

LESSON 5

Plant cells: common structures and specialised cells

1 Which of these images is showing a plant cell? Tick **1** correct answer



2 Which part of the plant absorbs water and minerals? Tick **1** correct answer

- leaves
- stem
- roots
- flower

3 Which of these processes do plants use to make glucose? Tick **1** correct answer

- respiration
- fertilisation
- protein synthesis
- photosynthesis

4 Match each sub-cellular structure to their function. Write the correct letter in each box

a	cell wall
b	chloroplasts
c	permanent vacuole

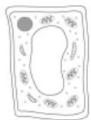
	contains chlorophyll where photosynthesis takes place
	contains cell sap which helps keep the cell turgid
	contains cellulose; provides strength to cell and support to plant

5 Where does aerobic respiration take place in cells? Tick **1** correct answer

- ribosomes
- chloroplasts
- nucleus
- mitochondria

6 A cell that is adapted to perform a specific job is called a _____ cell.
Fill in the blank

1 Which of these images is showing a plant cell? Tick 1 correct answer



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- leaves
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- chloroplasts
- nucleus
- mitochondria

6 A cell that is adapted to perform a specific job is called a specialised cell. Fill in the blank

OBJECTIVE/OUTCOME

I can identify common structures of plant cells and relate each structure to its function.

Keywords

cell wall

chloroplast

permanent vacuole

photosynthesis

active transport

Keywords

A **cell wall** is a subcellular structure made from cellulose fibres that strengthens the cell and supports the plant.

A **chloroplast** is a subcellular structure that contains the green pigment chlorophyll, which absorbs light for photosynthesis.

The **permanent vacuole** is a subcellular structure filled with cell sap that helps keep the cell turgid.

Photosynthesis is a chemical reaction that plants use to make glucose, taking place in the chloroplasts.

Active transport is the net movement of particles from a low to high concentration, against a concentration gradient, using energy.

Lesson outline

Plant cells: common structures and specialised cells



Plant cell subcellular structures



Specialised plant cells



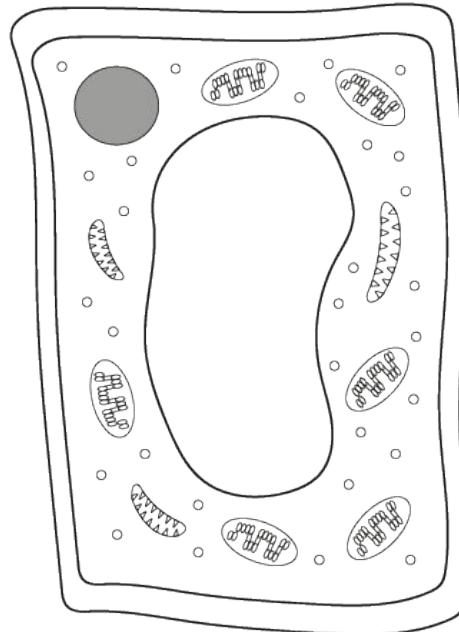
Features of specialised plant cells

What is this picture showing?

This is a 2D model of a plant cell.

The image shows the common subcellular structures you find in a plant cell.

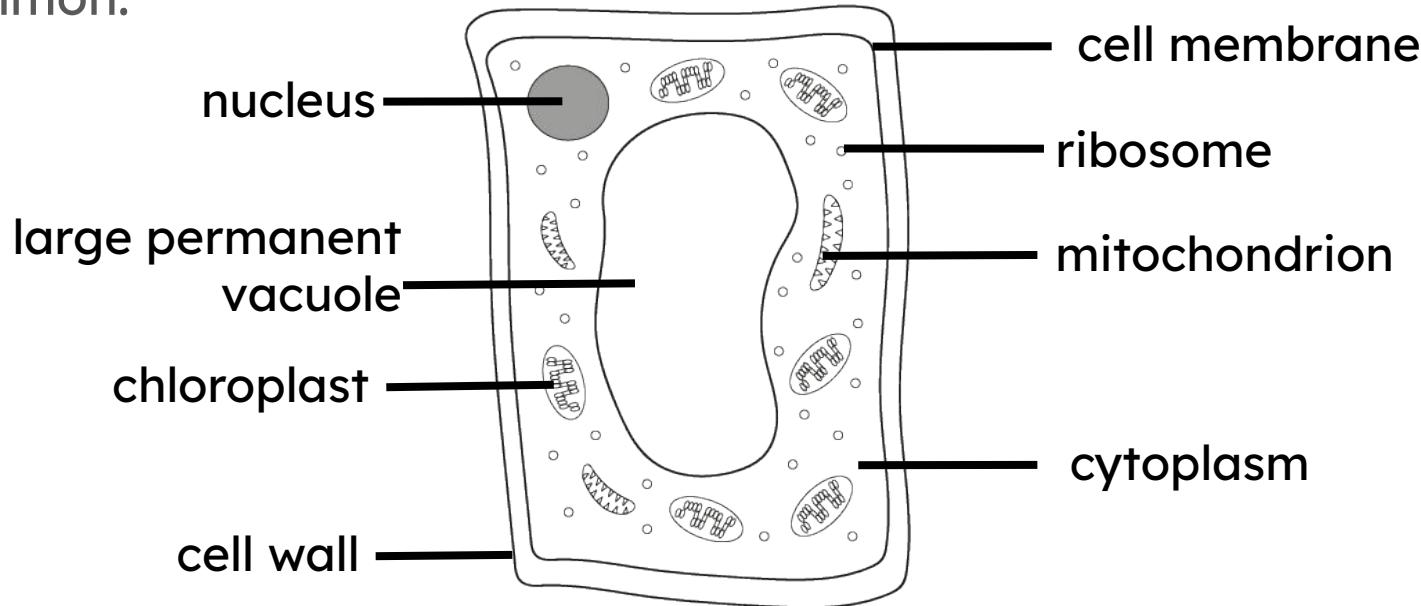
Can you identify any of the subcellular structures?



