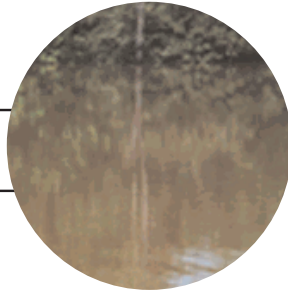


When pH changes

What happens?

ACTIVITY



Activity Overview

The pH of your aquatic site determines if the water is acidic, basic, or neutral. Most aquatic organisms have adapted to life in water with a specific pH. Slight pH changes put these organisms at risk and they may even die. A change in pH in the aquatic site may mean that pollution, sometimes caused by humans, is affecting the water. Extreme pH values may cause eye and skin irritation to humans.

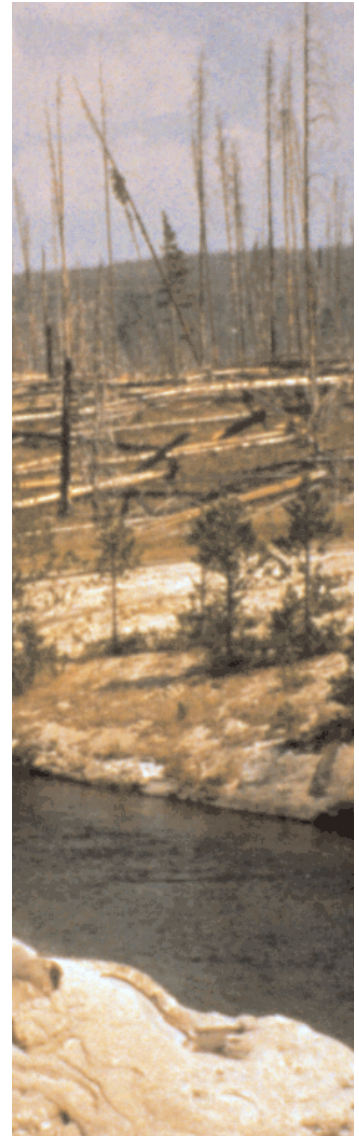
Perform an experiment to measure the pH level of your local aquatic site. First, make field observations to determine if the aquatic site supports animal life and vegetation. Next, collect a water sample. Use a pH Sensor connected to a TI CBL 2™ or Vernier LabPro, and a TI-73 Explorer™ to measure the pH of the sample. Take your measurements twice and find the average value.

What does your data tell you about the acidity of the water? Does the pH of your aquatic site explain your field observations?



Focus Question

What is the pH of your aquatic site?



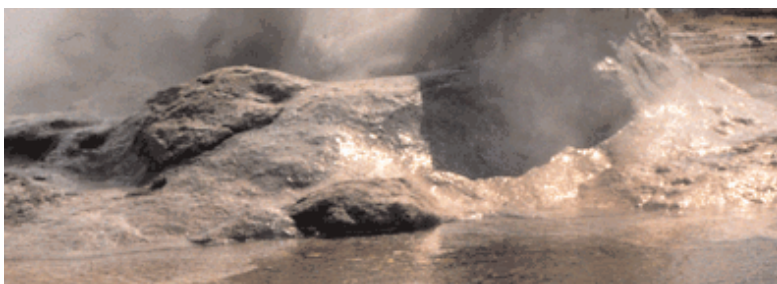
When pH changes

What happens?

