



Earth Science

Name: _____

LAB #9: ECLIPSES

Date: _____

Solar and Lunar Eclipses

Lab #9

Discussion: We have learned that solar eclipses can only occur during a new moon and that lunar eclipses can only occur during a full moon. With 365.25 days per year and 29.5 days for a synodic month, it could be possible to have 27 eclipses per year. But the actual maximum number of eclipses in one year is only 7 eclipses if you sum up both lunar and solar eclipses.

Purpose: By the time you finish this investigation, you should be able to:

1. explain how a lunar or solar eclipse occurs
2. tell why there can only be a maximum of 7 eclipses instead of 27 eclipses
3. explain the two requirements for an eclipse

Hypothesis: Using drawings and data charts as models helps us understand the world around us.

Vocabulary: define the following terms.

Ecliptic: _____

Orbital inclination: _____

Lunar nodes: _____

Synodic month: _____

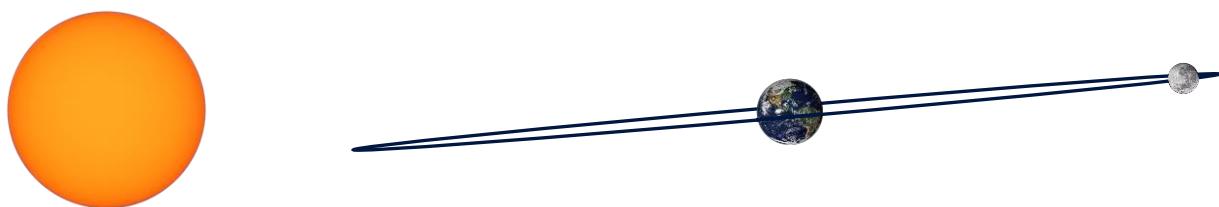
Sidereal month: _____

Lunar eclipse: _____

Solar eclipse: _____

Theory:

The orbit of the Moon is tilted 5.15° relative to the plane of Earth's orbit of the Sun:



Materials: large washer penny metric ruler (with holes)

Method:

Lunar eclipse:

1. In approximately the center of the space provided, lightly draw a horizontal line across the page leaving a 1 cm margin.
2. Use the hole in the large washer to draw a circle representing the Sun centered 4 cm from the left edge of the page and centered on the horizontal line.
3. Use the penny to draw a circle representing the Earth centered 14 cm from the left edge of the page and centered on the horizontal line.
4. Use the hole in the ruler to draw a circle representing the Moon centered 19 cm from the left edge of the page and centered on the horizontal line.
5. Label the Sun with a capital letter S, the Earth E, and Moon M.
6. Use a ruler to draw a line tangent to the top of both the Sun and the Earth.
7. Use a ruler to draw a line tangent to the top of the Sun and the bottom of the Earth.
8. Use a ruler to draw a line tangent to the bottom of both the Sun and the Earth.
9. Use a ruler to draw a line tangent to the bottom of the Sun and the top of the Earth.
10. Label the umbral shadow umbra and label the penumbral shadow penumbra.

Solar eclipse:

1. In approximately the center of the space provided, lightly draw a horizontal line across the page leaving a 1 cm margin.
2. Use a penny to draw a circle representing the Sun centered 4 cm from the left edge of the page and centered on the horizontal line.
3. Use the hole in the ruler to draw a circle representing the Moon centered 12 cm from the left edge of the page and centered on the horizontal line.
4. Use outside edge of the large washer to draw a circle representing the Earth centered 17 cm from the left edge of the page and centered on the horizontal line.
5. Label the Sun with a capital letter S, the Moon M, and Earth E.
6. Use a ruler to draw a line tangent to the top of both the Sun and the Moon stopping at the surface of the Earth.
7. Use a ruler to draw a line tangent to the top of the Sun and the bottom of the Moon to Earth.
8. Use a ruler to draw a line tangent to the bottom of both the Sun and the Moon to Earth.
9. Use a ruler to draw a line tangent to the bottom of the Sun and the top of the Moon to Earth.
10. Label the umbral shadow umbra and label the penumbral shadow penumbra.

No eclipse:

1. Approximately 3 cm below the words No eclipse, lightly draw a horizontal line across the page leaving a 1 cm margin.
2. Repeat the drawing of the solar eclipse except at step 3, draw the Moon centered 12 cm from the left edge of the page and centered 4 cm below the horizontal line.
3. For steps 6 and 8, stop the umbral shadow once the cone lines (lines top to top and bottom to bottom) come to a point.
4. For steps 7 and 9, stop the penumbral shadow once the lines pass the center of Earth.

Data Collection and Processing:

Lunar eclipse:

Solar eclipse:

No eclipse:

Analysis and Conclusions:

1. Describe the arrangement of the Sun, Moon, and Earth necessary for a lunar eclipse to occur.

2. Describe the phase of the Moon that must occur if there is to be a chance of a lunar eclipse.

3. Explain why a lunar eclipse can only occur when the Moon is within $17^\circ 25'$ of a lunar node.
(Hint: refer to the no eclipse drawing you made.)

4. Describe the arrangement of the Sun, Moon, and Earth necessary for a solar eclipse to occur.

5. Describe the phase of the Moon that must occur if there is to be a chance of a solar eclipse.

6. Explain why a solar eclipse can only occur when the Moon is within $11^\circ 38'$ of a lunar node. (Hint: refer to the no eclipse drawing you made.)
