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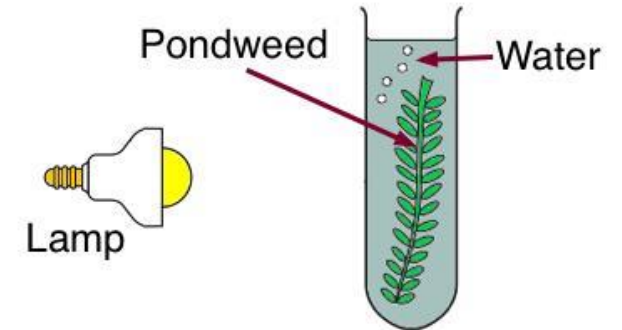
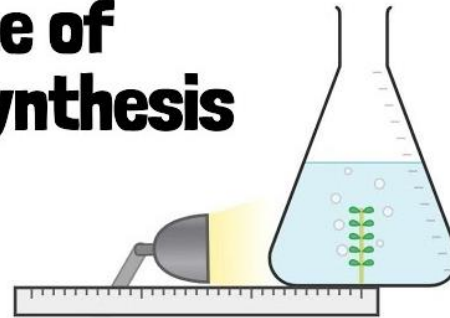
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INVESTIGATING PHOTOSYNTHESIS

Rate of Photosynthesis



Accredited by



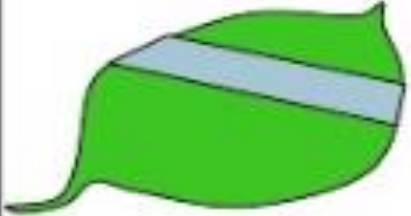

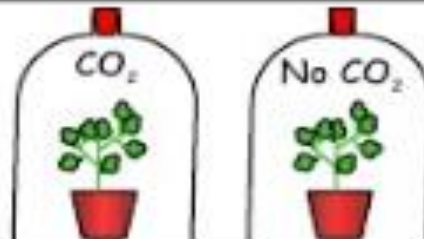
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معتمدة من

Investigating the requirements of photosynthesis/ Revision

Requirements of photosynthesis	Experiment	Result	Conclusion
Light		Uncovered areas turn blue black in the presence of iodine Covered areas turn brown in the presence of iodine	Light is required for photosynthesis
Chlorophyll		Green areas turn blue black in the presence of iodine White areas turn brown in the presence of iodine	Chlorophyll is required for photosynthesis
Carbon Dioxide		No CO_2 - brown in the presence of iodine CO_2 - Blue black	CO_2 is required for photosynthesis

13.1

Photosynthesis

Objective

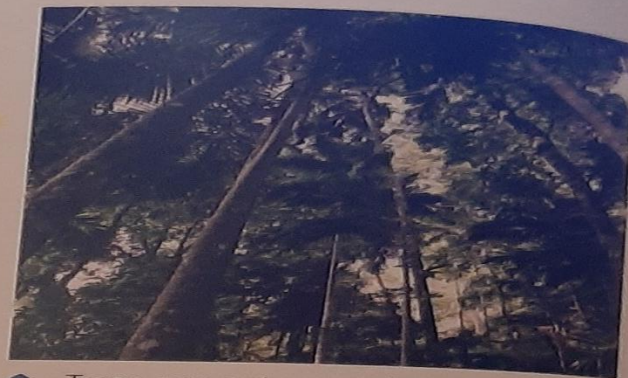
- Understand the process of photosynthesis and write the word equation

