

Name: \_\_\_\_\_ Teacher: \_\_\_\_\_ Pd. \_\_\_\_ Date: \_\_\_\_\_

## **STAAR Science Tutorial 28** **TEK 8.7B: Moon Phases**

### ***TEK 8.7B: Demonstrate and predict the sequence of events in the lunar cycle.***

At any point in time, half of the Moon is lit (illuminated) by the Sun, and half is not lit. However, for a viewer on Earth at any given time, the Moon may appear to be completely lit, completely dark, or somewhere in between. These varying appearances of the Moon are known as "Moon Phases," and have been used by humans for thousands of years to keep track of time, even before calendars were invented. It takes 29.5 days for the Moon to cycle through all of its phases, and return to the same starting point. Our current calendar system used this fact to establish months of about 30 days.

The Moon takes about 27.3 days to orbit (revolve) once around the Earth. It takes the same amount of time, 27.3 days, for the Moon to spin (rotate) once around its axis. This means that the one side of the Moon, known as the "near side", is always facing Earth, and the other "far side" is always facing away from the Earth. The reason that the rotation and revolution periods of the Moon are different from the time it takes to complete one cycle of Moon phases is that the Earth is also orbiting around the Sun, and the Moon thus has to revolve more than 360 degrees around the Earth for the Sun, Earth and Moon to all align again at the same starting point.

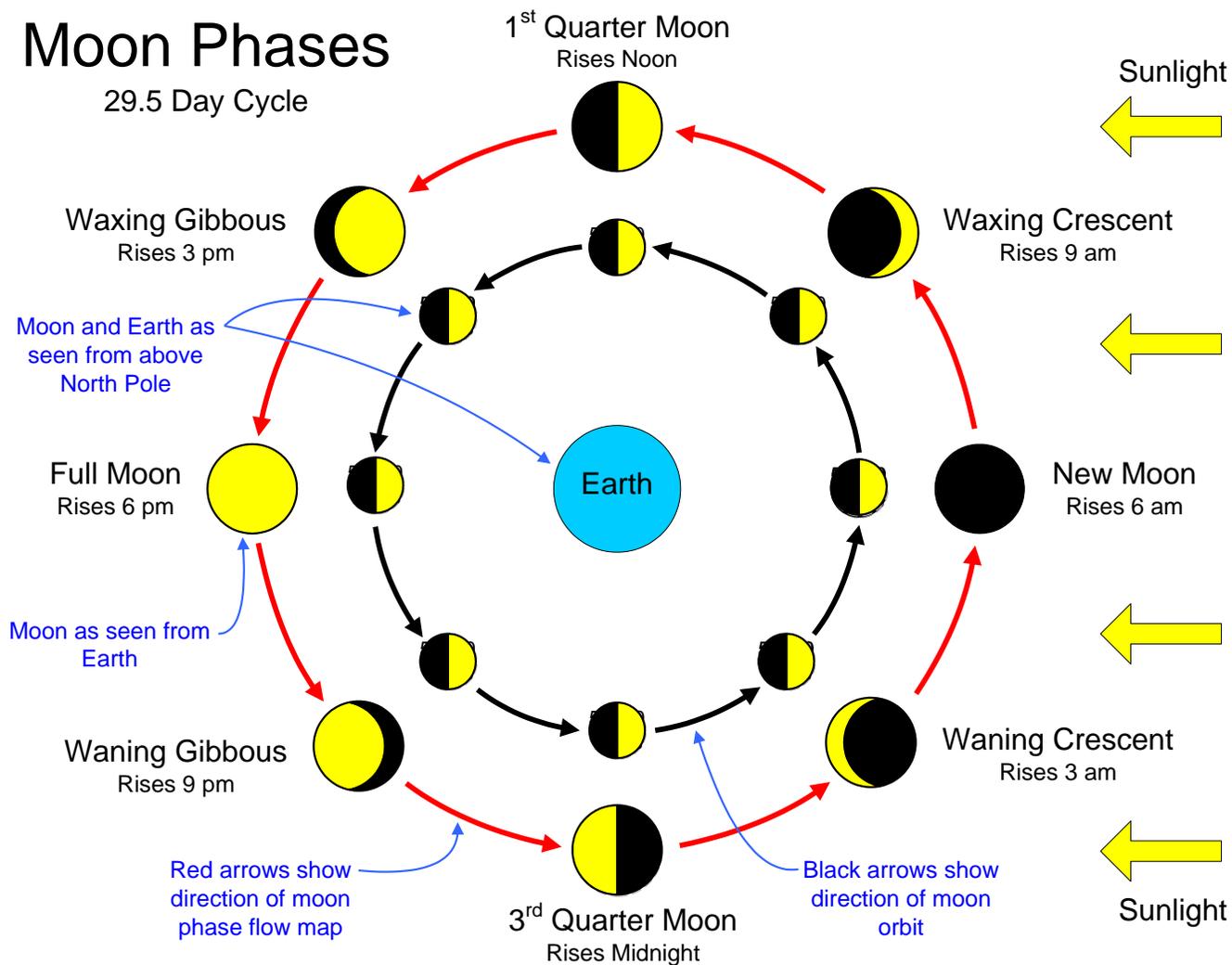
The direction of the Moon's rotation and revolution is counter-clockwise, when viewed from above the Moon's (and Earth's) North Pole. This is the same direction as the Earth rotates and revolves.

