Module 1: What is Astronomy?
Topic 4 Application: Lunar Phases Scientific Investigation

Before you begin the scientific investigation below, make sure to download the Lunar Phases Scientific Investigation Report. As you complete this scientific investigation, fill in any needed information on the report template. If you need more information about each section of the report, please visit the Developmental Module.

Introduction

Throughout this topic, you have seen images of the Moon as it completes each of its phases. But, what do lunar phases look like in real life? As the Moon completes a succession of lunar phases, the Moon's appearance changes, as does humans' ability to see sections of the Moon, and details on the Moon. By observing the Moon over periods of time, people are able to see these changes.

Objectives

In this scientific investigation, you will:

- review the lunar phases;
- observe the Moon in its lunar phases for fourteen days; and
- analyze the impact of external factors on the visibility of the Moon.

Hypothesis

Using the **Procedure and Data Collection** section below, read through the procedural information for this scientific investigation. Based on your understanding of the procedure, develop your own hypotheses which describe your expected results. Specifically, do you think you will always be able to see the Moon? How will the Moon change from day to day? When will the Moon's details be most visible? Record these hypotheses in the **Hypothesis** section of your Lunar Phases Scientific Investigation Report.

Equipment and Materials

- Pencil or pen*
- Lunar Phases Scientific Investigation Report
- Binoculars or a telescope (if available)

**Please Note: You may also use a computer-based or mobile application to record your lunar illustrations on the Lunar Phases Scientific Investigation Report.*

If you are unable to observe the Moon in an outdoor setting, you may use the *Dial-A-Moon* application on the NASA website. Enter the month and day for each of the dates that you would like to use for your scientific investigation report.

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Procedure and Data Collection

Before you begin your Lunar Phases Scientific Investigation, select a location and time to make your lunar observations each evening. You should try to make the observations from the same location and around the same time to maintain consistency in your data reporting.

1. On your Lunar Phases Scientific Investigation Report, indicate the date on which you are making your observation.
2. On your Lunar Phases Scientific Investigation Report, indicate the weather during which you are making your observation. You may include your observations of the weather, as well as exact information from local or national media sources.
3. Now it is time to make your lunar observation. If you are using binoculars or a telescope for assistance, take a few moments to observe the Moon with your naked eye before using optics. Then, look at the Moon from where you are located. Illustrate the Moon's appearance on your Lunar Phases Scientific Investigation Report. You may also make qualitative observations about the Moon around your illustration
4. Indicate on your Lunar Phases Scientific Investigation Report which lunar phase your illustration indicates.
5. Repeat Steps 1-4 for each of the fourteen days during which you are making your lunar observations.

Data

Use the table provided on your Lunar Phases Scientific Investigation Report to record your data from this scientific investigation. An *excerpt* of the data table is also shown below:

Day Number	Date	Weather	Moon Sketch	Lunar Phase
1				
2				
3				
4				
5				

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Data Analysis

In the **Data Analysis** section of your Lunar Phases Scientific Investigation Report, provide responses to the following questions:

1. When did you see the smallest part of the moon - at the beginning, middle, or end of your observation?
2. When did you see the largest part of the moon - at the beginning, middle, or end of your observation?
3. What causes the phases of the moon?
4. Was there an order, or pattern, to the way its shaped changed? If so, what was the pattern?
5. Were there other factors that impacted your ability to view the Moon each night?
6. During which phase were you able to see the most details on the Moon?

Conclusion

Using the **Conclusion** section of your Lunar Phases Scientific Investigation Report, compose three to four sentences describing an overall conclusion based on your data. Were your hypotheses true or false, and how do you know? Use the data and notes that you collected from your investigation to form your conclusion. Make sure that you include information that you gained from data analysis to support your conclusion.

Experimental Sources of Error

On your Lunar Phases Scientific Investigation Report, provide responses to the following questions: **Are there any sources of error? If so, what are they, and what could be done to minimize error?**