Name(s):	 	
Date:	 Course/Section:	
Grade:		

Observing the Sun

Objectives:

After completion of this lab, students will have:

- Developed an understanding of the five major surface features of the Sun, including the physical processes involved in features.
- 2. Properly assembled a personal solar telescope, and used it to safely observe the Sun.
- 3. Determined the temperature of a sunspot compared to the temperature of the rest of the Sun's surface.

Checklist:

Complete the pre-lab quiz with your team (if required).
Compile a list of resources you expect to use in the lab.
Work with your team to complete the lab exercises and activities.

- **Record your results and mark which resources you used.**
- □ Share and discuss your results with the rest of the class.
- Determine if your team's answers are reasonable.
- **Submit an observation request for next week (if required).**

Pre-Lab Quiz

Record your group's answers to each question, along with your reasoning. These concepts will be relevant later in this lab exercise.

1.		
2.		
3.		
4.		

Part 1: Features of the Sun

1. There are four major features on the sun. Using the table below, research these major features using the internet. Describe how you would identify each feature in a photo and give a physical description of how they are formed.

Feature	How to Identify	Physical description
Sunspot		
Plage		
Prominence		
Filament		
Granulation		

2. How are solar prominences and filaments similar? How are they different?

3. Examine the H-alpha spectral line image and the white light image of the Sun below. Identify and label examples of the features described in Question 1.





4. We will be using H-alpha images for the remainder of this lab. What is the H-alpha spectral line, and why would we use it to observe the sun?

Part 2: Viewing the Sun

 Telescopes are usually used to concentrate the light of faint objects in the night sky to make them more easily available. What is the primary difference between observing the sun and observing a faint star at night?

2. Why do we use special telescopes to observe the sun?

3. What safety concerns must be considered before looking at the sun with any telescope?

4. Using the Solar Telescope on VAO, take an image of the sun. Record any relevant settings, such as exposure time, in the space below.

5. How many of each feature discussed in Part 1 do you observe on the sun today using VAO?

Part 3: Properties of Solar Features

1. Using your VAO image, determine the height of a solar prominence compared to the diameter of the sun.

2. Now determine the height of the prominence in kilometers. Compare this to the size of Earth.

- 3. Using your image, determine the temperature of a sunspot. (If no large sunspots are visible, ask your TA for an image with a large sunspot.
 - a. Determine the minimum pixel brightness at the position of a sunspot. Then determine the average pixel brightness of the solar surface near the sunspot.

Minimum Pixel Brightness of Sunspot	Average Pixel Brightness of Solar Surface

b. Find the ratio of the two temperatures using the Stephan-Boltzmann Law.

c. Look up the average surface temperature of the sun. Use this and the ratio above to determine the temperature of the sunspot.

Part 4: The Sun's Rotation

1. Describe the feature you are tracking by drawing a diagram of the Sun. Measure how far the features moves between the two images in pixels and determine the diameter of the Sun in pixels.

Distance Traveled by Feature (pixels):	Diameter of the Sun (pixels):

2. If the images were taken a day apart, determine how long it would take for the feature to travel all the way around the Sun. Explain your reasoning and show your work. Report your answer in days.

Part 5: The Solar Cycle

1. Write down your method for determining what constitutes a sunspot in the images.

2. Fill in the chart below (label axes), and plot the number of sunspots for each year.

3. What trend do you observe? What year had the most sunspots and what year had the least number of sunspots?

4. How long did it take to go from a solar minimum to a solar maximum? How long is the solar cycle?

5. From your observations, what is the Sun's activity level this year? Where in the solar cycle is the Sun this year?