

## Moon, Sun and Seasons Lab

**Background:** You have probably noticed that as the seasons change, the sun's height in the sky changes. During the long days of summer, the sun's altitude is high for most locations in the United States. As winter approaches, however, the days get shorter and the sun's maximum altitude becomes lower. What you may not have noticed, is the monthly and yearly variations that the moon experiences in its maximum altitude. This lab will show you that variation.

### Materials:

- graph paper
- five (5) different colored pencils or markers

### Procedure:

- obtain materials
- the data table gives the maximum altitudes of the moon and sun on selected dates for an observer at 40° N latitude for a certain year. Use a colored pencil to plot the sun's maximum altitude using an asterisk (\*) for each of the dates given. Connect the asterisks to form a smooth curve.
- using different colored pencils, plot the maximum altitude of the moon for each of the dates in the data table. Use a hashtag (#) for a new moon; a dot (.) for first quarter moon; a circle (O) for the last quarter moon; and an "X" for a full moon. Once your points are plotted, connect all similar points in smooth curves. You will have a total of five (5) different curves.
- answer the analysis and conclusion questions

### Graph:

- for the graph, you are plotting altitude (in degrees) along the y-axis and the twelve (12) months of the year along the x-axis. Below is a sample of the graph layout. Remember the highest altitude is \_\_\_\_\_.
- it is ***strongly*** suggested that you complete each curve separately as it will be easier to connect the similar symbols.

**Note #1:** you must leave five (5) date boxes for the month of June.

**Note #2:** be aware that this graph is ***not*** completely labeled - you are expected to label the graph completely (i.e. axis labels; graph title; etc.)

### Sample Graph Layout

10°												
0°	<b>January</b>				<b>February</b>							
	<b>4</b>	<b>13</b>	<b>19</b>	<b>26</b>	<b>3</b>	<b>11</b>	<b>18</b>	<b>25</b>				

**Data Table:**

<b>Date</b>	<b>Moon Phase</b>	<b>Moon Altitude</b>	<b>Sun Altitude</b>
January 4	New Moon	25.9°	
January 13	First Quarter	62.9°	
January 19	Full Moon	72.0°	29.5°
January 26	Last Quarter	34.8°	
February 3	New Moon	33.1°	
February 11	First Quarter	69.9°	
February 18	Full Moon	60.2°	38.0°
February 25	Last Quarter	26.5°	
March 4	New Moon	45.3°	
March 12	First Quarter	74.5°	
March 18	Full Moon	50.7°	48.8°
March 26	Last Quarter	26.6°	
April 3	New Moon	58.9°	
April 10	First Quarter	71.6°	
April 17	Full Moon	36.1°	60.5°
April 24	Last Quarter	30.6°	
May 2	New Moon	66.5°	
May 9	First Quarter	64.6°	
May 16	Full Moon	29.6°	69.1°
May 24	Last Quarter	41.1°	
June 1	New Moon	73.7°	
June 7	First Quarter	55.2°	
June 15	Full Moon	26.0°	73.3°
June 23	Last Quarter	54.0°	
June 30	New Moon	73.4°	
July 7	First Quarter	39.9°	
July 14	Full Moon	28.3°	71.7°
July 22	Last Quarter	61.9°	
July 29	New Moon	69.1°	
August 5	First Quarter	32.2°	
August 13	Full Moon	37.4°	64.7°
August 21	Last Quarter	71.4°	
August 28	New Moon	56.0°	
September 3	First Quarter	27.6°	
September 12	Full Moon	50.0°	54.2°
September 19	Last Quarter	73.6°	
September 26	New Moon	46.6°	
October 3	First Quarter	27.4°	
October 11	Full Moon	58.2°	43.0°
October 19	Last Quarter	68.8°	

October 25	New Moon	37.9°	
November 2	First Quarter	34.6°	
November 10	Full Moon	68.9°	32.8°
November 17	Last Quarter	61.1°	
November 24	New Moon	28.4°	
December 2	First Quarter	45.9°	
December 9	Full Moon	72.6°	27.2°
December 16	Last Quarter	51.6°	
December 22	New Moon	27.3°	

**Analysis & Conclusion:**

1. On your graph, compare the new moon's maximum altitudes throughout the year to the curve connecting the Sun's maximum altitudes. Why do the new moon's altitudes parallel the path of the Sun?
2. During which months is the Sun highest and lowest in the sky? During which months is the full moon highest and lowest in the sky?
3. What is the relationship between the Sun's noon altitude and the maximum altitude of the full moon?
4. What effect does Earth's tilt have on the altitudes of the Sun and full moon? How is this shown on your graph?

***\*\*\*When doing the lab report write-up, be sure to follow the guidelines.\*\*\****