

Chapter Menu

Chapter Introduction

Lesson 1 Spherical Earth

Lesson 2 Earth's Interior

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Chapter Wrap-Up





How is Earth structured?



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Get Ready

What do you think?

Before you begin, decide if you agree or disagree with each of these statements. As you view this presentation, see if you change your mind about any of the statements.



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Get Ready

Do you agree or disagree?

1. People have always known that Earth is round.
2. Earth's hydrosphere is made of hydrogen gas.
3. Earth's interior is made of distinct layers.



Get Ready

Do you agree or disagree?

4. Scientists discovered that Earth's outer core is liquid by drilling deep wells.
5. Oceans are deepest near their centers.
6. Most of Earth's surface is covered by water.



Lesson 1

Spherical Earth

Key Concepts

- What are Earth's major systems and how do they interact?
- Why does Earth have a spherical shape?



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Lesson 1

Spherical Earth

Vocabulary

- sphere
- geosphere
- gravity
- density



Describing Earth

- Using satellites and other technology, scientists know that Earth is a sphere.
- A sphere is shaped like a ball, with all points on the surface at an equal distance from the center.
- Earth has four systems: atmosphere, hydrosphere, geosphere, and biosphere.



Describing Earth (cont.)

Earth is not a perfect sphere because it is somewhat flattened at the poles with a slight bulge around the equator.



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Describing Earth (cont.)

- The Earth's outermost system, the atmosphere, is the layer of gases surrounding Earth.
- The atmosphere is a mixture of nitrogen, oxygen, carbon dioxide, and traces of other gases.
- The hydrosphere is water on Earth's surface, underground, and as liquid water in the atmosphere.



Describing Earth (cont.)

- Most of the water in the hydrosphere is in salty oceans.
- Freshwater is in most rivers and lakes and underground.
- Some water is frozen in glaciers and polar ice sheets.
- Water continually moves between the atmosphere and hydrosphere.



Describing Earth (cont.)

- The geosphere is Earth's entire solid body, containing a thin layer of soil and sediments covering a rock center.
- The geosphere is the largest Earth system.
- Organisms in the biosphere live within and interact with the atmosphere, hydrosphere, and geosphere.



Describing Earth (cont.)



KEY CONCEPT CHECK

Identify Earth's four major systems.

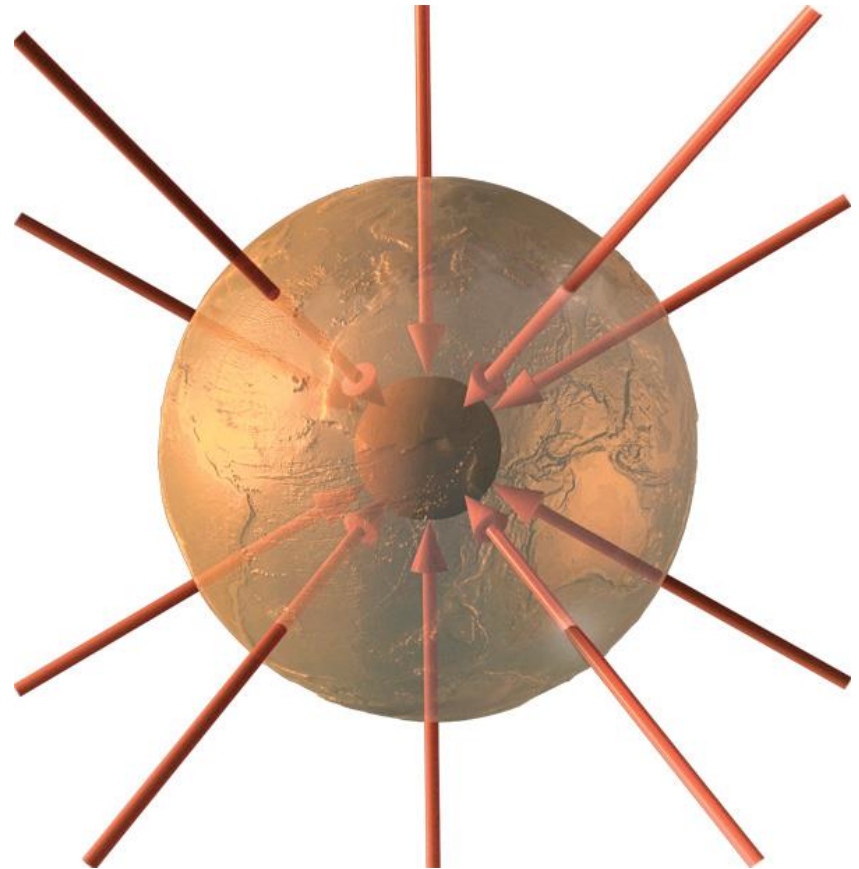


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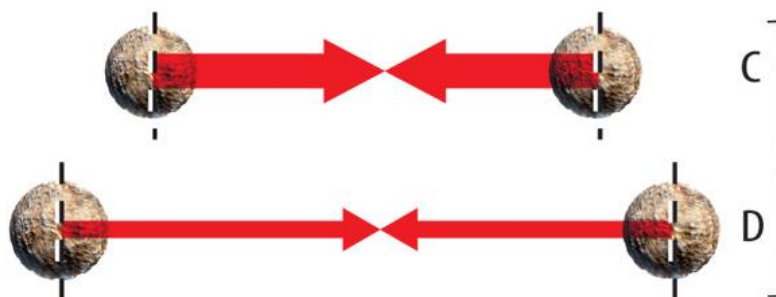
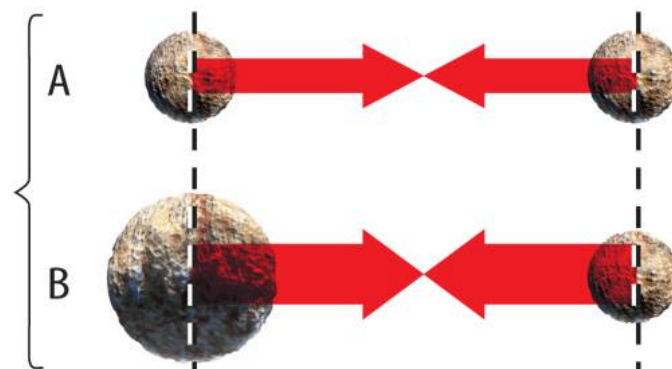
How did Earth form?

- **Gravity** is the force that every object exerts on every other object because of their masses.
- All objects on or near Earth are pulled toward Earth's center by gravity.



The force of gravity between two objects depends on the objects' masses and the distance between them.

The two objects in row A are the same distance apart as the two objects in row B. One of the objects in row B has more mass, creating a stronger gravitational force between the two objects in row B.

