

Photosynthesis

This guideline provides an overview of the content and didactic context of the media in the “Photosynthesis” media package.

1 Introduction to teaching this topic

1.1 Motivation for the topic

Photosynthesis is one of the most important metabolic processes in plants. It produces the largest proportion of the oxygen in our atmosphere, without which we could not survive.

This media in the media package provide a suitable way of acquainting students with the principle and the chemical process of photosynthesis. The media can used in chemistry and biology classes for the most part starting from grade 7.

1.2 Media selection

The “Photosynthesis” media package contains 13 media:

- One photo: Tree
- Three interactive graphics: General equation of photosynthesis, Photosynthesis – Principle (interactive), Photosynthesis – The components involved
- One animation: Photosynthesis – Principle
- One text document: Photosynthesis (information sheet)
- Two interactive exercises: Photosynthesis (cloze test), Photosynthesis – The components involved (matching exercise)
- One link: Experiments on photosynthesis
- One link list with links to information sheets and experiments
- One guideline for teachers
- Two video clips: Photosynthesis – An overview and Stomata, hair cells, and xylem

1.3 Background information for teachers

The media can be combined in various ways in terms of content and teaching method, depending on the focus of the class.

It is recommended that teachers work through the topic in the following steps:

- Introduction/motivation: Where does photosynthesis take place?
- Teaching phase: The principle of photosynthesis
- Practical work phase: Chemical reactions
Reaction equation – General equation
- Further study phase
Theory – exercises – experiments

Note: The button for calling up each medium is also indicated in the following list of media.

2 Introduction/motivation: Where does photosynthesis take place?

Photosynthesis occurs everywhere in nature except in extremely arid regions with little vegetation. It takes place in all green parts of the plant. The following medium shows a group of trees to symbolize where photosynthesis takes place. This photo also clearly illustrates how the leaves gradually change color in the fall when solar radiation decreases and fewer nutrients are available in the soil.

Medium Photo "Tree"

3 Teaching phase: The principle of photosynthesis

Now that the students know that photosynthesis takes place in the green parts of plants, the principle of photosynthesis can be explained graphically. Sunlight and green chlorophyll provide the necessary energy for the process to run. During the process, the carbon dioxide in the air and the water stored in the soil are converted to oxygen and glucose. The following media are suitable as supporting media to help explain this process. Teachers have the alternative of either explaining the principle using the interactive graphic or of running the animation. The animation shows the entire process, but can be stopped by the teacher at any point by clicking "Pause". They can then add their own notes, for example, with the interactive pen.

Media Interactive graphic "Photosynthesis – principle (interactive)"
Simulation "Photosynthesis – principle"
Video "Photosynthesis – an overview"
Video "Stomata, hair cells, and xylem"

The link list contains links to other information sheets on photosynthesis.

4 Practical work phase: Chemical reactions

Working through the chemical formulas is suitable beginning from grade 9.

4.1 Reaction equation

The particles involved in photosynthesis were defined when the principle was taught. Students can now work through the reaction equation, with instruction by the teacher. The aim is to make it clear that photosynthesis takes place in two different partial reactions, the light and the dark reactions. The following medium provides a simple way to work through the topic successfully, because the individual components involved in photosynthesis (for example, carbon dioxide, water, light, chlorophyll, and oxygen) can be displayed as needed; or alternatively, the reaction equation can be labeled manually. This exercise does not yet view the equation stoichiometrically.

Medium Interactive graphic "Photosynthesis – The components involved"

4.2 General equation

Light and dark reactions are two separate processes. For the light reaction, the plant needs (sun) light in order to split water molecules. (Note: Chlorophyll helps here by raising the released electrons to a higher energy level). The dark reaction, which takes place immediately afterwards, uses the energy-rich substances ATP and NADPH to transfer electrons. In the process, carbon dioxide is converted into glucose. Students will become acquainted here with the chemical equation and its stoichiometric balance. For this purpose, a table can be filled in with the two reaction equations either interactively or by hand.

Medium Interactive graphic "General equation of photosynthesis"

5 Further study phase

5.1 Theory

The information sheet and the website are suitable for further study on the topic, and can be given to students as homework or can be used as the basis for a presentation.

Medium Information sheet “Photosynthesis”

5.2 Exercises

The two interactive exercises are suitable for testing students’ level of knowledge. They can be used at the end of the lesson as an aid to memorization of the material that has just been learned, or for review at the beginning of the next lesson.

Students can work through the exercise themselves on the interactive whiteboard. The “Photosynthesis” cloze test can be filled in by hand or by dragging and dropping.

Media Matching exercise “Photosynthesis – The components involved (matching exercise)”
Cloze test “Photosynthesis (cloze test)”

5.3 Experiments

Because the theory of photosynthesis is highly complex and is often difficult for students to understand, the selected websites offer experimentation instructions with numerous possibilities for practical, real-world-oriented teaching and, in some cases, with interdisciplinary applications. Since there are a very large number of experiments available, we recommend visiting the links in advance and selecting individual experiments.

Medium Source of information “Experiments on photosynthesis”

The link list contains links to other experiments on photosynthesis.