

The Moon



Moon Shapes

Why does the moon seem to change its shape?

The moon is our closest neighbor in space. We often see it in the night sky. Sometimes the moon looks big and round. Other times it looks like the tip of your fingernail. Does the moon actually change its shape?

The moon is round like a ball. It **orbits** (travels around) the Earth. The sun shines on the moon, just like it shines on the Earth. As the moon moves around the Earth, we see a different part of the moon's sunlit surface. When the moon's lit-up side faces away from us, we call it the **new moon**. When its whole lit-up side faces us, we call it the **full moon**.

The different shapes of the moon are called **phases**.
What phase is the moon tonight?



Making Phases

Why does the moon look like it changes shape? Find out here.

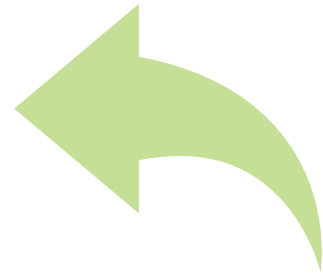
1. Turn on your model sun. Dim other lights. Stand three big steps from the model sun. Turn so your back is toward the sun.
2. Your head is the model Earth. Hold the model moon in front of you at arm's length. Lift it high enough so your shadow doesn't cover it.
3. Look at the light on your moon. Compare it to the four moon pictures on your data sheet. Which picture does it look most like? Write "full moon" in the box under that picture.
4. Turn left until the sun is directly on your left. Look at the light and shadow on your moon. Which picture does it most look like? (Notice which side is lit up.) Write "last quarter" in its box.
5. Turn left until you're facing the sun. Which picture does your moon look most like? Write "new moon" in its box.
6. Turn left until the sun is directly on your right. Which picture does your moon look most like? Write "first quarter" in its box.
7. Turn left until the sun is directly behind you again. Your model moon just made one full trip around your model Earth. The real moon takes about a month to orbit Earth.

Materials

- ★ model moon (from your teacher*)
- ★ model sun (from your teacher*)
- ★ "Making Phases" data sheet

Name: _____

Making Phases



Phases of the Moon

You have used your model sun and moon to observe four moon phases: Full Moon, Last Quarter, New Moon, and First Quarter. Now learn about the other phases too!

Materials

- ★ scissors
- ★ model sun (from your teacher*)
- ★ model moon (from your teacher*)
- ★ tape
- ★ "Phases of the Moon" data sheet

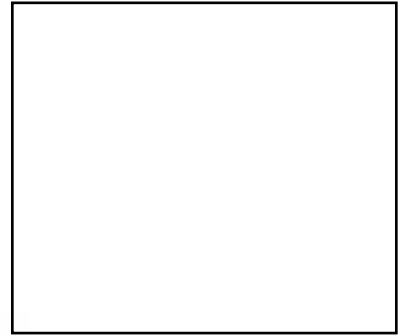
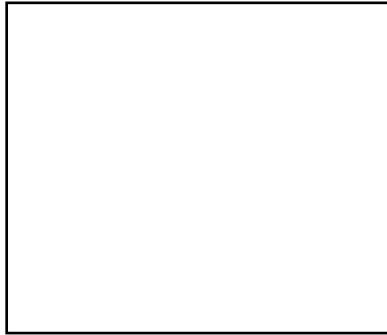
1. Use your finger to trace the arrows on your data sheet. The arrows show the order of the moon phases.
2. Cut out the four pictures at the bottom of your data sheet. Each one shows another moon phase. These phases happen between the first four phases you observed.
3. Turn on your model sun. Dim other lights. Stand three big steps from the model sun. Turn so your back is toward the sun. Hold the model moon in front of you at arm's length. Lift it high enough so your shadow doesn't cover it. You are modeling a Full Moon.
4. Slowly turn to your left until your moon is halfway between the Full Moon and Last Quarter phases. Look at the light and shadow on your moon. Which cutout picture is it most like? Tape that picture in the box between the Full Moon and the Last Quarter.
5. Keep turning left and observing your model. Figure out which picture goes in each of the other three boxes.
6. **Think:** Why does the shape of the moon seem to change as it orbits the Earth? Write your ideas on the back of your sheet.

