CAMBRIDGE IGCSE BIOLOGY · 0610

BIOLOGY



EXAM QUESTION PACK

TOPIC 6: PLANT NUTRITION

SCORE	PERCENTAGE
/	%

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Plant nutrition – 2023 November IGCSE 0610

1. Nov/2023 /Paper_ 0610/11/No.11

Which colour does hydrogencarbonate indicator turn if the carbon dioxide concentration is increased?

A green

B red

C violet

D yellow

2. Nov/2023 /Paper_ 0610/11/No.17

Parts of a plant are listed.

1 mesophyll cells

2 root cortex cells

3 root hair cells

4 xylem vessels

What is the pathway taken by water in the plant?

A $1 \rightarrow 4 \rightarrow 2 \rightarrow 3$

B $1 \rightarrow 2 \rightarrow 3 \rightarrow 4$

C $3 \rightarrow 1 \rightarrow 4 \rightarrow 2$

D $3 \rightarrow 2 \rightarrow 4 \rightarrow 1$

3. Nov/2023 /Paper_ 0610/13/No.11

What is a use of the carbohydrates made by photosynthesis?

A to produce cellulose for energy stores

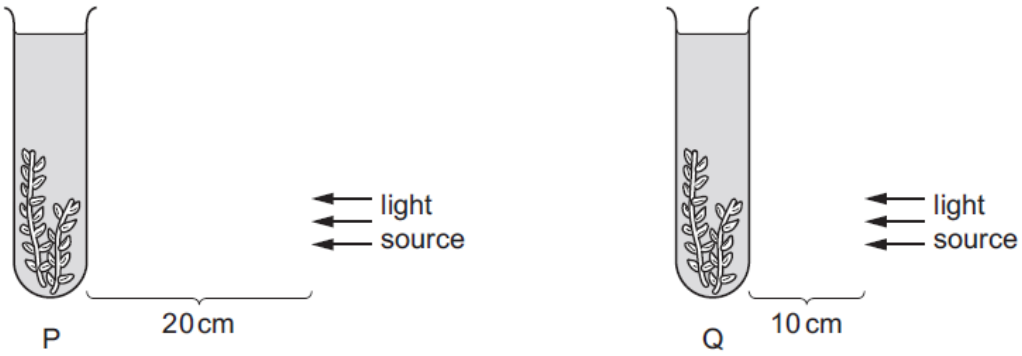
B to produce starch to build cell walls

C to produce starch for transport in the phloem

D to produce sucrose for transport in the phloem

4. Nov/2023 /Paper_ 0610/13/No.12

The diagram shows an experiment investigating the effect of light intensity on an aquatic plant.



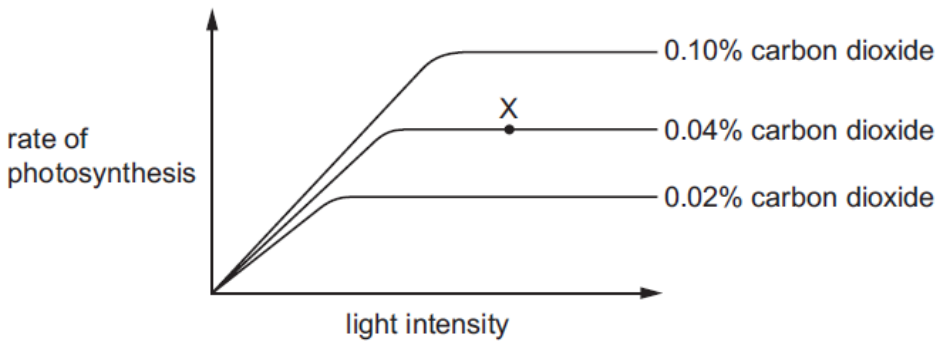
Photosynthesis occurred in both test-tube P and test-tube Q. Both test-tubes were kept at the same temperature. The number of bubbles produced in test-tube P was 12 bubbles per minute.

What is the most likely number of bubbles produced in one minute in test-tube Q?

A 0 **B** 3 **C** 12 **D** 48

5. Nov/2023 /Paper_ 0610/21/No.11

The graph shows how the rate of photosynthesis of a plant changes with light intensity, at three different carbon dioxide concentrations. In each case the temperature is 15 °C.