During a complete 29.5 day cycle of the Moon Phases, the Moon as seen from Earth, goes from being completely dark, called a "New Moon" to completely lit, called a "Full Moon", and then back to a completely dark New Moon again. During the first half of the cycle, a bit more of the Moon facing Earth is lit each night. These are called the waxing (brightening) phases of the moon. During the last half of the cycle, a bit less of the Moon facing Earth is lit each night. These are called the waning (darkening) phases of the Moon.

Each phase of the Moon has been given a name. When less than a quarter of the Moon facing earth is lit, it is called a "Crescent Moon". When about half of the Moon facing Earth is lit, it is called a "Quarter Moon." When about three-quarter's of the Moon facing Earth is lit, it is called a "Gibbous Moon". The complete cycle of Moon Phases, with their full names, are shown in the flow map diagram on the next page. Note that there are two quarter moons, two crescent moons and two gibbous moons, one each in the waxing side of the cycle, and one in the waning side of the cycle.

# Moon Phases

29.5 Day Cycle



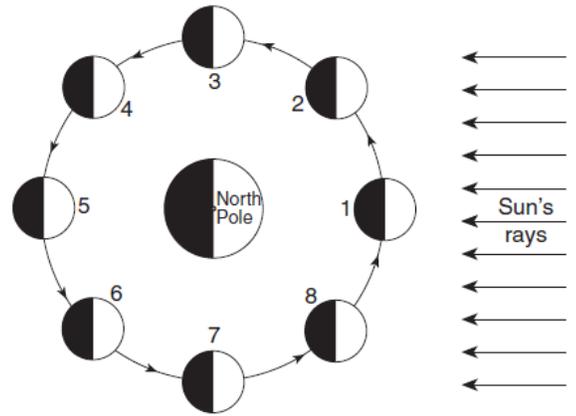
Note that during the waxing (brightening) phases, light first appears on the right edge of the Moon and moves across the entire Moon facing the Earth until a Full Moon is reached. Thus, any waxing phase moon is lit on the right edge and dark on the left edge. During the waning phases, a dark edge first appears on the right edge, and moves across the entire Moon facing Earth until a completely dark New Moon is reached, completing the cycle. Waning phase moons are lit on the left edge and dark on the right edge. The Moon rises about 50 minutes later each night, and each moon phase rises at a particular time. For example, a full moon rises about when the Sun sets, about 6 p.m.

Questions on the STAAR test about moon phases will likely require you to interpret a diagram of the Sun-Earth-Moon system, and predict what moon phase would be visible on Earth when the Moon and Sun are at certain positions. A typical diagram of this type is shown in practice question #1 on the next page. You may also be asked to place a sequence of moon phases in the correct order.

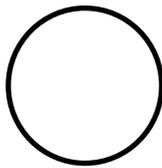
You should try to visualize yourself on the side of the Earth facing the Moon, and study the diagram to see what sides of the Moon would be lit by the Sun. If you have trouble doing this, you may need to memorize the phases of the Moon and where each phase occurs in its orbit around the Earth.

