

The Solar System

The Inner Planets

..... Before You Read

What do you think? Read the two statements below and decide whether you agree or disagree with them. Place an A in the Before column if you agree with the statement or a D if you disagree. After you've read this lesson, reread the statements to see if you have changed your mind.

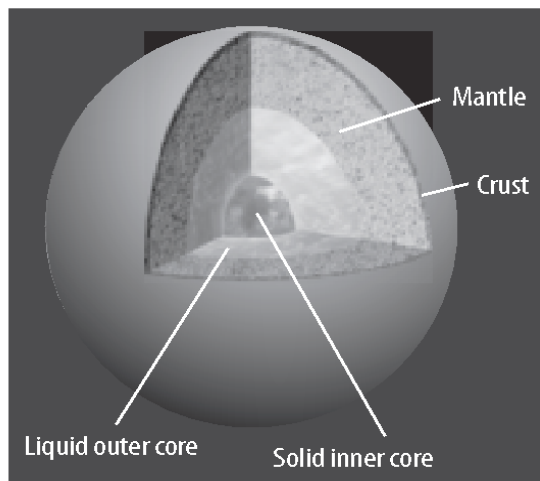
Before	Statement	After
	3. Earth is the only inner planet that has a moon.	
	4. Venus is the hottest planet in the solar system.	

..... Read to Learn

Planets Made of Rock

The inner planets—Mercury, Venus, Earth, and Mars—are also called terrestrial planets. *Terrestrial planets are the planets closest to the Sun, are made of rock and metal, and have solid outer layers.* Like Earth, the other inner planets also are made of rock and metallic materials and have a solid outer layer. As shown below, Mercury, Venus, and Earth have a solid inner core and a liquid outer core. The core of Mars is liquid with no solid part. However, the inner planets have different sizes, atmospheres, and surfaces.

Structure of Mercury, Venus, and Earth



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Key Concepts

- How are the inner planets similar?
- Why is Venus hotter than Mercury?
- What kind of atmospheres do the inner planets have?

Mark the Text

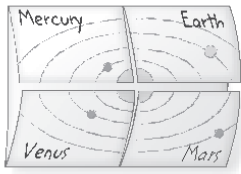
Identify the Main Ideas
Highlight the important ideas in each paragraph. Review these ideas as you study the lesson.

Visual Check

1. Distinguish Number each structure in the figure from 1 to 4 in order from the outermost layer to the innermost layer.

FOLDABLES®

Make a four-door book to organize your notes on the inner planets.



Key Concept Check

2. Compare How are the inner planets similar?

Key Concept Check

3. Apply Why is Venus hotter than Mercury?

Mercury

Mercury is the smallest planet and the planet closest to the Sun. Mercury has no moon and no atmosphere. The strength of a planet's gravity depends on its mass. Mercury's small mass creates weak gravity that cannot hold on to an atmosphere. With no atmosphere there is no wind that moves energy across the planet's surface. This results in temperatures as high as 450°C on the side of Mercury facing the Sun and as cold as -170°C on the side facing away from the Sun.

Mercury's Surface

Impact craters, depressions formed by collisions with objects from space, cover the surface of Mercury. There are smooth plains of solidified lava from long-ago eruptions. There are also high cliffs that might have formed when the planet cooled quickly, causing the surface to wrinkle and crack. Without an atmosphere, almost no erosion occurs on Mercury's surface. As a result, features that formed billions of years ago have changed very little.

Mercury's Structure

The structures of the inner planets are similar. Like all inner planets, Mercury has a core made of iron and nickel. A mantle of silicon and oxygen surrounds the core. The crust is a thin, rocky layer above the mantle. Mercury has a large core, possibly formed by a collision with a large object during the planet's formation.

Venus

Venus is the second planet from the Sun. It has no moon. It is about the same size as Earth. Venus rotates so slowly that its period of rotation is longer than its period of revolution. Unlike most planets, Venus rotates from east to west.

Venus's Atmosphere

The atmosphere of Venus is about 97 percent carbon dioxide. Its atmospheric pressure is nearly 90 times greater than Earth's. Venus has almost no water, yet a thick layer of clouds covers the planet. The clouds are made of acid.

The Greenhouse Effect on Venus

Venus is the hottest planet in the solar system. Its temperature averages 460°C . The greenhouse effect causes the high temperatures. *The greenhouse effect occurs when a planet's atmosphere traps solar energy and causes the surface temperature to increase.* The carbon dioxide in Venus's atmosphere traps energy and heats up the planet. The planet would be 450°C cooler without the greenhouse effect.

Venus's Structure and Surface

Solidified lava covers more than 80 percent of Venus's surface. The lava possibly came from volcanic eruptions.

Earth

Earth is the third planet from the Sun. Unlike Mercury and Venus, Earth has a moon.

Earth's Atmosphere

Gases and a small amount of water vapor make up most of Earth's atmosphere. The gases and vapor produce a greenhouse effect that increases Earth's average surface temperature. This effect and Earth's distance from the Sun warm Earth. As a result, large bodies of liquid water can exist on Earth. Earth's atmosphere also absorbs much of the Sun's radiation. This protects the surface below. Earth's protective atmosphere, liquid water, and moderate temperatures support a wide variety of life. ✓

Earth's Structure

Earth has a solid inner core surrounded by a liquid outer core. The outer core is surrounded by a mantle. Earth's crust is above the mantle. The crust is broken into large plates that slide past, away from, or into each other. It is made mostly of oxygen and silicon. Natural forces constantly destroy Earth's crust and create new crust.

Mars

Mars is the fourth planet from the Sun. It is about half the size of Earth. Unlike the other inner planets, Mars has no solid inner core. Its core is liquid. Mars has two moons. Space probes have visited Mars; however, they found no liquid water or life on the planet. ✓

Mars's Atmosphere

The atmosphere of Mars is much less dense than that of Earth. It is about 95 percent carbon dioxide. Temperatures range from about -125°C at the poles to about 20°C at the equator. Winds on Mars produce great dust storms. ✓

Mars's Surface

Iron oxide in the soil gives Mars its reddish color. The Martian canyon Valles Marineris is as long as the United States. The Martian volcano Olympus Mons is the largest known mountain in the solar system. Mars has polar ice caps made of frozen carbon dioxide and ice. Craters cover the southern hemisphere of Mars. The northern hemisphere is smoother and appears to be covered by lava flows.

✓ Reading Check

4. Explain Why is there life on Earth?

✓ Reading Check

5. Compare Earth's inner core with the inner core of Mars.

✓ Key Concept Check

6. Describe the atmosphere of each inner planet.
