

# Moon Phases



## Background

Watching the night sky, primitive civilizations believed that the Moon actually changed shape over the course of a month. These changes in apparent shape are known as the phases of the Moon.

Like all of the other planets in the Solar System, only one-half of the Moon can receive sunlight at a given time. As the Moon revolves around Earth, its appearance changes from day to day, depending upon its location in orbit. Sometimes the sunlit side of the Moon is facing away from Earth. This is referred to as the *New Moon*. During the New Moon, the Moon cannot be seen from Earth with the naked eye because the dark side is facing us and because you would be looking toward the Sun. The New Moon rises near the time of sunrise and sets near sunset.

When the sunlit side of the Moon faces Earth, a Full Moon is seen. For this to occur, the Moon must rise and set opposite the Sun. Therefore, when the Sun is setting in the evening (say, about 6:00), the Full Moon is rising in the east. Use the diagram to see why this must be the case.

In between the New and Full Moons, when only half of the side facing the Earth is illuminated, First and Third Quarter Moons are said to be seen. First and Third Quarter Moons get their name from their orbital "stage." If the New Moon is the beginning of the orbital cycle, then the Moon has completed one-fourth of its cycle at First Quarter. The Full Moon is halfway through the cycle. Three-quarters of the way through the cycle the Third Quarter Moon is seen. The end of the cycle is also the beginning of a new one—the New Moon. Again, use the diagram to help you visualize how this works.

Between New Moon and First Quarter, only a small part of the illuminated side of the Moon is visible from Earth. This is a *Crescent Moon*. We also see a Crescent Moon between Third Quarter and New Moon.

Between First Quarter and Full Moon, the Moon appears more than half full, but not

completely full. This is a *Gibbous Moon*. The Moon also appears gibbous between the full and third quarter phases

Between New Moon and Full Moon, when the Moon is becoming more and more full, the Moon is said to be *waxing*. Between Full Moon and New Moon, when the Moon is becoming less and less full, the Moon is said to be *waning*. So, starting with New Moon, the Moon waxes during the first half of its orbit and wanes during the second half of its orbit.

A more tangible way of appreciating the cause of the phases of the Moon is to make a model, using a light bulb for the Sun and tennis balls for the Earth and Moon.

## Topic

Moon Phases

## Objectives

Students will:

- Explain the phases of the Moon through modeling.
- Observe how the Moon's phases change.

## Overview

In this activity students will use a model to demonstrate the phases of the Moon and use the given diagrams to verify their models.

## Key Question

Why does the Moon's appearance change as it revolves around the Earth?

## Key Concept

- To model the phases of the Moon and determine why we see each phase.

## Materials & Preparation

- One tennis ball (paint 1/2 black)
- Student worksheets

1. Divide the class into groups of two.
2. Give one student a tennis ball while the other sits in a chair facing the front of the class. The front wall of the class is the Sun.

3. The student with the tennis ball walks in a circle around the other student, stopping at eight even intervals of 45 degrees.
4. As they walk in a circle the student holding the tennis ball positions the ball with the painted black surface facing away from the front wall (Sun).
5. The seated students draw on the student worksheets a picture of the ball exactly as they see it showing as much of the light and dark sides as is visible at each of the eight locations.
6. Give students the phases of the Moon diagram to verify their work.

**Management**

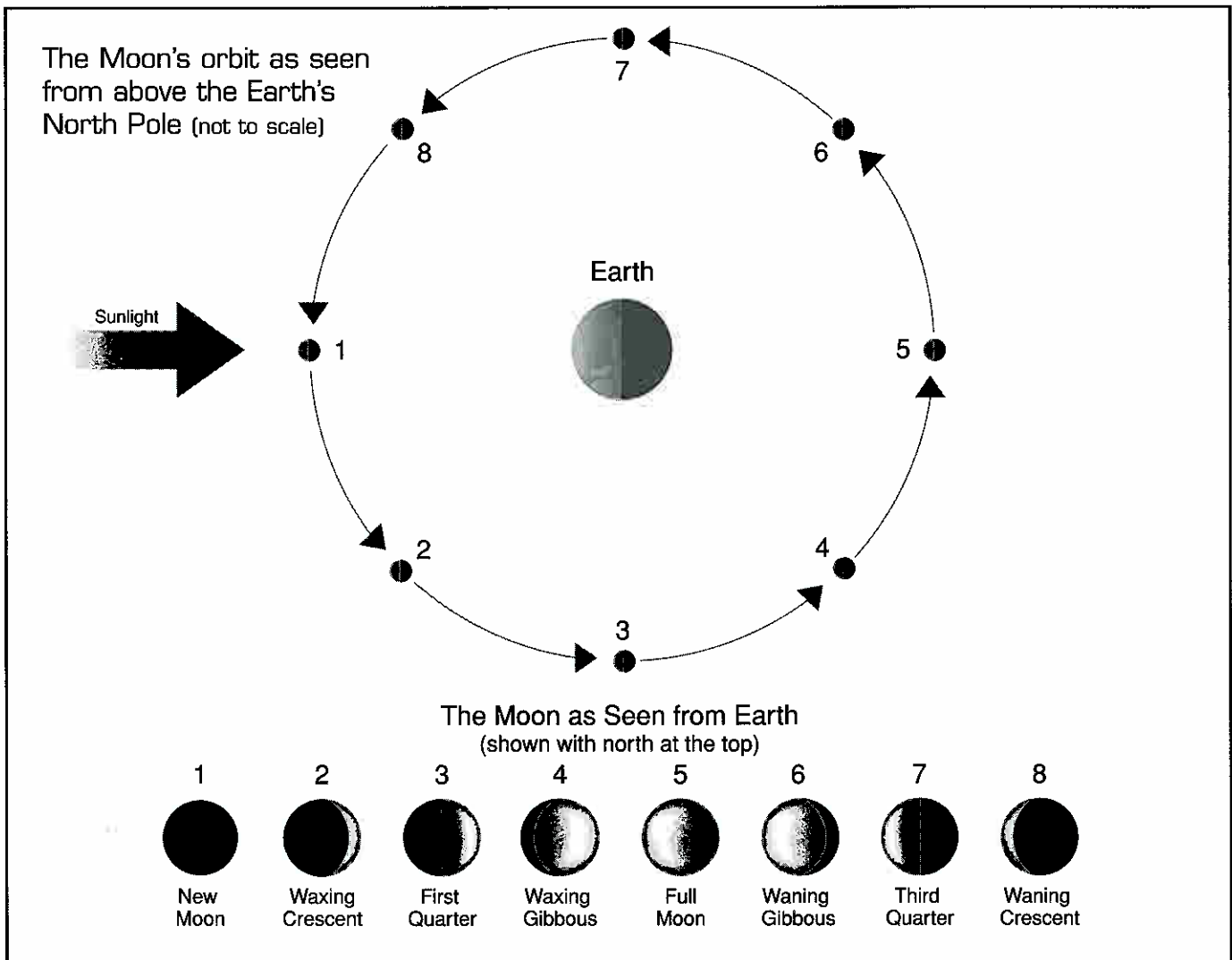
- One 50-minute class period.
- Students should work in groups of two.

