ORGANS: THE LEAF

23 APRIL 2014

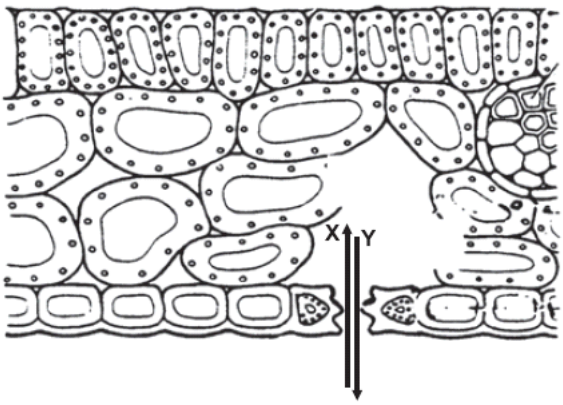
Lesson Description

In this lesson we:

- Examine the internal structure of a dicotyledonous leaf
- Discuss how the leaf is adapted to photosynthesis, gaseous exchange and transport

Challenge Question

The diagram alongside is a cross-section of a leaf where the arrows represent the net movement of two substances.

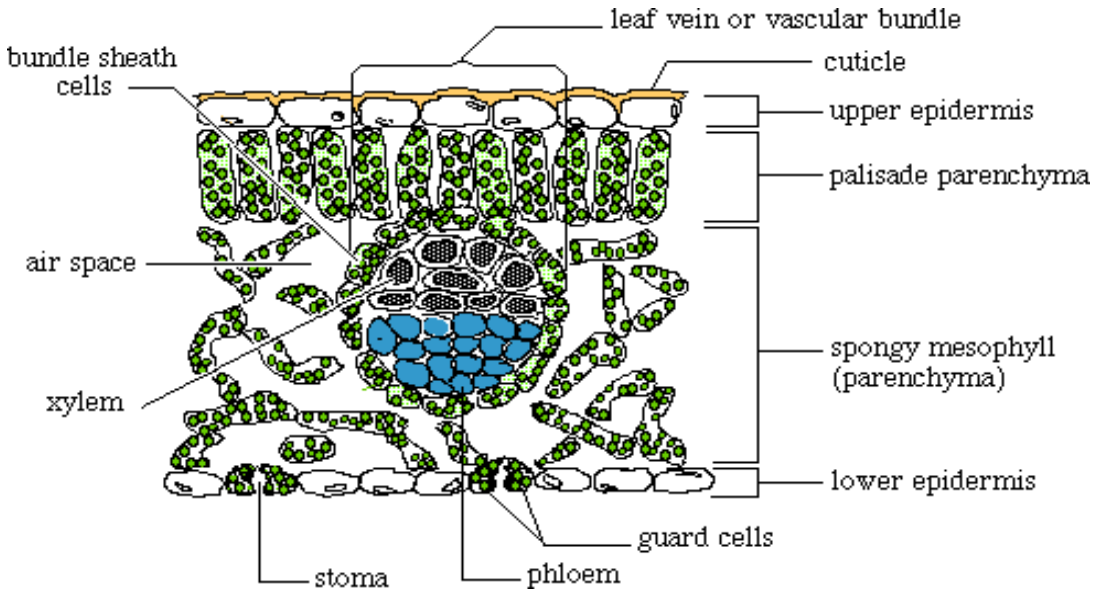


These substances, X and Y, are (in order)

A water and oxygen.
B water and carbon dioxide.
C carbon dioxide and oxygen.
D oxygen and carbon dioxide.

