



## Path of the Sun

## Lab #7

**Discussion:** Light for growing plants, seasons that stimulate growing plants, day and night are all a result of the sun and motions of planet Earth.

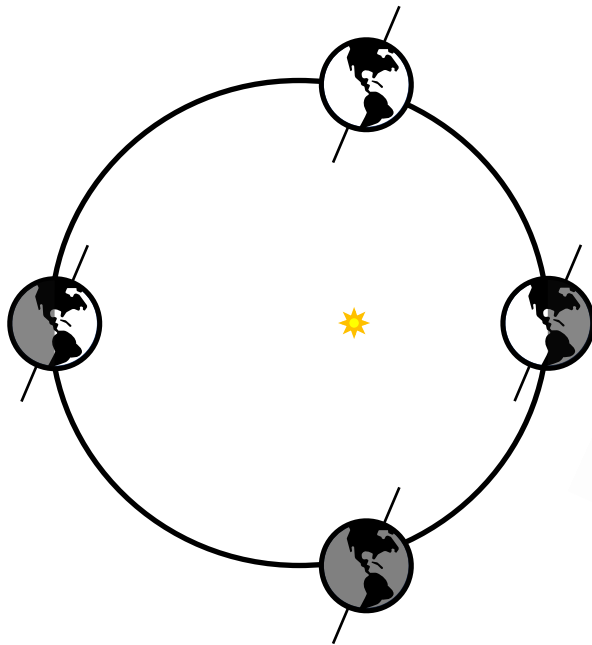
**Purpose:** By the time you finish this investigation, you should be able to:

1. determine the number of hours of daylight given a hemisphere plot of the sun's path for a day
2. determine the number of degrees the sun moves in one hour given a hemisphere plot of the sun's path for one day
3. determine the direction of sunrise and sunset given a hemisphere plot of the sun's path for a day
4. identify the season given a hemisphere plot of the sun's path for a day

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

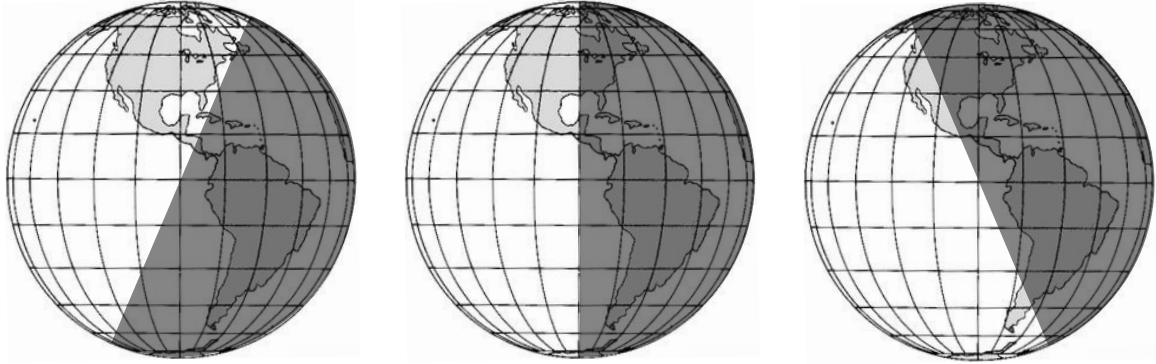
**Theory:**

Earth's axis is tilted 23.5°:



**Materials:** pencil                      metric ruler                      this packet

**Method:**



1. Analyze the supplemental sheet with high noon observations (see last page). Look for the information in the following steps.
2. Maximum altitude of the sun each day.
3. Highest value for maximum altitude listed.
4. Lowest value for maximum altitude listed.
5. Fill in the data on the chart below.

**Data Collection and Processing:**

1. List the value and date for maximum altitude listed on the high noon observations for the:  
Highest maximum value: \_\_\_\_\_  
Lowest maximum value: \_\_\_\_\_
2. Make a plot of altitude vs. time from the high noon observations table.
3. Define the terms below and give the latitude for each:  
Tropic of Cancer: \_\_\_\_\_  
\_\_\_\_\_  
Tropic of Capricorn: \_\_\_\_\_  
\_\_\_\_\_
4. Write labels for the beginning of each season on the globe maps at the top of this page.
5. Where would we observe due East and due West from FHS? (Is this on a longitude or latitude line?)  
\_\_\_\_\_
6. What is the shape of the apparent path of the sun across the sky? \_\_\_\_\_
7. Compare and contrast the shape of the sun's apparent path throughout the year.  
\_\_\_\_\_  
\_\_\_\_\_
8. From the second day of spring until the last day of summer, where will the sun rise and set?  
\_\_\_\_\_

