

Chapter 25 The Solar System

Section 25.1 Exploring the Solar System

(pages 790–794)

This section explores early models of our solar system. It describes the components of the solar system and scientific exploration of the solar system.

Reading Strategy (page 790)

Comparing and Contrasting After you read, compare the geocentric and heliocentric systems by completing the table below. For more information on this Reading Strategy, see the **Reading and Study Skills** in the **Skills and Reference Handbook** at the end of your textbook.

Solar System Models			
	Location of Earth	Location of Sun	Developer(s) of Theory
Geocentric System	Center of universe		
Heliocentric System			Aristarchus, Copernicus

Models of the Solar System (pages 790–791)

- Is the following sentence true or false? In the Northern Hemisphere, the stars appear to circle around the North Star.

- Name the five planets besides Earth that ancient observers could see with the unaided eye.
 - _____
 - _____
 - _____
 - _____
 - _____
- Many ancient Greeks thought _____ was the center of the universe.
- Circle the letter of each sentence that is true about a geocentric model.
 - Earth is stationary at the center.
 - Objects in the sky move around Earth.
 - The sun is the center of the solar system.
 - The planets revolve around the sun.
- Name the center of the solar system in a heliocentric model.

- Is the following sentence true or false? The first heliocentric model was widely accepted by most ancient Greeks. _____

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7. Is the following sentence true or false? The sun, moon, and stars appear to move because the Earth is rotating on its axis.

Planetary Orbits (page 792)

8. Planets move around the sun in orbits that are in the shape of a(n) _____.
9. The plane containing Earth's orbit is called the _____.
10. Name the two factors that combine to keep the planets in orbit around the sun. _____

Components of the Solar System (pages 792-793)

11. Circle the letters that identify objects in our solar system.
a. moons of the planets b. nine planets
c. the sun d. the stars other than the sun
12. Name three planets that were identified after the invention of the telescope in the early 1600s.
a. _____ b. _____ c. _____
13. Is the following sentence true or false? All of the planets have moons. _____
14. Unlike the sun, planets and moons do not produce their own _____.
15. Is the following sentence true or false? The sun's mass is smaller than the combined mass of the rest of the solar system.

Exploring the Solar System (pages 793-794)

16. Name three examples of types of modern technology that scientists use to explore the solar system.
a. _____ b. _____ c. _____
17. Circle the letter that identifies the first person to walk on the moon.
a. Alan Shepard b. Yuri Gagarin
c. Chuck Yeager d. Neil Armstrong
18. An unpiloted vehicle that sends data back to Earth is called a(n) _____.
19. Describe the space shuttle. _____

20. Is the following sentence true or false? The International Space Station is a permanent laboratory designed for research in space.

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Section 25.5 The Origin of the Solar System

(pages 818–820)

This section explains a theory of how the solar system originated. It also describes how this theory explains the composition and size of the planets.

Reading Strategy (page 818)

Identifying Main Ideas As you read, write the main idea for each topic. For more information on this Reading Strategy, see the **Reading and Study Skills** in the **Skills and Reference Handbook** at the end of your textbook.

Theories on the Origin of the Solar System	
Topic	Main Idea
The Nebular Theory	
Formation of the protoplanetary disk	
Planetesimals and protoplanets	
Composition and size of the planets	

The Nebular Theory (pages 818–819)

- The generally accepted explanation for the formation of the solar system is called the _____.
- Circle the letter of each sentence that is true about the nebular theory.
 - The solar nebula formed from the remnants of previous stars.
 - The explosion of a nearby star likely caused the solar nebula to start to contract.
 - As the solar nebula contracted, it began to spin more slowly.
 - The solar system formed from a rotating cloud of dust and gas.
- Describe a solar nebula. _____

- A large, spherical cloud of dust and gas in space is called a(n) _____.
- Is the following sentence true or false? Most planets and moons are revolving now in the direction that the protoplanetary disk was spinning. _____