Energy

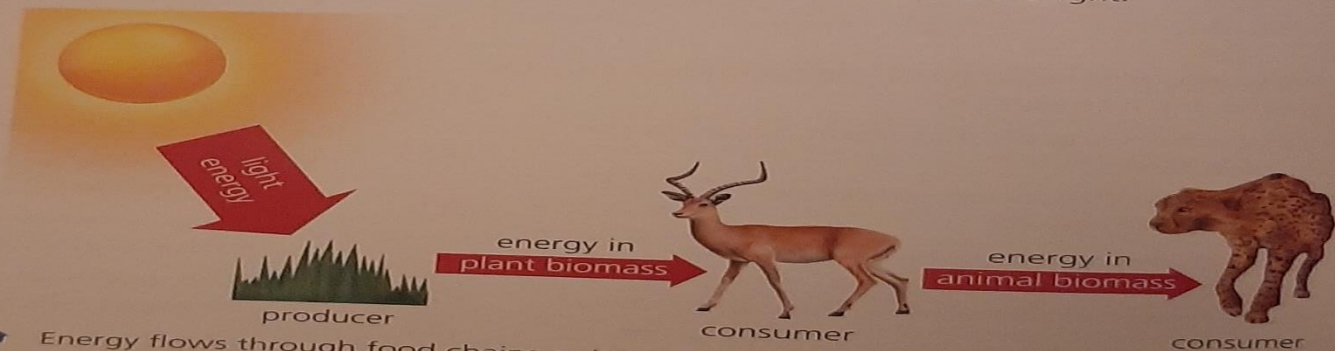
All plants need light. They use energy from light to make sugars such as glucose. Glucose stores energy. This energy can be released using respiration when the plant's cells need energy.

Plants also use glucose to build new cells. The more light energy plants absorb, the more they photosynthesise and the more their biomass increases.

Plant biomass keeps every animal alive – including us. It supplies the energy and building materials that herbivores use for growth. Then it gets passed along food chains to carnivores.



Trees can get very tall as they grow towards the light.



Energy flows through food chains as it transfers from producers to consumers.

Respiration and photosynthesis are opposite processes.

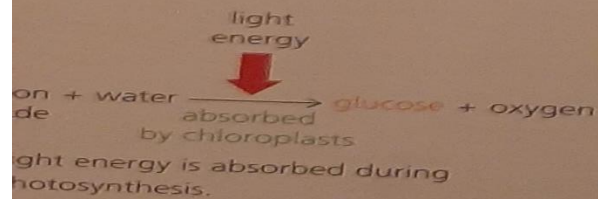
- Photosynthesis makes glucose. Respiration breaks glucose down.
- Respiration in plants and animals uses oxygen. Photosynthesis returns oxygen to the atmosphere.
- Respiration is an **exothermic** reaction – it releases energy. Photosynthesis is an **endothermic** reaction because it takes in light energy.

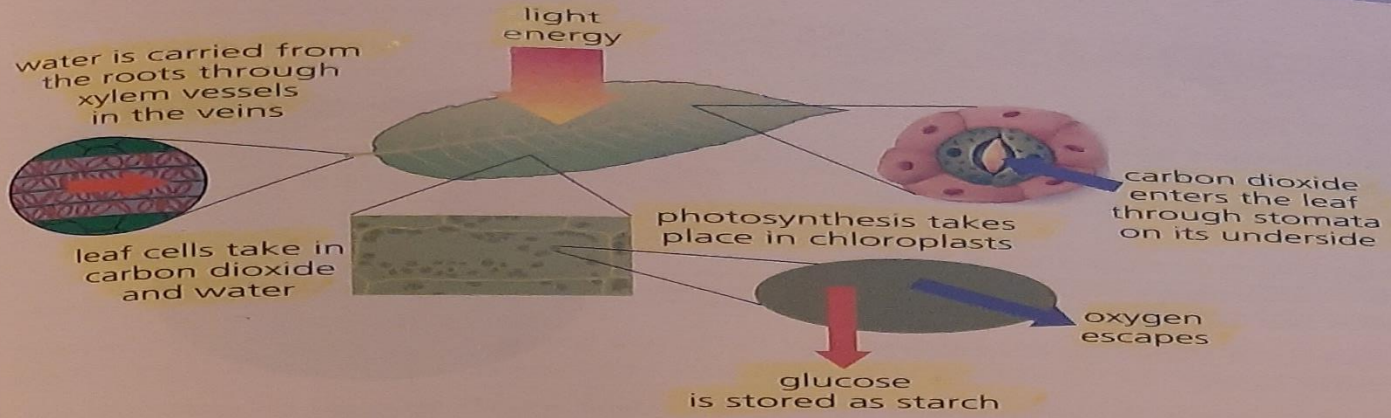
Chloroplasts

Photosynthesis takes place in **chloroplasts**, mainly in leaf cells. These cells take carbon dioxide from the air. Most leaves are very thin so gases diffuse in and out quickly. The water needed for photosynthesis is brought up from the roots in **xylem** vessels.



