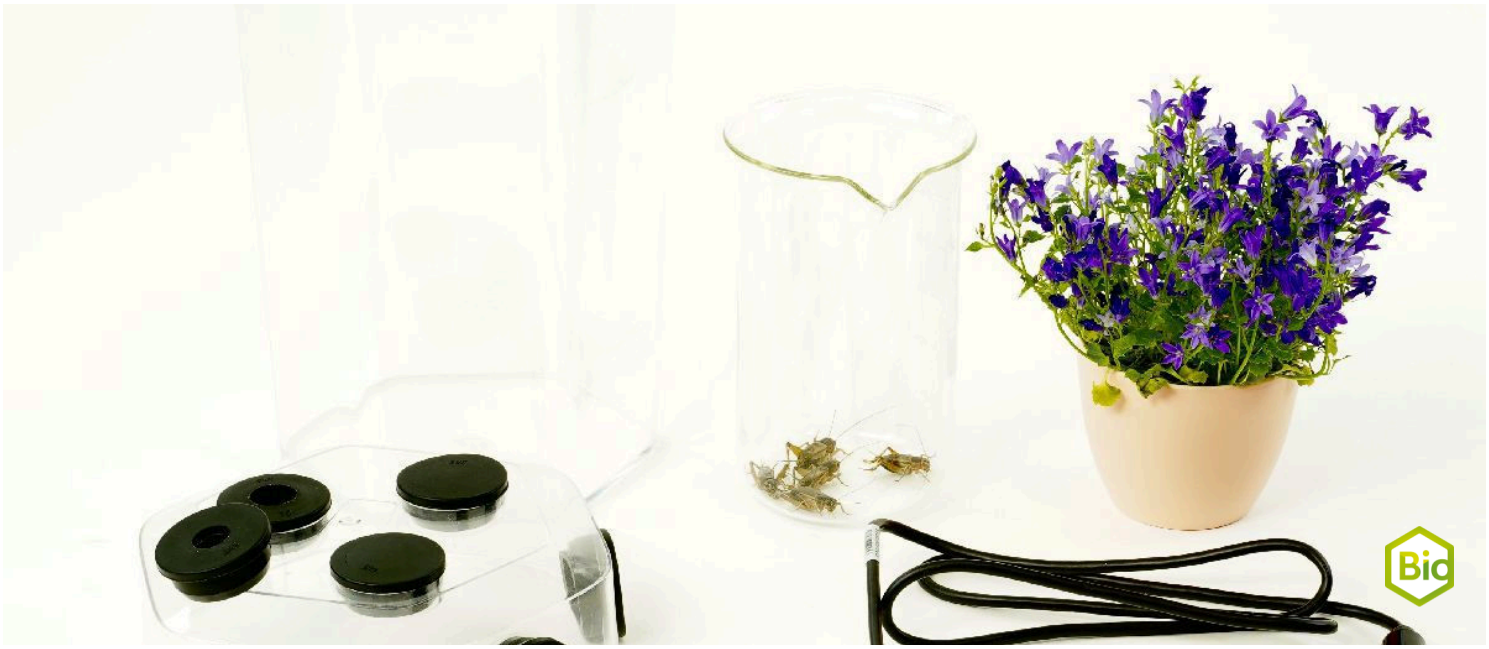
Interaction between plants and animals with Cobra SMARTsense



Biology > Animal Physiology / Zoology > General animal physiology

Difficulty level	Group size	Preparation time	Execution time
medium	2	20 minutes	30 minutes

This content can also be found online at:

http://localhost:1337/c/5f6818c6e5cabf00039728a3

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General Information

Application

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Experimental set-up with test animals and test plant

There was a time over 3 billion years ago when there was little or no oxygen in the earthly atmosphere. This changed with the advent of green plants, in the form of cyanobacteria, or blue-green algae. After a relatively short time, the oxygen content was at about the level we know today, but most of the unicellular organisms that existed until then died out because oxygen was toxic to them. As a result, organisms that consume oxygen developed. Some scientists even assume that without the high O_2-content had never existed in multicellular organisms.

Now it is like this: plants produce O_2Animals in turn consume it. This interaction in the cycle of matter is investigated in the following experiment.

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Other teacher information (1/2)

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Prior knowledge

Plants absorb carbon dioxide (CO_2) and give oxygen (O_2) off. Animals breathe O_2 and CO_2 off.

Scientific principle

This experiment shows how plants can produce O_2 and CO_2 and, like animals, absorb O_2 and absorb CO_2 ...to give.

Other teacher information (2/2)

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Learning objective

The aim of this experiment is to show pupils and students the material cycle of O_2 and CO_2 ...to bring it closer.

Tasks

The pupils and students should in this experiment:

- The O_2-content in the reaction vessel with plants and animals.
- The O_2-content in the reaction vessel with animals and observe.
- The O_2-content in the reaction vessel with plants and observe.

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Safety instructions

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

Select laboratory animals that do not misuse the test plant as fodder plant.

Theory

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Plants absorb carbon dioxide (CO_2) from the air and convert this with water to oxygen (O_2) and dextrose. This process is called photosynthesis and takes place in the chloroplasts of the plant cells. The plants use sunlight to convert a very low-energy substance, such as $CO_2$to produce an energy-rich substance, in this case glucose.

