

Red Edition
Grade 3–4
reading level

Purple Edition
Grade 4–5
reading level

Objectives

- Explore the characteristics of Earth, the Moon, and the Sun.
- Understand Earth’s location in the solar system.
- Discuss days, years, and seasons.
- List the phases of the moon.
- Describe tides and eclipses.
- Interpret systems, including the Earth, Moon, and Sun system.

Reading Comprehension Skills

Preview the Book ♦ Sequence

Skillbuilders are available for this title.

Supporting English Learners

Teach Academic English Make school language comprehensible to English Learners. Carefully select words that have to do with academic tasks, such as *preview*, *explain*, *describe*, and *sequence*, and teach them in meaningful contexts. Provide daily, explicit instruction to teach both science vocabulary and school language in depth.

Summary

The Delta Science Content Reader *Earth, Moon, and Sun System* begins with an overview of Earth, the Moon, the Sun, and the solar system to which they belong. Students learn how interactions between Earth and the Sun result in the regular patterns of days, years, and seasons. They discover how interactions between Earth and the Moon cause the Moon’s appearance to change during each month. The book introduces the phenomena of tides and eclipses before concluding with a discussion of systems.

Science Background

Earth is the planet we call home. A planet is a large, nearly spherical object that revolves around a star. Earth is the only planet known to have the conditions required to support life.

The Sun is the central and largest object in our solar system. Like other stars, our Sun is a huge ball of glowing gases that produces tremendous amounts of heat and light. Though the Sun seems to change position in the sky, it is actually Earth that moves around the Sun. Earth and all the other planets revolve around the Sun in paths called orbits.

The clearest effects of the relationship between Earth and the Sun are day and night. A day is the time it takes Earth to rotate once on its axis. As Earth rotates, the side of Earth facing the Sun has day, and the side facing away from the Sun has night. A year is the time it takes Earth to make one complete revolution around the Sun. Because Earth’s axis is tilted, sunlight shines more directly on some parts of Earth than on others. At different points in its orbit, different parts of Earth receive more or less direct sunlight. This regular variation in sunlight is what causes the seasons.

The Moon is Earth’s closest neighbor in the solar system and its only natural satellite. Though the Moon is the second brightest object in our sky, it does not produce any light of its own; it merely reflects light from the Sun. The phases of the Moon result from how much of the lighted part of the Moon we see as it revolves around Earth. Months are based on the lunar cycle of Moon phases.



What Are Earth, the Moon, and the Sun?

(pages 2–11)

Before Reading

Discuss the Cover

Cover Image Discuss the image on the cover of *Earth, Moon, and Sun System*. Use the information on the inside front cover to support the discussion.

Science Statement Discuss the science statement. Help students understand “relative positions” by describing their positions relative to one another.

Build Reading Skills (page 2)

Preview the Book Use Build Reading Skills on page 2 to review how to preview the book. Discuss the steps. Then model previewing the headings.

Think Aloud *What can I learn from the headings? On page 14, I see the red heading “Earth and the Sun.” This must be the main topic. The next three headings, on pages 14–16, are smaller and blue. These headings must break down ideas about Earth and the Sun into smaller parts.*

Guide students as they finish previewing *Earth, Moon, and Sun System*. Focus on nonfiction text features.

- Prompt them to look at the headings, photographs, captions, and diagrams. Ask questions such as *Why do you think that feature is there? How will it help you understand what you read?*
- Prompt them to look at the bold Vocabulary words. Guide the class in looking up a Vocabulary word in the Glossary.

Students can apply the skill in the Reflect on Reading activity on page 11.

K-W-L Chart Have students begin a K-W-L chart. They should add to it after each section.

What I Know	What I Want to Learn	What I Learned
The Moon seems to change shape.	Does the Moon really change shape?	

Make a Connection (page 3)

Make a Connection Discuss the Make a Connection question. Use this discussion to build background and activate prior knowledge about Earth, the Moon, and the Sun. (Possible answers: Moon: moves around Earth, looks as if changes shape, has craters, people have traveled there; Sun: huge, very hot and bright, rises in east and sets in west, plants need its light to grow)

Find Out About Read each statement to help students set a reading purpose. Explain that these are the important topics that they will learn about in this section.

