

The Wizard from Space

Why Does the Moon Have Phases?

A teacher-led demonstration for the whole class

Objective: After the activity students will better understand the reason for the changing phases of the moon; because the moon orbits the earth. Students can also make and record their own observations of the moon.

Classroom Materials:

- a classroom-type globe of the earth
- a white ball (20cm, or larger, in diameter)
- a bright source of light, such as a desk, or table, lamp, with its decorative shade removed, or an overhead projector
- a copy of the “Moon Phases” worksheet with the demonstration’s “moon” ball compared to pictures of the real moon (one per student)

How to use the Moon Phase Model:

- 1) Use a large empty room, or arrange the student’s desks around the perimeter of the classroom. Place the light source (the “sun”) on a tall support along the center of one of the walls at the end of the room.
- 2) Asking the class if they have noticed how the real moon appears to change shape from night to night and ask if they have an explanation why it does so. Explain that these changes, or moon phases, are caused by the moon orbiting the earth.
- 3) Have the class stand together in the center of the room -- with one of the students holding the classroom Earth globe – while facing the light source “sun.” This group represents observers viewing the moon in the night sky. Ask one student to take the “moon” ball and have them stand halfway between the group with the globe and the light source “sun.”
- 4) Turn on the “sun” and turn out the room lights. Make sure that all of the students have an unobstructed view of the light source “sun” as well as the “moon” ball.
- 5) Ask the student with the “moon” ball to begin to slowly walk counterclockwise around the group standing at the center of the room with the classroom globe while keeping the same distance from them.

6) The students at the center of the room should be able to see that the lit part of the “moon” ball changes as the other student slowly walks around them. This is analogous to what the real moon does as it orbits the earth. Repeat several of these orbits around the classroom globe so that everyone in the center group has a chance to see the changing phases on the “moon” ball.

7) Turn on the room lights and pass out the “Moon Phases” sheet that includes both pictures representing the appearance of the “moon” ball next to the corresponding pictures of how the actual moon appears. Labels for their names are included. Point out the similarity between the two drawings.

8) Turn out the room lights and turn on the “sun” again. Ask another student to slowly walk the “moon” ball around the group in the middle of the room (again starting between the group and the light source “sun”) one more time so that they can compare these drawings of the real moon’s phases with the phases that they observe on the moon model. This time however the student with the “moon” ball should stop at the following positions along the orbit so that the group in the center can compare the pictures on the “Moon Phases” sheet and the “moon” ball:

A/New Moon: 0° angular distance from light source “sun,” or at 12:00 counting the “sun” as that position on a clock’s dial. The side of the “moon” ball toward the students in the center is not lit.

C/First Quarter Moon: 90° angular distance from light source “sun,” or at 09:00. The right half of the “moon” ball is now lit.

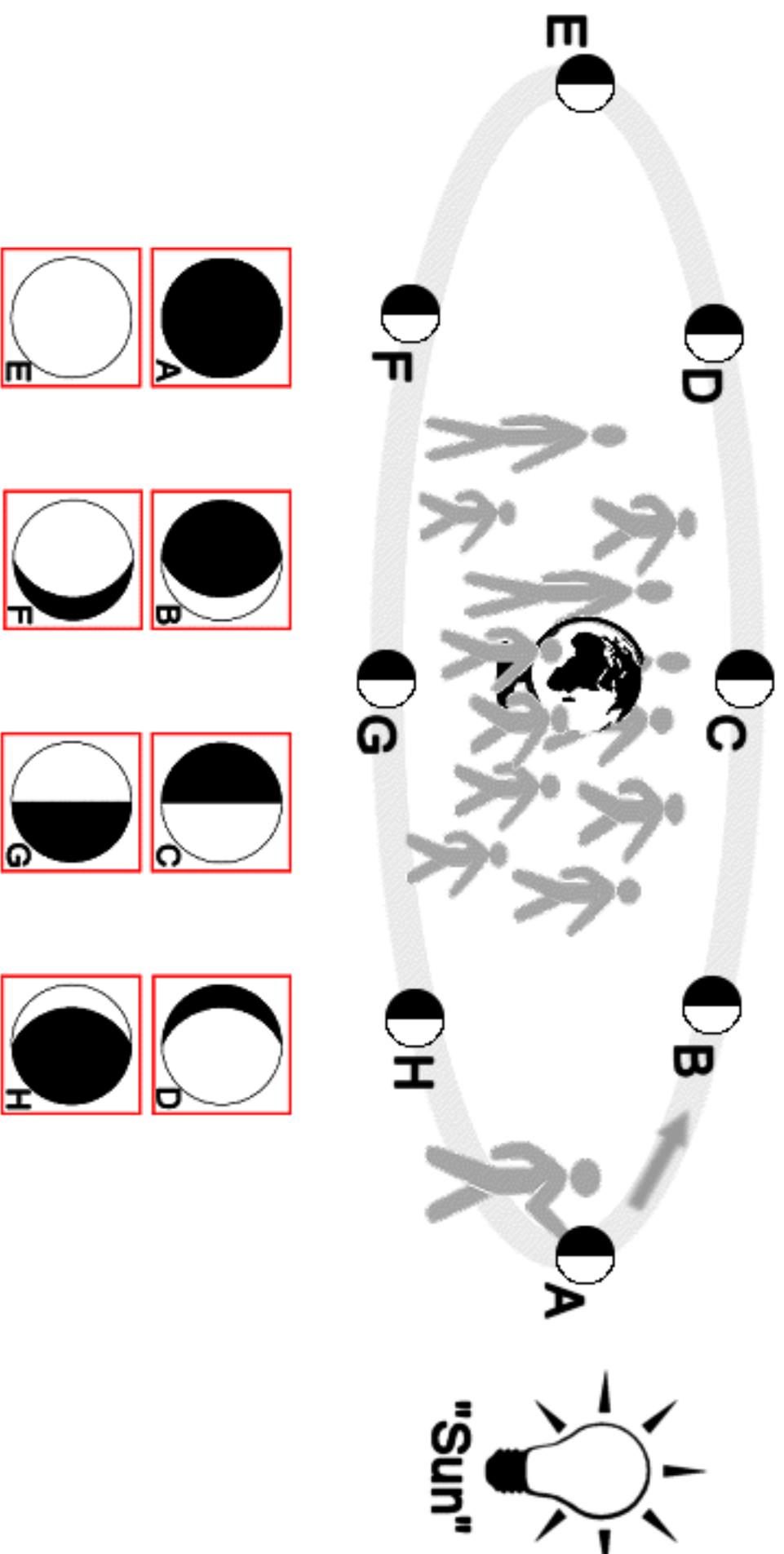
E/Full Moon: 180° angular distance from light source “sun,” or at 06:00. The half of the “moon” ball toward the students in the center is now lit.