Plant cell subcellular structures



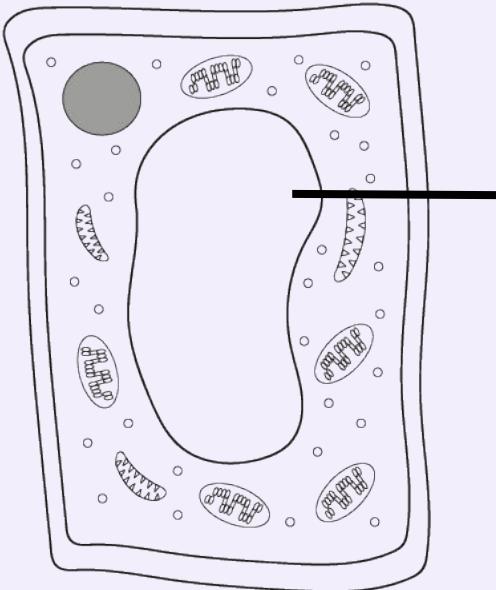
Animal and plant cells have certain subcellular structures in common.



Plant cells also have three additional subcellular structures. These are a **cell wall**, **chloroplasts** and a **large permanent vacuole**.

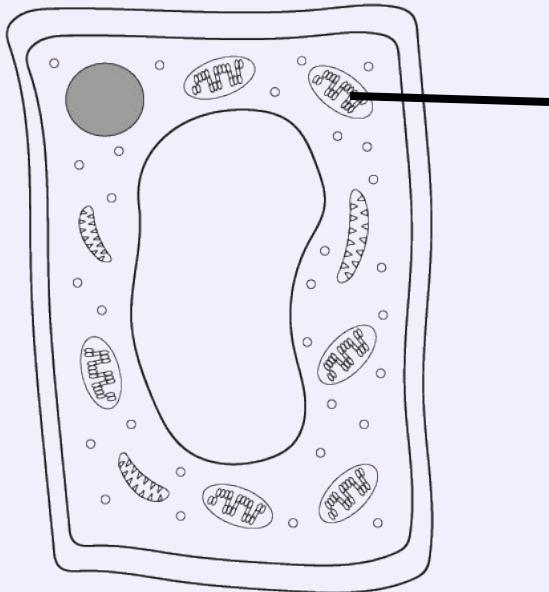
Which subcellular structure is the line pointing to?

- a cytoplasm
- b chloroplast
- c large permanent vacuole



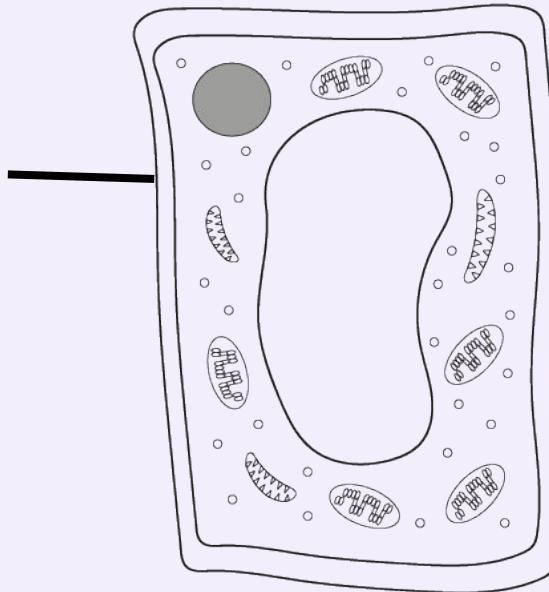
Which subcellular structure is the line pointing to?

- a mitochondrion
- b chloroplast
- c ribosome



Which subcellular structure is the line pointing to?

- a cell membrane
- b cytoplasm
- c cell wall ✓



Which of the following is not found in an animal cell?

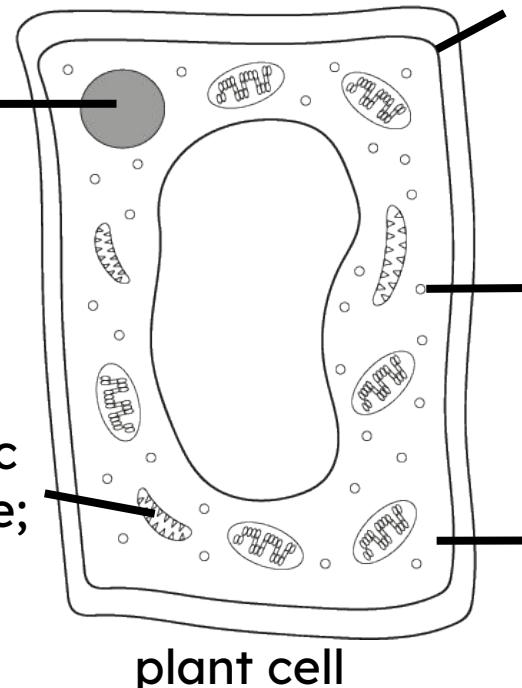
- a chloroplasts ✓
- b ribosomes
- c mitochondria

Plant cell subcellular structures



Each subcellular structure has a specific function.

Nucleus: controls the cell activities; contains DNA.



Mitochondrion: aerobic respiration occurs here; contains enzymes for respiration.

Cell membrane: partially permeable; controls what enters and exits the cell.

Ribosome: where protein synthesis takes place.

Cytoplasm: jelly-like liquid containing salts and nutrients; where many chemical reactions occur.

