition
- Self-Assessment with remediation
- Assessment reports for teachers



## Connect to Key Concepts

Reinforce the chapter's Big Idea by connecting it to important Key Concepts. For example, ask: **What are the major types of objects in our solar system and how are they classified?** (*The sun, the planets, and their moons are the major objects in the solar system. The sun is a star. The planets are classified as inner and outer planets based on their distance from the sun. Smaller objects include comets, asteroids, and meteoroids.*)

## Teaching Resources

### Teaching Resources, Unit 4

- Chapter 14 Key Terms Review
- Chapter 14 Vocabulary Skill

### Chapter Tests Levels A and B

- Chapter 14 Tests
- Chapter 14 Performance Assessment

### Standards Review Workbook

### Standards Review Transparencies

### Progress Monitoring Assessment

- Screening, diagnostic, and benchmark tests



For: Self-Assessment  
Visit: PHSchool.com  
Web Code: cxa-4140

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

Key

AA Active Art
RNG-A Reading and Note Taking Guide, Level A
RNG-B Reading and Note Taking Guide, Level B
TR Teaching Resources

# Chapter 14

# Study Guide



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 S 8.4.c, 8.4.d

- In a geocentric system, Earth is at the center. In a heliocentric system, Earth and the other planets revolve around the sun.
- Galileo's discoveries supported the heliocentric model. Kepler developed three laws that describe the motions of the planets.
- 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
- moon • astronomical unit

## 2 The Sun

### Key Concepts S 8.2.g, 8.4.b

- The sun produces energy through fusion.
- 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

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

## 3 The Inner Planets

### Key Concepts S 8.4.e

- The four inner planets are small and dense.
- 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.
- Liquid water flowed on Mars in the distant past.

### Key Terms

- terrestrial planets • greenhouse effect

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## 4 The Outer Planets

### Key Concepts S 8.4.e

- Jupiter, Saturn, Uranus, and Neptune are much larger and more massive than Earth, and they do not have solid surfaces.
- Jupiter is the largest and most massive planet in the solar system.
- Saturn has spectacular rings.
- 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 S 8.4.e

- 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 S 8.4.e, 8.6.c

- 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

## Diagnose and Remediate

Also available on Success Tracker

Standard	Review and Assessment Items	Standards-Targeted Resources	Additional Resources
S 8.2.g	13	RNG-A 239–240, 247; RNG-B 211	TR: Vocabulary Skill
S 8.4.b	2, 7, 12	RNG-A 239–241; RNG-B 211–214	TR: Key Terms
S 8.4.c	16, 17	AA cfp-5031; RNG-A 235; RNG-B 209–210	Student Edition in MP3 (English/Spanish)
S 8.4.d	1, 2, 6, 11, 23, 24, 25	RNG-A 235–240; RNG-B 206–211	Student Express with Interactive Textbook CD-ROM

## Target Reading Skill

**Create Outlines** In your notebook, complete your outline for Section 1 on *Observing the Solar System*.

### Observing the Solar System

- I. Earth at the Center
  - A. Greek Observations
    1. Geocentric—Earth-centered
    2. Geocentric system—Earth at the center of revolving planets and stars
  - B. Ptolemy's Model
    1. Planets on small circles that move on bigger circles
    2. Model was incorrect, but accepted for 1,500 years
- II. Sun at the Center
  - A.

## 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.

Complete the following sentences so that your answers clearly explain the key terms.

6. Each planet moves around the sun in an ellipse, which is \_\_\_\_\_.
7. The **photosphere** is the layer of the sun that \_\_\_\_\_.
8. Venus has the hottest surface of any planet because of the **greenhouse effect**, which is \_\_\_\_\_.
9. Like the other **gas giants**, Jupiter's characteristics include \_\_\_\_\_.
10. Mars and Europa are possible locations where **extraterrestrial life**, which is \_\_\_\_\_, might be found.

## 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.

**Video Assessment**  
Discovery Channel School  
*The Solar System*

Chapter 14 ♦ 581

## Target Reading Skill

**Create Outlines** Students should complete detailed outlines for Section 1. Check that outlines include main topics and sub-topics, key concepts, and supporting details.

