

Acidity changes of a watercourse with Cobra SMARTsense



Biology

Ecology & environment

Water analysis



Difficulty level

easy



Group size

2



Preparation time

10 minutes



Execution time

45+ minutes

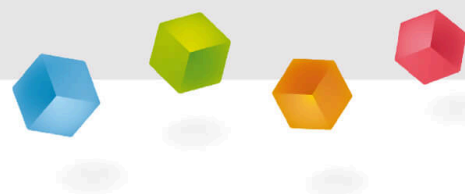
This content can also be found online at:



<https://www.curriculab.de/c/5f4452455eef7d00031fcaf8>

PHYWE

Teacher information



Application

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The pH value (a measure of the concentration of hydrogen ions) in a flowing body of water depends on the geological conditions, the input from agricultural use and plant activity. This experiment investigates how the pH value of a stream changes even over a short distance and a few kilometres from the source.

Other teacher information (1/3)

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Prior knowledge



The pH value is the negative decadic logarithm of the hydrogen ion activity. A pH value <7 is called acidic pH, a value >7 is called basic pH. A pH value of 7 is called neutral.

Scientific principle



The students are to use the "Cobra SMARTsense pH" pH sensor to measure the pH value of a body of water at different points.

Other teacher information (2/3)

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Learning objective



The students should recognize that the pH value of a water body can change due to various influences even over short distances.

Tasks

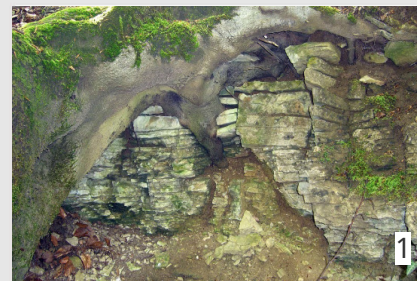


The students are to use the "Sensor Cobra SMARTsense pH" to measure the pH value of any water body at different points.

Other teacher information (3/3)

Influence on the pH value

- If the water flows through e.g. shell limestone at a measuring point (see Figure 1), the water will have a rather high pH value.
- Plant activity has a rather small influence on the pH value, even if this results in carbonic acid (Figure 2).
- Surface water can have a low, slightly acidic pH value. This is due to rain, which is combined with the CO_2 to carbon dioxide.



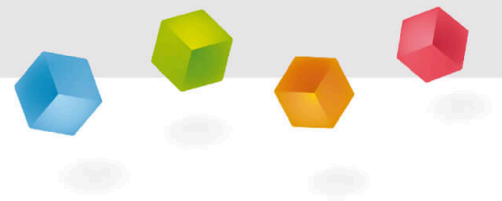
Safety instructions

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- While long-term storage of pH electrodes is best in 3 M KCL solution, the electrode for field measurement can be stored in a protective sleeve in tap water for a short time.
- Under no circumstances store in distilled water.
- Never allow the pH electrode to dry out.
- If absolute pH values are to be recorded, the pH electrode should first be calibrated, e.g. with buffer tablets pH 4 and buffer tablets pH 10.
- The general instructions for safe experimentation in science lessons apply to this experiment.

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Student Information

Motivation

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This experiment shows how different the pH value of water can be in a single body of water. Take a close look at the surroundings of the water during the measurement: Why could the pH be different here than at the other measuring stations?

Tasks

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Use the "Cobra SMARTsense pH Sensor" to measure the pH value at various points in a body of water (e.g. a small stream) and note the values. Look at the changes you can see in the course of the watercourse and think about the influences that could have led to a change in the pH value at the individual points.

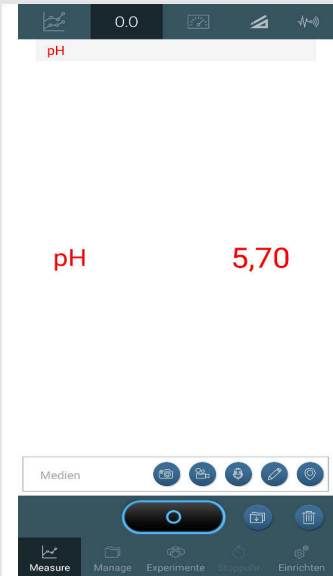


Equipment

Position	Material	Item No.	Quantity
1	Cobra SMARTsense - pH, 0 ... 14 (Bluetooth)	12921-00	1
2	Buffer solution tablets pH4, 100	30281-10	1
3	Buffer solution tablets pH10, 100	30283-10	1
4	Beaker, 250 ml, plastic (PP)	36013-01	2
5	Wash bottle, plastic, 500 ml	33931-00	1
6	Water, distilled 5 l	31246-81	1
7	measureAPP - the free measurement software for all devices and operating systems	14581-61	1

Set-up

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Structure of the experiment

- Make sure that Bluetooth is enabled on the mobile device.
- Turn on the Cobra SMARTsense pH sensor by pressing the power button.
- Open the PHYWE measureAPP and select the sensor "pH".

Procedure

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Performing the measurement

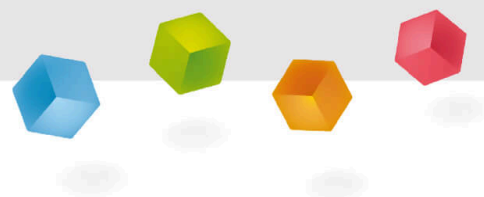
- Hold the pH probe in the water to be investigated.
- Note the pH value displayed in the measureAPP
- Look around you: What external influences could have caused the pH value to be different here than in the other places?



Calcareous subsoils (here: Muschelkalk) can have a great influence on the pH value.

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Report



Task 1

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Which statements are correct?

- ☐ Rainwater influences the pH value in a more alkaline direction.
- ☐ Muschelkalk influences the pH-value in a more basic direction.
- ☐ Muschelkalk influences the pH value in a rather acidic direction.
- ☐ Rainwater can be combined with the CO_2 to carbon dioxide (H_2CO_3) react.
- ☐ Rainwater influences the pH value in a rather acidic direction.

✓ Check

Task 2

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Drag the words to the right place

The pH value is a measure of the concentration of . It depends on various conditions:

use, activity, conditions.

While plant growth often has only a influence on the pH, fertilizer input and shell limestone can have a influence on the pH.

greater

plant

hydrogen ions

low

geological

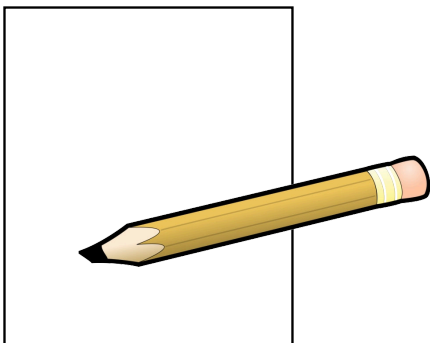
agricultural

☒ Check

Task 3

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Create a protocol, whereby photos and GPS data are useful in addition to the measured values and note the different pH values you measured. Think about which external influence could have led to a change and note it down next to the corresponding values. Now compare the values and reasons with your classmates. Do you come to the same results and can you draw the same conclusions?



Slide	Score / Total
Slide 14: pH value statements	0/3
Slide 15: Gap text pH	0/6

Total amount  ★ 0/9

 Solutions

 Repeat