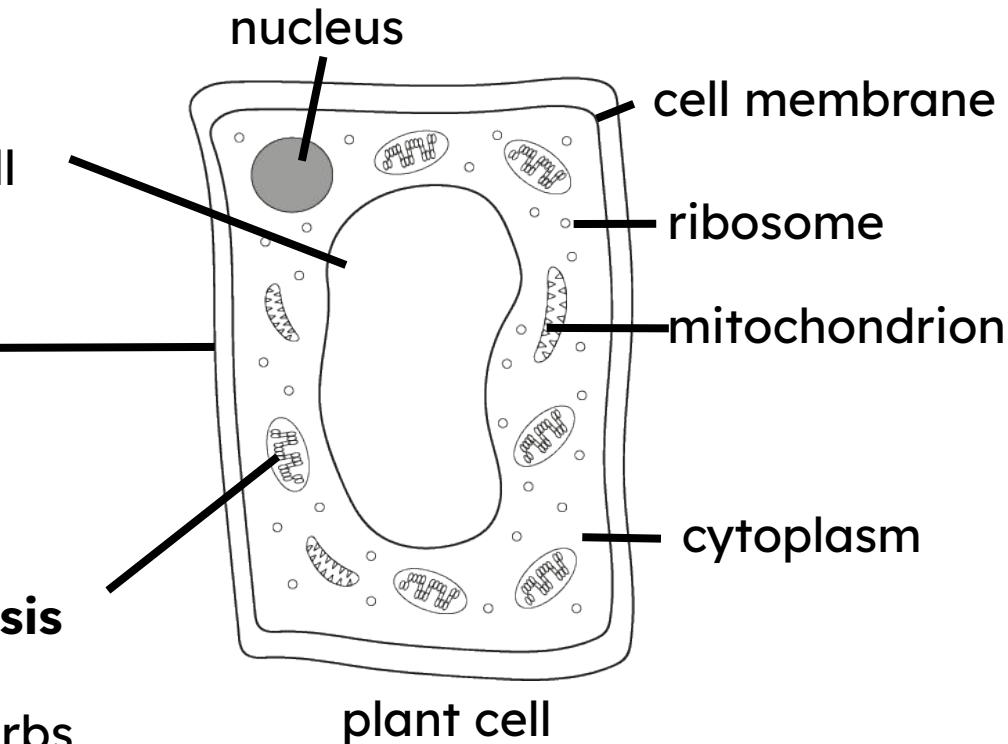
Plant cell subcellular structures



Large permanent vacuole: filled with cell sap to help keep the cell turgid.

Cell wall: made from cellulose fibres and strengthens the cell and supports the plant.

Chloroplast: where **photosynthesis** takes place; contains the green pigment chlorophyll, which absorbs light for photosynthesis.

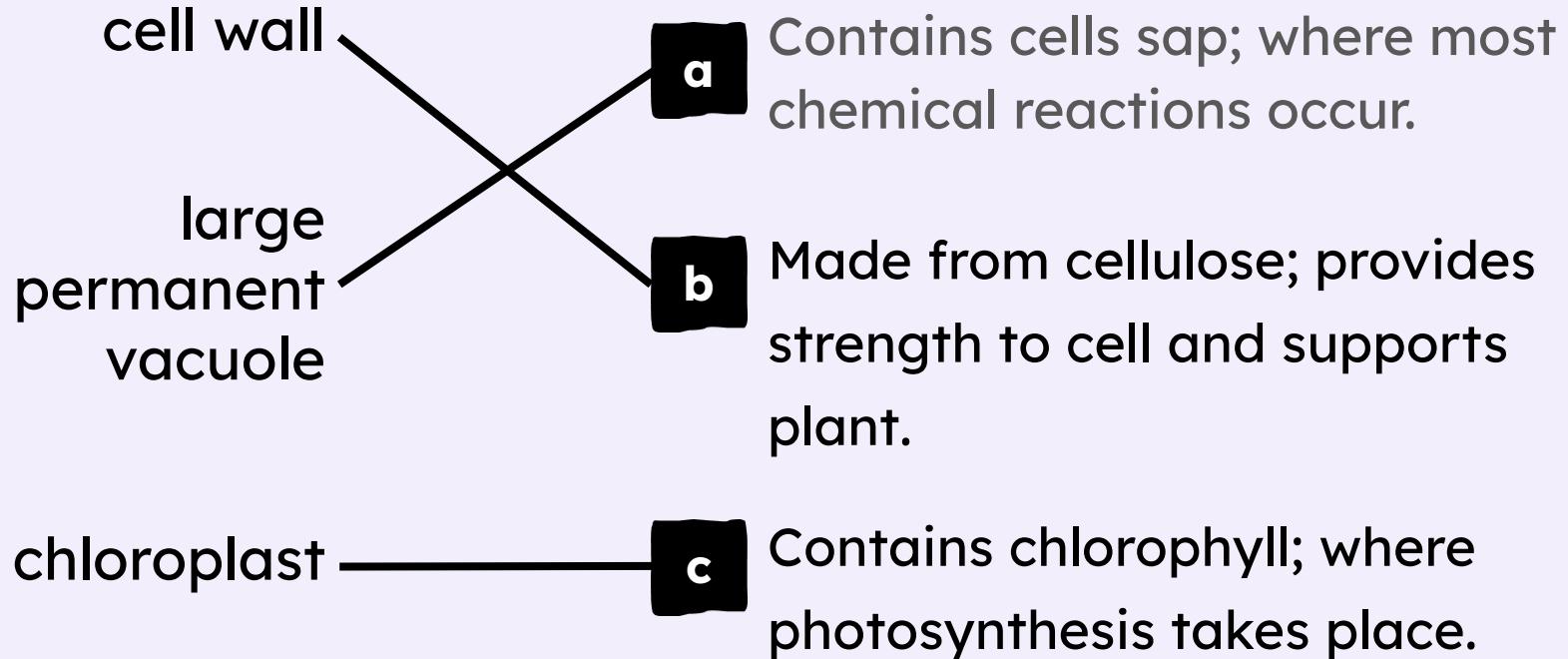


What is the function of the cell wall?

- a it is the site where most chemical reactions occur
- b to provide strength to the cell and support the plant
- c it is where photosynthesis takes place



Match the subcellular structure to the correct function.



