

17. WEATHER IN A TERRARIUM

How are temperature, absolute and relative humidity, dew point, and barometric pressure related within a microclimate such as a terrarium?

Objectives

- Explain how water and energy cycle through a microclimate.

Materials and Equipment

- Data collection system
- PASCO Wireless Weather Sensor
- Beaker, 250 mL
- Terrarium or suitable alternative

Safety

Follow regular classroom safety procedures.

Procedure

1. Set the sensor in an empty beaker as shown in Figure 1.
2. Set the beaker with sensor inside the terrarium. Place the terrarium in a well-lit area, but not in direct sunlight.

Note: Do not let the sensor get wet.

3. Turn on the Wireless Weather Sensor.
4. Select Remote Logging in SPARKvue.
5. Select the Weather Sensor at the top of the Wireless Devices menu.
6. Change the Sample Rate to 2 min in the Remote Logging Configuration menu, then select OK. The Bluetooth status indicator light on the Wireless Weather Sensor should be flashing amber. Your sensor is now collecting data remotely, and you can close SPARKvue. Leave the system undisturbed for 24 hours.

Note: The color flashing on the GPS status indicator light does not matter for this investigation.

7. Record your predictions in Table 1.
 - a. Of temperature, absolute humidity and barometric pressure, which do you predict will have the greatest percentage change in a 24-hour period? Base your prediction on how you think changes in energy will affect the system and explain your thinking.
 - b. Of temperature, absolute humidity and barometric pressure, which do you predict will have the least percentage change in a 24-hour period? Base your prediction on how you think changes in energy will affect the system and explain your thinking.
8. Return to the terrarium after 24 hours. With the Wireless Weather Sensor still in the terrarium, either long-press the sensor power button or turn it off and on. The Bluetooth status indicator light should now be alternating between red and amber flashes.
9. Select Remote Logging in SPARKvue.



Figure 1: Set sensor in beaker

10. Select the Weather sensor in the bottom portion of the Wireless Devices menu.
11. Choose Download Data from the Logged Data menu.
12. Choose Weather Dashboard from the Quick Start Experiments menu.
13. Use the arrows at the top to navigate through the first four pages in the experiment. Note the page titles and data displays. You will be using pages 2, 3, and 4.
14. Go to page 2 of the SPARKvue data to see Temperature results. Select the Time measurement on the x-axis. Choose Date and Time from the Experiment Clock menu.
15. Scale the graph. Sketch your Temperature results in Graph 1. Include numbers, labels, and units on the x- and y-axes. Use the SPARKvue coordinate tool to find initial and final temperatures, and use the statistics tool to find minimum, maximum, and average (mean) temperature values. Record results in Table 2.
16. Repeat Steps 14 and 15 for page 3 in SPARKvue; sketch results in Graph 2 and record values in Table 2.
17. Repeat Steps 14 and 15 for SPARKvue data page 4; sketch results in Graph 3 and record results in Table 2.
18. Use the equation below to calculate % Change for each measurement in Table 2. Record the results in Table 2.

$$\% \text{ Change} = \frac{(\text{Final Value} - \text{Initial Value})}{\text{Initial Value}} \times 100$$

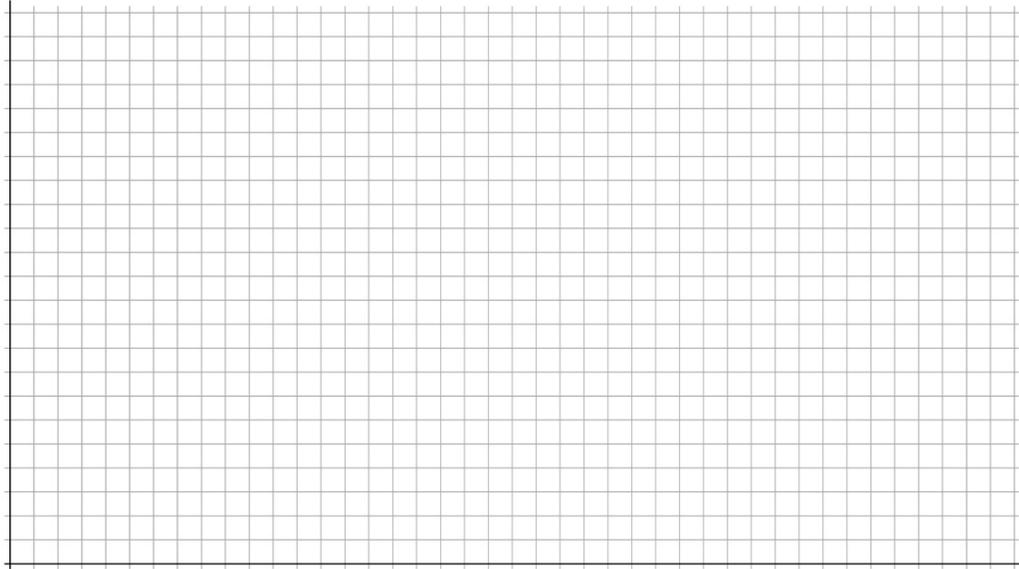
19. Once all data is recorded and graphs are complete, perform the following to permanently delete logged data from the sensor:
 - a. Select the Bluetooth icon to open the Wireless Devices menu. Select X to disconnect the sensor.
 - b. Select the Weather Sensor when it moves from the Connected Devices list to the Select a Wireless Device list.
 - c. When asked how you want to proceed, select Delete Data, then select OK.

