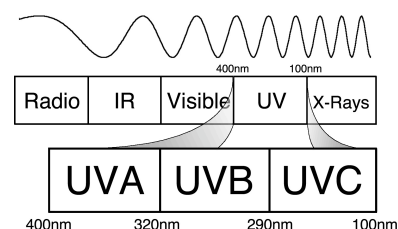


## PRELIMINARY ACTIVITY FOR

# Sunscreen Comparison

Sunscreens are available in many different types and with many different levels of protection. The most common measure of protection from UVB radiation is the SPF factor. SPF, or sun protection factor, describes the increased amount of time you can be in the sun before your skin starts to burn. For example, a sunscreen labeled SPF 8 means that you can be out in the sun eight times longer before burning than you would without using any protection. Products range from SPF 0 to SPF 50 or higher. But is SPF 50 really twice as protective as SPF 25? In this experiment, you and your classmates will search for answers to questions such as this.

Figure 1 shows the location of UV radiation in the electromagnetic spectrum. Notice that the ultraviolet band is broken into three types referred to as UVA, UVB, and UVC. The most harmful of these three, UVC radiation, is absorbed by the atmosphere and does not reach the Earth's surface. UVA radiation is deep-penetrating and causes tanning, wrinkles, and some forms of skin cancer. UVB radiation is also responsible for many skin problems such as sunburns and several forms of skin cancer.



**Figure 1**

In the Preliminary Activity, you will gain experience using a UVB Sensor and learn UV intensity measuring technique as you determine the amount of UVB radiation passing through plastic wrap and through plastic wrap coated with a thin layer of sunscreen.

After completing the Preliminary Activity, you will first use reference sources to find out more about ultraviolet radiation and sunscreens before you choose and investigate a researchable question. Some topics to consider in your reference search are:

- ultraviolet radiation
- sunscreens
- ozone depletion

## PROCEDURE

1. Prepare a test card.
  - a. Obtain a 4 x 6 inch index card.
  - b. Using the coin as your guide, draw two circles on the test card as shown in Figure 2.
  - c. Use scissors to cut out the circles.
  - d. Label one circle as your control.
2. Cover the test card with plastic wrap.
  - a. Cut out a 4 x 6 inch piece of plastic wrap. The person who does this should have clean hands with no sunscreen or lotions on them.
  - b. Lay the plastic wrap neatly on top of one of the test cards. Try to keep the plastic wrap flat so it is not wrinkled, but do not stretch it.
  - c. Tape the four corners as shown in Figure 2.

## Experiment 22

3. Apply sunscreen to the test card.
  - a. Place the test card in front of you with the plastic side facing up.
  - b. The circle labeled “control” should be kept clean. It will be used to measure the effect of the plastic wrap by itself.
  - c. Squeeze a very small amount of sunscreen on your finger.
  - d. Spread the sunscreen thinly and evenly over the appropriate circle on the plastic wrap.
  - e. Wipe off your finger well with a paper towel.
  - f. Let the sunscreen dry.
4. Connect the UVB Sensor and the data-collection interface.
5. Take your equipment outside.
6. Use the shadow of the UVB Sensor to aim it correctly without looking directly at the sun.
  - a. Hold the sensor with your thumb and first finger, pointing the sensor in the general direction of the sun.
  - b. Find the sensor’s shadow and observe how it changes shape as you move the sensor around.
  - c. Move the sensor around until the shadow becomes a small round circle. This indicates that the sensor is now pointing directly at the sun.
  - d. Keeping this sensor orientation in mind, clamp the UVB Sensor onto the ring stand as shown in Figure 3.
  - e. Once the sensor is securely on the ring stand, use the shadow again to make final adjustments to assure that the sensor is pointing directly at the sun.
7. Practice holding the one of your sample circles over the tip of the UVB Sensor. **Important:** The side with the sunscreen should be facing out, away from the sensor. Sunscreen should never come in contact with the UVB Sensor. It is okay if the plastic lightly touches the tip of the sensor.
8. When everything is ready, start data collection for the control.
9. Stop data collection after about 20 seconds. Use the Statistics function to determine the mean UVB intensity (in  $\text{mW}/\text{m}^2$ ). Record the value.
10. Repeat Steps 8–9 for the sunscreen-covered circle.

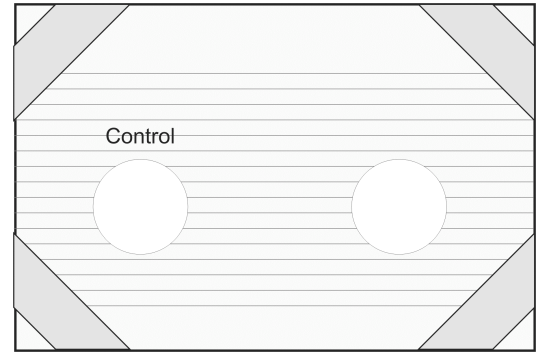


Figure 2

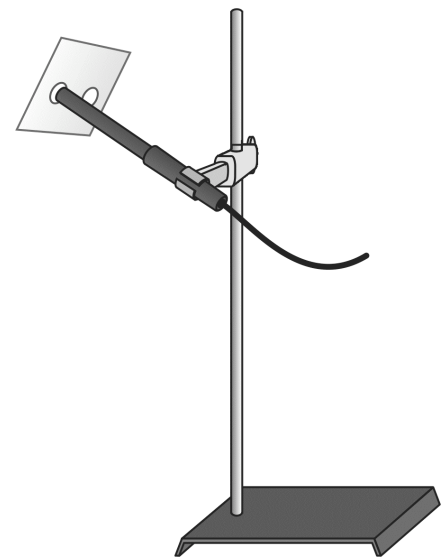


Figure 3

## **QUESTIONS**

1. What was the UVB intensity (in  $\text{mW}/\text{m}^2$ ) for your control?
2. What was the SPF of the sunscreen you tested? What was the UVB intensity (in  $\text{mW}/\text{m}^2$ ) for the sunscreen?
3. List at least one researchable question for this experiment.