What is the limiting factor for the rate of photosynthesis at point X on the graph?

A carbon dioxide concentration

B light intensity

C surface area of the plant

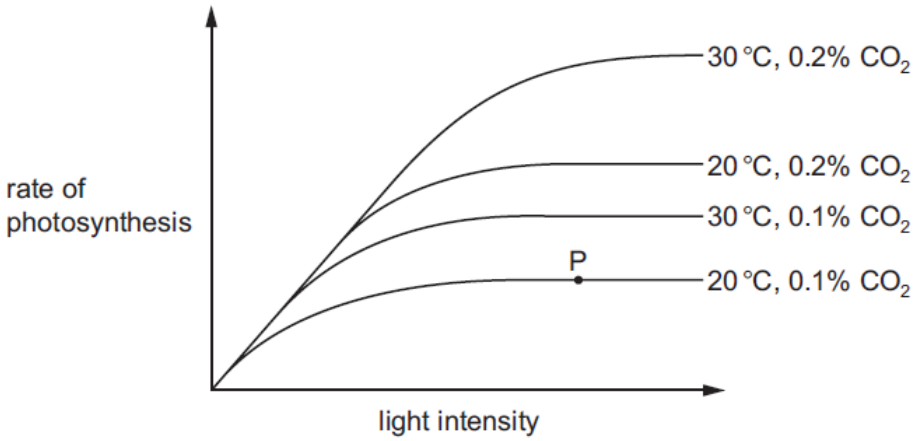
D temperature

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6. Nov/2023 /Paper_ 0610/22/No.11

The diagram shows how the rate of photosynthesis varies with light intensity.

The four curves show different conditions of temperature and carbon dioxide concentration.



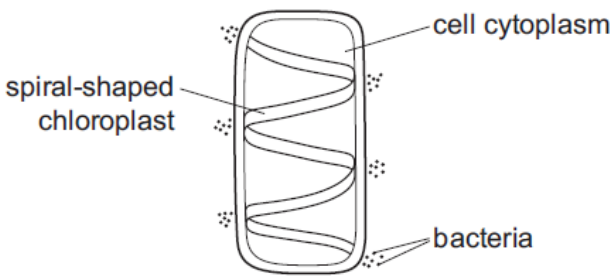
What limits the rate of photosynthesis at point P?

	light intensity	carbon dioxide concentration	temperature
A	✓	✓	✗
B	✓	✗	✗
C	✗	✓	✓
D	✗	✗	✓

key
✓ = yes
✗ = no

7. Nov/2023 /Paper_ 0610/22/No.12

The diagram shows a cell with groups of bacteria around its edge.



The bacteria have moved to areas of high oxygen concentration.

Which process in the cell causes the bacteria to form these groups?

A digestion

B photosynthesis

C reproduction

D respiration

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8. Nov/2023 /Paper_ 0610/23/No.11

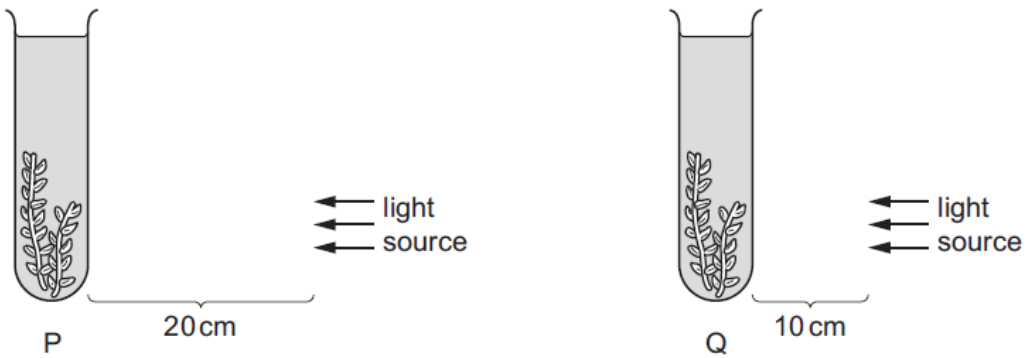
During growth, potato plants produce flowers and underground storage organs called tubers.