# Practice Questions

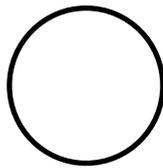
1. Draw in the labeled circles below the moon phase visible from Earth in each of the eight moon positions shown in the diagram to the right. Label each moon phase with its name.



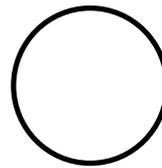
(Not drawn to scale)



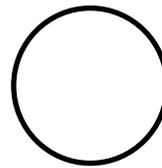
1



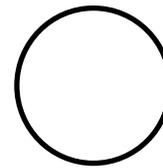
2



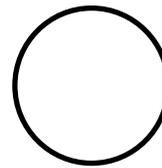
3



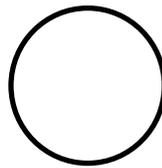
4



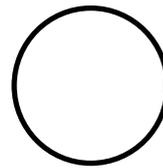
5



6



7



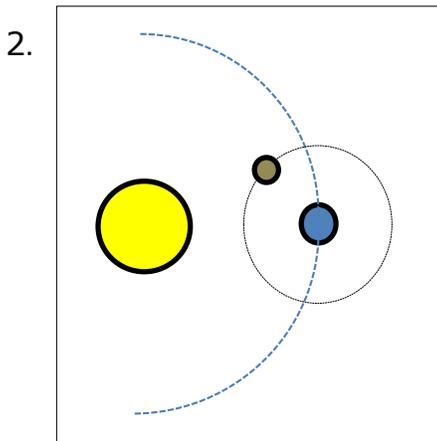
8

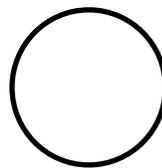
---



---

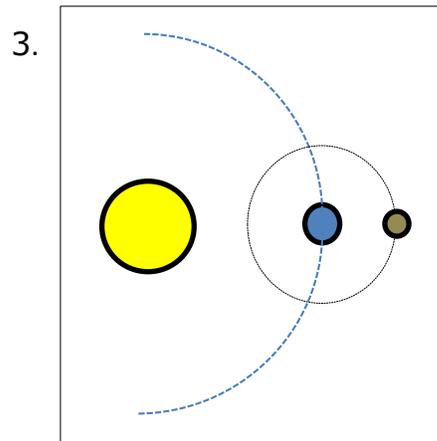
For questions 2-7, draw and name the moon phase visible from Earth for each of the following Sun-Earth-Moon diagrams. Note that the Sun is on the opposite side of the Earth, compared to the diagram above!

