

# Moon Phases, Day/Night

## 5<sup>th</sup> Grade

Natalie Anderson

### **Benchmark:**

SLC 10: Students will investigate daily patterns of light and shadow due to the orientation of the sun and the earth.

SLC 11: Students will describe and identify the phases of the moon.

### **Objectives:**

The students will understand and will be able to explain the phases of the moon. They will be able to describe the relationship between the alignment of sun, moon and the earth as it relates to the phases of the moon.

### **Materials:**

Every student needs:

- Activity Sheet 8
- Activity Sheet 10
- Pencil

Every group needs (approx 4):

- Small foam ball
- Globe with base
- Light bulb
- Light source
- Extension cord

The class needs:

- Inflatable globe
- Large foam ball
- Some way to cover the windows of the classroom (this might be tricky)

### **Initial Demonstration:**

Arrange the class in a semi-circle around a light source that is in the middle of the room. Take the inflatable globe and place it so the US is facing the light. Ask students what the light, shining on the earth, could represent? (*Sun*) Ask the students for observations about what they are seeing.

### **Target Observations:**

- The Earth is half illuminated
- The United States is facing the Sun, China is facing away from the Sun.

### **Target Model:**

*-When the Sun shines on the Earth, half of the Earth is in light, the other half is in darkness.*

*-Where it is dark it is nighttime and where it is light it is daytime.*

### **Procedure:**

Ask if anyone knows which way the earth is rotating on its axis (counterclockwise) and if they can explain how they know this. (Hint: in what direction does the Sun rise?) Ask what time of day it is when Ohio is completely facing the Sun? (*noon*) Rotate the earth in a counterclockwise direction until half of Ohio is in the dark. Ask what time of day this represents? (*sunset*) Continue to rotate until Ohio is completely opposite of the Sun. Ask what time of day this would be for Ohio? (*midnight*) Rotate one more time until Ohio is just beginning to be lit. Ask what time this represents? (*sunrise*)

### **Target Observations:**

- The Earth rotates counterclockwise.
- As the globe spins, different parts of the globe get light.
- Midnight is when you are facing away from the sun, noon is when you are facing towards the sun, etc...

### **Target Model:**

-When the Sun shines on the Earth, half of the Earth is in light, the other half is in darkness.  
-Where it is dark it is nighttime and where it is light it is daytime.  
*-As the Earth spins, different parts become light and dark.*  
*-Midnight, noon, sunrise, sunset, all refer to something that happens at a particular spot on Earth. The whole planet cannot be at midnight, etc... at the same time.*

### **Follow-Up:**

Have each group set up around a light source. Each group should have Activity sheet 8 and a globe. Have each group fill out the different illuminations of their position on Earth (i.e. Ohio) at different times of the day along with the direction the Earth is revolving around the Sun.

### **Demonstration:**

Arrange the class in a semi-circle around a light source that is in the middle of the room. Take the large foam ball and poke a hole in the side, and then insert a pencil to be used as a handle. If the light source represents the Sun and the globe is the Earth, what is the foam ball? (*Moon*) Ask the students to give observations about what they see.

### **Target Observations:**

- The foam-moon is only half lit up
- The foam-moon does not produce any light itself

### **Target Model:**

-When the Sun shines on the Earth, half of the Earth is in light, the other half is in darkness.  
-Where it is dark it is nighttime and where it is light it is daytime.  
-As the Earth spins, different parts become light and dark.

-Midnight, noon, sunrise, sunset, all refer to something that happens at a particular spot on Earth. The whole planet cannot be at midnight, etc... at the same time.  
*-The moon does not produce any light on its own.*

### **Procedure:**

Explain that phases of the moon refer to the amount of light reflected toward us as we view the moon. The moon moves in a predictable pattern as it orbits the Earth, and we are able to name the different phases of the Moon.

Hold the inflatable globe so it faces the dark side of the Moon. Ask the class if they were standing on the Earth globe, how would the Moon appear? Explain that when the Earth, Moon and Sun are aligned like this, it is impossible for us to see the Moon in the sky. What phase is it when the moon cannot be seen? (*New Moon, and is the beginning of the Lunar cycle.*) Everyone on Earth sees the same phase during any one day because the Earth rotates more quickly than the Moon orbits the Earth.

Demonstrate a quarter Moon. Move the Moon one-quarter of the way around the Earth in a counterclockwise direction until both the Earth and the Moon are half lit up by the Sun. Have the students take turns looking at the moon from the other side of the Earth. When the Moon looks like this, which phase is occurring? (*Quarter Moon, because only one quarter of the entire surface of the Moon is visible from Earth*)

Move the moon so it is behind the Earth, but so the rays of the Sun are still able to illuminate the Moon. When the Moon looks like this, which phase is it in? (*Full moon, as we can see the whole moon shape because it is completely illuminated*)

Move the Moon one quarter to the other side of the Earth. Ask which phase the Moon is in now. (*Quarter Moon, but something is different about this quarter moon from the other one*) What is the difference between the two quarters? (*Different parts of the moon are illuminated in each: the "first quarter" occurs just after the New Moon phase The "last quarter" occurs just before a New Moon.*)

Does anyone know how long it takes the Moon to orbit the Earth? (*Approximately one month for one lunar cycle; the word month is derived from an old Germanic word for Moon*)

### **Target Observations:**

- When the foam-moon is in different places relative to the Earth and Sun, it is illuminated differently to those on earth.