Vocabulary Read the Vocabulary words aloud. Explain to students that they will see these words in bold in this section. Start a T-chart on the board for *the Sun* and *the Moon*. Have students add information to the chart as they read.

During Reading

Earth (page 4)

- Reinforce the meanings of *revolve* and *rotate*. Have a student walk in a circle around you. Point out that the student is moving in a path around you the way Earth revolves around the Sun. Then have a student slowly spin in place to demonstrate how Earth rotates. Explain that *revolution* and *rotation* are the noun forms of the verbs *revolve* and *rotate*. We say Earth has completed one revolution when it has revolved around the Sun once. We say it has completed one rotation when it has rotated once. Challenge students to act out revolving and rotating at the same time to illustrate how Earth moves through space.
- Discuss the photograph of Earth on page 5. Ask: *What is the atmosphere?* (a layer of gases around Earth)
- Emphasize that Earth’s distance from the Sun is a key factor in Earth having liquid water, a requirement for living things. Earth receives energy from the Sun. Earth’s distance from the Sun means that it receives enough energy for water to be liquid instead of frozen ice, but not so much energy that liquids and gases “boil away” into space.

- ✔ **Checkpoint** (page 5) (atmosphere has gases, such as oxygen, that living things need; stays at temperatures that support life; has water in liquid form, and living things need water)

Earth's Moon (page 6)

- Discuss the photograph of the Moon in the sky on page 6. Ask: *What would happen to the light from the Moon if the Sun were gone? Explain.* (There would be no more light, because the Moon does not make its own light. We see the Moon because light from the Sun reflects off the Moon.)
- The Moon's almost nonexistent atmosphere is responsible for many of its differences with Earth. There is no sound on the Moon, because there is no air to carry sound waves. There is no weather, because weather is the condition of the atmosphere. Because it has little atmosphere to protect it, meteorites do not slow down or burn up the way they do in Earth's atmosphere, leading the Moon's surface to be covered with craters.

- ✔ **Checkpoint** (page 7) (has no liquid water and almost no atmosphere, gets much hotter and much colder, has many more craters)

The Sun (page 8)

- Ask: *How is the Sun's energy made?* (Inside the Sun, hydrogen is changed to helium. This gives off huge amounts of energy.)
- Ask: *How do living things depend on the Sun's energy for food?* (Plants use light energy from the Sun, along with air and water, to make their own food. Energy in that food passes to animals that eat plants.)
- Discuss the photograph of the Sun on page 9. Explain that this photograph was taken with a special telescope used to study the Sun. Emphasize that people should *never* look directly at the Sun.
- Help students understand how energy from the Sun powers the water cycle. Ask: *What happens to a puddle on a hot day?* (Possible answer: It dries up.) Explain that energy from the Sun heats up the water in the puddle, causing it to change from liquid water to the gas water vapor. As part of the water cycle, this water may eventually come back to Earth's surface as rain or snow.

- ✔ **Checkpoint** (page 9) (The Sun is a star. It is made mostly of the gases hydrogen and helium.)

The Solar System (page 10)

- Point out the phrase “not to scale” in the picture of the solar system on page 10. Explain that this means that the sizes of the objects and the distances between them are not what they would be if you shrunk the solar system down to the size of this picture. Because the sizes of objects in the solar system vary so greatly and the distances between them are so vast, it would be impossible to make a picture of the solar system of this size to scale.
- From the time it was discovered in 1930 until 2006, Pluto was considered a planet, even though it was unlike other planets in many ways. In 2006 Pluto was reclassified as a dwarf planet. Two other planet-like space objects were given dwarf planet status at the same time: Ceres, the largest object orbiting in the asteroid belt, and Eris, discovered in 2003 orbiting beyond Neptune.
- Ask: *What is gravity?* (the force that pulls all objects toward one another) *Why is this force important to the solar system?* (Objects stay in their orbits because of gravity.)

- ✔ **Checkpoint** (page 11) (Possible answers: Sun: at center of solar system, largest object; Inner planets: small and dense, solid and rocky surfaces, have few or no moons; Outer planets: very cold, huge, have rings and many moons, made mostly of gas; Comets: made of frozen gases, ice, rock, and dust; Asteroids: made of rock, metal, or both)

After Reading

Reflect on Reading (page 11) (Possible answer: The picture on page 6 helped me understand what craters look like.) After students complete the activity, have them describe the picture they chose to a partner, using their own words.