G/Last Quarter Moon: 270° angular distance from light source “sun,” or at 03:00. The left half of the “moon” ball is now lit.

9) Finish by letting another student slowly walk the “moon” ball several times around the center group, but this time they do not have to stop along the way.

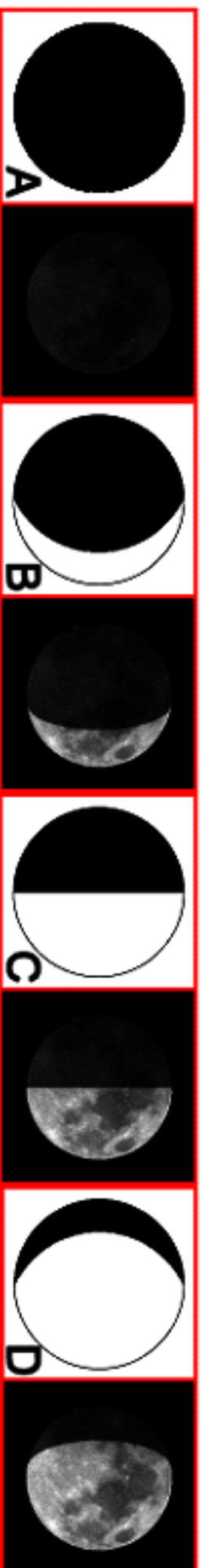
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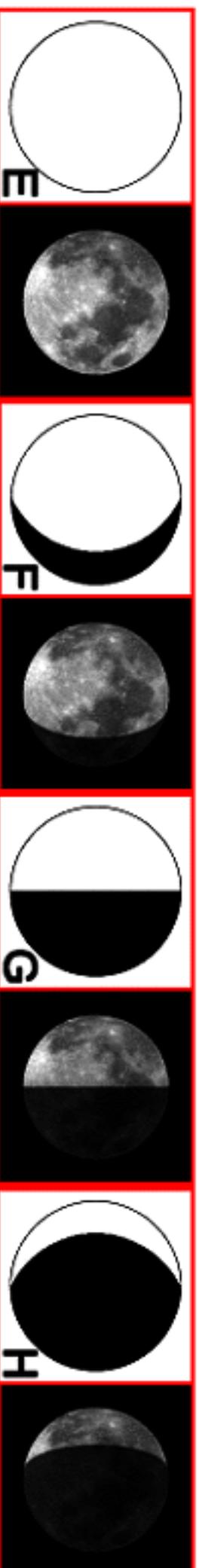


**New
Moon**

**Waxing
Crescent**

**First
Quarter**

**Waxing
Gibbous**



**Full
Moon**

**Waning
Gibbous**

**Last
Quarter**

**Waning
Crescent**

Optional Outdoor Observing Session Materials *per student*:

- small pocket flashlight, or a regular flashlight

- a copy of the blank “Moon Phases” worksheet with the numbers 1 through 8 below the outlines of the moon

- a pencil to fill out the worksheet

- a portable writing surface that the students can use while making their model observations

Procedure:

Once the students have a better understanding of what causes the changing phases of the moon they may wish to go outside and observe the real moon.

In order for the students to have a chance of seeing the moon when they start their observations, check a calendar showing moon phases, or “Den Svenska Almanackan.” Look for the New Moon phase – the completely black moon -- for the month when they are going to do their observations, then have them go outside a few nights later. Recall that the moon rises about 50 minutes later each night, so they will only be able to perform most of their observations between a few days after New Moon and Full Moon before the moon will be rising after their bedtimes. Alternatively, they could also try to make observations of the moon in the early morning sky before they go to school.

Have the students draw the line, or terminator, separating the dark and light halves of the moon on the “Moon Phases” worksheets that have the blank circles of the moon (numbered 1 through 8). Use one blank moon per observation date. Once the terminator is indicated some students may wish to draw in craters and the darker colored maria that they can see with the naked eye. Write the date of the observation on the line under each blank moon.

Outdoor Observing Tip:

If you look at the moon with a pair of binoculars (or a small telescope) you can see lots of exciting details on the moon’s surface.

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