During this time, which parts of the plant act as sources and sinks for translocation?

	flowers	leaves	potato tubers
A	sink	sink	source
B	sink	source	sink
C	source	sink	source
D	source	source	sink

9. Nov/2023 /Paper_ 0610/23/No.12

The diagram shows an experiment investigating the effect of light intensity on an aquatic plant.



Photosynthesis occurred in both test-tube P and test-tube Q. Both test-tubes were kept at the same temperature. The number of bubbles produced in test-tube P was 12 bubbles per minute.

What is the most likely number of bubbles produced in one minute in test-tube Q?

A 0 **B** 3 **C** 12 **D** 48

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10. Nov/2023 /Paper_ 0610/32/No.2(a _ c)

A student investigated photosynthesis in a variegated leaf.

A variegated leaf has a green part that contains a green pigment and a white part that does not contain the green pigment.

Fig. 2.1 is a photograph of some variegated leaves.

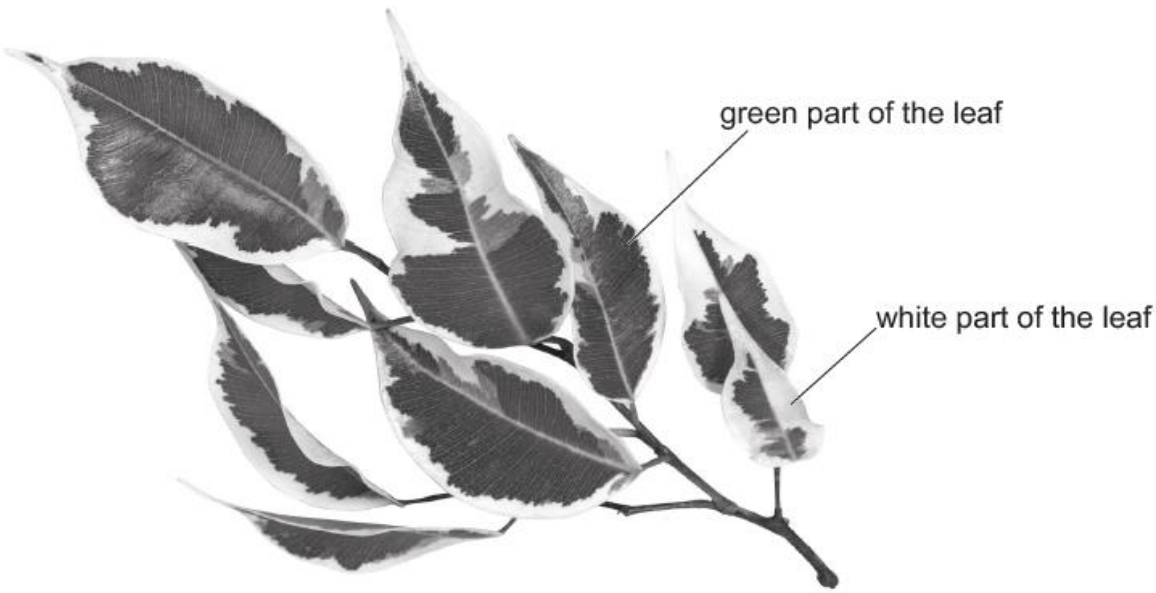


Fig. 2.1

(a) State where the green pigment is found in a plant cell.

..... [1]

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(b) A student investigated a variegated leaf from a plant that had been kept in the light for 24 hours.

The student prepared the leaf by boiling it and then placing it in ethanol to remove the green pigment.

The student then tested the leaf with iodine solution.

Table 2.1 shows the results.

Table 2.1

part of the leaf	colour with iodine solution
green	blue-black
white	yellow-brown

Explain the results shown in Table 2.1 for the white part of the leaf.

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..... [3]

(c) This investigation was repeated with a plant that was kept for 24 hours in an environment where all the carbon dioxide was removed.

Complete Table 2.2 to predict the results.

Table 2.2

part of the leaf	colour with iodine solution
green	
white	

[2]

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11. Nov/2023 /Paper_ 0610/33/No.3

(a) Fig. 3.1 is a drawing of a leaf from an oak tree.