Data Collection

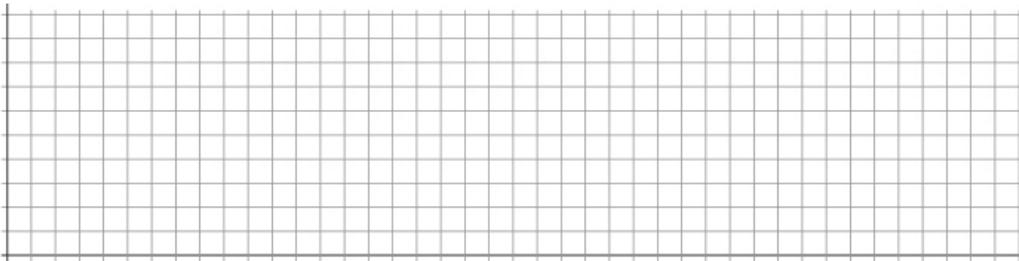
Table 1: Predictions of changes in temperature, absolute humidity, and barometric pressure

Your Predictions	
a. Greatest % change prediction & explanation:	b. Least % change prediction & explanation:

Graph 1: Temperature



Graph 2: Relative humidity, dew point, and absolute humidity



Graph 3: Barometric Pressure

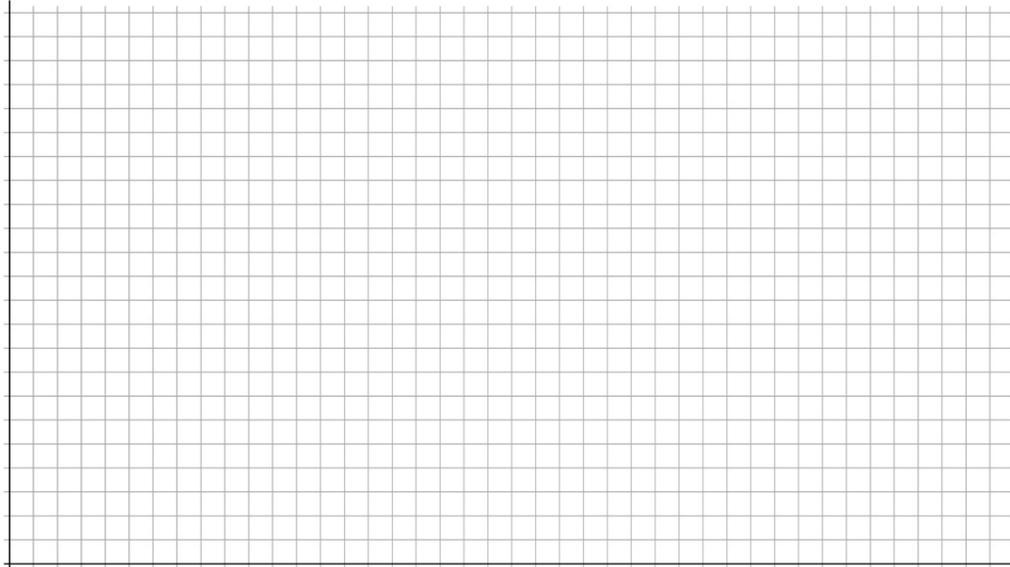


Table 2: Measurements for temperature, humidity, dew point, and barometric pressure

Measurement	Initial Value	Final Value	Minimum Value	Maximum Value	Average	% Change
Temperature (°F)						
Relative Humidity (%)						
Dew Point (°F)						
Absolute Humidity (g/m ³)						
Barometric Pressure (inHg)						

Questions and Analysis

1. Which factor changed the most over a 24-hour period, and how can this be explained by changes in either matter or energy moving through the terrarium system? Was your prediction correct? Support your answer with data.