Lesson outline

Plant cells: common structures and specialised cells



Plant cell subcellular structures



Specialised plant cells

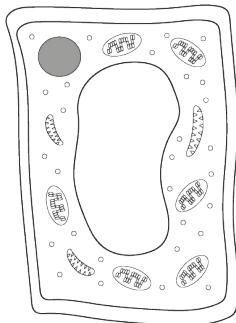


Features of specialised plant cells

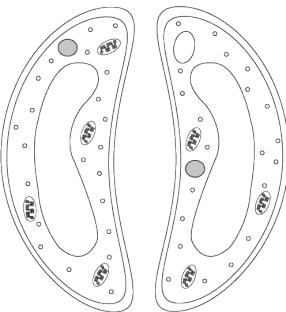
Specialised plant cells

Specialised cells in plants are adapted to carry out specific functions.

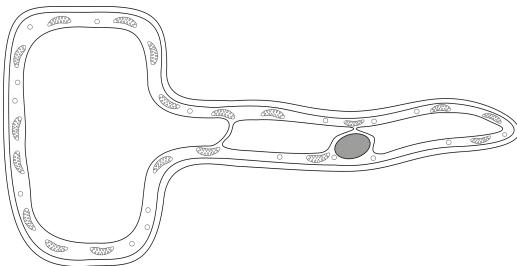
Can you name any of these specialised plant cells?



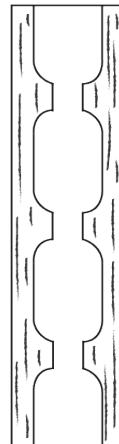
palisade
cell



guard
cell



root hair
cell



xylem

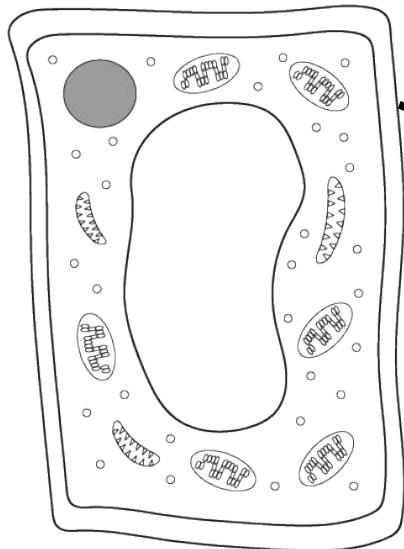


phloem

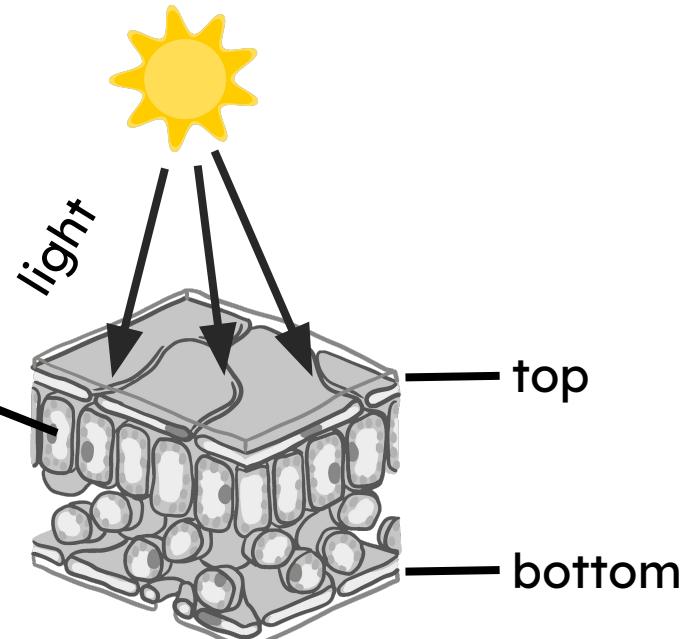
Specialised plant cells



Palisade cells are found at the top of leaves so that they can absorb as much light as possible.



palisade cell

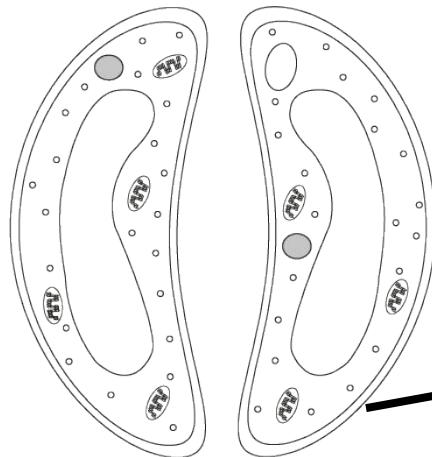


cross section of a leaf

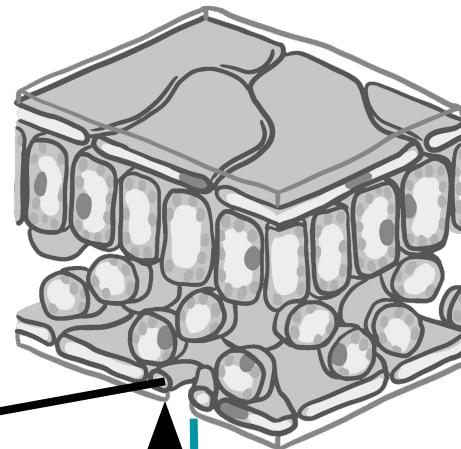
Specialised plant cells

Guard cells are found on the underside of leaves. They open and close the stomata.

When the stomata are open, carbon dioxide diffuses into the leaf and water vapour and oxygen diffuse out.



