

# Moon & Venus Phases Activity

ASTR 1060, The Universe, Dan Wik

---

**Goal:** Enable you to apply the Moon phases diagram to understand when different phases of the Moon rise and set, and to predict how the phase of the Moon and its rise and set time will change over time.

**Materials:** A Moon ball on a stick. This will provide you with a 3D model: you are an observer on Earth, the Moon is the ball on the stick, and the Sun is located at the front of the classroom. You will use your observations with your 3D model to better understand the Moon phases diagram:



**1) Telling time on Earth:** Relative to the sun, which way will an observer on Earth be facing at noon? How about at midnight, sunrise and sunset? Note that as an observer on earth you should be rotating towards your left (counter-clockwise). Now locate these same points on the diagram above and label them.

**2) The Illumination of the Moon:** Take out your Moon ball, hold it in front of you and determine which half of the ball is lit up by the sun. Now do the same on the diagram above, shading the half of the Moon that is dark (not lit up by the sun). What phase is this Moon seen from earth? Find this same Moon phase position using your Moon ball and draw the shape of the lit up portion of the Moon visible from Earth below.

**3) Phases of the Moon:** Using your Moon ball determine the location of the full Moon and new Moon. Then draw these on the diagram above and label them, shading the dark half of the Moon. Do the same for the third quarter Moon (hint, this Moon will have its left side side lit up looking from Earth and be on the top part of the diagram).

A) For an observer on Earth, when will the full Moon rise and set (remember your horizon: you can only see the half of the sky that you're facing!)?

Rise: \_\_\_\_\_ Set: \_\_\_\_\_

B) How about the third quarter Moon?

Rise: \_\_\_\_\_ Set: \_\_\_\_\_

**4) Motion of the Moon:** Which way does the Moon rotate around the Earth? Figure this out both for your Moon ball, and on the Moon phases diagram; draw an arrow indicating the direction of the Moons motion.

A) About how long does it take for the Moon to orbit the Earth once (this is the time between two full moons)?

B) How long does it take for the Moon to move from full to the third quarter?

C) Does the Moon rise earlier or later each day (use the rise and set times you figured out in Question 3)?

D) About how much earlier/later does it rise each day?

**5) Eclipses of the Sun and Moon:** From the Earth, the Moon and Sun appear to be about the same size on the sky. Arrange your Moon ball, head (the Earth), and the light representing the Sun to produce a solar and a lunar eclipse.

A) Draw both orientations

with labels:

B) If the orbit of the Moon were in exactly the same plane as the orbit of the Earth around the Sun, about how many solar eclipses would you expect per year?

C) The Moon's orbit is in fact slightly tilted relative to the Earth-Sun plane. How does this affect the number of eclipses that occur per year? What fact could cause the number of total lunar eclipses to be higher than the number of total solar eclipses in a given year?

**6) The Phases of Venus:** Through his telescope, Galileo observed that Venus also went through phases. This observation was critical for understanding that the Sun was at the center of our solar system, not the Earth. On the diagram below draw the orbit of Venus. Then determine and draw the location of the new, full and quarter phases as seen from the Earth. Shade the half of Venus not lit up by the Sun in each phase.



Earth

A) Galileo noticed that Venus appeared to change size significantly over time. At what phase would its size be largest and why?

B) Venus is called the Morning Star or Evening star. Consider when Venus will rise and set in its different phases to explain why you would never see Venus at midnight.