A beam of light made the chloroplasts in leaf cells glow.



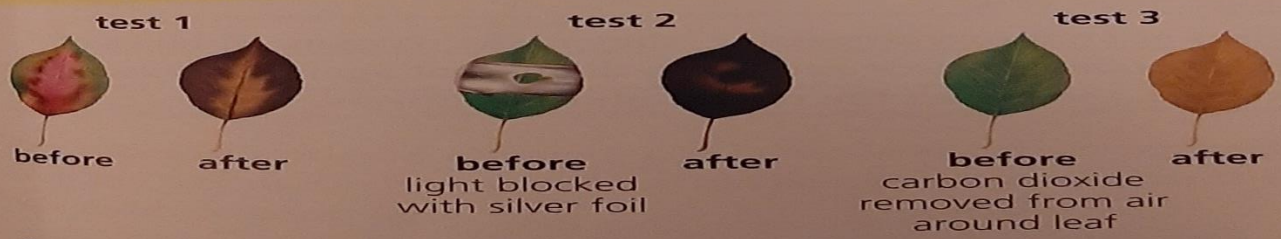


↑ Leaves are very thin so gases diffuse in and out of cells quickly.

Evidence

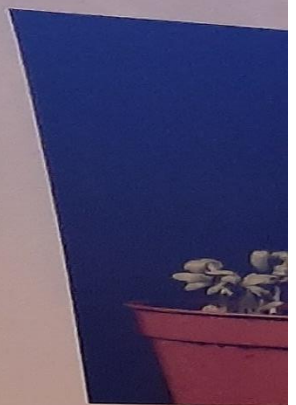
Seedlings need light. If seedlings are kept in the dark they produce tall, weak shoots and tiny yellow leaves. This growth uses up their energy supply, so the plants die after a few days. Seedlings that receive light have short sturdy stems. They use their first leaves to photosynthesise and produce the glucose they need to keep growing.

Some of the sugars made by leaf cells are moved to cells that have no chloroplasts. The sugars travel through the plant in **phloem** tubes. Other sugars are converted to starch and stored in leaves. **Iodine** can show where photosynthesis has taken place. It turns any stored starch dark blue.

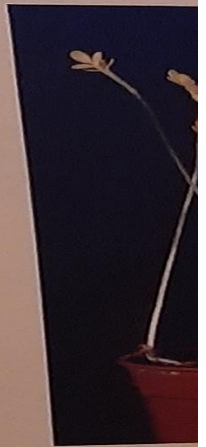


↑ If leaf cells contain starch they must have carried out photosynthesis.

- Q**
- 1 Explain why animals depend on plants to keep them alive.
 - 2 Describe how carbon dioxide and water reach the chloroplasts in leaves.
 - 3 Describe two pieces of evidence that show that plants cannot make their own food without light.
 - 4 Starch tests show where photosynthesis has taken place. What can you conclude using the evidence from test 1?
 - 5 What does the evidence from test 3 show?
 - 6 The amount of oxygen in a sample of air can be measured using an electronic sensor. How would you expect it to change around a sugar cane plant on a sunny day?



↑ Seedlings



↑ Seed

- Th
- ph
- ca
- →
- Le
- di
- W
- ro
- G
- S
- a

test 1



before



after

test 2



before

light blocked
with silver foil



after

test 3



before

carbon dioxide
removed from air
around leaf



after

↑ If leaf cells contain starch they must have carried out photosynthesis.

Page 159: Student book

Question 2: Describe how carbon dioxide and water reach the chloroplasts in leaves .

Carbon dioxide will diffuse through the stomata

Water is absorbed by the roots and transported through the xylem to the leaf

Question 4 : Starch tests show where photosynthesis has taken place .

What can you conclude using evidence from test 1 .

Test 1 shows that plants can only make their own food in the green parts of the leaves.