Fig. 3.1

The oak leaf has a large surface area.

Explain why having a large surface area is an adaptation for photosynthesis.

.....

.....

..... [1]

(b) State the word equation for photosynthesis.

..... [2]

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(c) Fig. 3.2 is a diagram of a section of a leaf from a dicotyledonous plant.

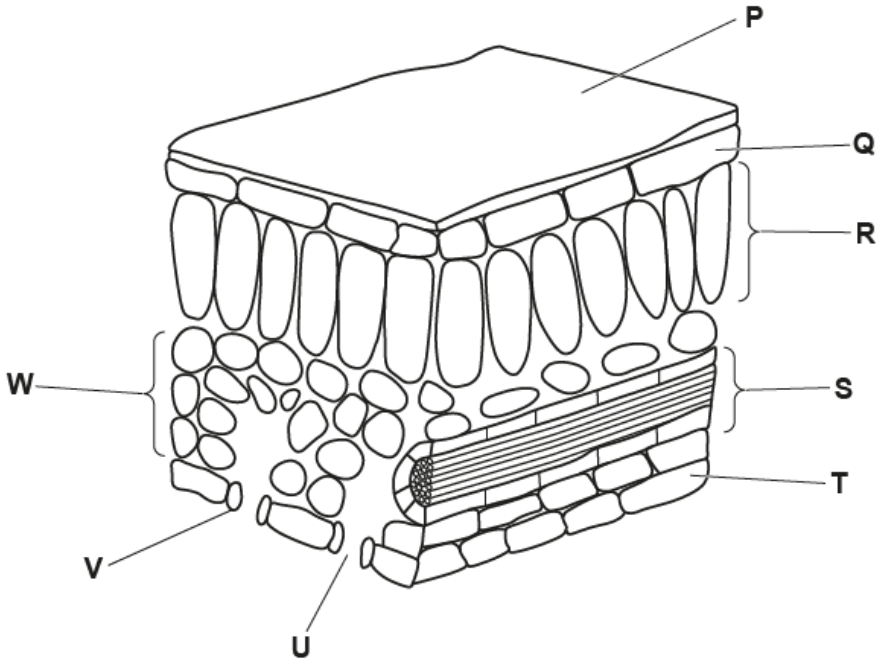


Fig. 3.2

(i) State the letter in Fig. 3.2 which identifies the tissue that contains the highest density of chloroplasts.

..... [1]

(ii) In Fig. 3.2, the letter **S** labels a vascular bundle.

State the names of **two** tissues found in the vascular bundle.

1 .....

2 .....
[2]

(iii) State the letter in Fig. 3.2 which identifies the cells that control gas exchange in the leaf **and** state their name.

letter .....

name .....
[2]

(iv) State the name **and one** function of the layer labelled **P** in Fig. 3.2.

name .....

function .....

.....
[2]

[Total: 10]

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12. Nov/2023 /Paper_ 0610/42/No.2

Fig. 2.1 is a photograph of some leaves of a water lily, which is a hydrophyte. The water lily has adaptive features that are found in many different hydrophytes.