9. From the second day of fall until the last day of winter, where will the sun rise and set?  
\_\_\_\_\_
10. Measure the latitude line that passes through the Great Lakes on the summer and winter globes at the top of page 2. Record the length of this line (to  $\pm 0.01$  cm) that is in shadow and in the light.  
Summer: \_\_\_\_\_  
Winter: \_\_\_\_\_
11. What is the rate of the sun's apparent movement across the sky? \_\_\_\_\_ degrees / hour

**Analysis and Conclusions:** (Use complete sentences.)

1. Calculate the range of the values from lowest to highest maximum altitude (Data 1):  
\_\_\_\_\_
2. How many degrees are between the Tropic of Cancer and the Tropic of Capricorn (Data 3)?  
\_\_\_\_\_
3. Compare your answers to Conclusions 1 and 2. Explain any similarity you observe.  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
4. Calculate the number of hours of daylight and night on winter solstice at  $45^\circ$  (see Data 10).  
\_\_\_\_\_
5. Will the sun ever go through the zenith in Syracuse, NY? Explain.  
\_\_\_\_\_  
\_\_\_\_\_
6. What has been happening to each of the following during the month of October?  
Direction of sunrise: \_\_\_\_\_  
Direction of sunset: \_\_\_\_\_  
Altitude of the sun at local noon: \_\_\_\_\_  
Rate of the sun's movement: \_\_\_\_\_  
Length of daylight hours: \_\_\_\_\_  
Time of sunrise: \_\_\_\_\_  
Time of sunset: \_\_\_\_\_
7. In which direction will the shadow of a flagpole point at sunrise on:  
September 21: \_\_\_\_\_  
December 21: \_\_\_\_\_  
March 21: \_\_\_\_\_  
June 21: \_\_\_\_\_

# Supplemental Sheet

## High Noon Observation Table

| Date   | Degrees | Minutes | Time of Maximum Altitude | Date    | Degrees | Minutes | Time of Maximum Altitude |
|--------|---------|---------|--------------------------|---------|---------|---------|--------------------------|
| Jan. 1 | 24      | 54      | 12:03                    | July 1  | 71      | 07      | 12:04                    |
| 8      | 25      | 37      | 12:06                    | 8       | 70      | 30      | 12:05                    |
| 15     | 26      | 40      | 12:09                    | 15      | 69      | 33      | 12:06                    |
| 22     | 28      | 04      | 12:11                    | 22      | 68      | 19      | 12:06                    |
| 29     | 31      | 46      | 12:13                    | 29      | 66      | 48      | 12:06                    |
| Feb. 5 | 32      | 44      | 12:14                    | Aug. 5  | 65      | 01      | 12:06                    |
| 12     | 33      | 56      | 12:14                    | 12      | 63      | 02      | 12:05                    |
| 19     | 36      | 19      | 12:14                    | 19      | 60      | 50      | 12:03                    |
| 26     | 38      | 52      | 12:13                    | 26      | 58      | 28      | 12:02                    |
| Mar. 4 | 41      | 30      | 12:12                    | Sept. 2 | 55      | 58      | 12:00                    |
| 11     | 44      | 14      | 12:10                    | 9       | 53      | 23      | 11:57                    |
| 18     | 47      | 00      | 12:08                    | 16      | 50      | 42      | 11:55                    |
| 25     | 49      | 45      | 12:06                    | 23      | 48      | 00      | 11:53                    |
| Apr. 1 | 52      | 29      | 12:04                    | 30      | 45      | 26      | 11:50                    |
| 8      | 55      | 09      | 12:02                    | Oct. 7  | 42      | 34      | 11:48                    |
| 15     | 57      | 43      | 12:00                    | 14      | 39      | 55      | 11:46                    |
| 22     | 60      | 09      | 11:58                    | 21      | 37      | 22      | 11:45                    |
| 29     | 62      | 25      | 11:57                    | 28      | 35      | 56      | 11:44                    |
| May 6  | 64      | 30      | 11:56                    | Nov. 4  | 32      | 40      | 11:44                    |
| 13     | 66      | 21      | 11:56                    | 11      | 30      | 37      | 11:44                    |
| 20     | 67      | 56      | 11:56                    | 18      | 28      | 49      | 11:45                    |
| 27     | 69      | 16      | 11:57                    | 25      | 27      | 17      | 11:47                    |
| June 3 | 70      | 18      | 11:58                    | Dec. 2  | 26      | 04      | 11:50                    |
| 10     | 71      | 00      | 11:59                    | 9       | 25      | 12      | 11:52                    |
| 17     | 71      | 23      | 12:01                    | 16      | 24      | 42      | 11:56                    |
| 24     | 71      | 25      | 12:02                    | 23      | 24      | 34      | 11:59                    |
|        |         |         |                          | 30      | 24      | 40      | 12:03                    |

# High Noon Observations

## Plot of Altitude vs. Time