Name: _____

Phases of the Moon



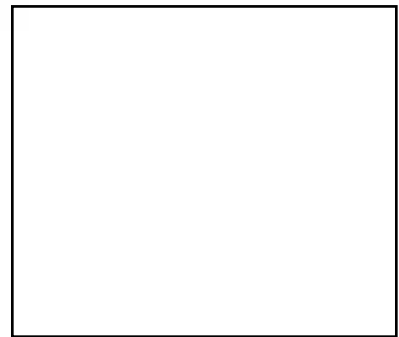
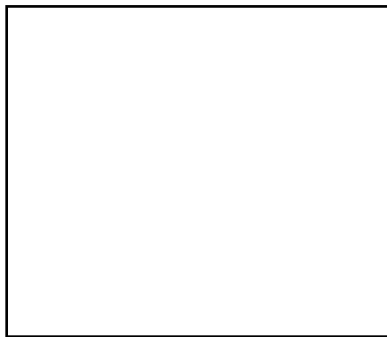
Full Moon



Last Quarter



First Quarter



New Moon



Waxing Crescent



Waning Crescent



Waning Gibbous



Waxing Gibbous

Background

Remind children that the time from the new moon (the dark phase) until the next moon is about a month! The moon is "tidally locked," which means the same side points toward Earth as it orbits around us.

Hands-On Hints

Review "left" and "right" as a class before doing these activities. Ask children to share their strategies for remembering which direction is which. For younger children, you may want to offer them a rubber-stamped image on the back of their left hand. (Both activities ask children to turn left.)

Model Moon: For each activity, you need a small white ball on a stick. (Materials are for each group of students.) Styrofoam balls are available in crafts stores and can be stuck on the pointed end of a pencil. Or you can buy inexpensive carnival game ping-pong balls and use strips of transparent tape to attach each one to the eraser end of a pencil, as shown at right.

Model Sun: This can be a flashlight, a lamp, or even a lit-up computer screen. Children will be facing this light source at times, so make sure it's not uncomfortably bright. You can tone down a bright flashlight with layers of wax paper. We found that a piece of wax paper folded in half three times (to make eight layers) and attached to an LED flashlight with a rubber band worked well. If you use flashlights, the beam may be narrow enough that you need to have one partner act as the sun, keeping the light focused on the model moon. Since light sources vary, test yours ahead of time.

Task Card 1: Making Phases

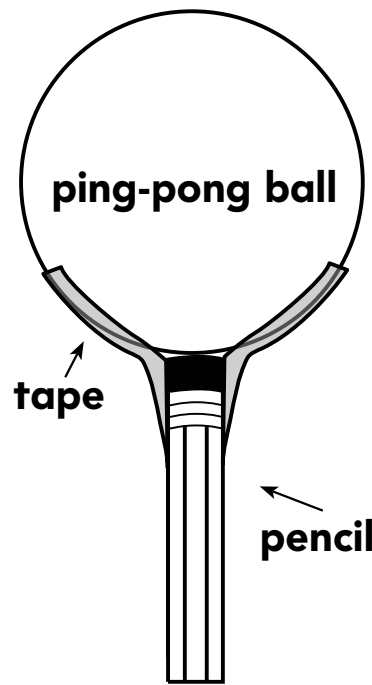
If you are working with flashlights, have children do this activity in pairs. Children should take turns being the Earth and the sun.

Starting with the full moon at the top of the diagram, the observed phases run counterclockwise: last quarter, new moon, first quarter (Steps 3–6).

Task Card 2: Phases of the Moon

Going counterclockwise from the full moon, the phases should be placed in this order: Full Moon, Waning Gibbous, Last Quarter, Waning Crescent, New Moon, Waxing Crescent, First Quarter, Waxing Gibbous (Steps 4 and 5).

The moon seems to change shape (Step 6) because we usually see only the lit-up part. As the moon orbits Earth, different amounts of the lighted part are visible from our planet.



For optimal results, we suggest following these steps:

1. Introduce the topic by reading aloud the nonfiction article. The article helps build background knowledge and provides context for the hands-on activities. You can project it onto your interactive whiteboard as you read it aloud. There is also a printable version that you can distribute to students so they can read along.
2. Divide the class into small groups. Hand each group a Task Card, and give each student a Data Sheet. (We recommend starting with Task Card 1.) Together with the class, read aloud the steps of the activity to ensure everyone understands what to do. You may also want to have each group conduct an inventory of their materials to make sure they have everything they need.
3. Have students do the activity and record on their Data Sheets.
4. Make sure to leave enough time before the end of the period so you can have a class discussion about the activity. Invite groups to share their findings and results, including any challenges they may have faced.
5. Gather students' data sheets to assess for understanding.

If you plan to continue the unit in your next lesson with the second Task Card, you might want to review the article with the class. In some cases, Task Card 2 builds upon Task Card 1, so you may want to quickly go over the first activity as well.

