



MODULE 7

The photosynthesis equation

TIMING

1 hour

MATERIALS

Magnetic symbols to attach to the board (see Media Gallery)
Photocopies of sheet E13

KEY WORDS

Light
Carbon dioxide
Water
Glucose
Starch
Oxygen
Plant growth

CROSS CURRICULAR ACTIVITY

Art

Overview

Photosynthesis is the process by which plants produce sugars and release oxygen as a by-product. Using the sugars and tiny quantities of soil nutrients, plants make all building materials they need for wood, stems, leaves, flowers, seeds and roots. In this module children discuss what plants need to produce sugars and oxygen. It is important that children complete this module before going on to Modules 8 and 9.

Aims

To understand the final products of photosynthesis.

To understand the role of the leaves and chlorophyll in photosynthesis.

To understand that through photosynthesis and tiny amounts of soil nutrients, plants synthesise all the structures needed for plant growth.

Teaching sequence

1. Draw a plant on the board or use magnetic symbols (see Figure 5 below and Media Gallery Experiments about plant growth M7 Photosynthesis equation symbols). Ask children what plants need in order to grow and how plants obtain these resources. Write their ideas on the board.
2. It is possible to use the analogy of a 'food factory' to explain the process of photosynthesis. The first step is that the plant produces sugars in their 'food factories' (mainly leaves) using various ingredients.
3. Water is transported to the 'food factory' via the roots and vascular bundles (tube-like structures e.g. see a cross section of celery stalk). Carbon dioxide is absorbed through the stomata (pores in the leaves). The energy for the 'factory' comes from the sun. The plant produces sugars in this 'factory' and oxygen as a by-product. To summarise as a word equation. **Water + carbon dioxide + sun's energy = sugars + oxygen.**
4. Distribute Sheet E 13 on which children write what they think Antonia needs to prepare a pizza and what Mr. Beech needs to produce sugars.
5. Add connections between sugars, soil minerals, water and plant growth to the drawing on the blackboard (Figure 5). In order to grow, plants produce sugars. But a plant isn't all sugars. Sugars are incorporated into leaves, roots, stems, flowers and other plant parts. With sugars and soil nutrients the plant synthesises everything that the plant needs to grow, e.g. new leaves, new stems, thicker bark, longer roots, seeds each year amongst others.
6. On sunny days the plants produce more sugars than they need to grow. They sometimes store the surplus sugars as starch in special storage places. These storage areas can be in the leaves, the roots, seeds, fruits or bulbs (special swollen leaf bases). Bulbs release these stores of starch in spring when the plant uses them to produce new leaves and start the photosynthesis process for another year. Draw the connection between sugars, starch and storage places in the drawing (Figure 5).
7. Children draw the figure on the blackboard in their science notebooks.
8. Children write two things they have learned.



Teacher's notes

Many children may have the misconception that plants obtain their food from the soil. Some advertisements emphasise that plants need plant food to grow well.

Plants do absorb small quantities of minerals from the soil, but this is not the main food for the plant. Plants absorb water from the soil through the roots and channel it through the vascular bundles in the stems to the leaves.

The leaves absorb carbon dioxide through the stomata and release oxygen. Leaves also play an important role in absorbing sunlight, using the green pigment, chlorophyll.

The leaves can therefore be thought of as the plants' 'food factories' and through the process of photosynthesis produce sugars which are used for growth and storage.

Chlorophyll is important, because only green plants can collect energy from the sun to manufacture the materials needed for growth. From sugars and minerals plants are able to make complex structures such as wood and leaves.

Based on many experiments, we now know how green plants produce all their structures. The plant absorbs water and minerals through the roots. Carbon dioxide is absorbed through the stomata in the leaves.

Sugars and oxygen are produced in the leaves from carbon dioxide and water using energy from the sun.

This process is called photosynthesis and requires chlorophyll. The sugars produced in the leaves are converted into starch for temporary storage because starch is not soluble in water and therefore will not diffuse.

To put it simply, turning sugar into starch stops too much water being drawn up which would cause the leaf to 'burst' or crack open. To be transported in the vascular bundles the starch is turned back into sugars. Sugars are channelled to the place where they are needed and directly used to build new structures (e.g. cellulose, wood etc).

In addition, some plants store sugar in special storage organs. For this purpose sugars are transformed into starch again (e.g. in potato tubers, roots, seeds etc). For the biochemical change of sugars into other materials (e.g. cellulose and proteins which are used for plant growth) the plants need nutrients taken from the soil via the roots (e.g. phosphorus, nitrogen etc).

There are symbols you can use in the Media Gallery Experiments about plant growth M7 Photosynthesis equation symbols.

Recipes for growth



To be healthy and to grow Antonia needs to eat.
Antonia's favourite food is pizza.

What ingredients does she need to prepare a delicious pizza?

.....

.....

.....

.....

So that Antonia stays healthy, she also eats lots of fruit and vegetables, because she knows that they contain vitamins and minerals which are also important for her growth.



To grow Mr. Beech needs sugars, which he can produce himself.

What does he need to produce these sugars?

.....

.....

.....

.....

To also stay healthy, he needs which he absorbs through his roots in

★ ★ ★ Today I learned