guard cell



cross section of a leaf

carbon
dioxide

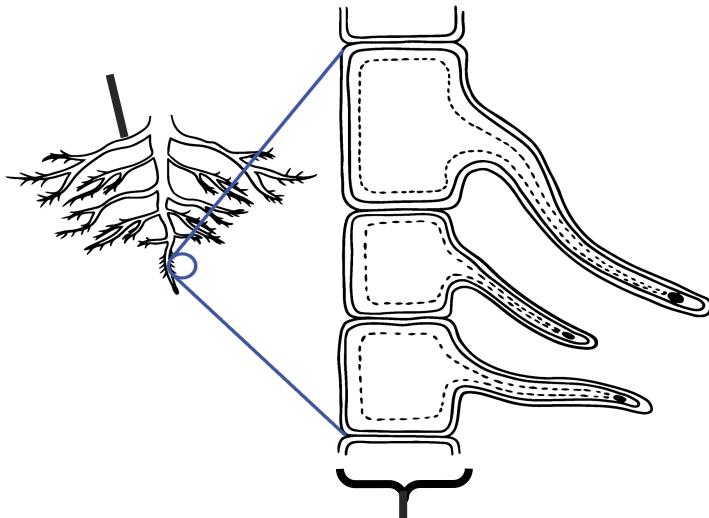
water vapour
and oxygen

Specialised plant cells

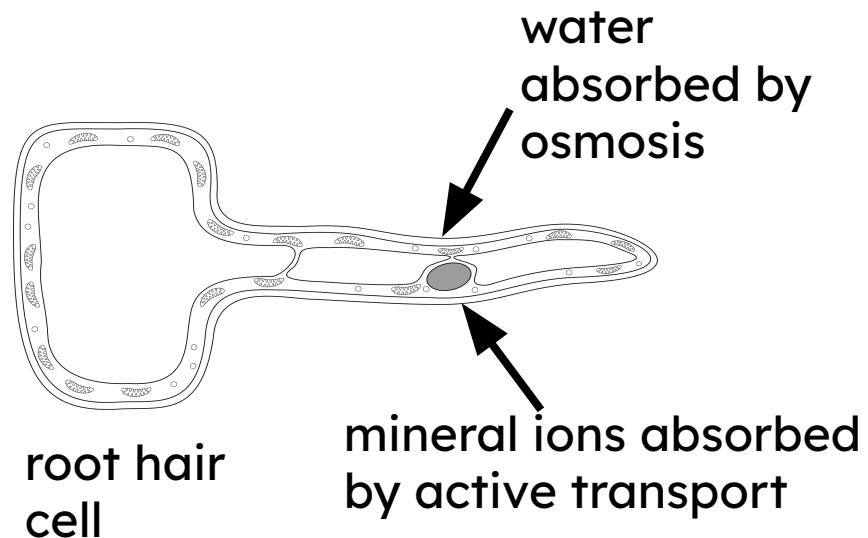


The outside surface of roots are covered in root hair cells. Their job is to absorb water and minerals from the soil.

roots of plants



many root hair cells



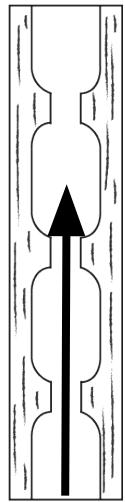
root hair cell

water absorbed by osmosis
mineral ions absorbed by active transport

Specialised plant cells

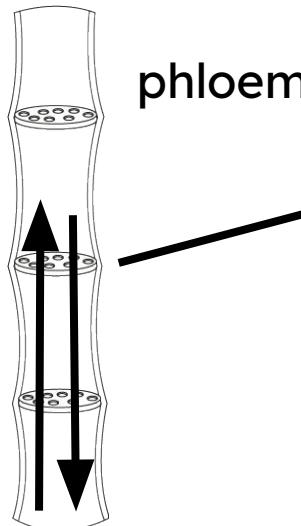
The xylem and the phloem run up the stem of plants.

xylem



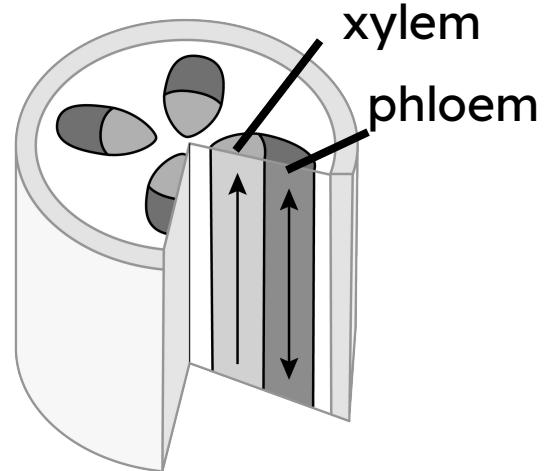
water

phloem



glucose and amino acids

The xylem transports water upwards from roots to leaves in one direction.



The phloem transports glucose and amino acids up and down the plant.

True or false?

The xylem transports water in all directions in a plant.

T

True

F

False



Justify your answer

a

Water travels from the roots to the leaves in one direction.



b

Water is needed for respiration and travels in all directions to every cell of the plant.

What is the function of the guard cells?

a control if the chloroplasts are open or closed

b control if the stomata are open or closed



c absorb energy for photosynthesis

True or false?

Root hair cells do not contain chloroplasts.

T

True ✓

F

False

Justify your answer

a

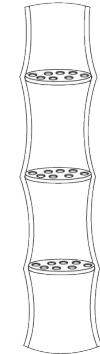
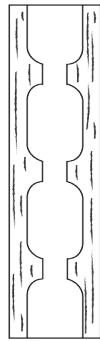
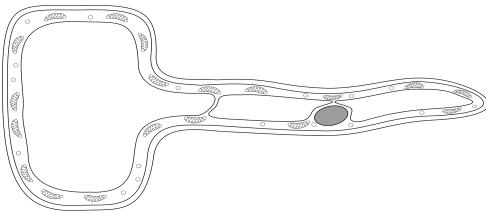
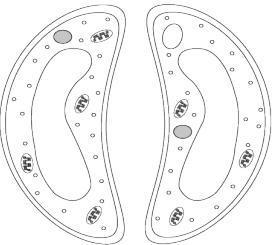
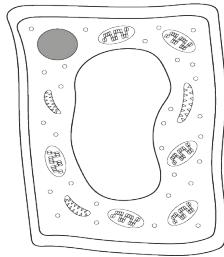
Photosynthesis can take place in the roots to make glucose.

b

Photosynthesis cannot take place without sunlight and so there are no chloroplasts in root hair cells. ✓

Task B Specialised plant cells

1. Name the specialised plant cells.



2. What is the function of the root hair cells?

Task B Specialised plant cells



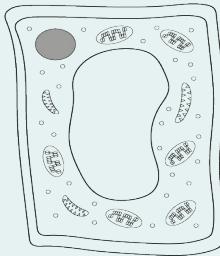
3. Explain where palisade cells are located in a leaf.
4. What is the function of the guard cells?
5. Which two specialised cells are located in the plant stem and what do they transport?

