# Title: Moon's Phase Wheel

| **Estimated Time: 2 class sessions of 45 minutes each** | |
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| **Core Ideas (GSE Standard(s) and elements):**<br>This activity is a wonderful way to demonstrate how the position of Sun, Moon, and Earth result in the phases of the Moon and Solar and Lunar Eclipses. The student will construct the Moon's Phase Wheel from the template provided and visualize the celestial positions of the Sun, Moon, and Earth resulting in the celestial phenomena.<br><br>**S6E2. Obtain, evaluate, and communicate information about the effects of the relative positions of the sun, Earth, and moon. a. Develop and use a model to demonstrate the phases of the moon by showing the relative positions of the Sun, Earth, and Moon.** | |
| **Science and Engineering Practices:**<br>**Asking Questions and Defining Problems:**<br>Ask questions and discuss information that arise from observing viewing video clips and pictures of the phases of the moon and eclipses. Seek additional information to clarify the questions.<br><br>**Constructing Explanations and Designing Solutions**<br><br>With the aid of the Sun/Moon/Earth wheel, explain how the positions of each celestial body impacts the observational results. | **Crosscutting Concepts:**<br><br>How does the position of Sun/Moon/Earth relate to the observational results of looking at Mercury and Venus as they go through their phases and how transits of the planets are related to the Solar and Lunar Eclipses? |
| **Authentic Scenario (Phenomena):**<br><br>• The Moon goes through its phases every 28 days or so. The Moon's Phase Wheel that the students will construct will help explain the process. | **Vocabulary:**<br><br>Moon Phases<br>Lunar Eclipse<br>Solar Eclipse<br>Sidereal Month<br>Synodic Month<br>Waxing Moon<br>Waning Moon |

- Using the Moon's Phase Wheel template provided, students will be asked to construct the wheel and describe how it can be used to interpret the phases of the moon and eclipses.

**Guiding Questions:**

- How do we observe the phases of the moon?
- How often do we see the Lunar and Solar Eclipses?
- What time of the day do we see Solar Eclipses?
- How many people can usually see a Solar Eclipse at one time?
- What are safety concerns when observing Solar Eclipses?
- What time of the day do we see Lunar Eclipses?
- How many people can see a Lunar Eclipse at one time?

**Materials Needed:**

- Moon's Phase Wheel template
- Scissors
- Brass Fasteners
- Electronic Device to download and observe the Stellarium – Planetarium.
- Optional - StarLab for additional Elaboration

**Safety Considerations:**

Anytime a students is asked to look into the sky, they must be reminded about the dangers of looking directly at the sun. They must be directed to never look at the sun with binoculars of a telescope. Students must also be given safety instruction about when and how to go outside at night to look at the Moon and planets.

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| | **Technology Integration:**<br>Students can down load a free app on their phone or computer that is a portable planetarium on their device. The App is called Stellarium.<br><br>Students can set their location (latitude and longitude) and date to see what is in the sky at their location give a specific time. They can change the time to any date and time they wish. Thus allowing them to see solar or lunar eclipses.<br><br>Students can watch the moon as it goes through the phases. They can even watch Mercury and Venus go through their phases and see as they transit the sun.<br><br>Optional- Schedule a StarLab session to come to the class for students to visualize these events in the portable planetarium. |

| 5E Stage | **Student Activities**<br>How will students engage actively in the three dimensions throughout the lesson?<br>**Teacher Activities**<br>How will the teacher facilitate and monitor student learning? |
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| **Engage** | **Teacher will:**<br>• Teacher will provide video clips of the phases of the moon.<br>• Teacher will show pictures and video clips of a lunar eclipse<br>• Teacher will show the students pictures and video clip of a solar eclipse.<br>• Teacher will demonstrate how a Moon's Phase Wheel operates.<br><br>**Student will:**<br>• Students will observe video clips and pictures of the phases of the moon and discuss among themselves what they observe. |

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| | • Students will observe pictures and video clips of a lunar eclipse and they will discuss what they think is happening.<br>• Students will observe pictures and video clip of a solar eclipse and reason how it might happen.<br>• Students will be given a chance to handle the demonstration Moon's Phase Wheel and discuss how to interpret the results from the wheel. |
| **Explore** | **Teacher will:**<br>• Teacher will provide the students with the Moon's Phase Wheel template.<br>• Teacher will explain how to cut out and assemble the Moon's Phase Wheel using the demonstration wheel as a model.<br>• Teacher will allow the students to manipulate the Moon's Phase Wheel in small groups.<br>• Students get together and discuss their small group findings with the rest of the class regarding the Moon Phase Wheel and how it works and what it describes.<br><br>**Student will:**<br>• Students will take the Moon's Phase Wheel template and, with scissors, cut out and fasten the wheel together.<br>• In small groups, the students will manipulate the wheel and observe how the wheel can explain the phases of the moon by positions of Moon, Sun, and Earth. |
| **Explain** | **Teacher will:**<br>• Teacher will ask the students in small groups to explain to the class their conclusions about the Moon's Phase Wheel and how it can be used to predict the relative position of the Sun/Moon/Earth during various phases of the moon.<br><br>**Student will:**<br>• Students will collaborate with one another and prepare a small group consensus about how the Moon's Phase Wheel works and how to explain it to the rest of the class. |

