

Close, continued

Answers to Section Review

1. Earth is an oblate, or slightly flattened, spheroid with a polar circumference of 40,007 km and an equatorial circumference of 40,074 km.
2. Answers should include two of the following: Earth's surface is mostly covered by water; Earth has a thick atmosphere containing a large proportion of oxygen; and Earth supports life.
3. Scientists observe how seismic waves travel through Earth's interior in order to determine the physical states of Earth's deeper regions.
4. Earth's three compositional layers are the thin crust at the surface, the large mantle that lies beneath the crust, and the core, which lies at Earth's center. The five structural layers describe the interior in terms of physical properties. The crust and upper mantle thus make up the lithosphere of solid, rigid rock; beneath this lies the asthenosphere of solid but plastic rock; the mesosphere is the solid rock that makes up the rest of the mantle; the liquid outer core comes next, and the solid inner core is at Earth's center.
5. Motion within the liquid iron of Earth's outer core may produce electric currents, which in turn generate Earth's magnetic field.
6. The force of gravitational attraction between two objects increases as the masses of the objects increase and as the distance between the objects decreases.
7. A person's greater weight at the poles than at the equator suggests that the equator is farther from Earth's center than the poles are, and therefore Earth's shape is not perfectly spherical.
8. The asthenosphere is solid rock that is able to flow because of its plasticity. The mesosphere is solid rock that remains rigid.
9. On the mountain peak, I would be farther from Earth's center than at sea level, so the gravitational attraction would be slightly less. Therefore, I would weigh less.

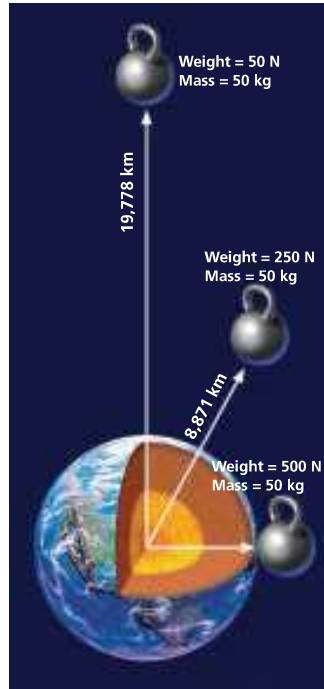


Figure 4 ▶ As the distance between an object and Earth's center increases, the weight of the object decreases. An object's mass is constant as its distance from Earth's center changes.

Earth's Gravity

Earth, like all objects in the universe, is affected by gravity. Gravity is the force of attraction that exists between all matter in the universe. The 17th-century scientist Isaac Newton was the first to explain the phenomenon of gravity. Newton described the effects of gravity in his *law of gravitation*. According to the law of gravitation, the force of attraction between any two objects depends on the masses of the objects and the distance between the objects. The larger the masses of two objects and the closer together the objects are, the greater the force of gravity between the objects will be.

Weight and Mass

Earth exerts a gravitational force that pulls objects toward the center of Earth. Weight is a measure of the strength of the pull of gravity on an object. The newton (N) is the SI unit used to measure weight. On Earth's surface, a kilogram of mass weighs about 10 N. The mass of an object does not change with location, but the weight of the object does. An object's weight depends on its mass and its distance from Earth's center. According to the law of gravitation, the force of gravity decreases as the distance from Earth's center increases, as shown in **Figure 4**.

Weight and Location

Weight varies according to location on Earth's surface. As you may recall, Earth spins on its axis, and this motion causes Earth to bulge near the equator. Therefore, the distance between Earth's surface and its center is greater at the equator than at the poles. This difference in distance means that your weight at the equator would be about 0.3% less than your weight at the North Pole.

Section 1 Review

1. **Describe** the size and shape of Earth.
2. **Describe** two characteristics that make Earth unique in our solar system.
3. **Summarize** how scientists learn about Earth's interior.
4. **Compare** Earth's compositional layers with its structural layers.
5. **Identify** the possible source of Earth's magnetic field.
6. **Summarize** Newton's law of gravitation.

CRITICAL THINKING

7. **Making Inferences** What does the difference between your weight at the equator and your weight at the poles suggest about the shape of Earth?
8. **Making Comparisons** How does the asthenosphere differ from the mesosphere?
9. **Analyzing Ideas** Why would you weigh less on a high mountain peak than you would at sea level?

CONCEPT MAPPING

10. Use the following terms to create a concept map: *crust, mantle, core, lithosphere, asthenosphere, mesosphere, inner core, and outer core.*

10. Earth's interior has five compositional zones—the *lithosphere*, which consists of the crust and the rigid upper part of the *mantle*; the *asthenosphere*; the *mesosphere*; and the two regions of Earth's *core*, the liquid *outer core* and the solid *inner core*.

CHAPTER RESOURCES

Chapter Resource File

- Section Quiz **GENERAL**

Workbooks

- Study Guide (also in Spanish)