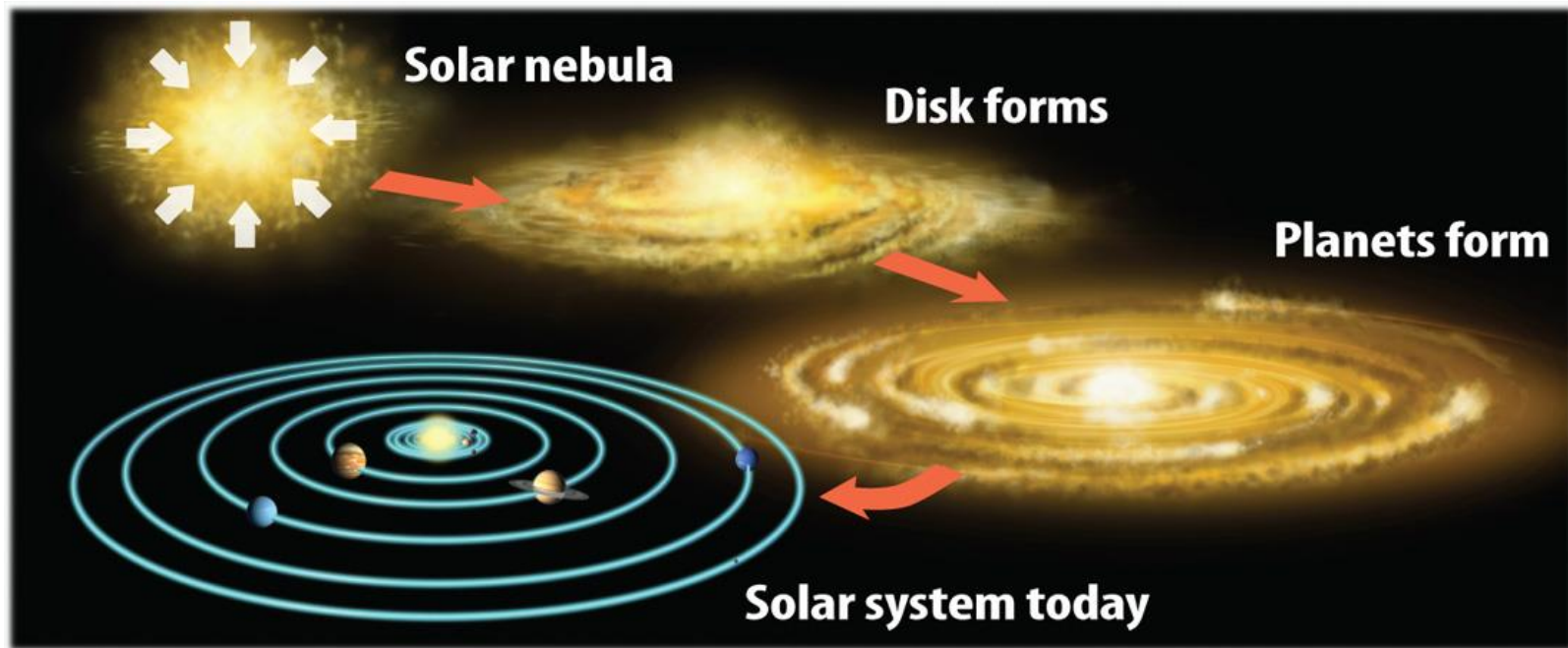


All four objects have the same mass. The two objects in row C are closer to each other than the two objects in row D and, therefore, have a stronger gravitational force between them.



How did Earth form? (cont.)

The solar system formed when a cloud of gas, ice, and dust, called a nebula, was pulled together by gravity.



How did Earth form? (cont.)

- The nebula shrank, flattened into a disk, and began to rotate.
- The materials in the center of the disk formed the Sun.
- Planets began to take shape from the remaining bits of material.



How did Earth form? (cont.)

- Earth formed as gravity pulled small particles together, that would collide, build mass, and collect more particles.
- Early Earth generated thermal energy in its interior, making the rocks of the planet soft enough to flow.
- Gravity pulled in the irregular bumps, the rock flowed, and Earth developed a relatively even spherical surface.



How did Earth form? (cont.)



KEY CONCEPT CHECK

How did Earth develop its spherical shape?



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The Formation of Earth's Layers

- Earth developed distinct layers of different material after thermal energy melted some of the material and it began to flow.
- Different materials formed layers according to their densities.



The Formation of Earth's Layers (cont.)

- Density is the amount of mass in a material per unit volume and can be described as $D = m/V$ (density is mass divided by volume).

WORD ORIGIN

density

from Latin *densus*, means “thick, crowded”



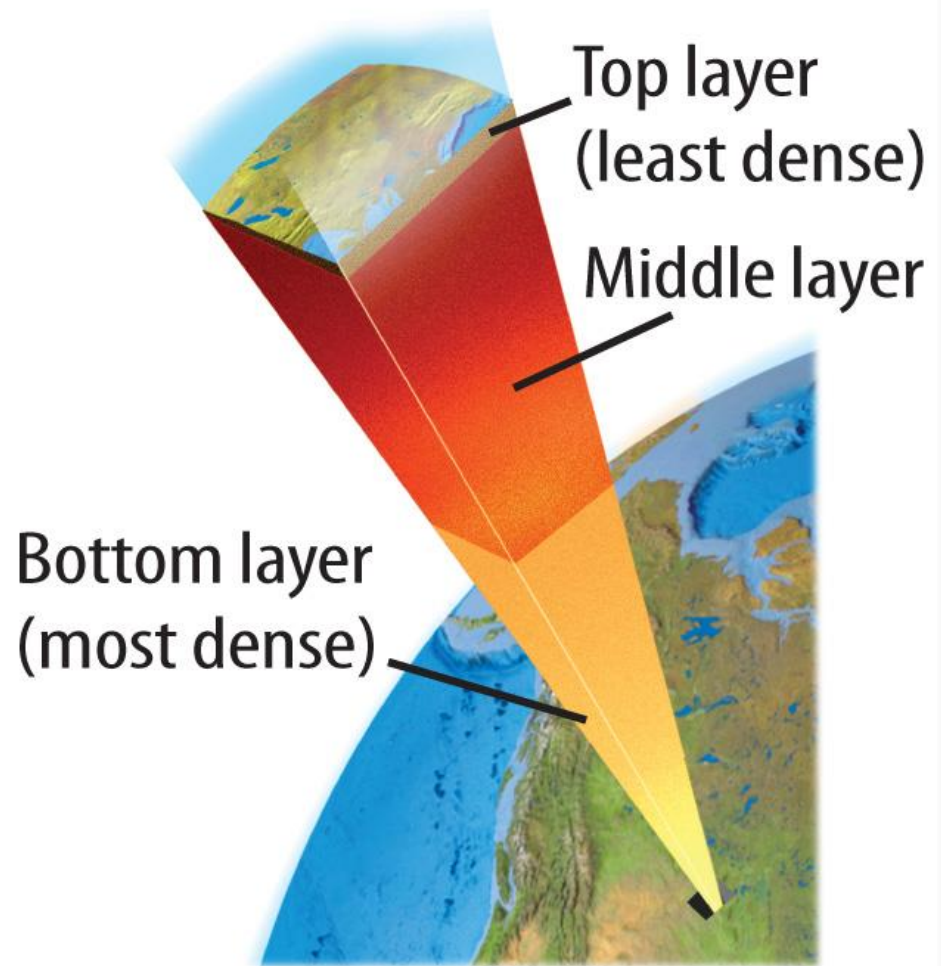
The Formation of Earth's Layers (cont.)

- If two materials have the same volume, the denser material will have more mass.
- When ancient Earth started melting, the densest materials sank and formed the innermost layer.



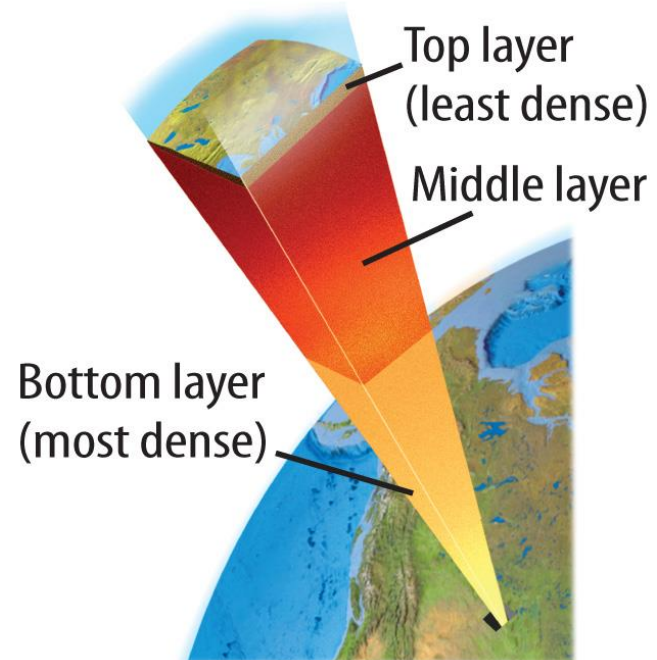
The Formation of Earth's Layers (cont.)

The least dense materials stayed at the surface and formed a separate layer, and materials with intermediate densities formed layers in between.



Summary

- Earth's systems, including the atmosphere, hydrosphere, biosphere, and geosphere, interact with one another.
- The geosphere is the solid body of Earth.



Summary

- The solar system, including Earth, formed about 4.6 bya. Gravity caused particles to come together and formed a spherical Earth.



Lesson Review

Earth's entire solid body can be referred to as which of these?

- A. atmosphere
- B. hydrosphere
- C. geosphere**
- D. biosphere



Lesson Review

Organisms interact with the atmosphere, hydrosphere, and geosphere in which of these?

- A. oceans
- B. atmosphere
- C. hydrosphere
- D. biosphere**



Lesson Review

What is the name for the cloud of gas, ice, and dust that was shaped by gravity to create the solar system?

- A.** nebula
- B.** hydrosphere
- C.** Sun
- D.** planet



Lesson Review

What do you think **NOW?**
Do you agree or disagree?

