Name _____ Date _____

LabQuest
22

A Water Field Study

When finding water quality, there are many measurements that can be made. In this experiment, you will measure water temperature, conductivity, and pH. Water temperatures in streams can range from 0°C in the winter to above 30°C in the summer. Cooler water in a stream is generally considered healthier than warmer water. Problems generally occur when changes in water temperature are noted along one stream on the same day. Some sample data are listed in Table 1.

Table 1: Water Temperatures of Selected Rivers

Site	Season	Temperature (°C)	Season	Temperature (°C)
Hudson River, Poughkeepsie, NY	Winter	5	Summer	25
Mississippi River, Memphis, TN	Winter	7	Summer	29
Rio Grande, El Paso, TX	Winter	16	Summer	21
Missouri River, Garrison Dam, ND	Winter	3	Summer	14
Willamette River, Portland, OR	Winter	9	Summer	22

Conductivity values in lakes and streams are typically found to be in the range of 100 to 500 µS/cm. In areas of especially hard water or high salinity, conductivity values may be as high as 1000 µS/cm. Drinking water usually has conductivity in the 50 to 1000 µS/cm range. Some sample data are listed in Table 2.

Table 2: Conductivity in Selected Rivers

Site	Season	Conductivity (µS/cm)	Season	Conductivity (µS/cm)
Hudson River, Poughkeepsie, NY	Spring	180	Fall	238
Mississippi River, Memphis, TN	Spring	266	Fall	440
Rio Grande, El Paso, TX	Spring	1020	Fall	1220
Sacramento River, Keswick, CA	Spring	142	Fall	120
Ohio River, Benwood, WV	Spring	600	Fall	286

The best pH range for most aquatic organisms is pH 6.5 to 8.2. The pH values of streams and lakes are usually between pH 7 and 8. Hard water will often have pH values between 7.5 and 8.5.

When doing this experiment, you might choose to compare water quality at two or more points on the same stream, in two or more different streams or lakes, or in a lake and a stream that runs into it.

OBJECTIVES

In this experiment, you will

- Use a Temperature Probe to measure water temperature.
- Use a Conductivity Probe to measure the conductivity of water.
- Use a pH Sensor to measure the pH of water.
- Make visual observations at the test sites.
- Compare water quality.

MATERIALS

LabQuest
LabQuest App
Temperature Probe
Vernier Conductivity Probe
Vernier pH Sensor
colorless plastic bottle
plastic cup or beaker

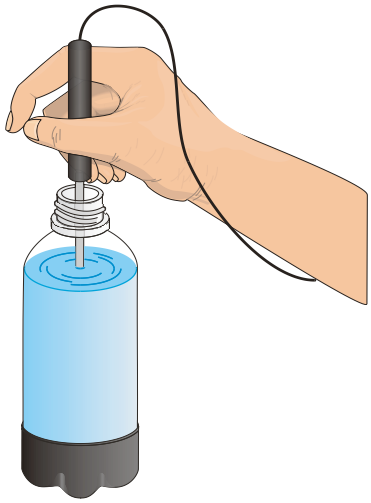

Figure 1

PROCEDURE

Part I Measuring Temperature

1. Connect the Temperature Probe to LabQuest and choose New from the File menu. If you have an older sensor that does not auto-ID, manually set up the sensor.

2. Fill the plastic bottle with water taken below the water surface at a point one meter from the shore. **CAUTION:** *Take all necessary precautions to ensure your safety!*

3. Measure the water temperature.
   a. Place the Temperature Probe into the sample.
   b. Gently move the probe in the water and note the temperature reading on the screen.
   c. When the temperature stops changing, record the reading in your data table.
   d. Disconnect the Temperature Probe.

Part II Measuring Conductivity

4. Set the Conductivity Probe on the 0–2000 µS/cm position. Connect the Conductivity Probe to LabQuest and choose New from the File menu. If you have an older sensor that does not auto-ID, manually set up the sensor.

5. Measure the conductivity of the *same* water sample.
   a. Place the Conductivity Probe into the water. Briefly swirl the probe in the water.
   b. Once the conductivity reading is steady, record the value in your data table.

Part III Measuring pH

6. Disconnect the Conductivity Probe and connect the pH Sensor to LabQuest. Choose New from the File menu. If you have an older sensor that does not auto-ID, manually set up the sensor.

7. Measure the pH of the *same* water sample.
   a. Remove the pH Sensor from its protective container and store the container safely aside.
   b. Rinse the pH Sensor using a plastic cup or beaker and water from the site.
   c. Place the pH Sensor into the water sample. Briefly swirl the pH Sensor in the water.
   d. Once the pH is steady, record the reading. Return the pH Sensor to its container.

8. Note and record the clarity (clearness) of the water sample.

9. Make and record other observations (concerning algae, plants, water "critters," animals, flow rate, etc.) related to water quality at the site.

10. Repeat Steps 1–9 at one or more other sites.

DATA AND OBSERVATIONS

Site		
Temperature (°C)		
Conductivity (µS/cm)		
pH		
Clarity		
Other observations		

PROCESSING THE DATA

1. How did the water quality at the different sites compare?

2. What differences did you find? Explain the differences.

3. What similarities did you find? Explain the similarities.

4. At which site was the water "best"? Explain why it was the best.

5. What new ideas for testing water quality did you come up with while doing this experiment?

Name _____ Date _____

EXTENSIONS

1. Test water quality at the same site at different times.
2. Test the effects of rain or snow on water quality.
3. Test water quality at sites upstream and downstream from a wastewater treatment plant.