Apply Science Concepts (page 11) This activity applies a concept from Find Out About on page 3. Encourage students to review the information about the Moon on pages 6–7 before answering. (Possible answer: I would need a spacesuit with air, because the Moon has almost no atmosphere. The spacesuit would also have to protect me from the Moon's temperatures, which can get much hotter and much colder than Earth's.)

How Do Earth, the Moon, and the Sun Interact? (pages 12–23)

Before Reading

Build Reading Skills (page 12)

Sequence Use Build Reading Skills on page 12 to review sequence. Discuss the tips. Then model identifying the sequence of seasons in the Northern Hemisphere in the diagram on page 16.

Think Aloud *Earth has four seasons. Spring is one season. Which season happens next? I'll follow the arrows to find out. Summer is the next season. Fall is the season after that. Winter is the last season before we have spring again.*

Guide students as they identify other familiar sequences, such as the things they do to get ready for school every morning or the steps they have followed in a recipe. Students can apply the skill in the Reflect on Reading activity on page 23.

Make a Connection (page 13)

Make a Connection Discuss the Make a Connection question. Use this discussion to build background and activate prior knowledge about how Earth, the Moon, and the Sun interact. (Possible answer: Maybe the Sun seems to move across the sky because Earth rotates.)

Find Out About Read each statement to help students set a reading purpose. Explain that these are the important topics that they will learn about in this section.

Vocabulary Read the Vocabulary words aloud. Explain to students that they will see these words in bold in this section. Start a word web on the board with *Systems* in the center. Add *Earth and Sun System* and *Earth, Moon, and Sun System* in two connected circles. Have students add words and information to the web as they read.

During Reading

Earth and the Sun (page 14)

- You may wish to use a classroom globe to demonstrate how Earth rotates around an axis. You can extend the demonstration by shining a flashlight on the globe while it spins to illustrate the cause of day and night.
- Emphasize that the word *day* has a special meaning when used to describe the movement of the planets. Ask: *What is a day?* (the amount of time a planet takes to rotate once) *How long is a day on Earth?* (about 24 hours) Discuss that other planets rotate at different speeds, so their days are different lengths.
- Ask: *What changes can we see in the sky every day because of Earth's rotation?* (The Sun, Moon, and stars seem to rise in the east. Then they seem to move slowly across the sky and set in the west.)
- Ask: *What is a year?* (the amount of time a planet takes to revolve once around the Sun)
- Discuss the diagram of a year on page 15. Ask: *What does the arrow in the picture show?* (Earth's orbit) *Do you think a planet with a larger orbit than Earth's would have a longer or shorter year? Explain.* (longer, because it would take longer to revolve once around the Sun)
- The cause of the seasons is one of the most commonly misunderstood science concepts. Because we are familiar with feeling warmer when closer to a source of heat, it is easy to conclude that warmer months occur when Earth is closer to the Sun. But in fact, Earth is usually closest to the Sun early in January, when the Northern Hemisphere has winter. It is usually farthest from the Sun early in July, when the Northern Hemisphere has summer.
- Ask: *What is the Northern Hemisphere like in summer?* (The Sun appears higher in the sky. There are more hours of daylight. Temperatures are warmer.)
- Direct sunlight warms Earth more than indirect sunlight because energy from rays of direct sunlight is concentrated in a smaller area. This warms the area more than the more spread out rays of indirect sunlight would. Along with the increased number of daylight hours, this is what causes summer to be warmer than winter.

- Discuss equinoxes. On two days of the year, called equinoxes, the number of hours of daylight and darkness are equal. On these days, we experience about 12 hours of daylight and 12 hours of darkness. In the Northern Hemisphere, the spring equinox occurs on March 20 or 21 and marks the beginning of spring. The autumn equinox occurs on September 22 or 23 and marks the beginning of fall.

✔ **Checkpoint** (page 17) (Earth has seasons because its axis is tilted. As Earth revolves around the Sun, this tilt causes parts of Earth to point more toward the Sun. Other parts of Earth point more away from the Sun.)