Task B Specialised plant cells

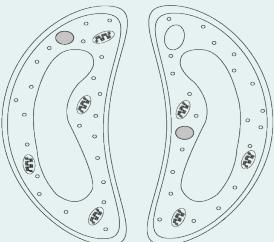


Feedback

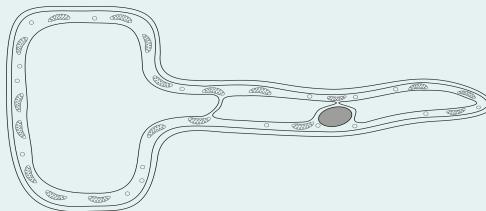
1. Name these specialised plant cells.



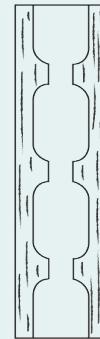
palisade
cell



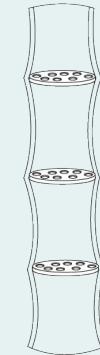
guard
cell



root hair
cell



xylem



phloem

2. What is the function of the root hair cells?

The outside surface of roots are covered in root hair cells. Their job is to absorb water and minerals from the soil.

3. Explain where palisade cells are located in a leaf.

Palisade cells are found at the top of leaves, this is so they can absorb as much energy as possible for photosynthesis.

4. What is the function of the guard cells?

Guard cells control the opening and closing of the stomata. Carbon dioxide diffuses into the stomata; water vapour and oxygen diffuse out.

5. Which two specialised cells are located in the plant stem and what do they transport?

The xylem and phloem are found inside the stem:

- *The xylem transports water up the plant from roots to shoots.*
- *The phloem transports glucose and amino acids up and down.*

Lesson outline

Plant cells: common structures and specialised cells



Plant cell subcellular structures



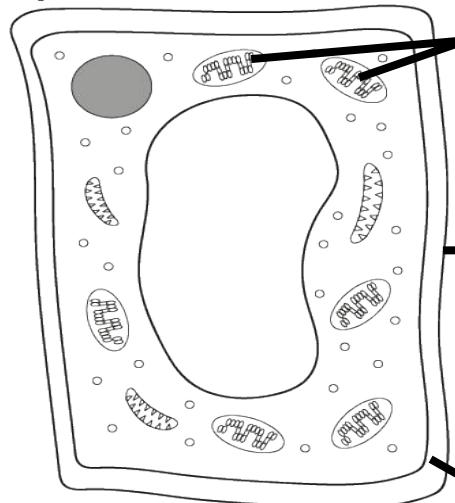
Specialised plant cells



Features of specialised plant cells

Features of specialised plant cells

Palisade cells are adapted to their function in the following ways:

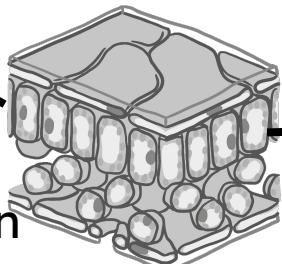


Many chloroplasts to absorb as much light as possible for photosynthesis.

Column-shaped so that they can be packed close together at the top of the leaf.

palisade cell

cross section
of a leaf



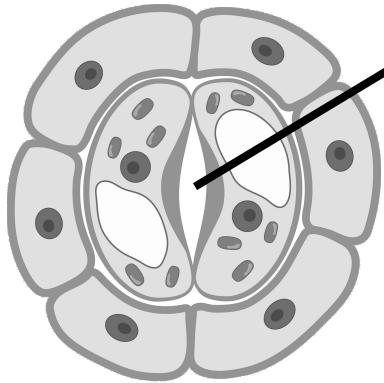
Found at the top of the leaf to absorb as much light as possible.

Features of specialised plant cells



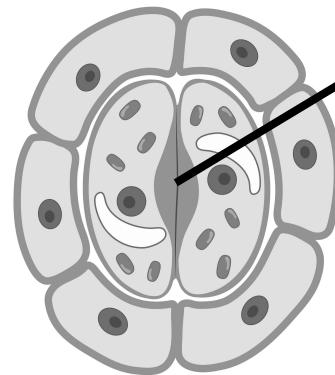
Guard cells are adapted to their function in the following ways:

stomata during day



open
stomata;
water can
evaporate

stomata at night



closed
stomata;
water
cannot
leave

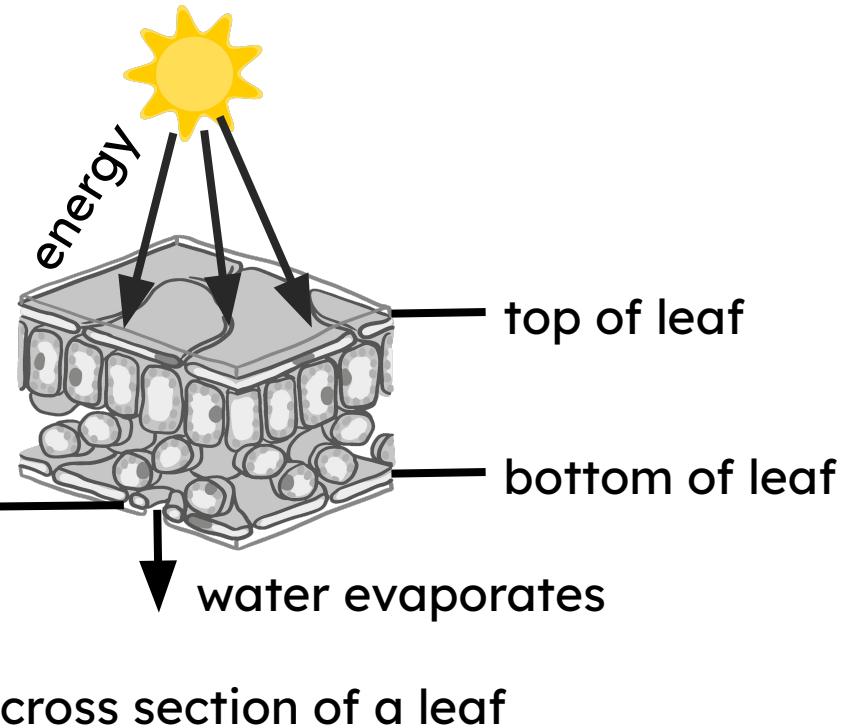
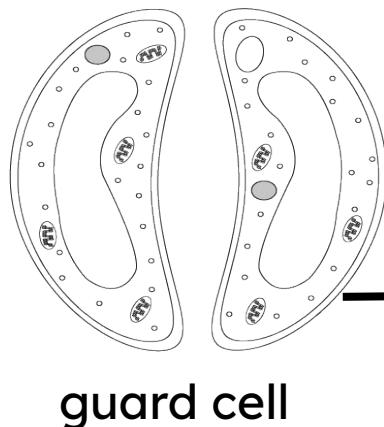
In bright light, the guard cells absorb water by osmosis and become turgid, keeping the stomata open.