1. People have always known that Earth is round.
2. Earth's hydrosphere is made of hydrogen gas.



Lesson 2

Earth's Interior

Key Concepts

- What are the interior layers of Earth?
- What evidence indicates that Earth has a solid inner core and a liquid outer core?



Lesson 2

Earth's Interior

Vocabulary

- crust
- mantle
- lithosphere
- asthenosphere
- core
- magnetosphere

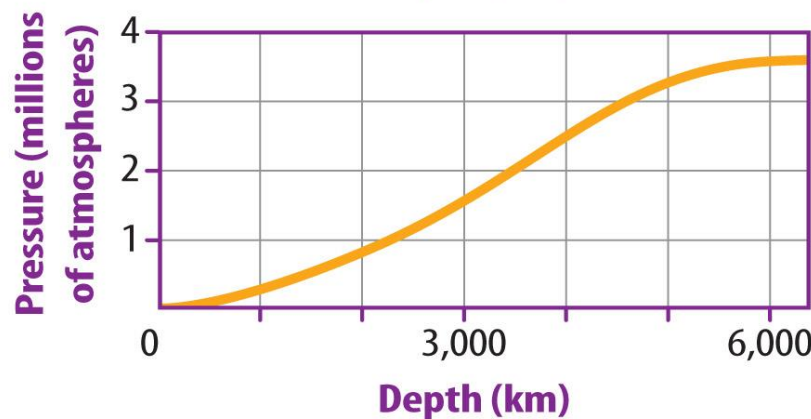
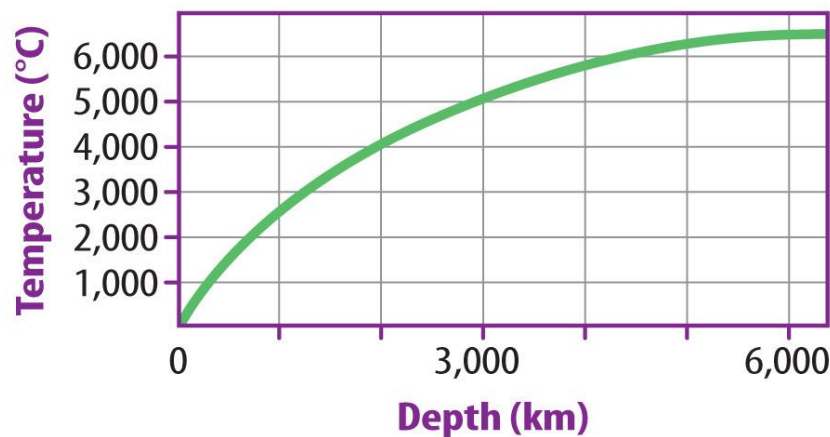
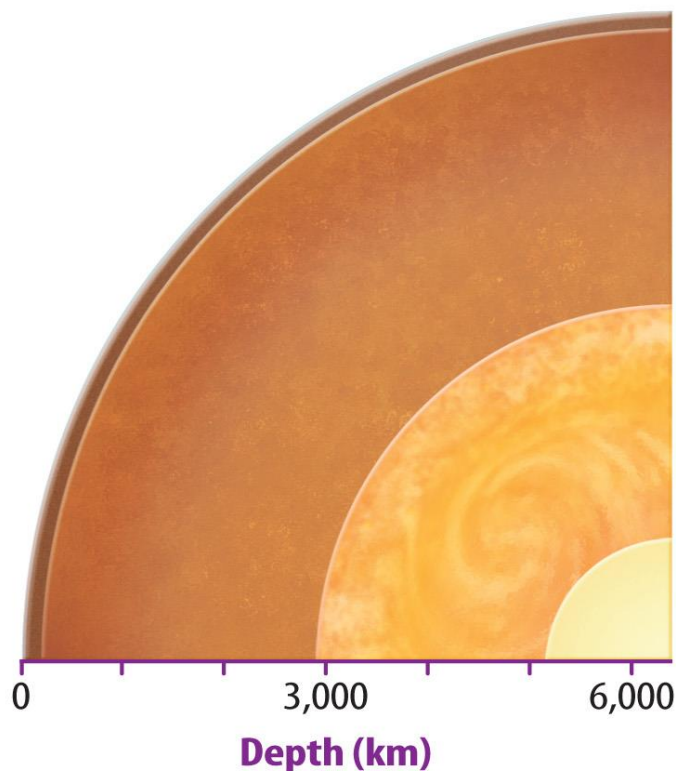


Clues to Earth's Interior

- Deep mines and wells give scientists hints about Earth's interior.
- Scientists also use earthquake waves to gather information about Earth's interior.
- By studying how earthquake waves move, scientists are able to infer the density and composition of the materials within Earth.



Temperature and pressure increase as depth increases inside Earth.

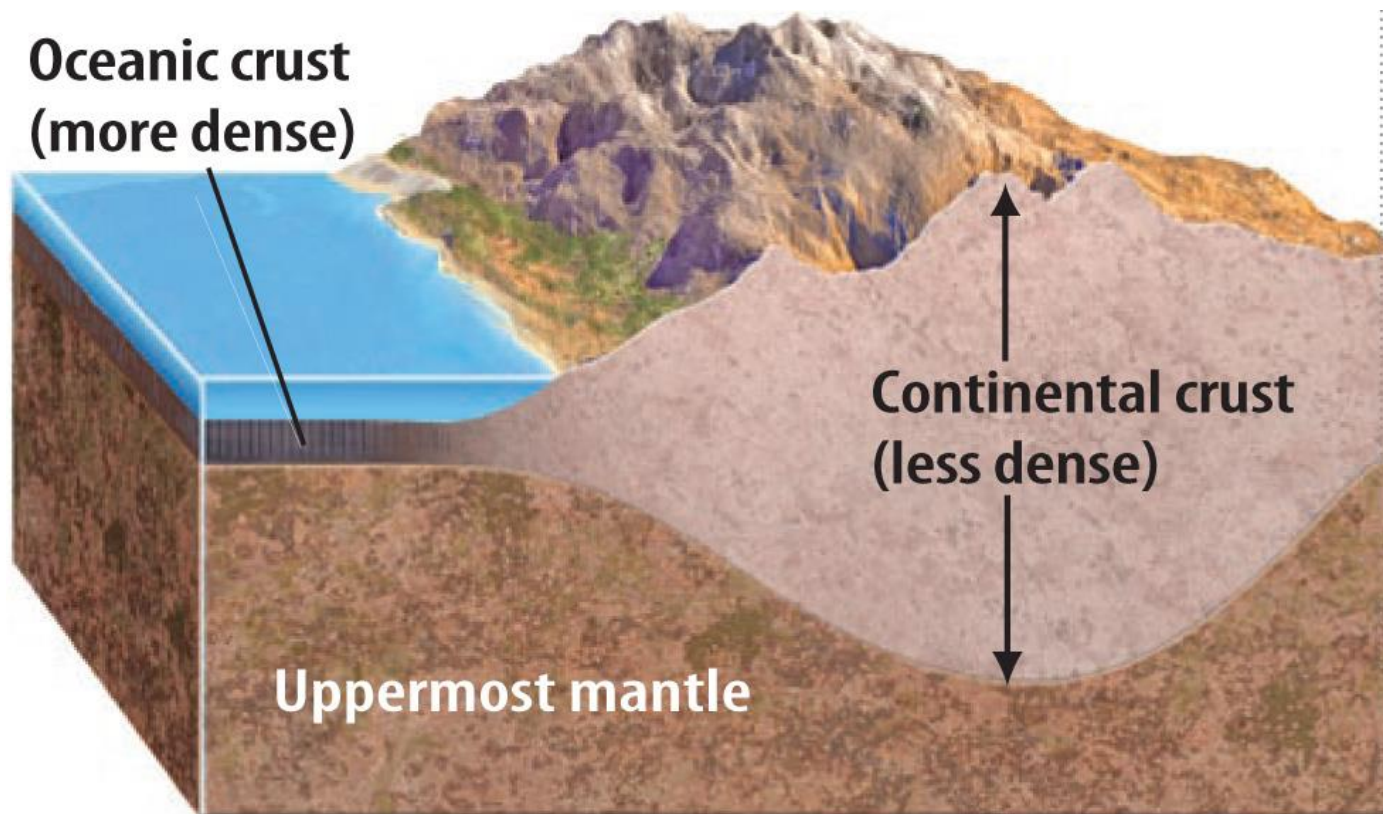


Earth's Layers

- The brittle, rocky, outer layer of Earth is called the crust.
- The crust is the least dense layer of the geosphere and much thinner than the other layers.