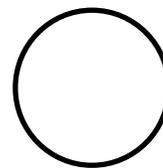




\_\_\_\_\_

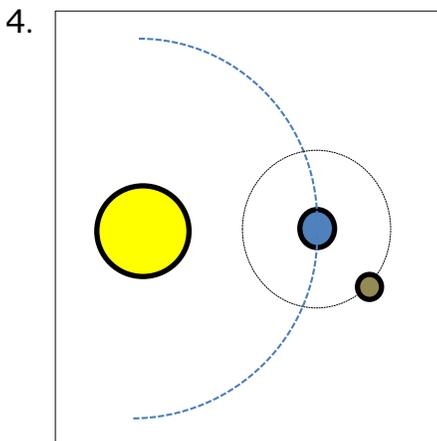
\_\_\_\_\_

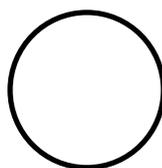




\_\_\_\_\_

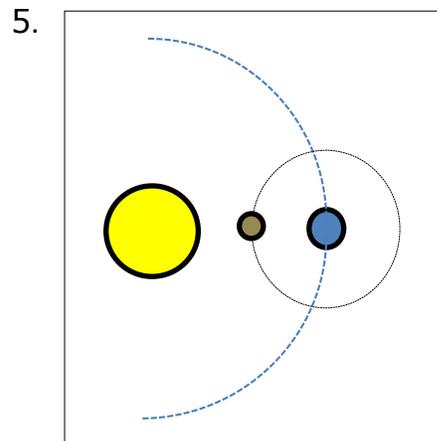
\_\_\_\_\_

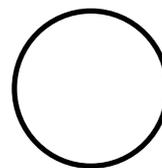




\_\_\_\_\_

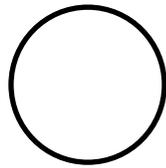
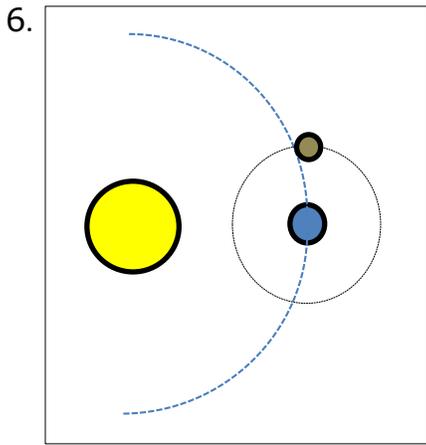
\_\_\_\_\_





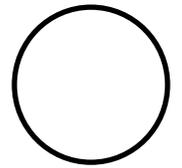
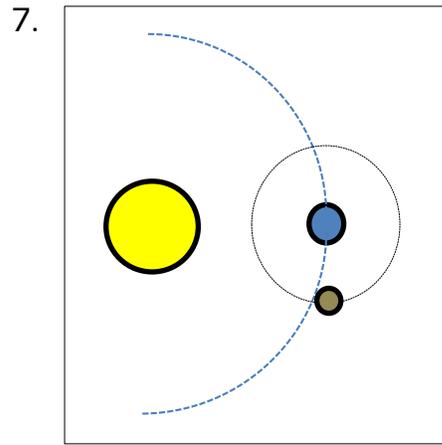
\_\_\_\_\_

\_\_\_\_\_



\_\_\_\_\_

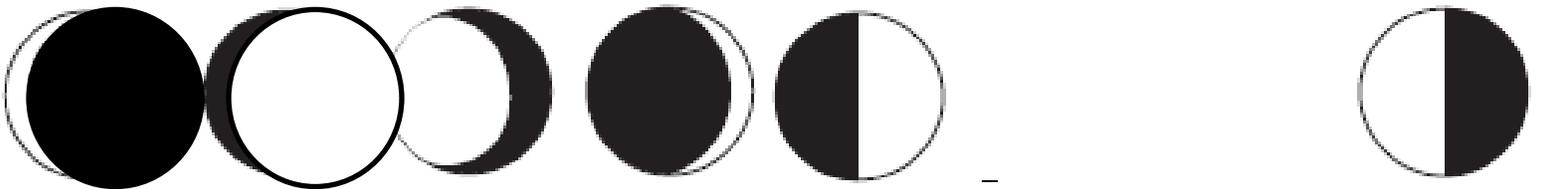
\_\_\_\_\_



\_\_\_\_\_

\_\_\_\_\_

8. Label the following moon phases in the correct order, starting with the New Moon.



\_\_\_\_\_

9. How much of the Moon, as seen from Earth, is lit during a crescent moon? \_\_\_\_\_

10. How much of the Moon, as seen from Earth, is lit during a gibbous moon? \_\_\_\_\_

11. How much of the Moon, as seen from Earth, is lit during a quarter moon? \_\_\_\_\_

12. How much of the Moon, as seen from Earth, is lit during a full moon? \_\_\_\_\_

13. How much of the Moon, as seen from Earth, is lit during a new moon? \_\_\_\_\_

14. Is more or less of the lit side of the Moon visible from Earth each night during the waxing phases of the Moon? \_\_\_\_\_

15. Is more or less of the lit side of the Moon visible from Earth each night during the waning phases of the Moon? \_\_\_\_\_

16. In what direction does the Moon revolve around the Earth? \_\_\_\_\_

17. How long does it take to complete a cycle of Moon phases? \_\_\_\_\_

18. Which side of the Moon is lit during the waxing phases? \_\_\_\_\_

19. Which side of the Moon is lit during the waning phases? \_\_\_\_\_

20. What moon phase reflects the most light back to Earth? \_\_\_\_\_