In low light levels, the guard cells lose water and become flaccid, causing the stomata to close.

Features of specialised plant cells



Stomata are located on the underside of leaves to limit the amount of water lost through evaporation.

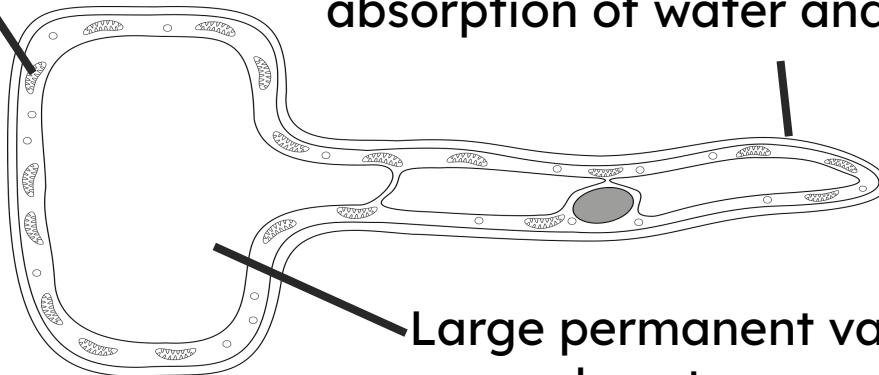


Features of specialised plant cells



Root hair cells are adapted to their function in the following ways:

Many mitochondria to release energy needed for active transport of minerals from the soil.



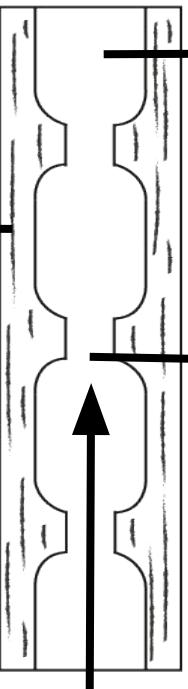
Long, thin hair-like projection to increase the surface area for absorption of water and mineral ions.

Large permanent vacuole to store as much water as possible.

Features of specialised plant cells



Xylem cells are adapted to their function in the following ways:



Cell walls are thickened with lignin to strengthen the hollow tubes and provide support.

Xylem cells are effectively dead; they contain no subcellular structures, allowing water to pass through freely.

The ends of the cells have broken down, forming long hollow tubes that allow water to move through.

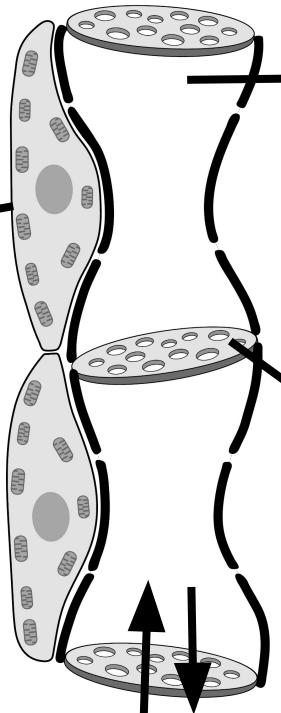
water moves up in one direction

Features of specialised plant cells



Phloem cells are adapted to their function in the following ways:

Companion cells contain many mitochondria, which release energy to help transport glucose and amino acids.



Cells have few subcellular structures, allowing more glucose and amino acids to flow through.

Sieve plates join cells; they have small holes that allow glucose and amino acids to flow through (translocation).

glucose and amino acids move up and down

EXIT TASK GROUP ACTIVITY

Which is not true for a xylem cell?

- a contains lignin to strengthen
- b contains companion cells to transfer energy
- c cells contain no ends to create hollow tubes



Why do root hair cells have long hair like projections?

- a to store as much water as possible
- b increase surface area to absorb more light energy
- c increase surface area to absorb more water and minerals



True or false?

At night, guard cells become turgid and stay open.

T

True

F

False



Justify your answer

a

Guard cells are open at night to allow water to leave.