The crust under oceans is called oceanic crust and is made of dense rocks containing iron and magnesium.



Earth's Layers (cont.)

- Earth's **mantle** is the thick middle layer in the solid part of Earth, immediately below the crust.
- The iron-rich rocks of this layer are peridotite and eclogite.
- The rocks in the uppermost layer of the mantle are brittle and rigid.



Earth's Layers (cont.)

- Scientists group the crust and the uppermost mantle into a rigid layer called the **lithosphere**.
- The layer of rocks within the mantle, where the rock is soft enough to flow, is called the **asthenosphere**.
- The solid rock below the asthenosphere, where high pressure prevents melting, is the upper mantle and lower mantle.



Earth's Layers (cont.)

WORD ORIGIN

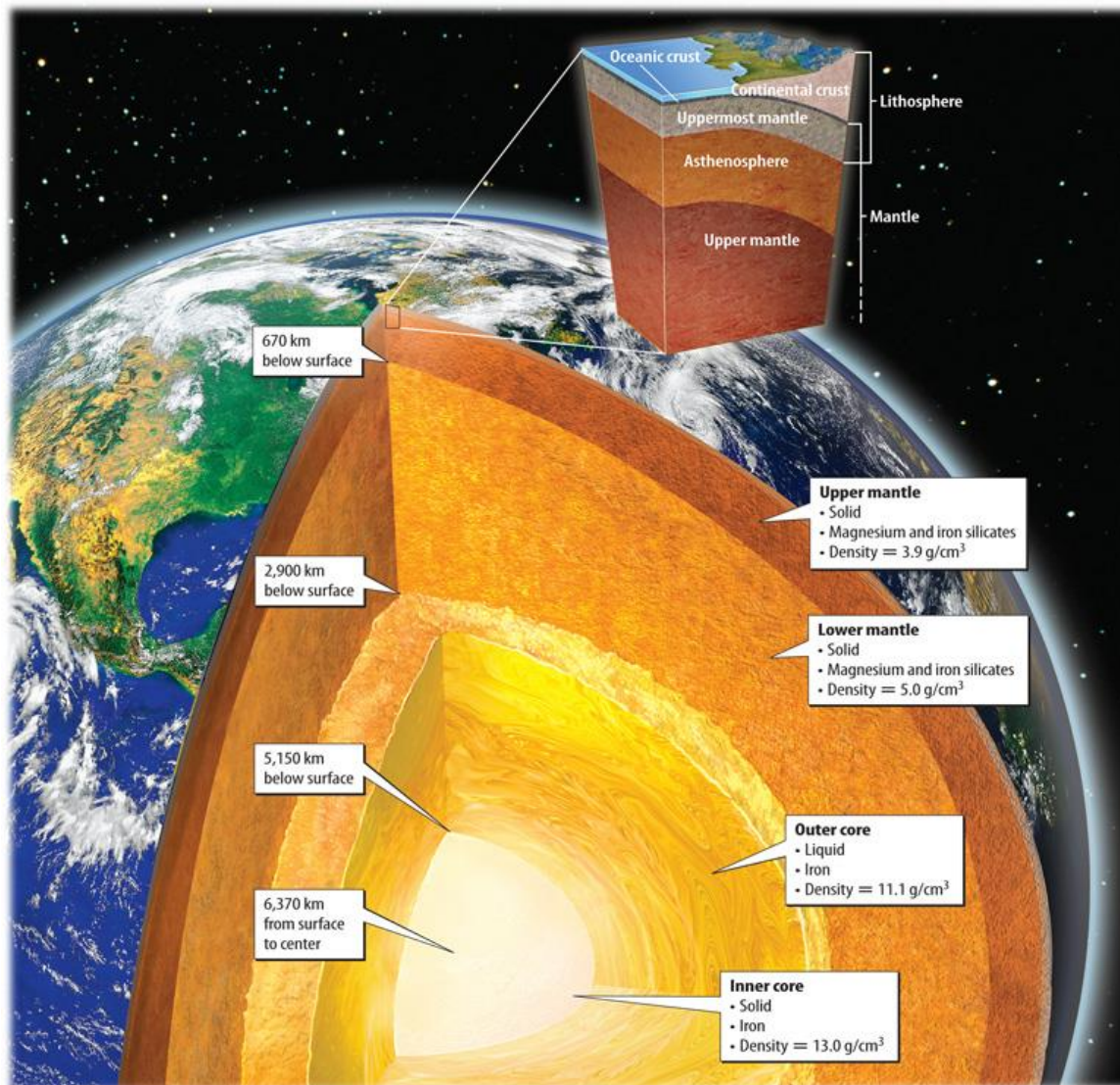
asthenosphere

from Greek *asthenes*, means
“weak”; and *spharia*, means
“sphere”



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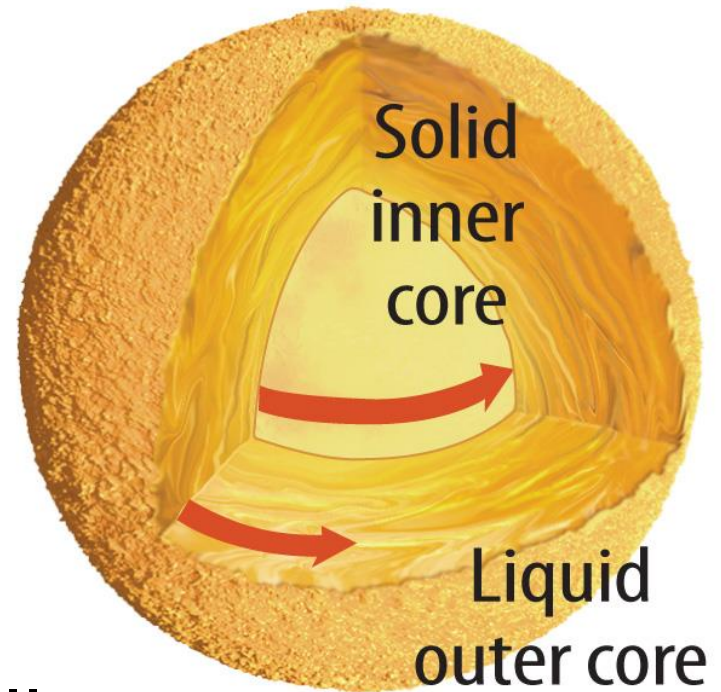


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Earth's Layers (cont.)

- The dense metallic center of Earth is the core.
- The core has a liquid outer core and a solid inner core and is mostly iron with small amounts of nickel and other elements.



Earth's Layers (cont.)

SCIENCE USE V. COMMON USE

nickel

Science Use a specific type of metal

Common Use a coin worth five cents



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Earth's Layers (cont.)



KEY CONCEPT CHECK

What are the interior layers of Earth?



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Earth's Layers (cont.)

- Scientist learned that the outer core is liquid by analyzing earthquake waves.
- The inner core is a dense ball of solid iron crystals.



Earth's Layers (cont.)



KEY CONCEPT CHECK

What evidence indicates that the outer core is liquid?