Earth, the Moon, and the Sun (page 18)

- Ask: *What do we say the Moon is doing when we see more and more of its lighted side each night?* (waxing, getting fuller) *In which phase can we see the whole side of the Moon that is lighted?* (full moon) *What do we say the Moon is doing after the full moon phase?* (waning, getting smaller)
- Help students connect the diagram of the lunar cycle on page 19 with the photographs of the phases of the Moon along the bottom of pages 18 and 19. Ask: *In the lunar cycle picture, how much of the Moon is lighted by the Sun in each phase?* (half) Point to the phase at the bottom of the diagram. *Which phase is this?* (third quarter) *What do we see during this phase?* (We see half of the lighted side of the Moon and half of the dark side.)
- Ask: *Suppose you are on the beach one sunny day. You can see the Moon in the sky overhead. Do you think it is closer to high tide or low tide? Explain.* (Possible answer: I think it is closer to high tide. The Moon's pull on Earth is strongest on the side of Earth closest to the Moon. If the Moon is in the sky overhead, the beach must be on the side of Earth closest to the Moon.)
- ✔ **Checkpoint** (page 22) (As the Moon rotates, different parts face the Sun. The phases of the Moon happen because the Moon revolves around Earth. As the Moon moves in its orbit, we see more or less of the side of the Moon that is lighted by the Sun.)

About Systems (page 23)

- Encourage students to think of other systems they know about, such as school systems. Ask: *What are some parts of a school system?* (Possible answers: school buildings, teachers, students, principals) *What are some other systems you know about?* (Possible answers: human digestive system, transportation systems)
- Ask: *Do you think the solar system would still be a system without gravity? Explain.* (Possible answer: No. Objects in the solar system interact because of gravity. Without gravity, the Sun, planets, and other objects would not affect one another, so they would not be a system. They would go off in separate directions.)
- ✔ **Checkpoint** (page 23) (A system is a group of related parts that form a whole. The parts affect one another, or interact. Possible answers: solar system; Earth and the Sun; Earth, the Moon, and the Sun)

After Reading

Reflect on Reading (page 23) Encourage students to refer to the photographs on pages 18–19 when making their moon phase cards. (Sequence of phases: new moon, waxing crescent, first quarter, waxing gibbous, full moon, waning gibbous, third quarter, waning crescent) You may wish to extend the activity by making it into a game. Have students take turns displaying a card, and have other students tell which phases come directly before and after that one.

Apply Science Concepts (page 23) This activity applies a concept from Find Out About on page 13. NASA's eclipse Web site is a good place to research upcoming eclipses. Note that lunar eclipses are more likely to be on the class list because they are visible from a much wider area on Earth than solar eclipses.

➡ **Continued on last page**

Name: _____

Date: _____

Test: Earth, Moon, and Sun System

Part A: Vocabulary

moon	orbit	phase	revolve
rotate	solar system	Sun	tide

Choose the correct vocabulary word for each sentence. Write the word on the line.

1. Our _____ is a star, a huge ball of very hot, glowing gases.
2. Both the inner planets and the outer planets _____ around the Sun.
3. Earth and the other planets _____ around an imaginary center line called an axis.
4. One rocky _____ moves around our planet.
5. Our _____ has many objects, including planets, asteroids, and comets.
6. Earth's _____ around the Sun is shaped like an oval.
7. Each different shape of the Moon that we see is a different _____.
8. The regular rise and fall of the water level in the ocean is called the _____.

Part B: Science Concepts

Mark the best answer to each question.