Conclusion :(Chlorophyll is needed for photosynthesis)

Question 5: What does the evidence from test 3 show ?

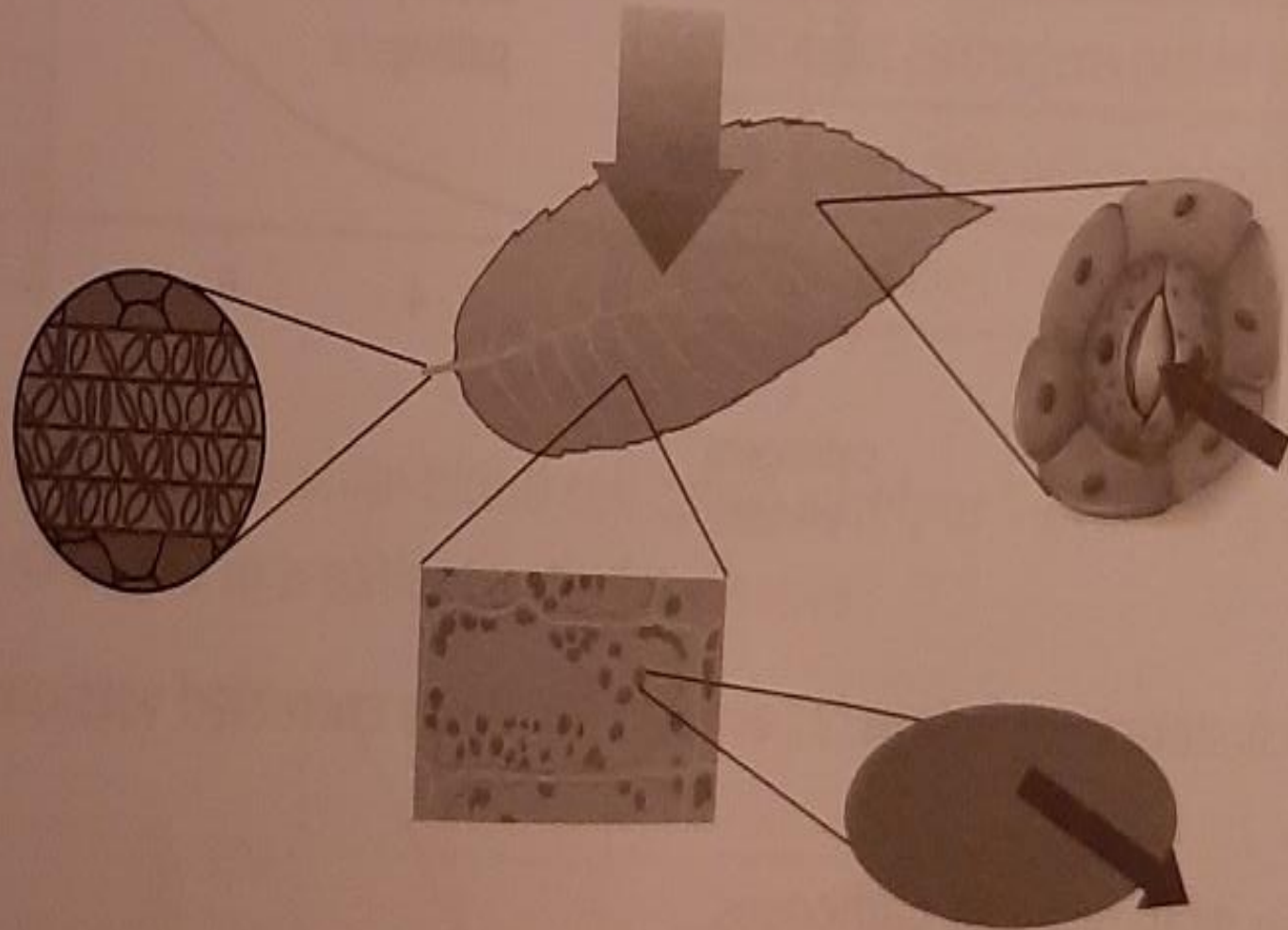
Test 3 shows that plants can only make their own food if they have carbon dioxide around their leaves .