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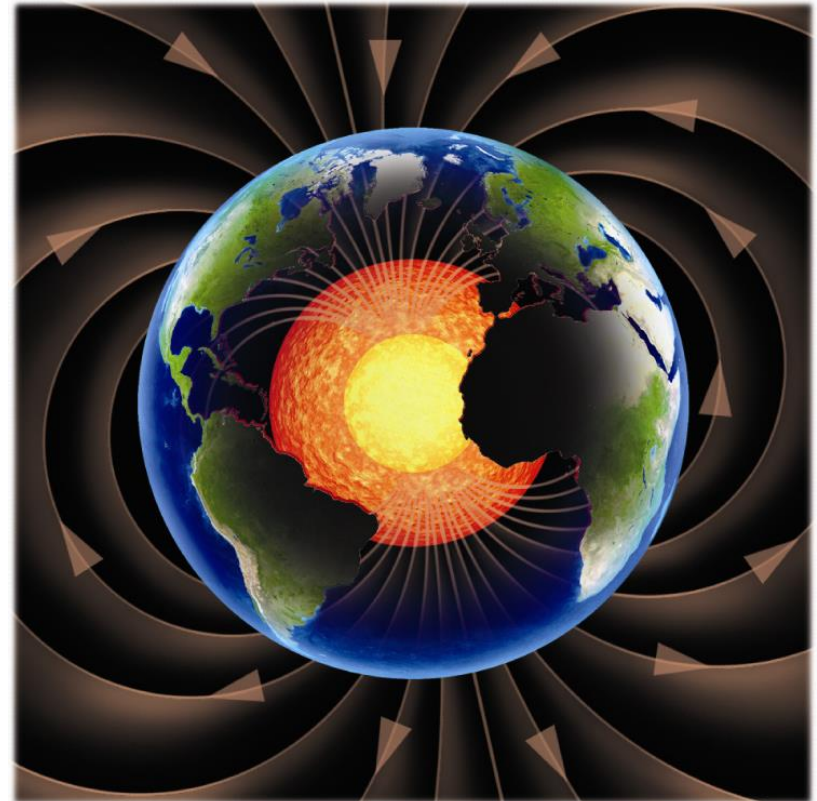
Earth's Core and Geomagnetism

- For centuries, people have used compasses and Earth's magnetic field to navigate.
- Earth's magnetic field is a region of magnetism produced in part by the flow of molten materials in the outer core.
- The magnetic field acts like a giant magnet with opposite poles.



Earth's Core and Geomagnetism (cont.)

The outer part of the magnetic field that interacts with cosmic rays and charged particles from the Sun is called the magnetosphere.



Earth's Core and Geomagnetism (cont.)

WORD ORIGIN

magnetosphere

from Latin *magnes*, means
“lodestone”; and *spharia*, means
“sphere”

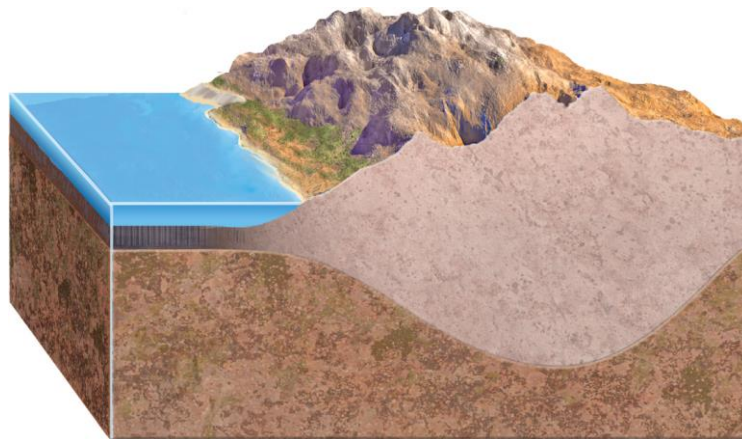


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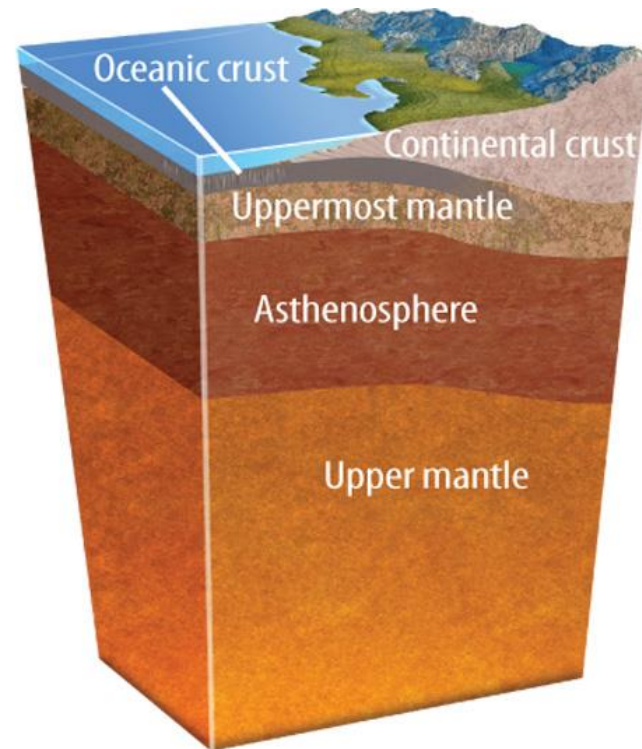
Summary

- Earth's layers include the crust, mantle, and core. Oceanic crust is under oceans. The continents are made of continental crust.



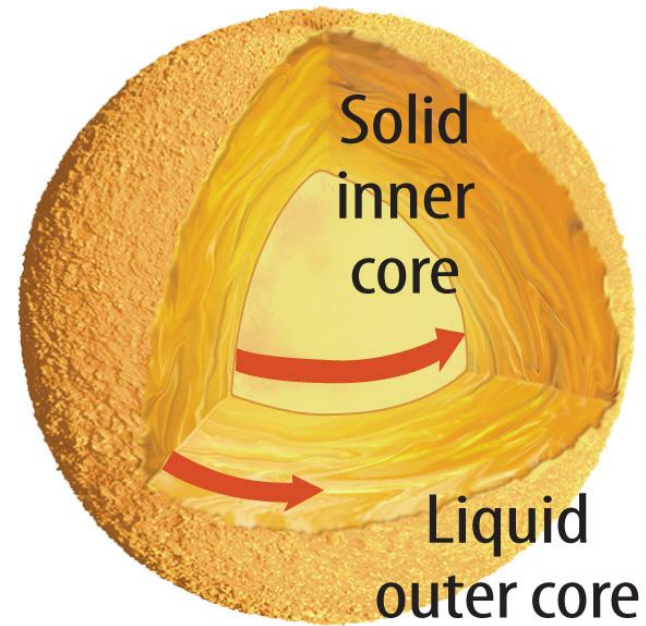
Summary

- The mantle is Earth's thickest layer. It includes part of the lithosphere and the asthenosphere.



Summary

- Earth's core has a liquid outer core and a solid inner core.



Lesson Review

If two materials have the same volume, the denser material will have which of these?

- A. greater weight
- ☒ B. more mass
- C. less mass
- D. less weight



Lesson Review

Which term describes the layer of rocks within the mantle where the rock is soft enough to flow?

- A.** mantle
- B.** crust
- C.** lithosphere
- D.** asthenosphere



Lesson Review

What did scientists analyze to learn that the Earth's outer core is liquid?

- A. rocks
- B. oceanic crust
- C. earthquake waves**
- D. the mantle



Lesson Review

What do you think **NOW?**
Do you agree or disagree?

3. Earth's interior is made of distinct layers.
4. Scientists discovered that Earth's outer core is liquid by drilling deep wells.



Lesson 3

Earth's Surface

Key Concepts

- What are Earth's major landforms and how do they compare?
- What are the major landform regions of the United States?



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Lesson 3

Earth's Surface

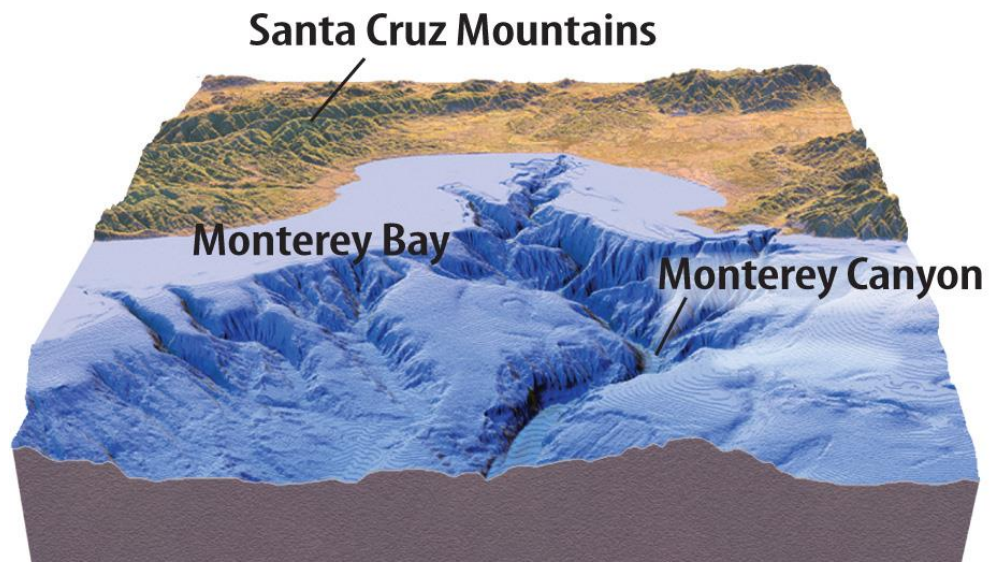
Vocabulary

- landform
- plain
- plateau
- mountain



Oceans and Continents

- Oceans cover more than 70 percent of Earth's surface.
- Many of the features that appear on dry land also appear on the ocean floor.