From the air, animals take O_2 which then travels via the blood vessels to all cells in the body. They then release CO_2which is returned from the blood to the lungs. In insects, the respiratory organs are called tracheas, which are holes in the carapace that branch out more and more finely and thus transport the oxygen into the entire body. During this process, the CO_2 ...to be returned. This process is controlled by contraction and expansion of the insect carapace, similar to the expansion of the chest when breathing. The process by which cells O_2 with glucose or other energy-rich substances to form water and CO_2 and release it again is called cell respiration. Contrary to common belief, plants also breathe cells. In all living organisms this takes place in the mitochondria of the cell.

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Equipment

Position	Material	Item No.	Quantity
1	Cobra SMARTsense - Oxygen, 0 ... 20 mg/l (Bluetooth + USB)	12933-01	1
2	Photosynthesis Experiment Chamber, 29 cm (11.4"), fits the Cobra SMARTsense sensors	64837-00	1
3	Beaker, Borosilicate, tall form, 400 ml	46028-00	1
4	measureAPP - the free measurement software for all devices and operating systems	14581-61	1

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Structure and implementation

Set-up (1/2)

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For measurement with the **Cobra SMARTsense sensors** the **PHYWE measureAPP** is required. The app can be downloaded free of charge from the relevant app store (see below for QR codes). Before starting the app, please check that on your device (smartphone, tablet, desktop PC) **Bluetooth** is **activated**.

iOS

Android

Windows

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Set-up (2/2)

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Test materials

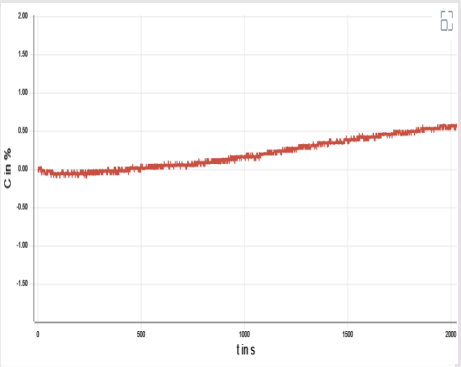
First, the laboratory animal(s) are placed in the reaction chamber. This is then sealed airtight. The oxygen measuring device is inserted into the chamber through the rubber plug provided. Now the measurement can be performed. This is carried out again for plant and animals, and then only for the plant. The separate measurements are necessary to get one dimension of how much O_2 that produce plants and absorb animals.

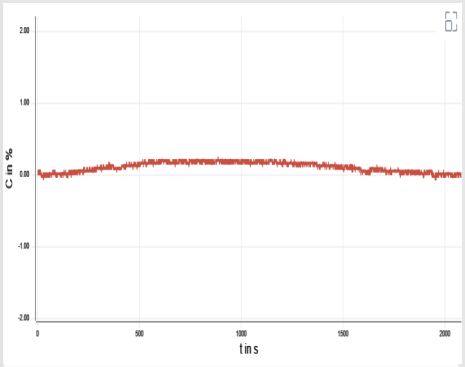
For the measurement the sensor is connected to the laptop or mobile device. In the measureAPP air should be selected as medium and a continuous measurement. It is recommended to set the sensor to zero. The measurements should last at least 30 minutes, but in any case they should be about the same length for all three measurements.

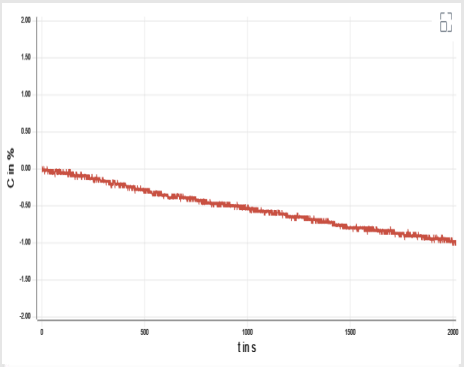
Procedure

When the measurements are completed, the results should look something like the pictures below. Left the single measurement with the plant, right the single measurement with 20 steppe crickets and in the middle the measurement with animals and the plant.

The test is also suitable for quantitative measurements, provided the chamber is well sealed.







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Report (1/3)

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fossilized ferns

Why did so many unicellular organisms die out about 2.4 billion years ago?

- Because of a meteorite impact.
- Because the oxygen content of the atmosphere rose rapidly in a short period of time
- They were eaten by plants
- Due to a severe climate change

Report (2/3)

Only animals do cellular respiration.

○ True ○ False

Check

Only plants carry out photosynthesis.

○ True ○ False

Check

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Report (2/3)

PHYWE

Only animals do cellular respiration.

○ True ○ False

Check

Only plants carry out photosynthesis.

○ True ○ False

Check

Report (3/3)

PHYWE

Drag the right word into the right field

During _____, _____ to carbon dioxide and water. This process takes place in the _____.
In _____ oxygen and glucose are produced by the reaction of _____ and carbon dioxide. This process takes place in the _____.

photosynthesis
mitochondria
chloroplasts
water
cellular respiration
oxygen is converted with glucose

Check

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