Conclusion : (Carbon dioxide is needed for photosynthesis)

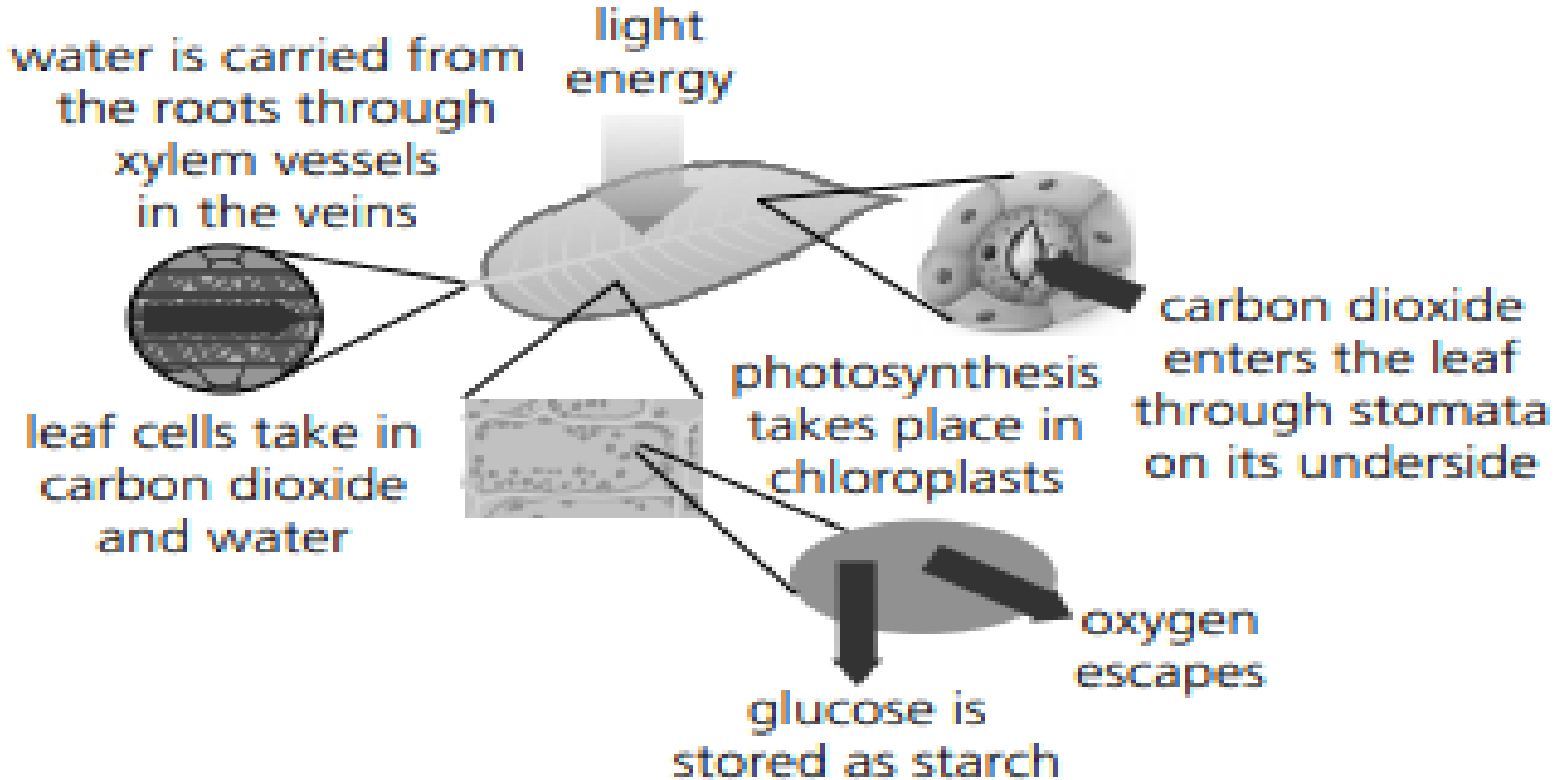
Question 6 : The amount of oxygen in a sample of air can be measured using an electronic sensor , How would you expect it to change around a sugar cane plant on a sunny day ?