### **Target Model:**

-When the Sun shines on the Earth, half of the Earth is in light, the other half is in darkness.

-Where it is dark it is nighttime and where it is light it is daytime.

-As the Earth spins, different parts become light and dark.

-Midnight, noon, sunrise, sunset, all refer to something that happens at a particular spot on Earth. The whole planet cannot be at midnight, etc... at the same time.

-The moon does not produce any light on its own.

*-The moon is illuminated differently, called phases, when it is in different places around the earth.*

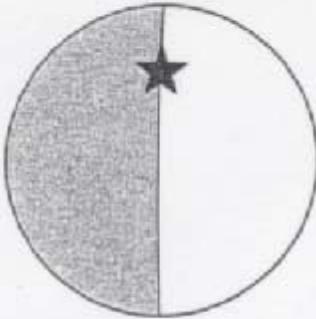
**Follow-Up:**

Set up a second light source in the room on a level surface. Each group needs a copy of Activity sheet 10 along with a globe and small foam ball. Have the students demonstrate the motion of the Moon around the Earth (remind them that the Earth orbits the sun in a counterclockwise direction and that the Moon orbits the Earth also counterclockwise). Have each person in the group fill out the activity sheet according to what they see when the moon is in different positions around the Earth. (Show the group members how to lower their heads to the level of the Earth in order to see how the Moon appears to someone standing on Earth.)

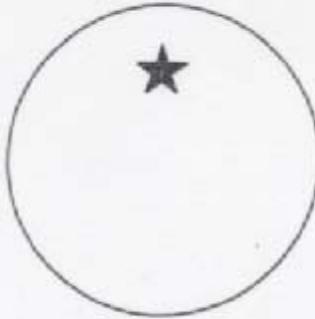
# Rotation

1. The star on each globe below represents your location on Earth. Shade the globe to reflect how the Earth would be illuminated at the following times of day at your location. The first one has been done for you.