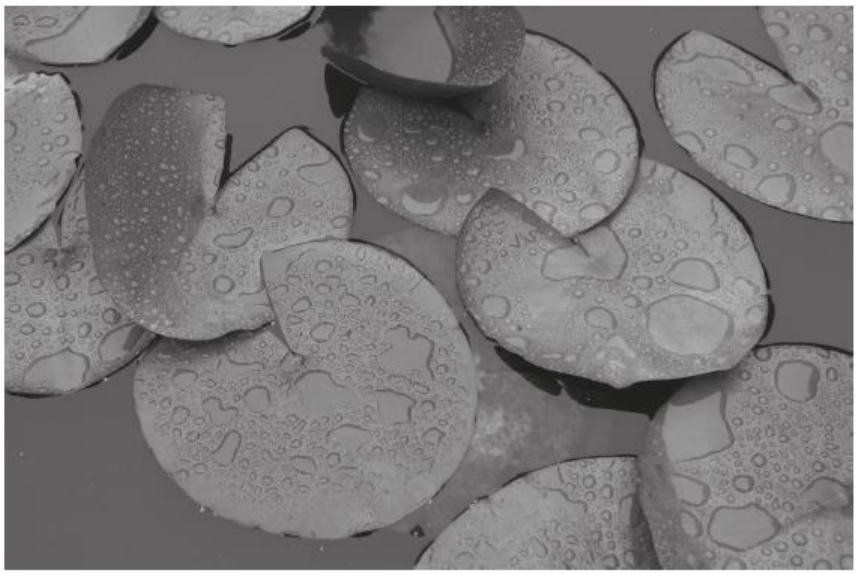


Fig. 2.1

(a) Describe what is meant by an adaptive feature.

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..... [2]

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(b) Fig. 2.2 is a photomicrograph of a cross-section of a part of a water lily leaf.

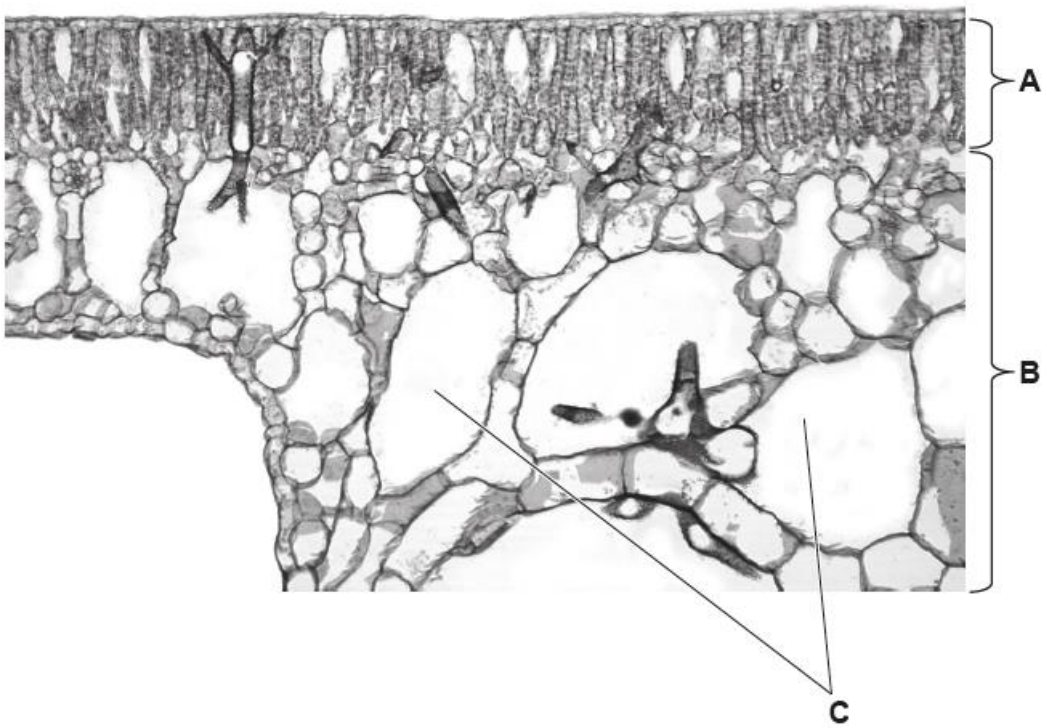


Fig. 2.2

(i) State the names of the parts labelled **A**, **B** and **C** in Fig. 2.2.

A .....

B .....

C .....

[3]

(ii) Explain how part **C** in Fig. 2.2 adapts the hydrophyte for its environment.

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..... [3]

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(c) A scientist calculated the mean number of stomata per mm^2 in the upper and lower epidermis in tomato plants and water lily plants. Tomato plants are a type of terrestrial plant.

Table 2.1 shows the results.

Table 2.1

	mean number of stomata per mm^2	
plant	in upper epidermis	in lower epidermis
tomato	10	129
water lily	475	0

(i) Compare **and** explain the differences in the mean number of stomata in a tomato plant and in a water lily plant.

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..... [5]

(ii) State the name of the cells that control the opening and closing of stomata.