The amount of oxygen will increase as more oxygen is produced by photosynthesis .

3 Add labels to the diagram below to show how water and carbon dioxide enter a leaf, where photosynthesis takes place, and what happens to the products made.



3 Labels added to the diagram as shown below.



6.3

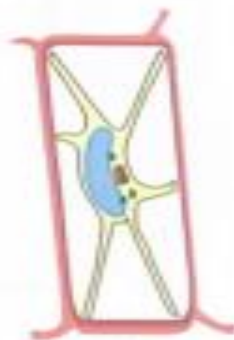
Water and minerals

Objective

- Describe how water and minerals are absorbed by roots and transported to leaves



turgid cell



flaccid cell in a plant that is short of water

- Flaccid cells are floppy so they cannot stand upright.

Why plants need water

Plants need water because their cells use water for photosynthesis, and water evaporates from their leaves. If a plant doesn't get enough water, it **wilts**. That means its leaves and stem droop because their cells cannot support themselves.

Normally each cell's vacuole pushes against its cell walls (see page 43). This keeps the cell **turgid**, which makes it firm and rigid.

If a plant can't take in enough water, each cell's vacuole shrinks. Then there's nothing to press the cytoplasm against the cell wall. The cell becomes **flaccid**. Flaccid cells are floppy, so they can't hold a plant up.

Water also carries minerals to cells. The minerals are stored in the vacuole until the cell needs them.



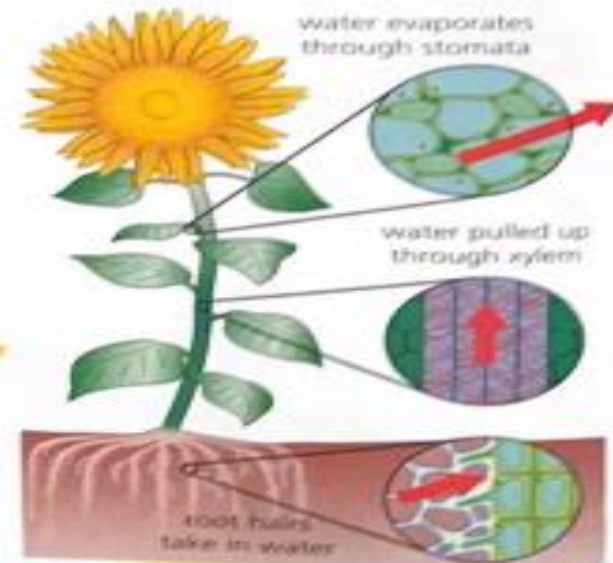
- This plant has wilted. Its cells cannot support themselves without water.

How do water and minerals enter and leave the plant?

The flow of water through a plant is called **transpiration**.

It begins when water evaporates and escapes through gaps called **stomata** on the undersides of the leaves. This pulls more water up through **xylem** vessels to replace it.

Xylem vessels are hollow tubes. They run through the stem connecting the veins in the leaves to the roots. The roots maintain the plant's water supply by absorbing it from the soil. **Root hair cells** (see page 45) give the root a very large surface area to make this easier. They also use some of the energy they get from respiration to take minerals in from the soil.



- Evaporation from the leaves makes water flow continuously from the roots to the leaves.

Controlling the flow of water



SEM of guard cells around a stomata – magnified 960 times.

Stomata can be opened and closed. Each **stoma** is surrounded by two specialised cells called **guard cells**. At night, leaves don't need to take carbon dioxide in for photosynthesis, so the stomata close. They can also close during the day if a leaf is short of water.

Guard cells have specialised cell walls that make them push each other apart when they are turgid. When they lose water and become flaccid, the gap between them closes.

Question 2 / page 89

2 The diagram on the right shows a leaf trapped between two slides. Under each slide is a piece of cobalt chloride paper. This paper turns pink when water touches it. Explain why the paper on the bottom of the leaf turns pink before the paper on the top of the leaf.

