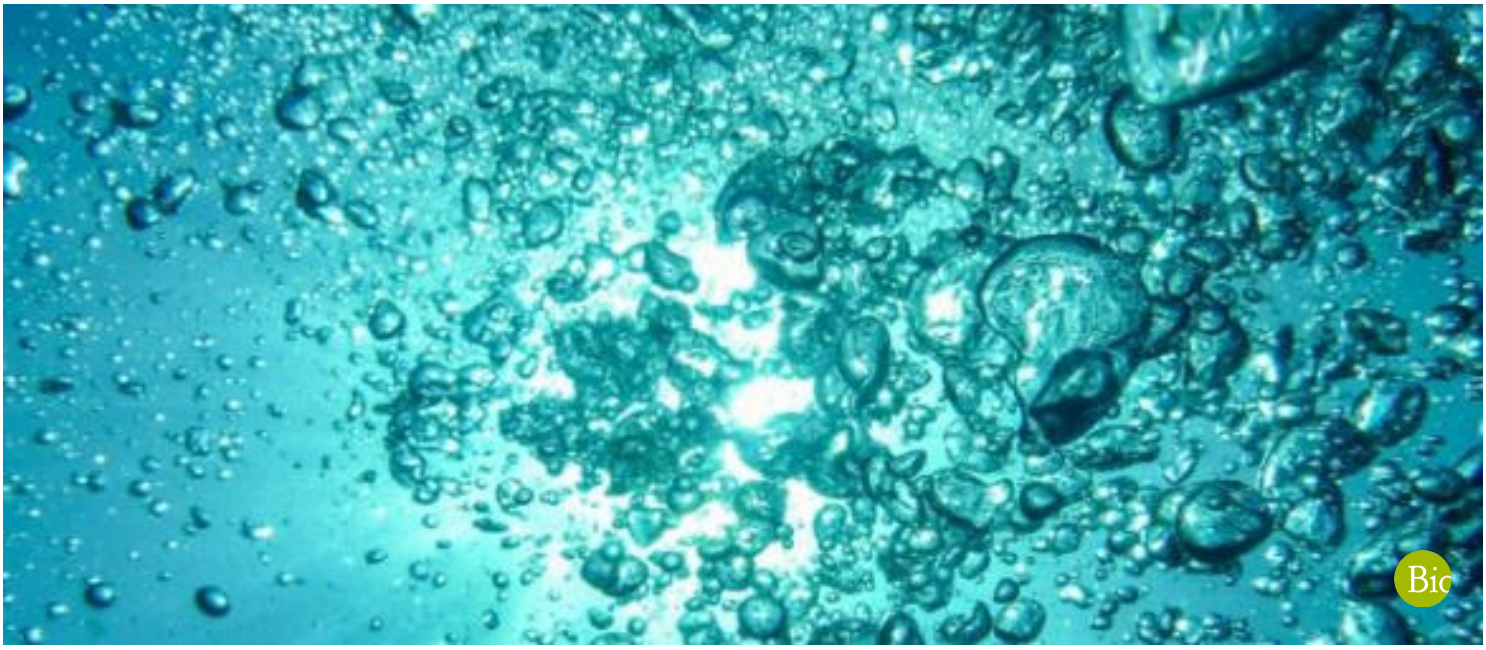
Importance of oxygen for animals in waters with Cobra SMARTsense



Biology | Ecology & environment | Water analysis

Difficulty level	Group size	Preparation time	Execution time
easy	2	10 minutes	20 minutes

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Teacher information

Application

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Oxygen plays a vital role for us humans and all other land animals. But also in water the oxygen content is responsible for the life existing today. In this experiment the students learn to measure the oxygen content of water and what influence, for example, the temperature has on it.

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Other teacher information (1/3)

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Prior knowledge

Oxygen is one of the most common elements on earth. The air we breathe consists of 21% oxygen. It is vital for all animals and most plants, but in too high concentrations it is often toxic. Students should be familiar with the principles of human respiration and photosynthesis, as well as the solubility of gases in water.