## Reviewing Key Terms

1. d
2. b
3. c
4. a
5. b
6. a flattened (elongated) circle
7. gives off visible light
8. the trapping of heat by the atmosphere
9. no solid surface, large size, many moons, and surrounded by a set of rings
10. life beyond Earth

## Writing in Science

**E-LA: Writing 8.2.0**

**Writing Skill** Descriptive

### 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 lacks interest
- 2 Includes accurate description of either a gas giant or a terrestrial planet and of the trip
- 1 Includes inaccurate information or is incomplete

## 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

## 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.

# 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.

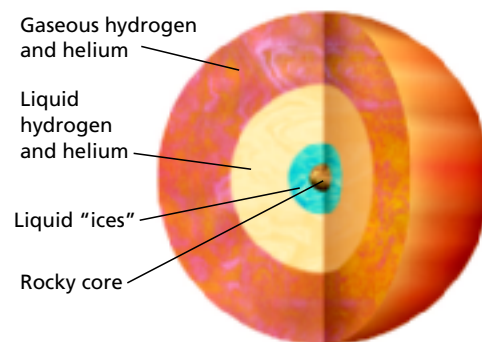
## Thinking Critically

**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.



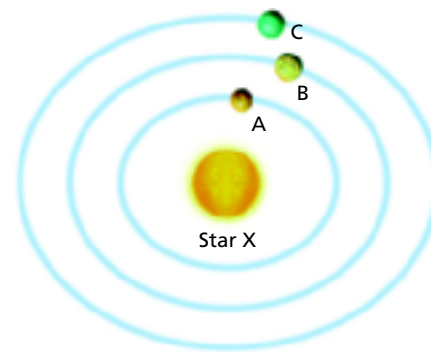
582 ♦

**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.



## Standards Investigation

**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.

## 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.



Choose the letter of the best answer.

- 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. **S 8.4.e**
- Mercury has a daytime temperature of about 430°C and a nighttime temperature below -170°C. What is the best explanation?  
 A Mercury has a greenhouse effect.  
 B Global warming is occurring on Mercury.  
 C Mercury is the closest planet to the sun.  
 D Mercury has no real atmosphere. **S 8.4.e**
- The process by which the sun produces energy is called  
 A combustion.  
 B a chemical reaction.  
 C nuclear fusion.  
 D nuclear fission. **S 8.4.b**
- You can see the planets at night because  
 A they produce their own light.  
 B sunlight reflects from their surfaces.  
 C nuclear fusion takes place in their cores.  
 D their surfaces are brighter than those of the stars. **S 8.4.d**
- The sun remains stable as a result of a balance between the  
 A outward pressure of nuclear fission and the inward pull of nuclear fusion.  
 B outward pressure of nuclear fusion and the inward pull of gravity.  
 C outward pressure of gravity and the inward pull of nuclear fusion.  
 D outward pressure of the greenhouse effect and the inward pull of gravity. **S 8.2.g**

The table below shows data for five planets in our solar system. Use the table and your knowledge of science to answer Questions 6–8.

Planet	Period of Rotation (Earth days)	Period of Revolution (Earth years)	Average Distance From the Sun (AU)
Mars	1.03	1.9	1.5
Jupiter	0.41	12	5.2
Saturn	0.45	29	9.6
Uranus	0.72	84	19.2
Neptune	0.67	164	30.0

- Which planet has a “day” that is most similar in length to a day on Earth?  
 A Mars  
 B Jupiter  
 C Uranus  
 D Neptune **S 8.4.e**
- Light takes about 8 minutes and 20 seconds to travel from the sun to Earth, 1 AU 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 **S 8.4.c**
- 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. **S 8.4.e**

## Apply the BIG Idea

- Describe three major differences between the terrestrial planets and the gas giants. **S 8.4.b**

Teachers can monitor student progress and supply remediation when necessary.

- C; **S 8.4.e**
- D; **S 8.4.e**
- C; **S 8.4.b**
- B; **S 8.4.d**
- B; **S 8.2.g**
- A; **S 8.4.e**
- C; **S 8.4.c**
- B; **S 8.4.e**

## Focus on the BIG Idea

- Sample: 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 a set of rings and has many moons. None of the terrestrial planets has rings and none has more than two moons. **S 8.4.e**



## Standards Investigation

**S 8.4.e**

**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.

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.

## Teaching Resources

### Laboratory Manual TE

- Standards Investigation Scoring Rubric

The Standards Investigation Scoring Rubric will help you evaluate students' work. If you share the rubric in advance, students will know what is expected of them.