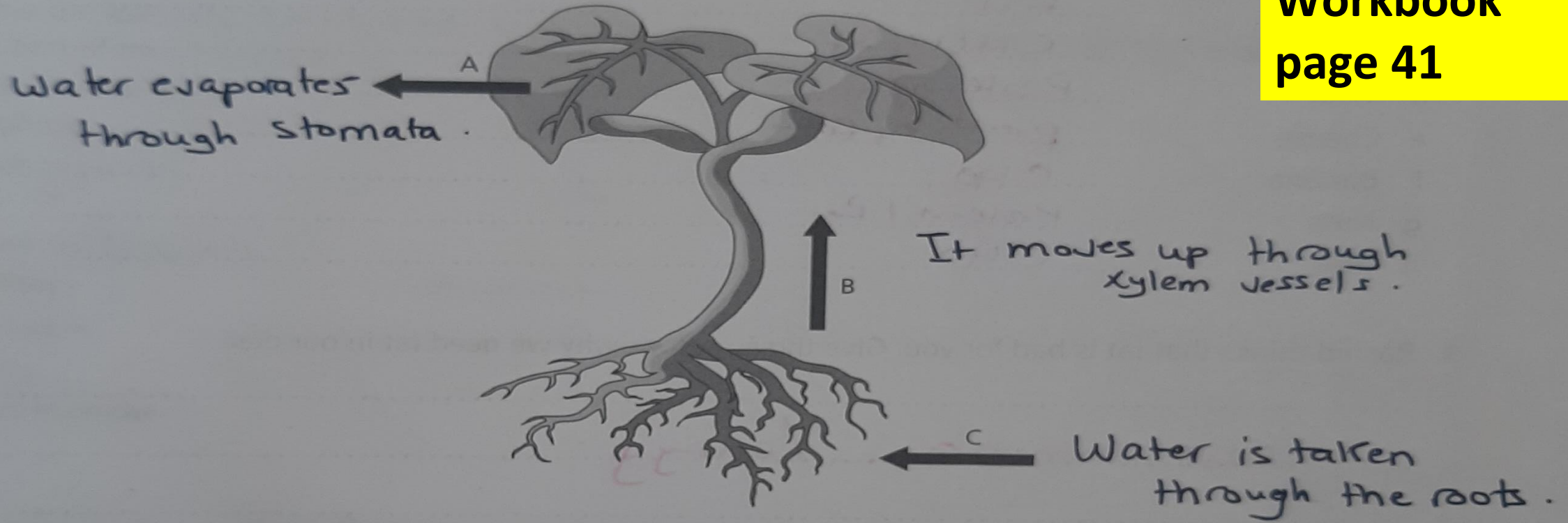


More water leaves the bottom of the leaf because this is where the stomata are.

By transpiration water will evaporate turning into water vapour that will diffuse through stomata and then it will condense forming water droplets.

2 Label the arrows on the diagram below to explain how water moves through a plant.

**Workbook
page 41**



3 Draw lines to join each observation about transpiration to the correct explanation.

Observation	Explanation
Plants continually lose water	to allow carbon dioxide to enter them
There are pores on the undersides of leaves	to help them absorb more water
Root hairs give plants a large surface area	because their stomata close
Water flows from the roots to leaves	because it evaporates from their leaves
Plants lose less water at night	because it is pulled up xylem tubes to replace the water that evaporates

Answer key /pages 90,91 questions 2,3, 4,7 and 9

Question 2 :

- a. The pondweed uses carbon dioxide for photosynthesis. Removing carbon dioxide from the solution turns the indicator purple.
- b. In the dark, respiration adds carbon dioxide to the water.

Question 3 :

- Q3.a. As the light intensity increased, the amount of dissolved oxygen increased.
- b. As the light intensity increased, the amount of dissolved carbon dioxide would decrease because more would be used for photosynthesis

Question 4 :

- a. **Oxygen gas**
- b. **Apparatus B.**
- c. **By increasing light intensity .**

Question 7 :

- a. **Palisade cell**
- b. **To absorb as much light as possible**
- c. **For respiration**
- d. **Starch grains will decrease**

Question 9 :

Q9. a. Xylem vessels (cells)

b. It carries water and soluble minerals from the roots up to the leaves.

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Thank you