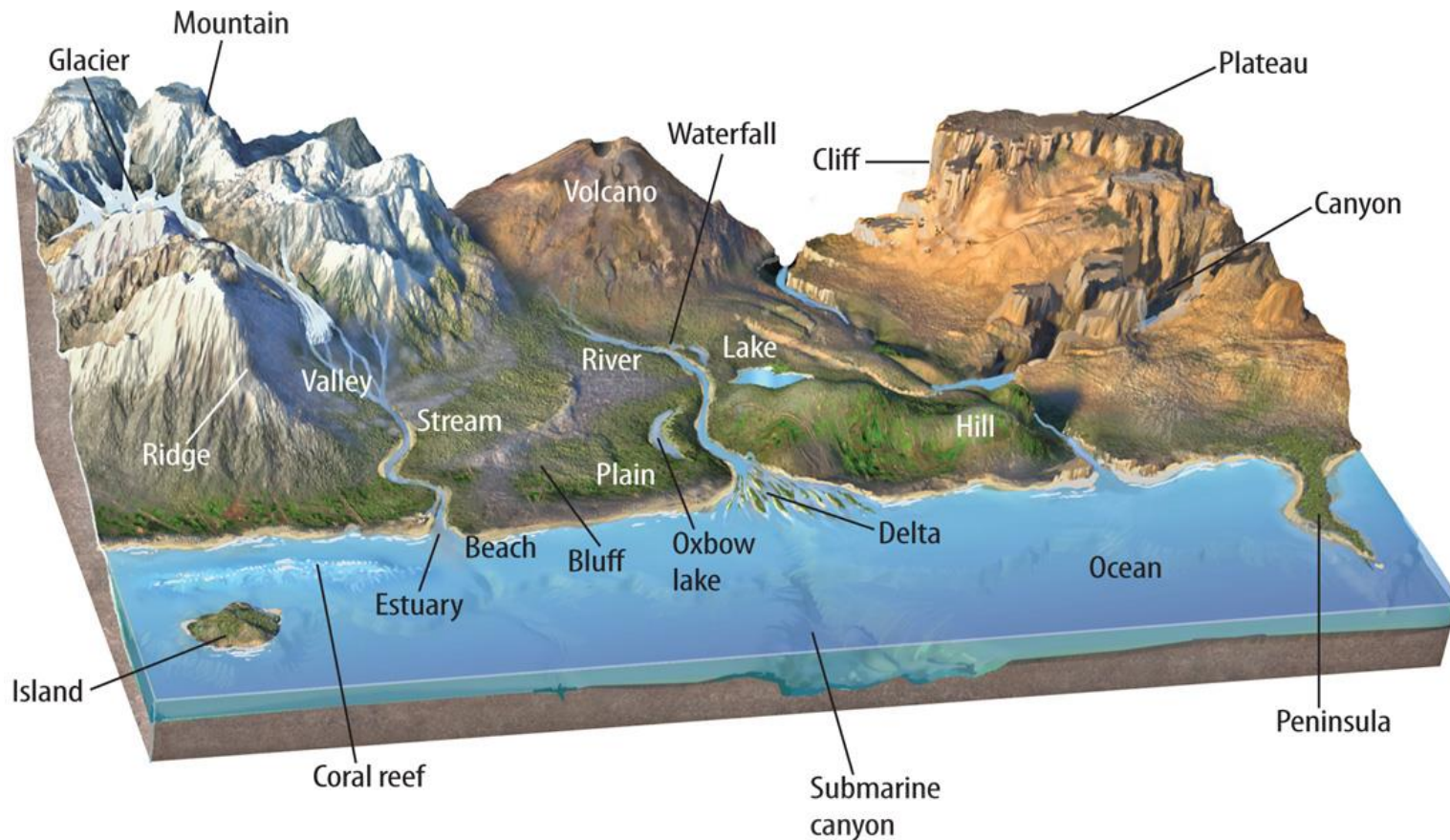


Landforms

- Landforms are topographic features formed by processes that shape Earth's surface.
- Scientists use the term topography to describe the shape of a geographic area.
- Many factors such as erosion or uplift of Earth's surface can create and affect landforms.



A landform is usually identified by its surface form and location.

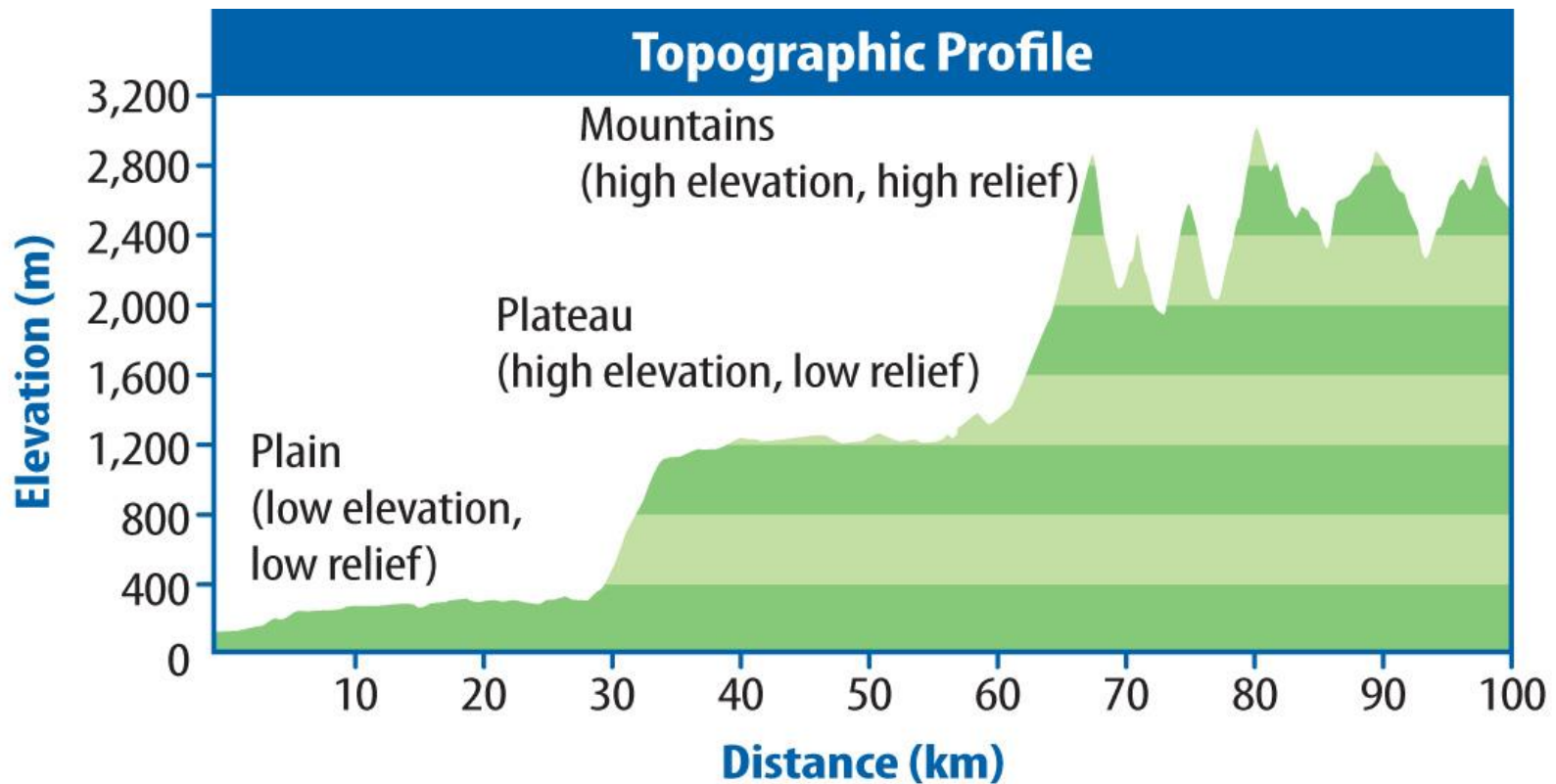


Landforms (cont.)