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6. Circle the letter of each sentence that is true about the formation of the protoplanetary disk.
 - a. The disk was densest in the center and thinner toward the edges.
 - b. At the center of the disk, nuclear reactions fused hydrogen and helium and the sun was formed.
 - c. The temperature at the center of the disk was extremely low.
 - d. Nearly all of the mass of the solar nebula became concentrated near the outer edge of the disk.
7. Asteroid-like bodies that combined to form planets were called _____.
8. The process by which planetesimals grew is called _____.
9. Put the following events about the formation of planetesimals and protoplanets in correct order. Number the events 1–5 in the order that they occurred.
 - _____ Balls of gas and dust collided and grew larger.
 - _____ Planetesimals became large enough to exert gravity on nearby objects.
 - _____ Planetesimals grew by accretion.
 - _____ Protoplanets joined to form the current planets in a series of collisions.
 - _____ Planetesimals grew into protoplanets.

Composition and Size of the Planets (page 820)

10. At _____ pressures, such as those found in space, cooling materials can change from a gas directly into a solid.
11. Ice-forming materials _____ at temperatures between 500 K and 1200 K.
12. Why are the terrestrial planets relatively small and rocky? _____

13. Circle the letter of each sentence that is true about the formation of the gas giants.
 - a. The gravity of the gas giants decreased as they grew larger.
 - b. Ice-forming material could condense in the outer solar system.
 - c. The planets grew large and were able to capture hydrogen and helium from nearby space.
 - d. Less material was available for the gas giants to form than was available for the terrestrial planets.
14. Is the following sentence true or false? Scientists have found planets in orbit around distant stars that provide support for the nebular theory.

Chapter 26 Exploring the Universe

Section 26.1 The Sun**(pages 828–833)**

This section describes how the sun produces energy. It also describes the sun's interior and atmosphere.

Reading Strategy (page 828)

Build Vocabulary Copy the table on a separate sheet of paper and add more lines as needed. As you read, write a definition of each vocabulary term in your own words. For more information on this Reading Strategy, see the **Reading and Study Skills** in the **Skills and Reference Handbook** at the end of your textbook.

The Sun	
Vocabulary Term	Definition
Core	
Radiation zone	
Convection zone	

Energy from the Sun (pages 828–829)

- The sun gives off a large amount of energy in the form of _____ radiation.
- Circle the letter of each sentence that is true about nuclear fusion in the sun.
 - Less massive nuclei combine into more massive nuclei.
 - The end product of fusion is hydrogen.
 - Fusion is a type of chemical reaction.
 - Hydrogen nuclei fuse into helium nuclei.

Forces in Balance (page 829)

- For the sun to be stable, inward and outward forces within it must be in _____.
- Is the following sentence true or false? The sun remains stable because the inward pull of gravity balances the outward push of thermal pressure from nuclear fission. _____

The Sun's Interior (pages 830–831)

- Circle the letter of each layer of the sun's interior.

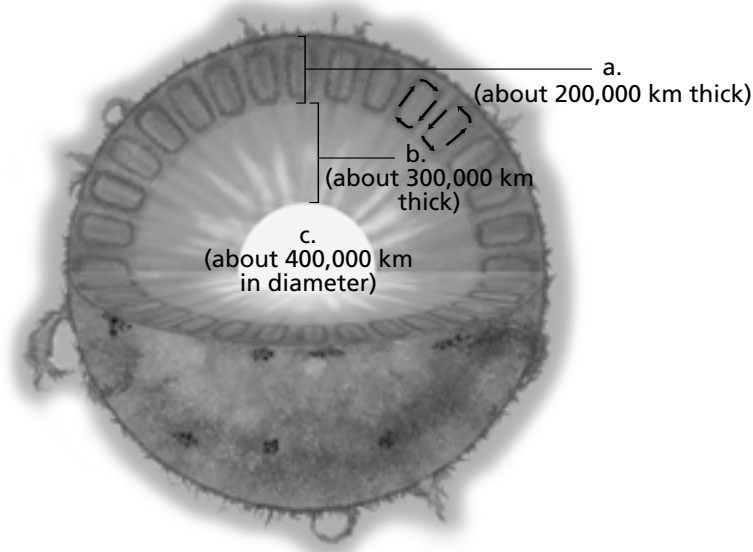
a. the radiation zone	c. the convection zone
b. the photosphere	d. the core

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6. Circle the letter of each way that energy moves through the sun.

