Acidity changes of a watercourse with Cobra SMARTsense

Biology | Ecology & environment | Water analysis

Difficulty level	Group size	Preparation time	Execution time
easy	2	10 minutes	45+ minutes

This content can also be found online at:

http://localhost:1337/c/5f4452455eef7d00031fcaf8

PHYWE

Teacher information

Application

PHYWE

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.

PHYWE

Robert-Bosch-Breite 10
37079 Göttingen

Tel.: 0551 604 - 0
Fax: 0551 604 - 107

info@phywe.de
www.phywe.de

Other teacher information (1/3)

PHYWE

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.

PHYWE

Robert-Bosch-Breite 10
37079 Göttingen

Tel.: 0551 604 - 0
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info@phywe.de
www.phywe.de

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

- 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.

Robert-Bosch-Breite 10
37079 Göttingen
Tel.: 0551 604 - 0
Fax: 0551 604 - 107
info@phywe.de
www.phywe.de

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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?

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Robert-Bosch-Breite 10
37079 Göttingen

Tel.: 0551 604 - 0
Fax: 0551 604 - 107

info@phywe.de
www.phywe.de

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.

PHYWE

Robert-Bosch-Breite 10
37079 Göttingen

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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

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Robert-Bosch-Breite 10
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Set-up

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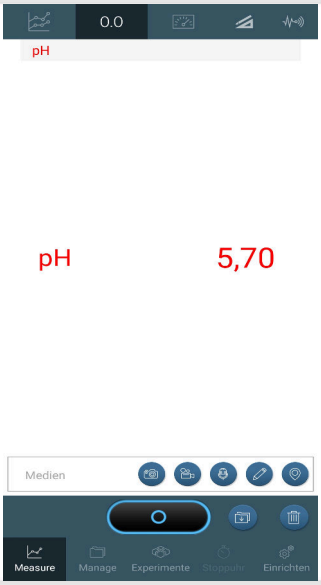

Structure of the experiment

- 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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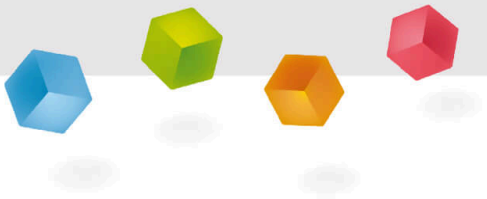

Report

Task 1

PHYWE

Which statements are correct?

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

Check

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Robert-Bosch-Breite 10
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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.

agricultural
geological
plant
greater
low
hydrogen ions

Check

Task 3

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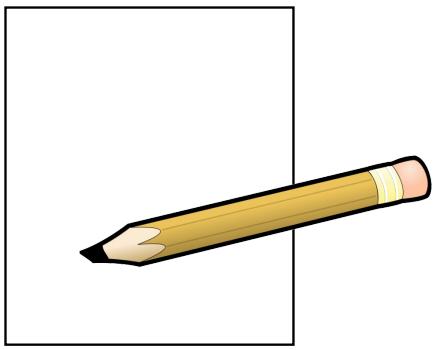
Create a protocol, whereby photos and GPS data are useful in addition to the measured values and note the different pH values you measured. Think about which external influence could have led to a change and note it down next to the corresponding values. Now compare the values and reasons with your classmates.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



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

Total amount 0 / 9

Solutions Repeat

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