Name: _____ Date: _____

Eclipses

Science Literacy Article

An **eclipse** is the partial or total blocking of light of the Sun or Moon by another celestial (space) object. There are two main types of eclipses:

1. **Solar eclipses** occur when the Moon passes between the Sun and the Earth. During a solar eclipse, the *Moon blocks out light from the Sun* and a *shadow* is cast onto the Earth's surface. Solar eclipses can *only occur during a new moon phase* since this is when the Sun, Moon, and Earth are aligned. There are three main types of solar eclipses:

    a) A **total** solar eclipse occurs when the Sun, Moon, and Earth are in a *direct line* and it is only visible from a *very small area on Earth's surface*. During a total solar eclipse, the sky becomes *completely* dark for people that are in the *center* of the Moon's shadow.

    b) A **partial** solar eclipse occurs when the Sun, Moon, and Earth are *not perfectly lined up* in a straight line. During a partial solar eclipse, only *part of the Sun* is blocked by the Moon. The sky on Earth's surface may become a little more dim, but it does *not* get completely dark.

    c) An **annular** solar eclipse occurs when the Moon is *farthest away* from the Earth, so it does not block the entire view of the Sun. During an annular solar eclipse, the *Moon appears to glow around its edges*. This glowing is actually from the Sun's top layer, known as the corona.

    Solar eclipses produce two different shadows that are cast on Earth's surface by the Moon. The fully shaded, darkest area of the shadow cast on Earth's surface is referred to as the **umbra**. If you are located within the umbra, you will observe a total eclipse. The lighter, partially shaded, outer region of the shadow is referred to as the **penumbra**. If you are located within the penumbra, you will observe a partial eclipse. During an eclipse, the penumbra covers a much larger area than the umbra. No matter which area you view a solar eclipse from, it can be extremely harmful to look directly at the eclipse. Whether the Sun is fully or partially blocked, its ultraviolet rays can still damage your eyes when viewing the eclipse for any period of time. Therefore, it is recommended to use *special glasses* that will filter out these harmful rays from the Sun.

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2. **Lunar eclipses** occur when the Earth is positioned between the Sun and the Moon. This causes the Moon to appear darkened as it passes into Earth's shadow. During a lunar eclipse, the *Earth blocks out light from the Sun and a shadow blocks out the Moon*. Therefore, a lunar eclipse can only occur during a full moon phase and is *only visible at night*. There are three main types of lunar eclipses:

   a) A **total** lunar eclipse occurs when the *Moon and Sun are on opposite sides of the Earth*. The Moon passes directly into the Earth's umbra and appears reddish in color. This is because some light still reaches the Moon's surface as it passes through the Earth's atmosphere.

   b) A **partial** lunar eclipse occurs when only a *portion of the Moon is in Earth's umbral shadow*. The exact alignment of the Sun, Earth and Moon determines how the partial lunar eclipse is viewed on Earth. Partial lunar eclipses are more common and at least two occur every calendar year.

   c) A **penumbral** lunar eclipse occurs when the *Moon passes through Earth's penumbral shadow*. Since the penumbra is the lighter part of the shadow, a penumbral lunar eclipse appears more subtle and it is *very difficult to observe*. Since lunar eclipses occur at night, the light you are viewing is simply a reflection of the Sun's light off of the Moon's surface. Therefore, it is not harmful to your eyes to view a lunar eclipse and no special glasses are needed.

As you have read, there are several different types of both solar eclipses and lunar eclipses. Although they have no significant impact on the daily processes on Earth, eclipses offer scientists the chance to study the Sun and Moon in more detail.

- Eclipses offer the opportunity to *better observe the corona* of the Sun. Since the majority of the Sun is blocked during an eclipse, the glowing corona is more visible and can be more *easily photographed* and measured.
- Observing *how the Moon's surface loses heat* during an eclipse also allows scientists to better understand the Moon. The rate of cooling depends on the different *compositions and sizes* of the materials that are found on the Moon. Eclipses also help improve the understanding of the *lunar orbit*. Specific positions of the Moon determine when and where eclipses will occur.

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