Summary

- When looking at the leaf you need to link it to the plant tissues that you have already covered
- A dorisiventral leaf means that the leaf is structurally different on the top and the bottom
- The diagram below shows the different tissues that make up the leaf

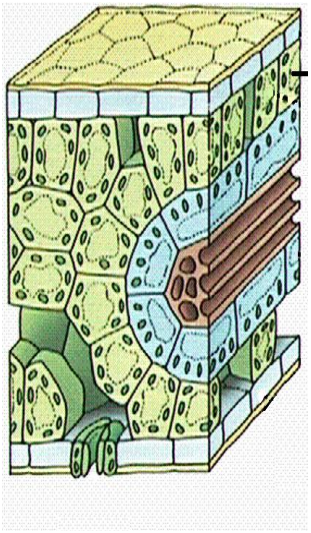


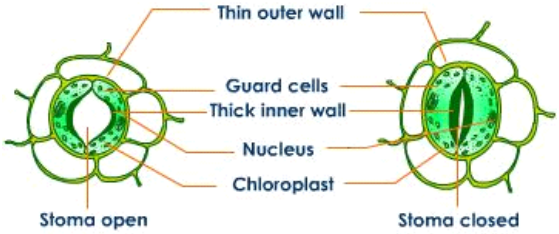
- The leaf needs to be able to:

- Photosynthesize
- Allow gaseous exchange
- Transport of water and food

How is the leaf adapted for photosynthesis?

- The lamina is large – providing a large surface area to absorb as much sunlight as possible.
- Thin lamina – allows gases to move in and out easily by diffusion.
- Cuticle is impermeable to water and transparent - prevents the loss of water and allows sunlight through to the palisade mesophyll cells.
- Epidermal cells are transparent – allow sunlight through.
- The lower surface has many stomata – ensures the gaseous exchange occurs.
- The palisade tissue is directly below the epidermis and arranged longitudinally – increase the surface area exposed to the sunlight.
- The palisades have many chloroplasts – to absorb the maximum amount of sunlight.





How is the leaf adapted for gaseous exchange?

- The lower surface has many stomata – ensures the gaseous exchange occurs.
- The palisade has thin walls – to allow osmosis and the diffusion of gasses into and out of the cells.
- The spongy mesophyll cells have large intercellular air spaces – gaseous exchange
- The spongy mesophylls have thin cell walls - to allow osmosis and the diffusion of gasses into and out of the cells.

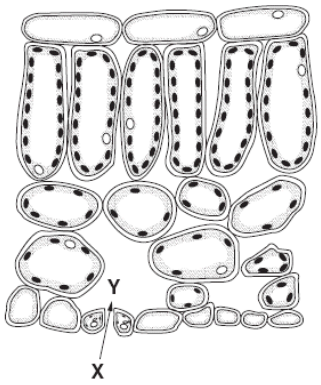
How is the leaf adapted for transport of water and food?

- The vascular bundles have xylem – to transport water and minerals from the root, up the stem to the mesophyll for photosynthesis.
- The vascular bundles have phloem – to transport the dissolved nutrients made during photosynthesis, to other parts of the plant.

Test Yourself

Question 1

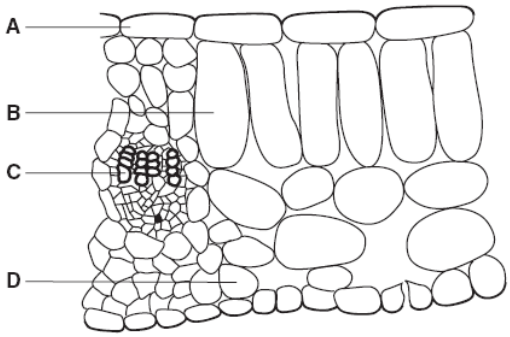
By which process does carbon dioxide pass from X to Y?



A diffusion
B osmosis
C translocation
D transpiration

Question 2

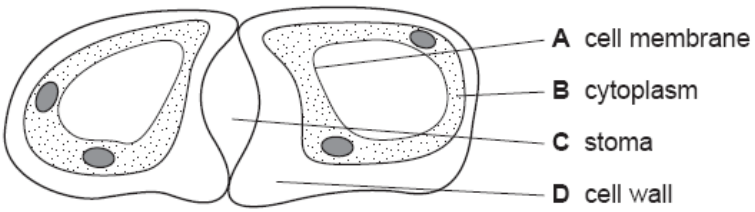
Use this diagram, which shows a cross-section through a leaf, to answer



Which cell is filled with chloroplasts?

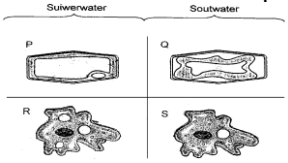
Question 3

The diagram shows a student's drawing of guard cells. Which label line is incorrect?



