Answer Key
The Sun-Earth-Moon System

Lesson 1

Before You Read
1. disagree
2. disagree

Read to Learn
1. Nuclear fusion produces huge amounts of energy.
2. b. near circle
3. the Sun’s gravitational pull on Earth
4. counterclockwise from west to east
5. Earth rotates from west to east, making the Sun appear to move from east to west across the sky.
6. Earth’s rotation axis points away from the Sun from the autumn equinox to the spring equinox—September to March.
7. because of Earth’s curved surface
8. tilted surface
9. Because Earth’s surface becomes more tilted as you move away from the equator and toward the poles, areas near the poles receive less of the Sun’s energy than areas near the equator.
10. $152,000,000 \times 0.62 \text{ miles/1 km} = 94,240,000 \text{ miles}$
11. Students label the left figure as winter.
12. The tilt causes the yearly cycle of seasons.
13. Students use different colors to highlight the seasons in the northern and southern hemispheres at each equinox and solstice.
14. on the June solstice

After You Read
1. Possible answer: Earth’s axis leans most toward or away from the Sun on solstices and leans neither toward nor away from the Sun on equinoxes.
Lesson 2

Before You Read
3. disagree
4. disagree

Read to Learn
1. giant impact hypothesis
2. from lava that flowed through the Moon’s crust and hardened
3. Earth’s gravitational pull on the Moon
4. It takes much longer for Earth to revolve around the Sun (about 365.24 days); the Moon revolves around Earth in 27.3 days.
5. the motion of the Moon around Earth and sunlight
6. the phases in which less of the Moon’s near side is lit each night
7. Students should circle the full moon.

After You Read
1. During waxing, more of the Moon’s near side is lit each night; during waning, less of the Moon’s near side is lit each night.
2. Features of the Moon’s Surface: craters, maria, highlands. Moon’s Phases: Week 1, first quarter; Week 2, full moon, Week 3, third quarter; Week 4, new moon
3. Students should explain how making an outline helped them understand the lesson.

Lesson 3

Before You Read
5. disagree
6. agree
Read to Learn

1. This is the only time when Earth, the Moon, and the Sun are lined up and the Moon casts a shadow on Earth’s surface.
2. The Moon’s shadow would not pass over North America during the solar eclipse shown here.
3. Because the Moon’s orbit is slightly tilted compared to Earth’s orbit, Earth is above or below the Moon’s shadow during most new moons.
4. because Earth casts a larger shadow than the Moon
5. during the full moon phase
6. Both take place during the full moon phase when the Moon moves into Earth’s shadow, and the stages are similar.
7. In both figures, students should highlight the two high-tide ends of Earth.
8. because the Sun is much farther from Earth than the Moon is
9. Students add Spring tide to the Full moon and New moon callouts. Students add Neap tide to the First-quarter moon and Third-quarter moon callouts.

After You Read

1. Light is totally blocked in an umbra and only partially blocked in a penumbra, making a penumbra lighter than an umbra.

2.

<table>
<thead>
<tr>
<th>Event</th>
<th>Positions of Earth, the Sun, and the Moon</th>
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<tbody>
<tr>
<td>Total solar eclipse</td>
<td>Students’ drawings should show the Moon directly between Earth and the Sun. The Moon should be in the new moon phase.</td>
</tr>
<tr>
<td>Total lunar eclipse</td>
<td>Students’ drawings should show Earth directly between the Sun and the Moon, completely blocking the Moon. The Moon should be in the full moon phase.</td>
</tr>
<tr>
<td>Spring tide</td>
<td>Students’ drawings should show Earth, the Sun, and the Moon in a straight line.</td>
</tr>
<tr>
<td>Neap tide</td>
<td>Students’ drawings should show Earth, the Sun, and the Moon forming a right angle.</td>
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</tbody>
</table>