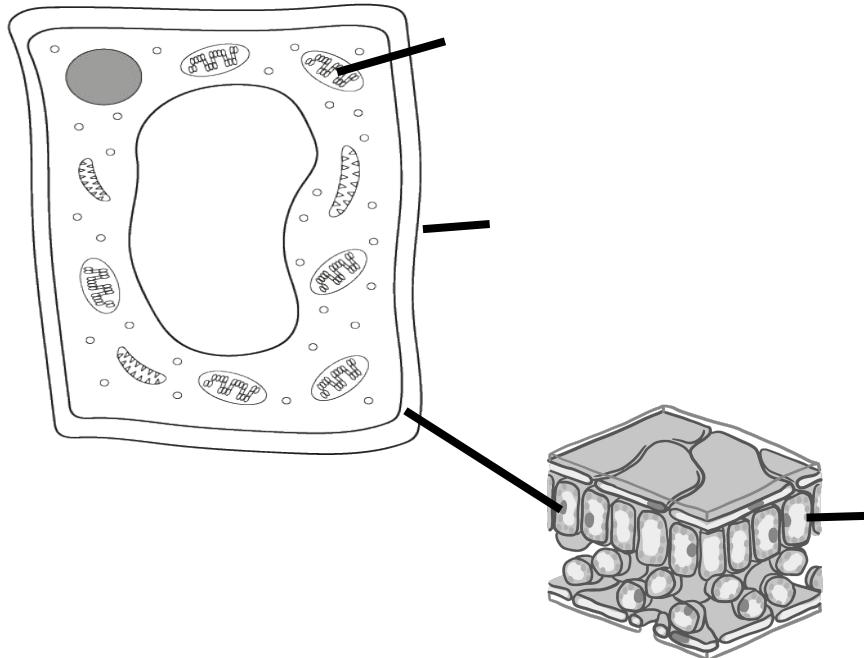
b

Guard cells are closed at night to stop water loss.



Task C Features of specialised plant cells

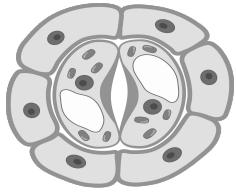
1. Add labels and annotations to the diagram to describe three ways palisade cells are adapted to their function.



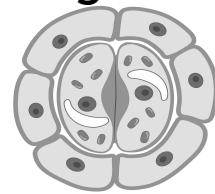
Task C Features of specialised plant cells

- Explain how guard cells help control the amount of water that is lost from plant leaves.

day



night



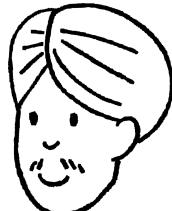
- Describe three adaptations of root hair cells.

Task C Features of specialised plant cells



- Andeep has been asked to describe the difference between xylem and phloem cells.

What statements made by Andeep are correct, and which are incorrect?
Make corrections for any incorrect statements.



Andeep:

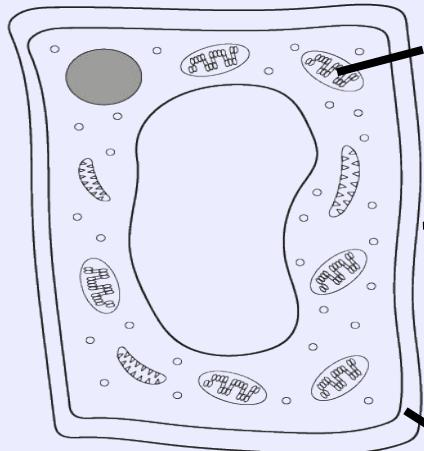
Xylem cells are practically dead. Their ends have broken down to form long hollow tubes for glucose to travel through. Xylem cells are connected to companion cells which provide energy to move glucose.
Phloem cells have few subcellular structures to allow more water to move through. They also have sieve plates with small holes to allow water to move through easily.

Task C Features of specialised plant cells



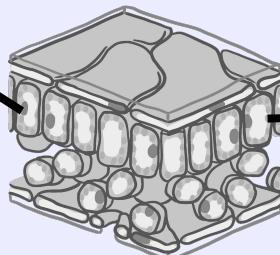
Feedback

1. Add labels and annotations to the diagram to describe three ways palisade cells are adapted to their function.



many chloroplasts to absorb as much light as possible for photosynthesis

— column-shaped so that they can be packed close together at the top of the leaf



found at the top of the leaf to absorb as much energy as possible

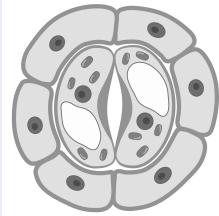
Task C Features of specialised plant cells



Feedback

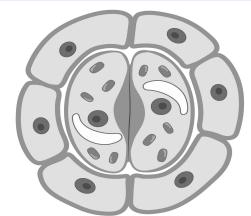
2. Explain how guard cells help control the amount of water that is lost from plant leaves.

day



Guard cells absorb water by osmosis during the day and become turgid; this keeps the stomata open, allowing water to evaporate.

night



Guard cells lose water at night and become flaccid; this closes the stomata, preventing water from evaporating.

3. Describe three adaptations of root hair cells.

Long, thin, hair-like projections increase the surface area for the absorption of water and mineral ions.

A large permanent vacuole stores as much water as possible.

Many mitochondria release the energy needed for the active transport of minerals from the soil.

Task C Features of specialised plant cells



Feedback

4. What statements made by Andeep are correct, and which are incorrect? Make corrections for any incorrect statements.



Xylem cells consist of essentially dead cells that form hollow tubes.

Companion cells provide energy to help move glucose.

Phloem cells have few subcellular structures.

Phloem cells contain sieve plates with small holes.



Water passes through the xylem, not glucose.

Xylem cells are not connected to companion cells; phloem cells are.

Glucose passes through the phloem, not water.

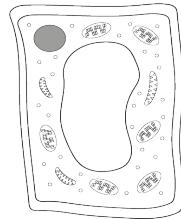
Sieve plates allow glucose to move through, not water.

Summary Plant cells: common structures and specialised cells

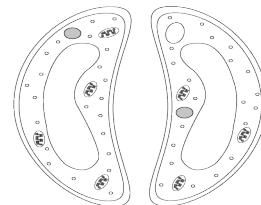
Plant and animal cells do have some common subcellular structures. Plant cells usually have three additional structures; cell wall, chloroplasts and a large, permanent vacuole.

Each subcellular structure has a specific function within the cell.

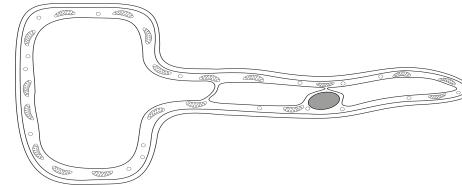
Specialised cells are adapted for their function. They each have specific features that enable them to carry out their functions.



palisade cell



guard cell



root hair cell



xylem



phloem