Question 4

After being placed in salt water for an hour a plant cell seen under a microscope looks like the one in the diagram alongside.



The term which would best describe the state of this cell is…

A lysed
B crenate
C turgid
D plasmolysed.

Question 5

Which of the following are **both** structurally suited to perform the functions of water transport and support in a plant?

A sieve tube and companion cell.
B xylem vessel and companion cell.
C tracheid and xylem vessel.
D sieve tube and tracheid.

Question 6

The chief food making tissue of a plant is called

A Chlorenchyma
B Cortex
C Phloem
D Epidermis
E Xylem

Question 7

Most of the photosynthesis in a plant occurs in the

A spongy mesophyll
B guard cells of the stoma
C green cortex cells
D phloem of the leaf vein
E palisade mesophyll

Question 8

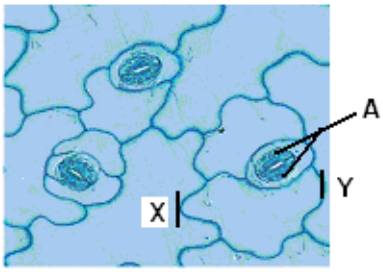
The movement of sugars from the leaves through the phloem is called

A photosynthesis.
B transpiration.
C translocation.
D food storage.

Improve your Skills

Question 1

Examine the photograph below showing part of the epidermis covering a *Ligustrum* leaf.



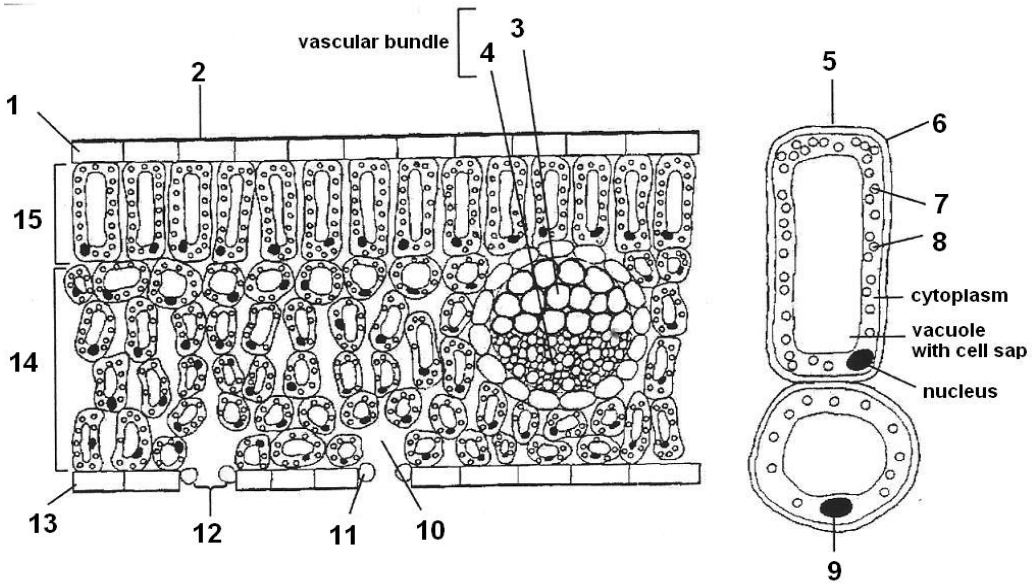
x 380

a.) The cells labelled A are modified for a particular function. State their function, and explain how they **differ** from the rest of the cells forming the epidermal tissue of the leaf. [3]

b.) Calculate the actual diameter of the epidermal cell as the lines labelled X and Y. Show all working out. [2]

Question 2

Study the following diagram of the cross section through a dicot leaf and answer the questions that follow



a.) Give the main function of this plant organ. (1)

b.) Provide labels for parts 1, 2, 9, 10, 12. (5)

c.) State the number of the region of this plant organ where you find diffusion of gasses? (2)

d.) In which numbered part does photosynthesis mainly take place? (1)

e.) How is the part mentioned in question (d) structurally adapted to the process of photosynthesis? (3x2)

Question f refers to gasses.

f.) Which gas moves

i.) in at number 12 during the day.

