Phases of the Moon

Name: _____

Purpose:

-To determine why we see different phases of the moon on different days.

-To further investigate how the relative positions of the sun, moon, and Earth affect our view of the moon.

Problem: How do the relative positions of the Sun, Moon, and Earth affect our view of the Moon?

or

What is the effect of the relative positions of the Sun, Moon, and Earth on the view of the Moon?

Research:

It's probably easiest to understand the moon cycle in this order: new moon and full moon, first quarter and third quarter, and the phases in between.

The **new moon** occurs when the moon is positioned *between* the earth and sun. The three objects are in approximate alignment. The entire illuminated portion of the moon is on the back side of the moon, the half that we cannot see.

At a **full moon**, the earth, moon, and sun are in approximate alignment, just as the new moon, but the moon is on the opposite side of the earth, so the entire sunlit part of the moon is facing us. The shadowed portion is entirely hidden from view.

The **first quarter** and **third quarter** moons (both often called a "**half moon**"), happen when the moon is at a 90 degree angle with respect to the earth and sun. So we are seeing exactly half of the moon illuminated and half in shadow.

Once those four key moon phases are understood, the phases between should be fairly easy to visualize, as the illuminated portion gradually transitions between them.

An easy way to remember and understand those "in between" lunar phase names is by breaking out and defining 4 words: crescent, gibbous, waxing, and waning. The word *crescent* refers to the phases where the moon is *less* that half illuminated. The word *gibbous* refers to phases where the moon is *more* than half illuminated. *Waxing* essentially means "growing" or expanding in illumination; *waning* means "shrinking" or decreasing in illumination.

Thus you can simply combine the two words to create the phase name, as follows:

After the new moon, the sunlit portion is increasing, but less than half, so it is **waxing crescent**. After the first quarter, the sunlit portion is still increasing, but now it is *more* than half, so it is **waxing gibbous.** After the full moon (maximum illumination), the light continually decreases. So the **waning gibbous** phase occurs next. Following the third quarter is the **waning crescent**, which wanes until the light is completely gone -- a new moon.

Hypothesis: If the relative positions of the sun, moon, + earth change, then the view of the moon will change because as the moon revolves around the earth, differing amounts of the lit part of the moon are seen.

Procedures:

NOTES: The Styrofoam ball represents the moon. The lamp is the sun. You are the Earth.

1. Face the light.
2. Hold the "moon" between your face and the "sun" so that the ball is slightly above your eye level.
3. Complete the data table for this position (Start: 0 degrees)
4. Turn slowly 45° counterclockwise, holding the moon in the same position in front of your face.
5. Complete the data table for this position (45 degrees)
6. Continue rotating 45° counterclockwise (follow the "Degrees of a Circle Reference Sheet") until you return to your starting position. Be sure to stop at each position & complete the data table!

Data Table:

Position	Word Description	Drawing
Start (0°)		
45°		
90°		
135°		
180°		
225°		
270°		
315°		
360°		

Conclusion:

The problem in this experiment was "What is the effect of the relative positions of the Sun, Moon, and Earth on the view of the Moon?." The major findings of the experiment included the further the Moon was from the light source, the easier it was to gain results. Also, when the position of the Moon changed while revolving around the Earth, the amount of light observed changed. The connection(s) between the findings and the problem are that the relative positions of the Sun, Moon, and Earth did affect the view of the sunlit portion of the Moon. The hypothesis was supported because as the "Moon" revolved and the "Sun", the amount of the sunlit portion of the Moon that was seen changed. Based on the results, the hypothesis remains "if the relative positions of the Sun, Moon, and Earth change, then the view of the Moon will change because as the Moon revolves around the Earth, differing amounts of the lit part of the Moon will be seen." The original research stated that the sunlit portion of the Moon would gradually increase until the Full Moon phase (maximum illumination), and gradually decrease until it reached the New Moon phase, and the experimental research found the same. There were no errors in the experiment.

Degrees of a Circle Reference Sheet