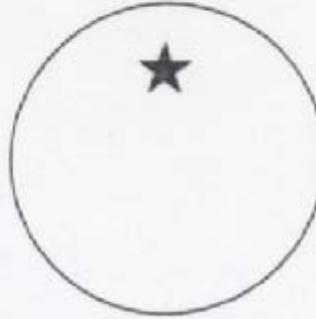
sunrise



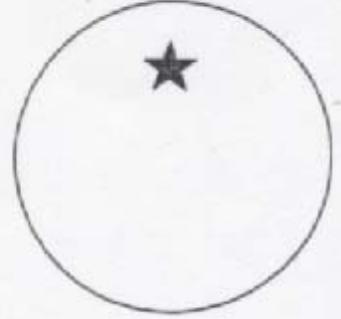
noon



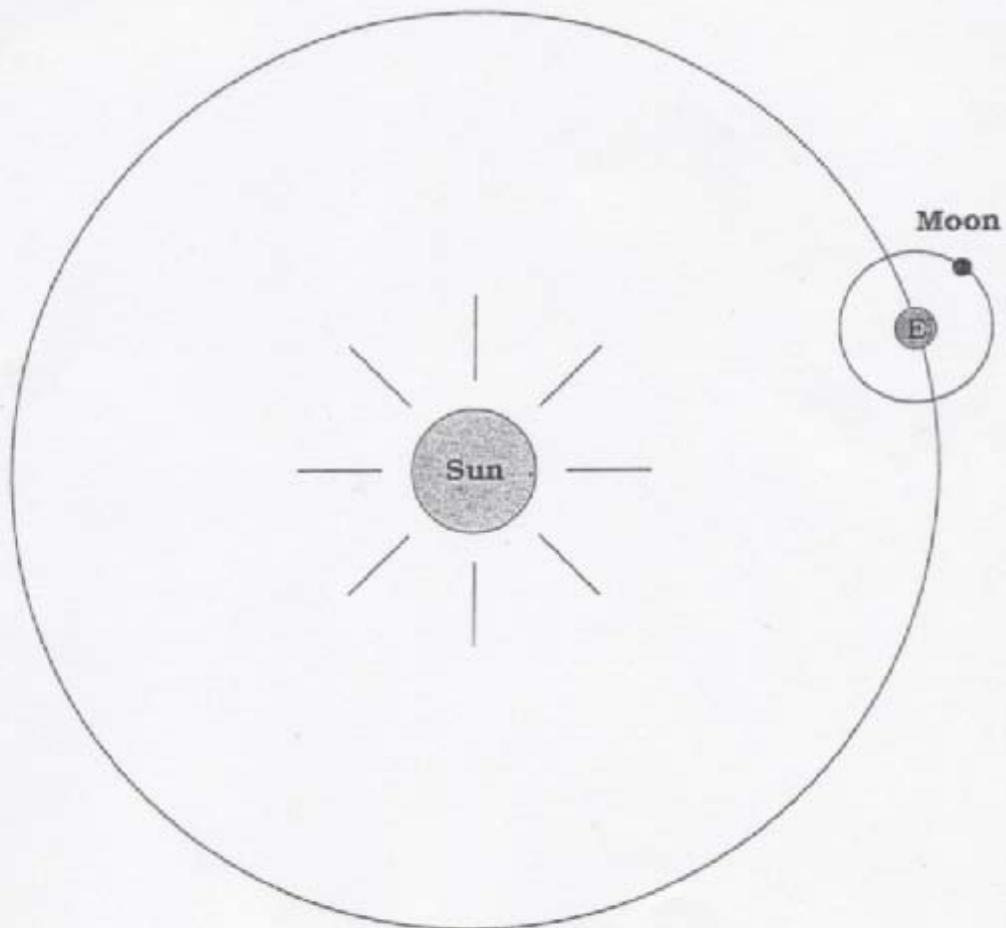
sunset



midnight

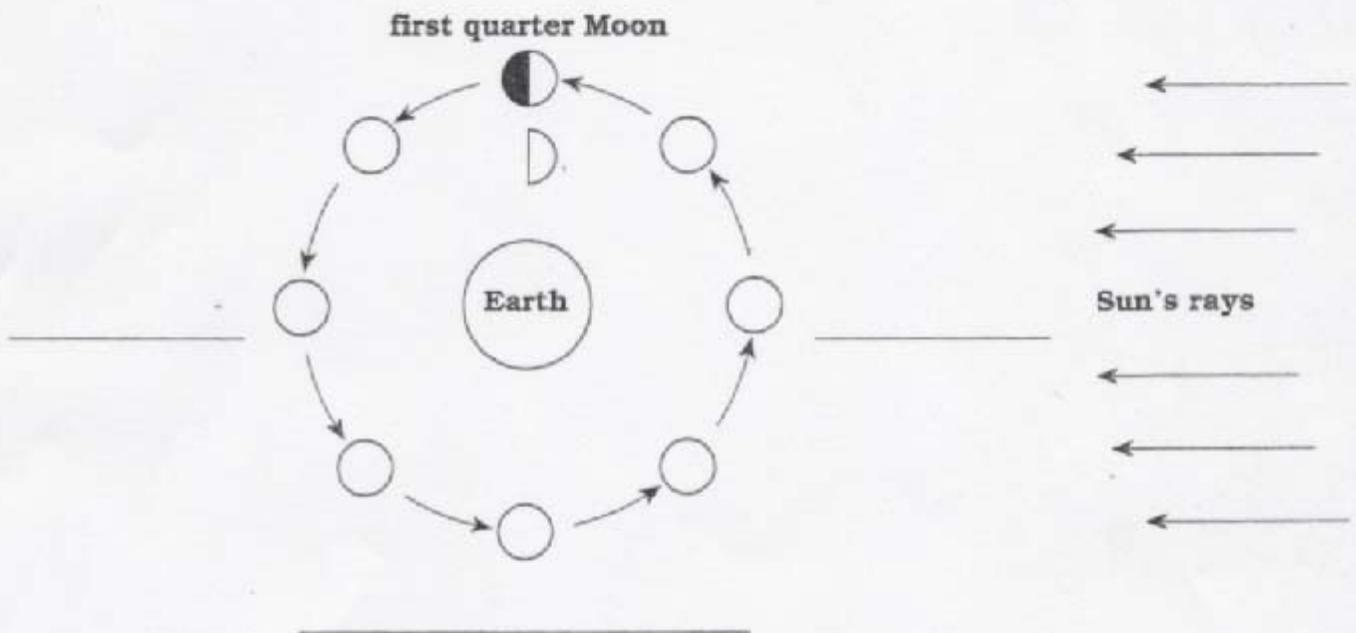


2. Add arrows to the orbits of the Earth and Moon, shown below, to indicate their direction.



## Lunar Phases

1. Label the four major phases of the Moon. On the outer ring of Moons, shade the side of the Moon that is dark during each phase. Then, next to each Moon, draw the shape of the Moon as it appears from Earth. (The first quarter Moon is completed for you.)



2. Draw and label the actual illumination and the apparent shape of the two crescent phases of the Moon.
3. Draw and label the actual illumination and the apparent shape of the two gibbous phases of the Moon.