- Scientists use the term elevation to describe the height above sea level of a particular feature.
- Relief is a term that scientists use to describe differences in elevation.



Areas with high relief have a relatively large difference between the lowest elevation and the highest elevation.



Landforms (cont.)

- Plains are landforms with low relief and low elevation.
- Plains can form when sediments are deposited by water or wind.



Landforms (cont.)

WORD ORIGIN

plains

from Latin *planus*, means “flat, level”



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Landforms (cont.)

- Plateaus are areas with low relief and high elevation.
- Plateaus are much higher than the surrounding land and often have steep, rugged sides.
- Plateaus can form when forces within Earth uplift rock layers or cause collisions between sections of Earth's crust.



Landforms (cont.)

- Plateaus can also be formed by volcanic activity.
- **Mountains** are landforms with high relief and high elevation.
- Mountains can form from a buildup of lava on the ocean floor, or when forces inside Earth fold, push, or uplift huge blocks of rocks.



United States Landforms



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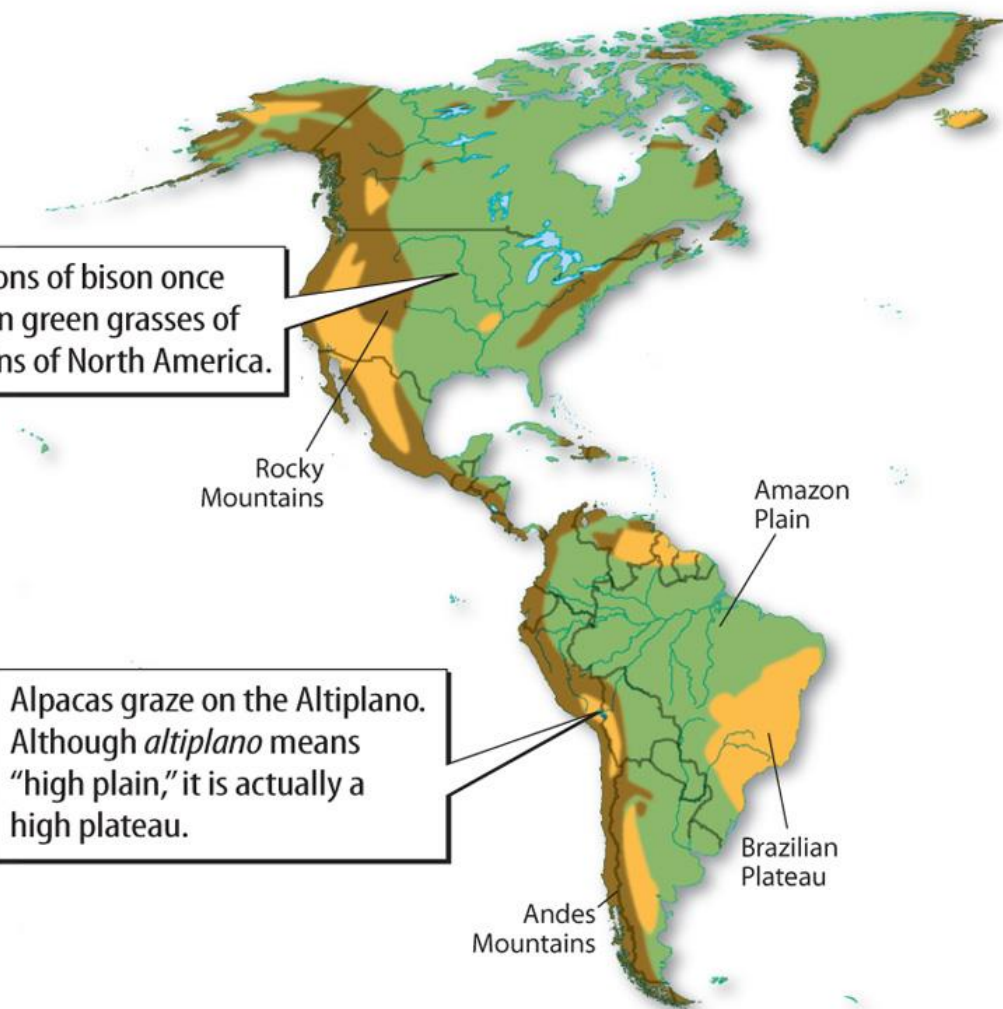
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Mediainages/Photodisc/Getty Images



Millions of bison once grazed on green grasses of the interior plains of North America.



Rocky Mountains

Amazon Plain

Alpacas graze on the Altiplano. Although *altiplano* means "high plain," it is actually a high plateau.

Brazilian Plateau

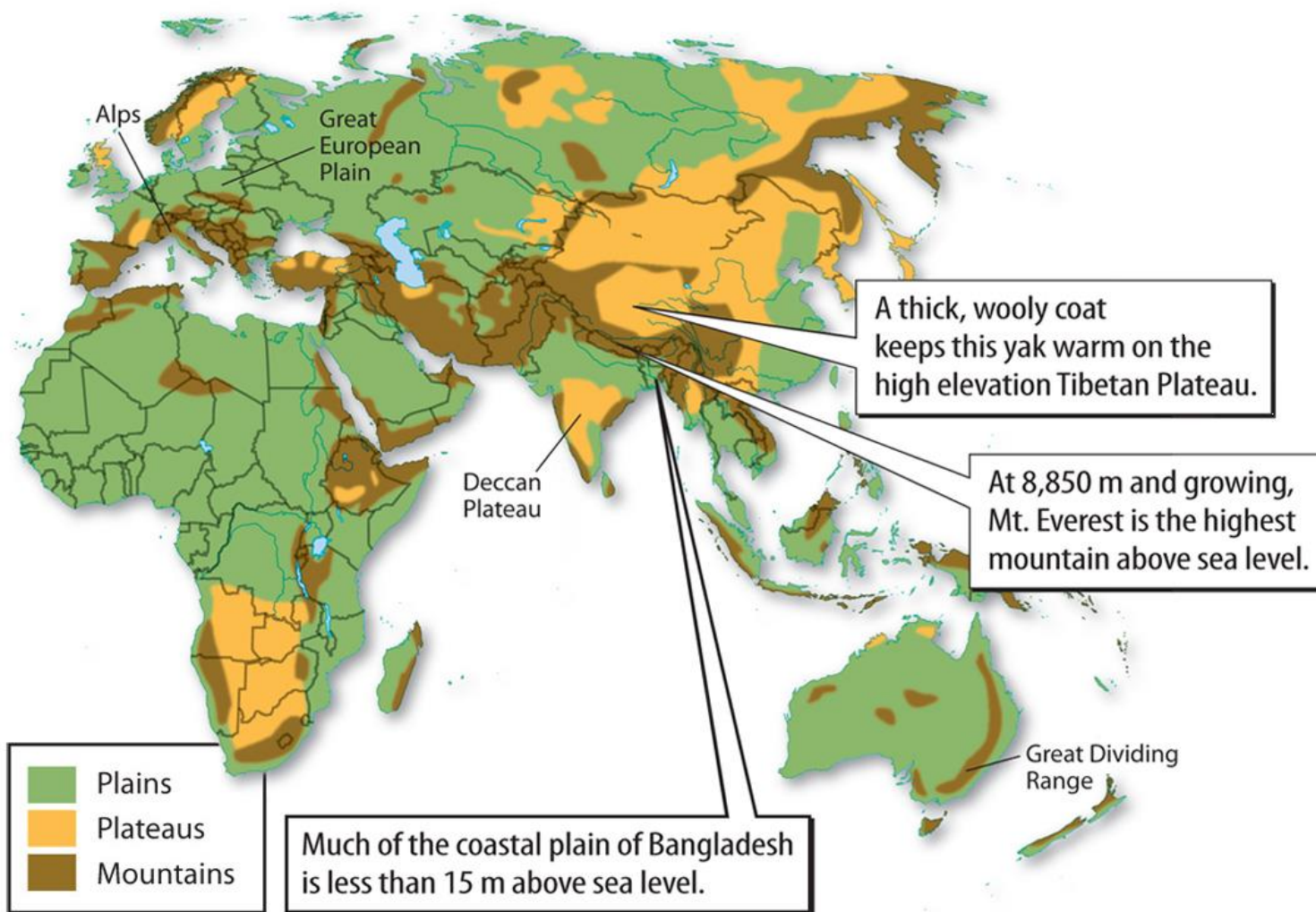
Andes Mountains

- Plains
- Plateaus
- Mountains



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Landforms (cont.)