Scientific principle

Water can have different oxygen concentrations in different states. This will be demonstrated in this experiment.

Other teacher information (2/3)

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Learning objective

The students should recognize that the oxygen content is influenced by the temperature, but also by the plants present in the water.

Tasks

Students should use the Cobra SMARTsense Oxygen Sensor to measure the oxygen content of tap water, stale water, refrigerator cold water, hot water and water with a stem of water plague (*Elodea canadensis*) measure.

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Other teacher information (3/3)

Oxygen content in water

- The solubility of oxygen in water decreases with increasing temperature.
- Saturation value at 0°C 14.6 mg/l; at 20°C 9.1 mg/l
- Fish require at least 4 mg oxygen per litre of water.
- Aquatic plants produce oxygen by photosynthesis and need carbon dioxide for this.
- The oxygen content fluctuates between day and night.
- Both aerobic and anaerobic metabolic processes take place in water. Oxygen is essential for the aerobic processes.

Safety instructions

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- The general instructions for safe experimentation in science teaching apply to this experiment.

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Student Information

Motivation

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Oxygen determines all our lives, both on land and in the water. While we humans have to carry oxygen with us in the form of a compressed gas cylinder in order to breathe under water, aquatic life can filter this oxygen directly from the water. While we humans get along very well with an oxygen content of 21% in the air we breathe, fish in water need an oxygen content of only 4 mg/l - that is only about 0.0004%!

The oxygen content is influenced by various factors. In this experiment you will learn about the most important ones.

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Tasks

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Cobra SMARTsense Oxygen

Measure the oxygen level of:

- Tap water
- cool water
- warm water
- Water with a stem of water plague (let it stand for one night)
- stagnant water without water plague (let it stand for one night)

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Equipment

Position	Material	Item No.	Quantity
1	Cobra SMARTsense - Oxygen, 0 ... 20 mg/l (Bluetooth + USB)	12933-01	1
2	measureAPP - the free measurement software for all devices and operating systems	14581-61	1

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Set-up (1/2)

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The Cobra SMARTsense and measureAPP are required to measure the oxygen content. The app can be downloaded free of charge from the App Store - QR codes see below. Check whether Bluetooth is activated on your device (tablet, smartphone).

measureAPP for Android

measureAPP for iOS

measureAPP for Windows

Set-up (2/2)

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Structure of the experiment

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

Water plants have a positive influence on the oxygen content in the water

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Procedure

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Performing the measurement

- The measured values are obtained by immersing the sensor in the respective water sample.
- Hold the probe of the value you want to measure in the respective water.
- Read the value in the PHYWE measureAPP and enter it into a table in your handwritten log.
- Do not forget to clean the probes after each measurement to obtain accurate results.

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Report

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Task 1

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Select the correct statements.

- [ ] The oxygen content is reduced by the existing aquatic plant, as aquatic plants are not able to carry out photosynthesis.
- [ ] The oxygen content of warm water is higher than of cold water.
- [ ] The oxygen content of cold water is higher than that of warm water.
- [ ] The oxygen content is increased by the existing aquatic plant, as it carries out photosynthesis.

Check

Task 2

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Fish require an oxygen concentration of at least 4 mg/l.

○ True ○ Wrong

Check

There is far less oxygen in deeper water than in higher water, even if the temperature is lower there.

○ True ○ Wrong

Check

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Task 3

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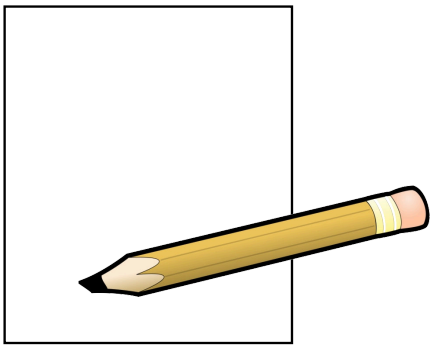
Compare the different values you measured, which you entered in a table and discuss their meaning in class.



Slide	Score / Total
Slide 15: Oxygen content	0/2
Slide 16: Multiple tasks	0/2

Total amount 0/4

Solutions Repeat

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