..... [1]

[Total: 14]

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13. Nov/2023 /Paper_ 0610/43/No.2

(a) Fig. 2.1 is a diagram of a cross-section of part of a leaf.

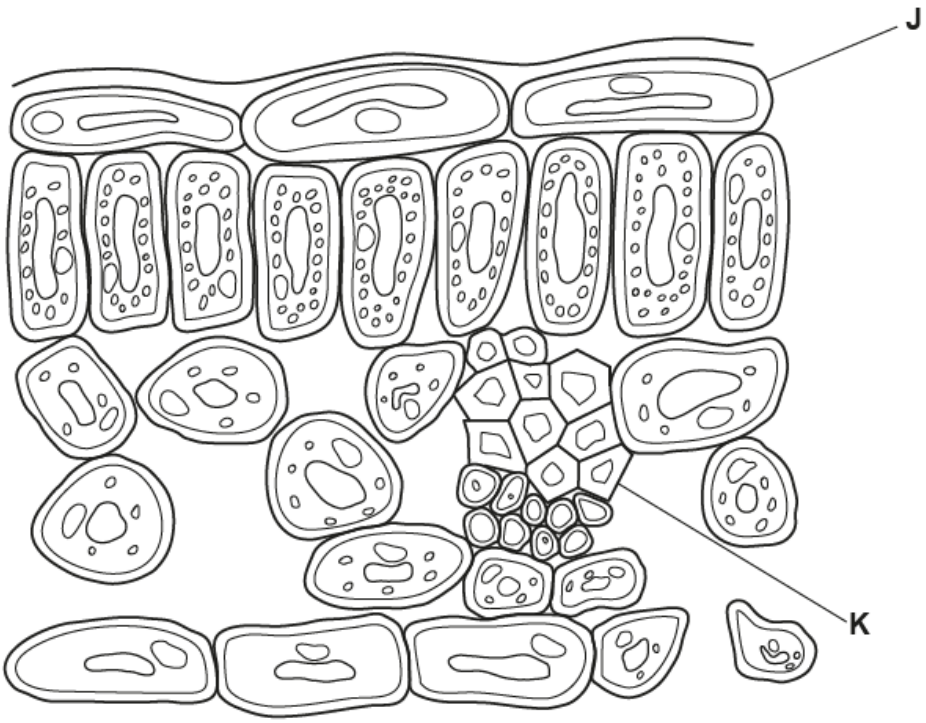


Fig. 2.1

Identify and explain how the structures labelled **J** and **K** are adapted for photosynthesis.

J .....

.....

.....

.....

K .....

.....

.....

.....

[4]

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(b) In an experiment, thale cress plants (*Arabidopsis thaliana*) were grown in normal atmospheric and high carbon dioxide concentrations. The transpiration rate, the mean number of chloroplasts per cell and the concentrations of starch and magnesium ions were measured.

The results are shown in Table 2.1.

Table 2.1

factor measured	normal carbon dioxide concentration	high carbon dioxide concentration
transpiration rate/AU	8.1	5.6
mean number of chloroplasts per cell	8	11
concentration of starch /μg per mg of leaf	38	67
concentration of magnesium ions /mg per g of leaf	2.7	2.3

Complete the sentences about the data shown in Table 2.1.

Table 2.1 shows that increasing the carbon dioxide concentration caused more starch to be produced in the leaves. This shows that, at a normal carbon dioxide concentration, carbon dioxide is a ..... for photosynthesis.

During photosynthesis, ... molecules of carbon dioxide are required to make one molecule of glucose.

The greater quantity of starch stored in the leaves grown in a high carbon dioxide concentration means, when needed, more sucrose can be produced for transport in the phloem, so the leaves act as a ..... .

The greater number of chloroplasts per cell in the leaves grown in the higher carbon dioxide concentration means that more energy can be absorbed from ..... and transferred to ..... energy.

The transpiration rate is lower when the carbon dioxide concentration is higher. This means reduced loss of ..... from the leaves.

Magnesium ion concentration is lower in these leaves because they have used the magnesium ions to make ..... .