At the end of a unit, consider asking students to evaluate the topic and activities. This can be as simple as a thumbs-up or thumbs-down. Engage them in a discussion about what they liked or did not like and why. You might find this feedback useful for future lessons.

The two Task Cards feature hands-on activities that incorporate the following eight science and engineering practices—identified by the NGSS as essential for all students to learn:

1. Asking questions and defining problems
2. Developing and using models
3. Planning and carrying out investigations
4. Analyzing and interpreting data
5. Using mathematics and computational thinking
6. Constructing explanations and designing solutions
7. Engaging in argument from evidence
8. Obtaining, evaluating, and communicating information

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ISBN: 978-1-338-09900-3
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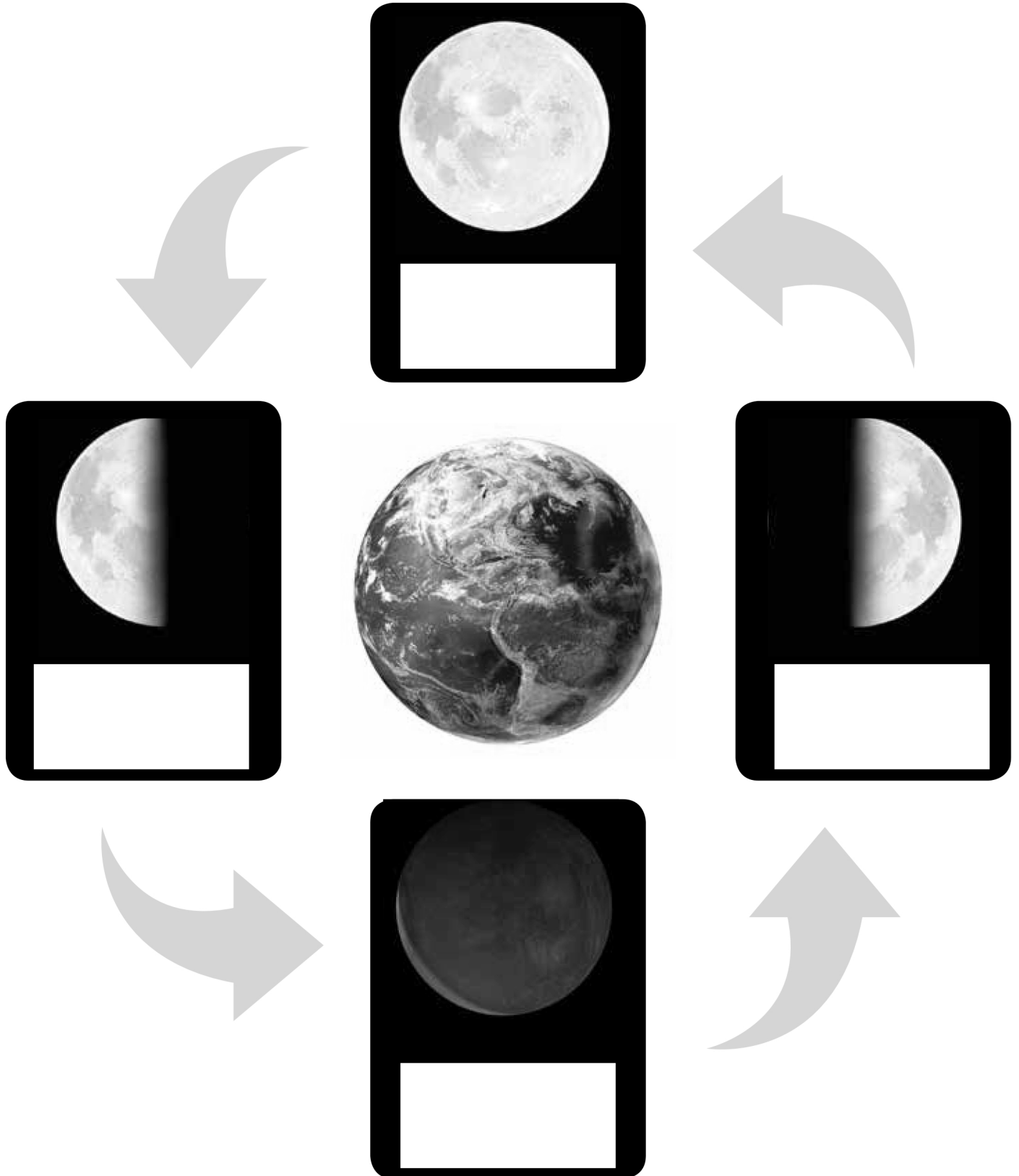
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Phases of the Moon