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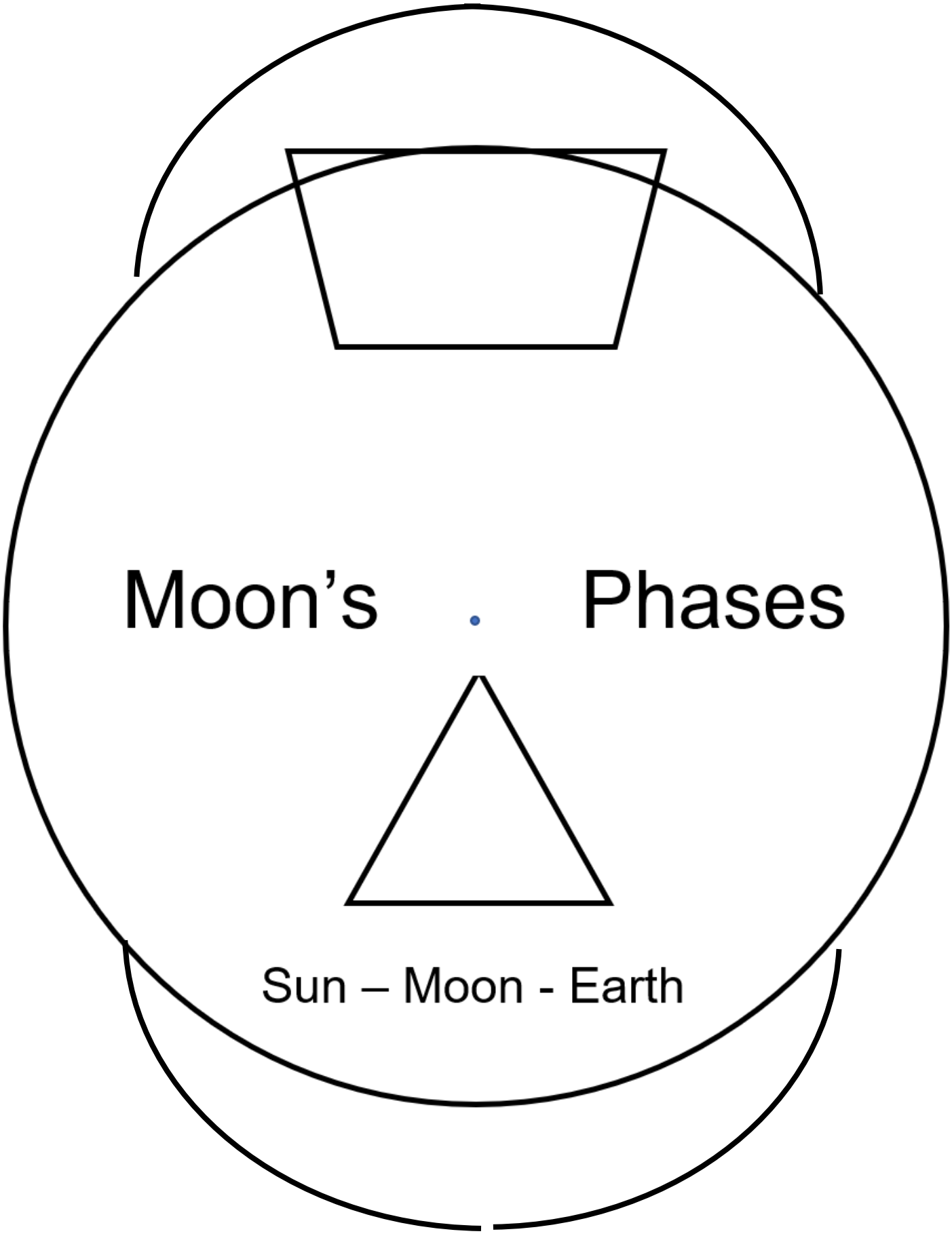
| **Elaborate** | **Teacher will:**<br>• Teacher will show the video clip and pictures of a Lunar and Solar Eclipse.<br><br>**Student will:**<br>• Students will discuss among themselves in small groups about how each type of eclipse is possible and which part of the Moon's Phase Wheel can explain the relative position of the Sun/Moon/Earth can be used to predict the eclipses.<br>• Students will then use the Moon's Phase Wheel to predict which phase of the Moon one might see the two types of eclipses and explain why.<br>• Students will use the Moon's Phase Wheel to predict what time of day one might expect to see each type of eclipse (Solar or Lunar). |
| **Evaluate** | **Teacher will:**<br>• Facilitate the student discussion.<br><br>**Student will:**<br>• Students will present their findings about how and when Solar and Lunar Eclipses can happen and why.<br>• They will also predict how many people on Earth can see each type of Eclipse with and explanation as to why. |

**Teacher Notes:**

The Moon's Phase Wheel template is best printed on heavy card stock so when students begin to manipulate it, it will not be too flimsy to read and turn.

If possible, the teacher should schedule a trip to the Portable Planetarium (StarLab) through their lead teacher or principal.

The teacher must be able to explain how a Solar Eclipse is a specific regional event that can only occur during the day and during a New Moon. A Lunar Eclipse is a world-wide event that can only be observed during a Full Moon.


Moon's Phases
Sun – Moon - Earth

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