



Discussion Guide (for use during or after reading)

1. What is gravity? (What Is Gravity?, p. 4-7)
 - a. Gravity is the force that attracts all other objects toward one another. It affects the entire universe! All objects have gravity.
2. What affects the strength of gravity? (What Is Gravity?, p. 4-7)
 - a. The strength of gravity depends on distance and mass. The farther away two objects are from one another, the less gravity between them. In addition, the more mass an object has, the more pull it has on other objects.
3. How are weight and mass related? (Mass vs. Weight, p. 10-11)
 - a. The ideas of weight and mass are quite similar. Sometimes people even use the words interchangeably. In science, however, we know weight and mass are different, but related. Mass describes how much matter something contains. Mass does not change whether an object is on Earth, the moon, Jupiter, etc. Weight, on the other hand, depends on gravity. Weight is a measure of the pull of gravity on an object.
4. Why would the weight of an object change when it is on Earth, the moon, and Jupiter even though its mass stays the same? (Mass vs. Weight, p. 10-11)
 - a. Mass describes the amount of matter in an object, so mass stays the same regardless of the object's location. However, weight is a measure of the pull of gravity on an object. Changing the amount of gravity would therefore change the weight of an object. Because the moon has less gravity than Earth, objects have less weight on the moon than on Earth (even though their mass stays the same). Similarly, objects on Jupiter have more weight than they would on Earth because Jupiter is more massive and therefore has more gravity than Earth.
5. According to the text, gravity causes all objects to speed up as they fall, but not all objects fall at the same speed. Why is this? (How Objects Fall, Friction, p. 12-15)
 - a. Not all objects fall at the same speed because of the force of friction. Friction is the rubbing between objects that slows them down and produces heat. Particles in the air rub against the particles of the falling objects, causing them to slow down or speed up at different speeds.

6. What is inertia? (Inertia, p. 16-17)
 - a. Inertia is the idea that an object in motion tends to stay in motion and an object at rest tends to stay at rest until a force acts upon it.
7. Describe what might happen to a soccer ball if kicked on Earth, the moon, Jupiter, and in space. Use what you know about gravity and inertia to explain why this is. (Inertia, p. 16-17)
 - a. If you kick a soccer ball on Earth, it will eventually fall to the ground because of all the forces on Earth working to change the ball's motion. For example, gravity pulls the ball toward Earth. In addition, air particles rub against the ball, and this friction causes it to slow down. If you kick a soccer ball on the moon, it will soar because there is far less gravity on the moon than on Earth. The opposite is true about Jupiter. A soccer ball will hardly move due to the force of gravity. However, if you kick a soccer ball in space, it will continue moving in a straight line because there are no forces of gravity or friction to slow it down or stop it.
8. How does the sun's gravity affect the planets? (Gravity and the Sun, p. 18-19)
 - a. The sun is massive! Because of this, its gravity is so strong that it keeps the planets in our solar system from hurtling into space. The sun's gravity is offset by the planets' inertia, which keeps them from crashing into the sun. The sun's gravity acts like an invisible string tethered to the planets and keeping them in orbit.
9. According to the text, what is one way scientists know the moon's gravity pulls on Earth? (Gravity and the Moon, p. 20-21)
 - a. The moon has less mass than Earth and therefore has less gravity. However, scientists know the moon's gravity still pulls on Earth because of ocean tides. The water in the ocean is pushed and pulled by the moon's gravity, creating waves and tides that rise and fall.
10. Describe how scientists believe gravity played a role in the creation of our sun and other aspects of our solar system. (Gravity and the Solar System, p. 22-25)
 - a. Scientists believe that around 4.5 billion years ago, gravity acted as a glue and brought particles from a spinning cloud of gas and dust together. The force of gravity caused the particles to continue to spin faster and faster, eventually creating a ball of fuel we know as the sun. Scientists also believe that gravity caused other particles to collide around the sun. These particles eventually became more massive and began to form other parts of our solar system, such as planets and moons.