Name_____
Date_____Partner _____
Lab_____Class_____

APPARENT DIURNAL MOTION OF THE SUN

Introduction: Many times you have observed the sun rising in the morning, moving across the sky during the day, and setting in the evening. You must realize, however, that this is only an apparent motion. The real motion of Earth's rotation is responsible for this apparent motion of the sun. In this lab you will examine this apparent motion of the sun more closely and look for evidence of change.

Objective: You will learn how to determine the apparent diurnal motion of the sun

Vocabulary:

Arc: _____

Zenith: _____

Horizon: _____

Apparent Motion: _____

Real Motion: _____

Diurnal: _____

Procedure A:

Record your answers when required on the Data Table.

(Refer to the diagram on the first page for these procedures)

1. Obtain a sheet of graph paper and a ruler.
2. Find the center on the graph paper, and using the ruler, draw a cross through the center point of the paper, making sure the legs of the cross reach the edge of the paper.
3. Obtain a clear plastic hemisphere and a transparency marker (One each per group)
4. Place the sphere on the graph paper, and by standing above the sphere, line the center point of the hemisphere up with the center of the graph paper.
5. Mark the top of the graph paper North and, using the transparency marker, transfer this mark on to the globe. (The North line should line up with the top middle of your graph paper.
6. Mark the other three cardinal directions on the globe with correspondence to North.
7. Take the graph paper, globe, and marker outside.
8. Line up the graph paper, so that the North line is pointing directly North. (Have your teacher help you line it up to North)
9. Using a transparency marker, move the marker tip so that the shadow of the marker is lined up with the center of the graph paper. Mark this point **SUN** on the globe. **NOTE THE EXACT TIME!**
10. Head back inside

Procedure B:

1. Measure from the south horizon up 43^0 and make a mark. Label mark Noon (This is the location of the equinox sun on this part of Earth)
2. Using a string, hold one end of the string at the East mark, pull it over the 43^0 mark, and bring it to the West mark on the globe.
3. While holding the string tight, have someone else use the transparency marker and trace the path of the string across the globe. Label this EQUINOX.
4. Using your external protractor and starting at the Noon mark, measure along the EQUINOX line toward the East until you reach 6am. (Remember: The Sun moves roughly 15 degrees along the arc every hour)
5. Repeat step 5, substituting West for East and 6pm for 6am.
6. Using the same technique as used to find 6am and 6pm for the EQUINOX, find where these times will be for the mark labeled **SUN**. (Remember: Keep the line parallel to the EQUINOX line)
7. Make a line that is parallel to the EQUINOX by running a string starting at the 6am mark, going through the mark for the sun, and finishing at the 6pm mark. Have some one trace the string and mark its position on the globe. Mark this line APPARENT MOTION
8. Take the graph paper, globe, and marker outside.
9. Line up the graph paper, so that the North line is pointing directly North. (Have your teacher help you line it up to North)
10. Using a transparency marker, move the marker tip so that the shadow of the marker is lined up with the center of the graph paper. Mark this point **SUN2** on the globe.(This should be on the apparent motion line) **NOTE THE EXACT TIME!** Head back inside.

Procedure C:

1. Using the external protractor, measure the angle between **SUN** and **SUN2.** Record.
2. Using the equation below, distinguish how many degrees the sun has moved in 1 hr (Rate of Apparent Motion).

$$\frac{\text{(Time 2- Time 1)}}{\text{60 Minutes}} = \frac{\text{(Your Obtained Angle)}}{\text{X (degrees per hour)}}$$

3. Record answer to calculation in the data table.
4. Measure the total degrees of arc along the apparent motion line. Record
5. Note and record the sunrise and sunset compass direction.
6. Clean the globes and return all materials to the proper location.
7. Answer the Discussion questions and Conclusion.

Data Table:

Degrees of Arc between 1st and 2nd reading	
Rate of the Sun's apparent motion	
Total Degrees of Arc for one day	
Sunrise Compass Direction	
Sunset Compass Direction	

Discussion Questions: (Answer in Sentences)

1. What is the shape of the apparent path of the sun across the sky?

2. According to your observations, what is the approximate angular distance in degrees the sun moves in one hour?

3. At the rate you calculated in Question 2, how many hours would it take the sun to travel 360 degrees?

4. According to the model hemisphere and your data, was the sun directly overhead at noon? Explain how your data confirms your answer.

5. According to the model hemisphere and your data, on this day did the sun rise directly in the east and set exactly in the west? Again, explain how your data confirms your answer?

6. In degrees, what was the sun's altitude at 12:00 noon on the day the readings were taken?

7. Using the total degrees of arc the sun appeared to travel and its apparent rate of motion, determine the number of hours of daylight on the day the readings were taken.

CONCLUSION:

Describe the sun's apparent diurnal motion in terms of its path, direction, and rate of movement.