WATER AND PH

Driving Question

What levels of acid rain or fog do we have in our local watersheds?

Materials and Equipment

- pH sensor
- Conductivity sensor
- Marking pen
- Beaker, 250-mL (4)
- Graduated cylinder, 100-mL
- Small container (for distilled vinegar solution)
- Stirring rod
- White vinegar, 250 mL
- Water sample, 250 mL (3)
- Distilled water, 250 mL
- Labels or tape
- pH calibration buffers 4, 10

Background

Acid rain can occur when precipitation occurs in the presence of aerosol chemicals like sulfur dioxides and nitrogen dioxides, commonly released during the processing and burning of fossil fuels like gasoline. Acid rain can directly impact agriculture by harming plant tissues, decreasing soil and water quality, and consequently reducing yields. One way to investigate the impacts of acid rain is to examine the buffering capacity of water sources. Water with dissolved ions like $CaCO_3$, often found in areas with limestone has very high buffering capacity and is less susceptible to acid rain.

Procedure

1. Collect three water samples from your home or neighborhood, for instance, from ponds, rivers, wells, and tap water. Label each water sample.

2. Connect to the pH and conductivity sensor and open the AGR 04 Water and pH.spklab file.

    - If the file is not available create a data table to record the conductivity and pH of the water samples. Use manual sampling mode to collect the data.

3. Measure and pour 200 mL of distilled water and 200mL of vinegar into separate 250-mL beakers

4. Rinse the pH sensor with distilled water and calibrate it according to the product manual

5. Place the pH sensor and conductivity sensor into the beaker of vinegar. Wait until the pH reading stabilizes and record the reading in Table 1. Rinse the sensors with distilled water.

6. Place the pH sensor and conductivity sensor into the beaker of distilled water. Wait until the pH reading stabilizes. Rinse the sensors with distilled water.

7. Measure the pH and conductivity of the three water samples and record the measurements in Table 1. Be sure to rinse the sensors with distilled water between samples.

8. Using the pipet, add 1 mL of vinegar to each water sample, gently stir the sample and wait for 3min before proceeding.

9. Rinse the sensors with distilled water., Measure and record the pH and conductivity for the each of the three water samples with vinegar added. Record the data in Table 1 in the column entitled “With Acid”.

10. Calculate the change in pH and conductivity after the acid was added to each sample.

Table 1: Stabilized pH and conductivity readings for water samples before and after applying "acid rain"

Sample	Initial Reading (control)		With Acid		Change	
	pH	Conductivity	pH	Conductivity	∆**pH**	∆**Conductivity**
Vinegar			NA	NA	NA	NA
Distilled Water						
1:_____						
2:_____						
3:_____						

Analysis & Questions

1. Compare the change in pH for each sample. Using the distilled water as a control, did the samples you collected show a greater or smaller change in pH?

2. Which water samples seemed to show the least amount of pH change when the acid was added? Why do you think these samples were resistant?

3. Runoff from our lawns and golf courses often contains soil and dissolved fertilizers. What might be the consequences of this runoff to the river water?

4. In some high mountains regions, especially on coastal forests polluted air results in fog with a low (acidic) pH. What might be the consequences to the trees as well as the creeks as the fog passes through the ecosystem?