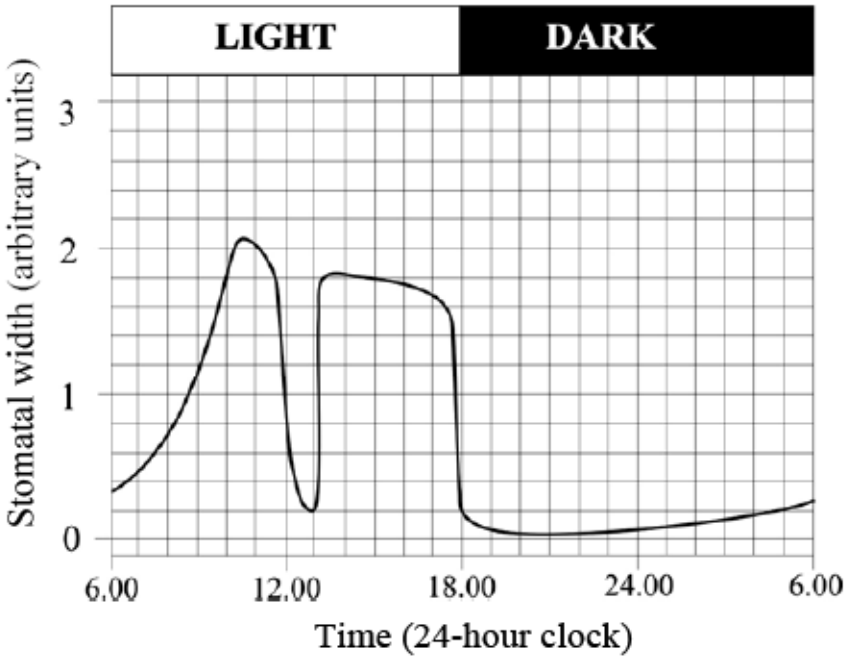
ii) out at number 12 during the day (2)

g) Label parts 3 and 4 and state what is transported by each one. (4)

h) The part numbered 12 is involved in gaseous exchange. Name THREE gases thatare exchanged through the opening at 12. (3)

Question 3

The graph shows changes in the width of stomatal openings in a dicotyledonous plant that is adapted to living in a hot tropical climate.



a.) At what time were the stomata most open? (1)

b.) Draw a diagram of the surface view of a stoma to show the guard cells as they would appear at 13.00 hours. Label those features of the guard cells that make them different from the adjacent epidermal cells. (5)

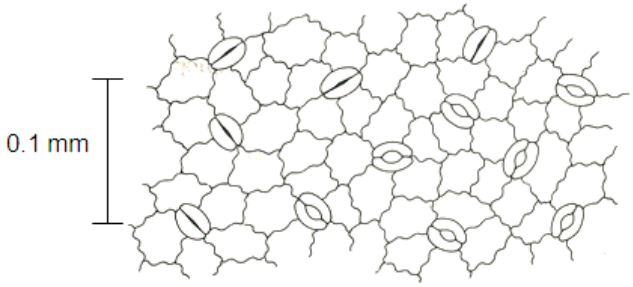
c.) Describe how osmosis causes stomata to open. (5)

d.) Explain how the change in stomatal width at 13.00 hours may be of advantage to a plant that lives in a tropical climate. (3)

e.) State a possible disadvantage to the tropical plant of this pattern of change in stomatal width at 13.00 hours. (2)

Question 4

Study the diagram below and answer the questions



a.) How many stomata are shown in this drawing of leaf epidermis?
b.) How many of the stomata are open?
c.) How many are likely to be open at night? Why?

Links

- **Worksheets:** http://freepdfdb.com/ppt/plant-organs-worksheet
- **Worksheets and Diagrams :** http://www.biologycorner.com/worksheets/leaf_coloring.html
- **Diagrams** : www.enchantedlearning.com/themes/ **HYPERLINK "http://www.enchantedlearning.com/themes/leaf.shtml"leaf** HYPERLINK "http://www.enchantedlearning.com/themes/leaf.shtml".shtml