**Reflection & Discussion**

1. What do the terms waxing and waning mean?
2. Are there special meanings to the terms gibbous and crescent?

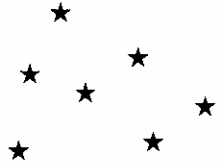
**Transfer/Extension**

1. Have students research and write a report about the history of using the Moon to tell time.



Students will use this diagram to verify their work.

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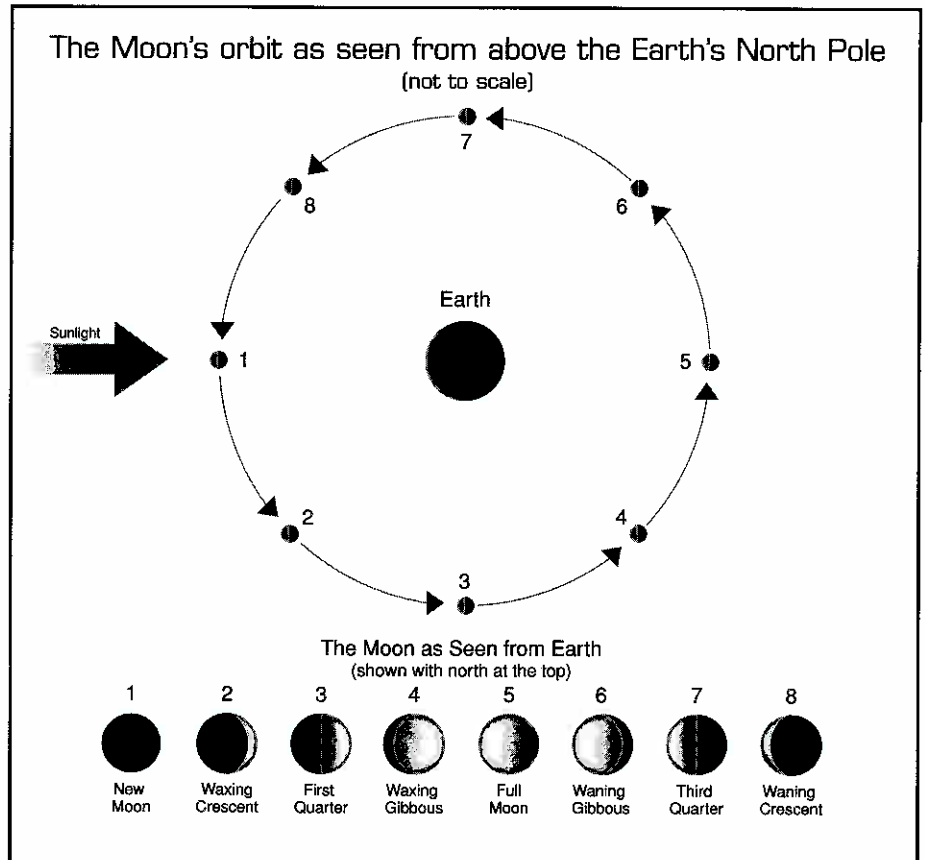


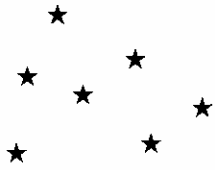
## Student Procedures

1. One student takes a tennis ball while the other sits in a chair facing the front of the class. The front wall of the class represents the direction of the Sun, and the source of light.
2. The student with the tennis ball walks in a circle around the other student, stopping at eight even intervals of 45 degrees.
3. At each stop, the student holding the tennis ball positions the ball with the painted black surface facing away from the front wall (Sun).
4. The seated student draws on the student worksheet a picture of the ball exactly as they see it, showing both the light and dark sides as much as each is visible.
5. Look at each drawing and try to name each of the Moon phases.
6. Use the phases of the Moon diagram to verify your work.

## Questions and Conclusions

1. What do the terms waxing and waning mean?
2. Are there special meanings to the terms gibbous and crescent?
3. Do your drawings look like the ones on the Phases of the Moon diagram? Why/or why not?





**S T U D E N T   W O R K S H E E T**

**Position #1**

**Position #2**

**Position #3**

**Position #4**

**Position #5**

**Position #6**

**Position #7**

**Position #8**