Procedure

- ① **Make Field Observations.**
 - a. Make observations at your aquatic site about weather, type of aquatic site, signs and condition of animal life, signs and condition of vegetation, signs of pollution.
 - b. Record your observations in your *Journal*.
- ② **Connect the pH Sensor to the TI CBL 2™ or Vernier LabPro and TI-73 Explorer™.**
 - a. Plug the pH Sensor into Channel 1 of the TI CBL 2™ or Vernier LabPro.
 - b. Use the link cable to connect the TI-73 Explorer™ to the interface.
 - c. Firmly press in the cable ends.
- ③ **Obtain your aquatic site water sample.**
 - a. Try to collect the sample from below the surface of the water and as far away from shore as is safe. If suitable, construct a sampler with a rod and a container.
 - b. Fill the beaker with about 100 mL of the water sample. You may collect the water sample directly in the beaker.
 - c. If you cannot test for pH right away store the sample in an ice chest. Allow the sample to return to room temperature before you measure the pH.
- ④ **Set up the TI-73 Explorer™**
 - a. Turn on the TI-73 Explorer™ and start DATAMATE. (*For instructions on DATAMATE, see Appendix A*).
 - b. Press **[CLEAR]** to reset the program.
 - c. Select **SETUP** from the main screen.
 - d. If the TI-73 displays the pH Sensor in CH 1, proceed directly to Step 5. If it does not, continue with this step to set up the sensors manually.
 - e. Press **[ENTER]** to select CH1.
 - f. Select **PH** from the **SELECT SENSOR** menu.

continued on page 3



ACTIVITY

Materials*

- TI-73 Explorer™
- TI CBL 2™ or Vernier LabPro
- TI-73 DataMate
- pH Sensor
- 250-mL beaker
- pH 7 buffer solution (for calibration - optional)
- pH 10 buffer solution (for calibration - optional)
- Distilled water
- Paper tissue



pH Sensor

*This activity has been written for use with the TI-73 Explorer™, however it can be easily adapted for use with the TI-83 and the TI-83 Plus. Appendix A explains how to transfer DataMate on your device and how to use DataMate for data collection.





Adapted from "Experiment 2 - pH", *Water Quality with Calculators*, written by Johnson, Robyn L., Holman, Scott, and Holmquist, Dan D., published by **Vernier Software & Technology**, 2002.

When pH changes

What happens?

continued from page 2

Procedure

- 5 **Set up the TI-73 Explorer™ for data collection.**
 - a. Use  and  to select MODE and press **ENTER**.
 - b. Select SINGLE POINT from the SELECT MODE menu.
 - c. Select OK to return to the main screen.
 - 6 **Collect your pH data.**
 - a. Remove the pH Sensor from the storage bottle. Rinse the tip of the sensor thoroughly with the water sample.
 - b. Place the tip of the sensor into the water sample, 3-4 cm deep.
 - c. When the readings stabilize, select START to begin sampling. Leave the probe tip submerged while data is being collected for 10 seconds.
 - d. After 10 seconds, the pH value will appear on the TI-73 Explorer™ screen.
 - e. Record this value in the table (copy the table in your *Journal*).
 - f. Press **ENTER** to return to the main screen.
 - g. Repeat Step b - f to take a second pH reading.
 - 7 **Analyze your data.**
 - a. Find the average of your pH values and enter it in the table.
 - b. Complete the Observations and Conclusions section. Answer the questions in your *Journal*.
 - 8 **Store the pH Sensor.**

Rinse the sensor with distilled water and return it to the storage bottle when you have finished collecting your data.
- ↻ To repeat the experiment, press **ENTER** to return to the main screen of DataMate and follow the steps above.

Water Sample pH Values	
Reading	pH
1	
2	
Average	

ACTIVITY

Observations & Conclusions

- A. What observations did you make at your aquatic site? (weather, description and type of site, signs and condition of animal life, signs and condition of vegetation, signs of pollution).
- B. Is the pH of your aquatic site acidic, basic, or neutral?
- C. Compare your pH readings with your observations. Based on your observations and the information provided in the research article, identify the factors that influenced your pH readings.
- D. Find examples of watersheds (local or outside of your area) that are affected by pH. Describe efforts that are being done to maintain or change pH levels.



Adapted from "Experiment 2 - pH", *Water Quality with Calculators*, written by Johnson, Robyn L., Holman, Scott, and Holmquist, Dan D., published by **Vernier Software & Technology**, 2002.