Prerequisites for photosynthesis

Biology | Plant Physiology / Botany | Photosynthesis

Difficulty level	Group size	Preparation time	Execution time
easy	1	10 minutes	10 minutes

This content can also be found online at:

http://localhost:1337/c/61276a0b870bca000351fa57

PHYWE

Teacher information

Application

PHYWE

Test setup

Photosynthesis (assimilation of CO_2) can be described as the ability of plants to produce organic substances from carbon dioxide and water with the help of light. Sugar and starch are produced through many intermediate steps. Photosynthesis is the most important biochemical process on earth because it provides plants with basic structural and energy components. Without it, life and growth would not be possible. Organisms that cannot perform photosynthesis themselves live directly or indirectly from the assimilation of green plants. Life in its present form is only possible through photosynthesis.

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Other teacher information (1/2)

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Prior knowledge

Students should already be familiar with the biological and chemical processes of photosynthesis.

Scientific Principle

Photosynthesis is the most important biochemical process on earth, as it provides plants with basic structural and energetic components.

Other teacher information (2/2)

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Learning objective

Students should identify how photosynthesis is related to starch formation.

Tasks

Students should investigate what conditions must be met for a plant to produce starch.

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Safety instructions

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- Ethanol is highly flammable.
- The general instructions for safe experimentation in science lessons to be applied to this experiment.
- For the H- and P-phrases please refer to the corresponding safety data sheets.

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Student Information

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Motivation

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Test setup

Photosynthesis (assimilation of CO_2) can be described as the ability of plants to produce organic substances from carbon dioxide and water with the help of light. Sugar and starch are produced through many intermediate steps. Photosynthesis is the most important biochemical process on earth because it provides plants with basic structural and energy components. Without it, life and growth would not be possible. Organisms that cannot perform photosynthesis themselves live directly or indirectly from the assimilation of green plants. Life in its present form is only possible through photosynthesis.

Tasks

What does a plant need to produce starch?

Using the nasturtium shown on the left, investigate the conditions that must be met for a plant to produce starch.

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Equipment

Position	Material	Item No.	Quantity
1	Support base, variable	02001-00	1
2	Support rod, l = 600 mm, d = 10 mm, split in 2 rods with screw threads	02035-00	1
3	Wire gauze with ceramic, 160 x 160 mm	33287-01	1
4	Beaker, Borosilicate, tall form, 100 ml	46026-00	1
5	Graduated pipette 10 ml	36600-00	1
6	Graduated cylinder 100 ml, PP transparent	36629-01	1
7	Support ring, i.d. 130mm,w.boss	37722-03	1
8	Bottle, narrow mouth, 100ml, clear	41101-01	1
9	Pipettor,bulb,3 valves, 10ml max.	47127-01	1
10	Tweezers,straight,pointed,120mm	64607-00	1
11	Scissors,straight,pointed,l 110mm	64623-00	1
12	Petri dish, d 100 mm	64705-00	1
13	Water, distilled 5 l	31246-81	1
14	Iodine potass.iodide sol., 250 ml	30094-25	1
15	Denaturated alcohol (spirit for burning), 1000 ml	31150-70	1
16	Butane burner, Labogaz 206 type	32178-00	1
17	Butane cartridge C206, without valve, 190 g	47535-01	1

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Set-up

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- In the evening, attach four 30 mm diameter cork discs in pairs to two leaves of a well-developed nasturtium using pins (Fig. 1).
- Make sure that the two discs are exactly opposite each other on the upper and lower side of the leaves (Fig. 2).
- Place the plants the next morning in as bright a place as possible, preferably so that the partially darkened leaves are directly hit by the sun for some time. If this is not possible, expose them to light with an incandescent lamp. After 3 - 4 hours, heat water in a beaker of 100 ml capacity until boiling, using the tripod base, the tripod rod, the tripod ring and the wire net.


1


2

Procedure

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- Separate the partially darkened leaves from the plant and throw them into the boiling water to kill them. Remove the leaves with tweezers after about one minute and place them in a 100 mm diameter Petri dish containing 96% ethyl alcohol (ethanol).
- After 1 - 2 hours the leaves have become almost colourless. Rinse them with water (picture on the right) and pour iodine-potassium iodide solution according to LUGOL over them in a Petri dish of 100 ml diameter.

Rinse the leaves with water

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Report

Task 1

Drag the words to the right place.

Photosynthesis can be described as the ability of _____ to produce organic matter from carbon dioxide and water using _____. Sugars and _____ are produced by many intermediate steps. Photosynthesis is the most important _____ process on Earth because it provides plants with basic structural and energy components. Without it, _____ and growth would not be possible.

light
life
biochemical
starch
plants

Check

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Task 2

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Choose the correct statements.

- [ ] Starch is detected by the LUGOL solution (blue-violet coloration). The part of the leaf which was not covered by the cork discs is discolored.
- [ ] Starch is detected by the iodine-potassium iodide solution according to LUGOL (blue-violet coloration). The part of the leaf which was covered by the cork discs is discolored.
- [ ] The LUGOL solution is an iodine-potassium iodide solution.

Check

Task 3

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Choose the correct statements.

- [ ] By destroying the membrane, the green pigment, chlorophyll, enters the ethanol when the leaves are transferred there after boiling.
- [ ] Immersion of plant leaves in boiling water causes membrane destruction.
- [ ] Immersing the plant leaves in boiling water makes them durable. They thus retain their colour even when immersed in ethanol.

Check

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Slide	Score / Total
Slide 13: Photosynthesis	0/5
Slide 14: Solutions	0/2
Slide 15: Dipping the plant leaves	0/2

Total 0 / 9

Solutions Repeat

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