- a. gravity
- b. convection
- c. radiation
- d. nuclear fusion

7. List the layers of the sun’s interior shown on the diagram.



- a. _____
- b. _____
- c. _____

The Sun’s Atmosphere (page 831)

8. Circle the letter of each layer of the sun’s atmosphere.

- a. photosphere
- b. chromosphere
- c. corona
- d. core

9. When can the corona be seen? _____

Features of the Sun’s Atmosphere (pages 832–833)

Match each description to a feature of the sun’s atmosphere.

Description	Feature of Sun’s Atmosphere
_____ 10. Spectacular features of the sun’s atmosphere that occur near sunspots	a. solar flares
_____ 11. Areas of gas in the atmosphere that are cooler than surrounding areas	b. prominences
_____ 12. Sudden releases of energy that produce X-rays and hurl charged particles into space	c. sunspots

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Section 26.5 The Expanding Universe (pages 852–855)

This section describes Hubble’s Law. It also explains the big bang theory.

Reading Strategy (page 852)

Previewing Before reading, examine Figure 26 and write at least two questions to help you understand the information in it. As you read, write answers to your questions. For more information on this Reading Strategy, see the **Reading and Study Skills** in the **Skills and Reference Handbook** at the end of your textbook.

The Evolution of the Universe
Questions on the Evolution of the Universe

Hubble’s Law (pages 852–853)

- Is the following sentence true or false? The apparent change in frequency and wavelength of a wave as it moves towards or away from an observer is known as the Doppler effect.

- How can astronomers use the Doppler effect? _____

- Circle the letter of each sentence that is true about spectrums of stars or galaxies.
 - As a star or galaxy circles the Earth, the lines in its spectrum shift toward the middle of the spectrum.
 - As a star moves toward Earth, the lines in its spectrum are shifted toward shorter wavelengths.
 - As a star or galaxy moves away from Earth, the lines in its spectrum are shifted toward longer wavelengths.
 - The greater the observed shift in spectrum, the greater the speed the star or galaxy is moving.
- The shift in the light of a galaxy toward the red wavelengths is called a(n) _____.
- Describe Hubble’s Law. _____

- Is the following sentence true or false? The most distant galaxies that can be seen from Earth are moving away at more than 90% of the speed of light. _____

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7. Describe what the observed red shift in the spectra of galaxies shows.

The Big Bang Theory (page 854)

8. Astronomers theorize that the universe came into being in an event called the _____.
9. Circle the letter of each sentence that is true according to the big bang theory.
- a. The matter and energy in the universe was once concentrated in a very hot region smaller than a sentence period.
 - b. The universe began billions of years ago with an enormous explosion.
 - c. The universe came into existence in an instant.
 - d. The matter and energy in the universe has taken billions of years to form.
10. After the big bang, it is theorized that the universe _____.
11. How large was the universe when the sun and solar system formed?
-
12. Circle the letter of each sentence that gives evidence that supports the big bang theory.
- a. The existence of cosmic microwave background radiation.
 - b. The red shift in the spectra of distant galaxies.
 - c. The fact that the sun is about 20 billion years old.
 - d. The pulling of atoms together into gas clouds by gravity.
13. Recent measurements of the microwave background radiation have led astronomers to estimate that the universe is _____.

Continued Expansion (page 855)

14. Matter that does not give off radiation is known as _____.
15. Circle the letter of each sentence that is true about dark matter.
- a. Astronomers currently don't know what it is or how it is distributed.
 - b. It cannot be seen directly.
 - c. It can be measured using the Doppler effect.
 - d. It can be detected by observing how its gravity affects visible matter.
16. Why is it significant that the galaxies contain as much as ten times more dark matter than visible matter? _____
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