9. Which of these is a main feature of the Moon's surface?
(A) sand
(B) craters
(C) ice
(D) oceans
10. How much time does it take for Earth to spin once around its axis?
(A) a day
(B) a week
(C) a month
(D) a year

Test: Earth, Moon, and Sun System (continued)

11. What is a main cause of high tide?

- (A) energy from the Sun
- (B) the Moon's rotation
- (C) the Moon's pull on Earth
- (D) strong ocean currents

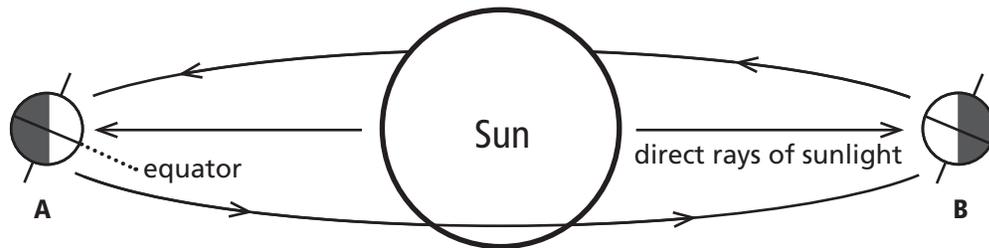
12. What causes most of the interactions in the Earth, Moon, and Sun system?

- (A) energy
- (B) gravity
- (C) gas
- (D) tides

Write the answer.

13. Think about a planet whose atmosphere has no oxygen. The planet is cold because it is far from the Sun. It has ice, but no liquid water. Could this planet support life the way Earth can? Explain.

14. Look at the picture. Label what season it would be in the Northern Hemisphere at points A and B. Tell which season is warmer and why.



A _____ B _____

15. Describe what causes the phases of the Moon.

Let's Review

(inside back cover)

Have students complete their K-W-L charts before answering these questions. Possible answers are shown.

- 1. Cover Connection** (As Earth rotates, the part of the planet that faces the Sun has daylight. The part that is turned away from the Sun has darkness, or night. Earth has seasons because its axis is tilted. As Earth revolves around the Sun, this tilt causes parts of Earth to point more toward the Sun and other parts to point more away from the Sun. Tides are caused mainly by gravity between Earth and the Moon. As Earth rotates, different places on Earth have high tide and low tide.)
- 2.** (The Moon has no liquid water and almost no atmosphere. It gets much hotter and much colder than Earth. It has many craters. The Moon revolves around Earth. It also rotates. It takes the same amount of time to rotate once as to revolve once.)
- 3.** (As Earth rotates, the part of the planet that faces the Sun has day. The part that is turned away from the Sun has night.)
- 4. Sequence** (The seasons always happen in the same order because Earth always stays tilted in the same direction and it always revolves around the Sun in the same direction.)
- 5. Write** (Descriptions will vary but should include information about the weather and the amount of daylight and darkness during the chosen season. Students should also include their reasoning about how they think the Sun's rays hit their part of Earth during that season.)

Try It! An area with a flat, level surface and a clear view toward the south works best for observing shadows. Remind students to mark where their feet are so they can stand in the same place later in the day. Encourage them to trace the whole shadow each time. The marks should illustrate how students' shadows change in both position and length over the course of a day.

Science at Home Have students do this activity at home with a family member. Weather and the timing of moonrise and moonset will prevent students from making observations every night, but attempting to do so will provide the most complete record of the lunar cycle. A park or other area with few artificial lights will provide the best conditions for observing the Moon.

Answers to Test

(Teacher's Guide pages 6–7)

1. Sun 2. revolve 3. rotate 4. moon 5. solar system 6. orbit 7. phase 8. tide 9. B 10. A 11. C 12. B 13. No. Living things need oxygen, and this planet does not have any. Living things need the right temperatures, and this planet is cold and far from the Sun. Living things also need liquid water, and this planet has only ice. 14. A: summer; B: winter; Summer is warmer because the Northern Hemisphere is tilted toward the Sun, so the sun's rays hit it more directly. 15. The phases of the Moon happen because the Moon revolves around Earth. As the Moon moves in its orbit, we see more or less of the side of the Moon that is lighted by the Sun.

ADDITIONAL ASSESSMENT OPPORTUNITIES Use the Checkpoints, Reflect on Reading, and Apply Science Concepts features and Let's Review questions as additional assessment opportunities.

Delta Science Content Readers are 24-page nonfiction student books with informative, engaging text and full-color photos and illustrations. The readers present key science content and vocabulary found on state tests, present key reading skills and strategies useful for reading informational text, support and extend the experiences and content of hands-on activities, promote scientific inquiry, and serve as a home-school link. They are available in two editions: Red Edition for Grades 3–4 and Purple Edition for Grades 4–5.

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