KEY CONCEPT CHECK

Describe at least three major landform regions in the United States.

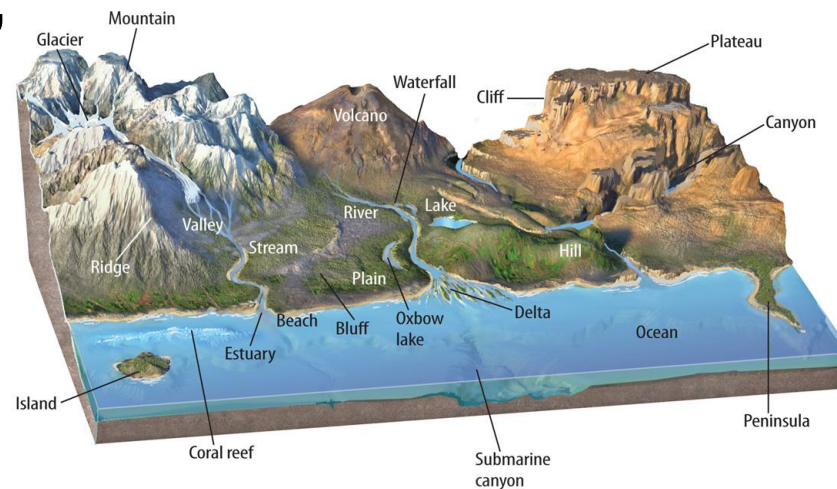


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Summary

- Landforms are topographic features formed by processes that shape Earth's surface.
- Major landforms include flat plains, high plateaus, and rugged mountains.



Summary

- Major landform regions in the United States include the Appalachian Mountains, the Great Plains, the Colorado Plateau, and the Rocky Mountains.



Lesson Review

Which term refers to landforms with low relief and low elevation?

- A.** plains
- B.** plateaus
- C.** mountains
- D.** oceans



Lesson Review

Which term is used to describe the height above sea level of a landform's particular feature?

- A.** relief
- B.** mountain
- C.** elevation
- D.** topography



Lesson Review

Which term do scientists use to describe differences in elevation?

- A. height
- B. plateau
- C. relief**
- D. elevation



Lesson Review

What do you think **NOW?**
Do you agree or disagree?

- 5. All ocean floors are flat.
- 6. Most of Earth's surface is covered by water.



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Over geologic time, Earth has developed three major layers, the crust, the mantle, and the core, which are continuously being altered.



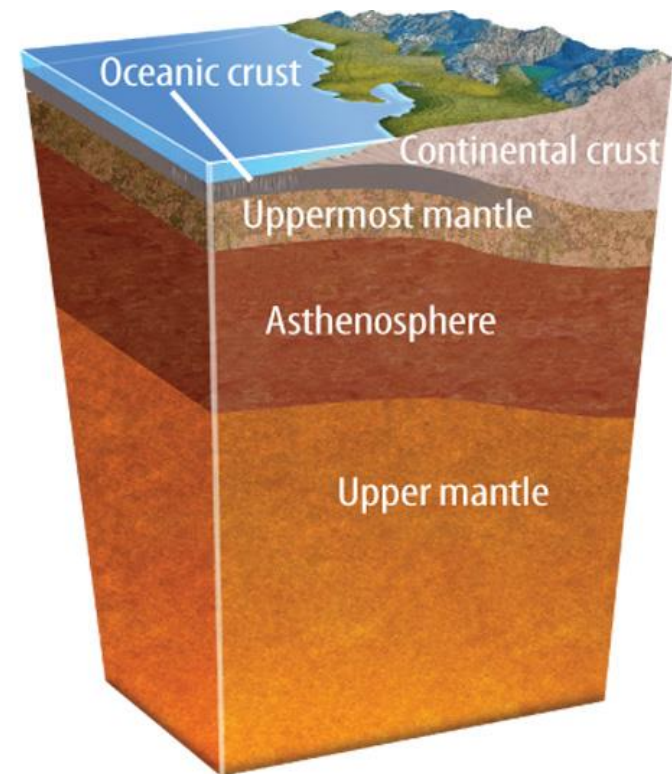
Lesson 1: Spherical Earth

- Earth's major systems include the atmosphere, hydrosphere, biosphere, and geosphere.
- All four major Earth systems interact by exchanging matter and energy. A change in one Earth system affects all other Earth systems.
- Gravity caused particles to come together to form a spherical Earth.



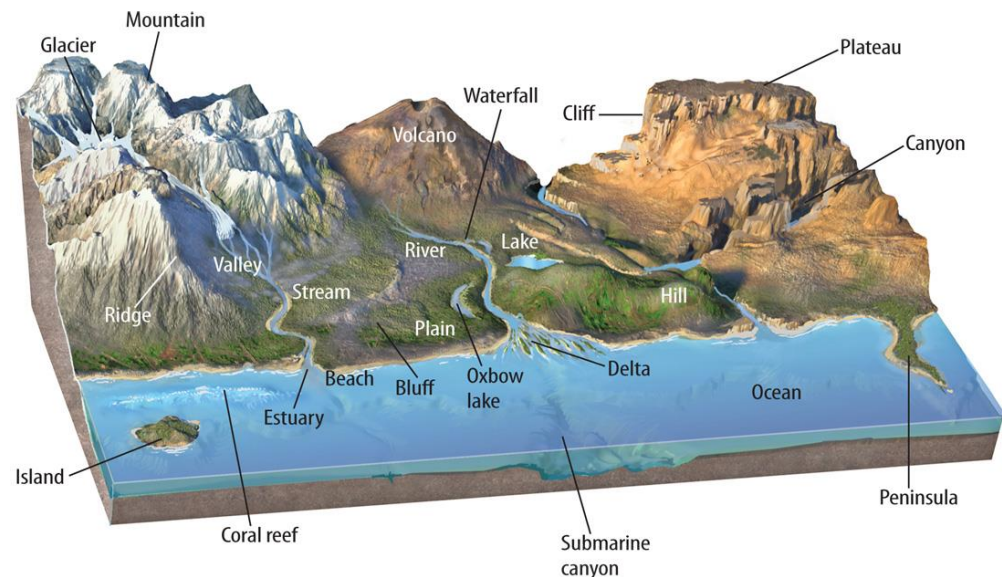
Lesson 2: Earth's Interior

- Earth's interior layers include the crust, mantle, and core.
- By analyzing earthquake waves, scientists have determined that the outer core is liquid and the inner core is solid.



Lesson 3: Earth's Surface

- Earth's major landforms include plains, plateaus, and mountains. Plains have low relief and low elevation. Plateaus have low relief and high elevation. Mountains have high relief and high elevation.
- Plains, plateaus, and mountains are all found in the United States.



Chapter Review

Which of these is made of the layer of gases surrounding Earth, and is the Earth's outermost system?

- A. hydrosphere
- ☒ B. atmosphere
- C. geosphere
- D. biosphere



Chapter Review

Which of the following holds most of its water in salty oceans?

- A. atmosphere
- B. biosphere
- C. hydrosphere**
- D. geosphere



Chapter Review

What is the force that every object exerts on every other object because of their masses?

- A.** nebula
- B.** density
- C.** volume
- D.** gravity



Chapter Review

Which of these refers to the rigid layer made up of the crust and the uppermost mantle?

- A.** lithosphere
- B.** mantle
- C.** asthenosphere
- D.** core



Chapter Review

Which term refers to areas with low relief and high elevation?

- A. mountains
- B. plains
- C. landforms
- D. plateaus**



Standardized Test Practice

What is the amount of mass in a material per unit volume?

- A. weight
- B. temperature
- C. density**
- D. depth



Standardized Test Practice

Which of these refers to the thick middle layer in the solid part of Earth, immediately below the crust?

- A.** mantle
- B.** core
- C.** crust
- D.** lithosphere



Standardized Test Practice

Which of these is the outer part of the Earth's magnetic field that interacts with cosmic rays and charged particles from the Sun?

- A. North pole
- B. South pole
- C. core
- D. magnetosphere**



Standardized Test Practice

What term do scientists use to describe the shape of a geographic area?

- A. landform
- ☒ B. topography
- C. mountain
- D. relief



Standardized Test Practice

Which of these are topographic features formed by processes that shape Earth's surface?

- A.** landforms
- B.** plains
- C.** plateaus
- D.** mountains