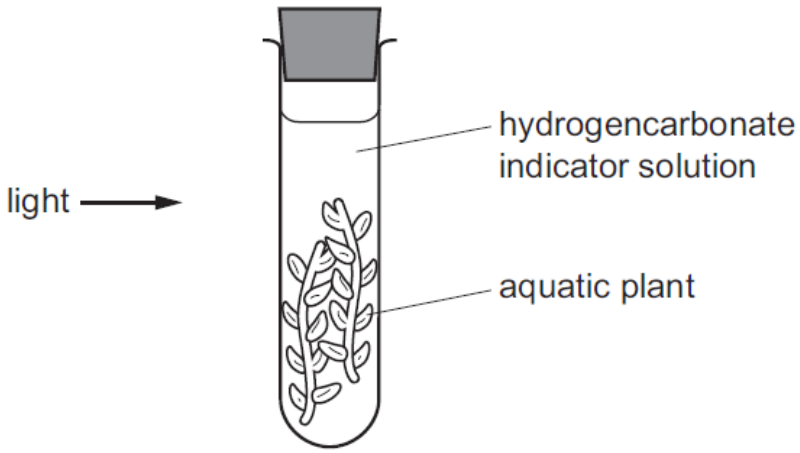
[7]

[Total: 11]

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1. June/2023/Paper_0610/11/No.12

An experiment is set up to investigate gas exchange in aquatic plants.



The hydrogencarbonate indicator solution is orange at the start.

Which colour is it after three hours?

A blue-black

B orange

C purple

D yellow

2. June/2023/Paper_0610/11/No.13

How are most leaves adapted for photosynthesis?

A They have a large surface area and are thick.

B They have a large surface area and are thin.

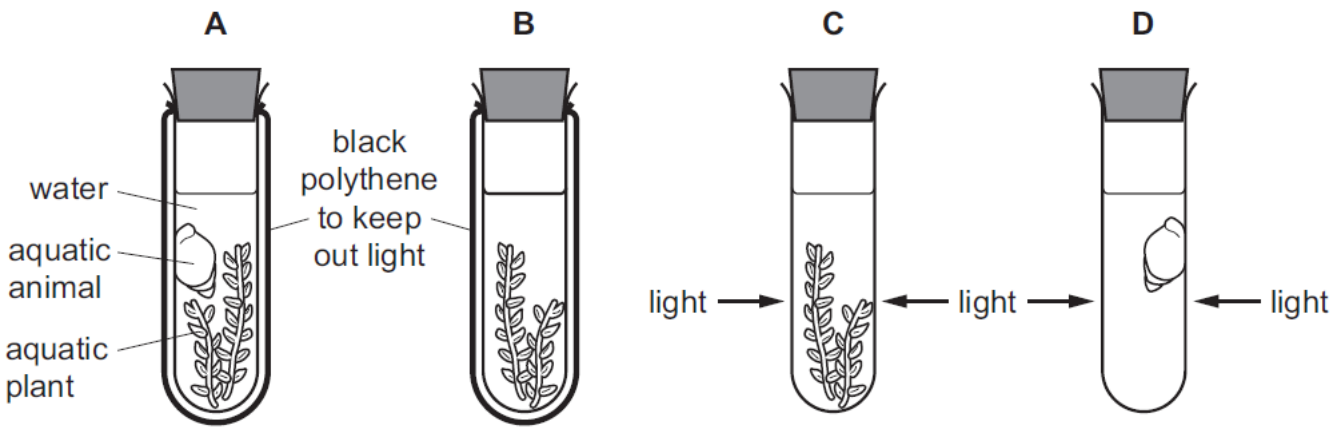
C They have a small surface area and are thick.

D They have a small surface area and are thin.

3. June/2023/Paper_0610/12/No.12

Four test-tubes are set up as shown.

Which test-tube contains the least carbon dioxide after one hour?



4. June/2023/Paper_0610/12/No.13

Which row shows the uses of some carbohydrates in plants?

	glucose	starch	sucrose
A	cell walls	transport	energy storage
B	energy storage	cell walls	respiration
C	respiration	energy storage	transport
D	transport	respiration	cell walls

5. June/2023/Paper_0610/13/No.6

By which process does oxygen pass out of a leaf?

A diffusion

B osmosis

C egestion

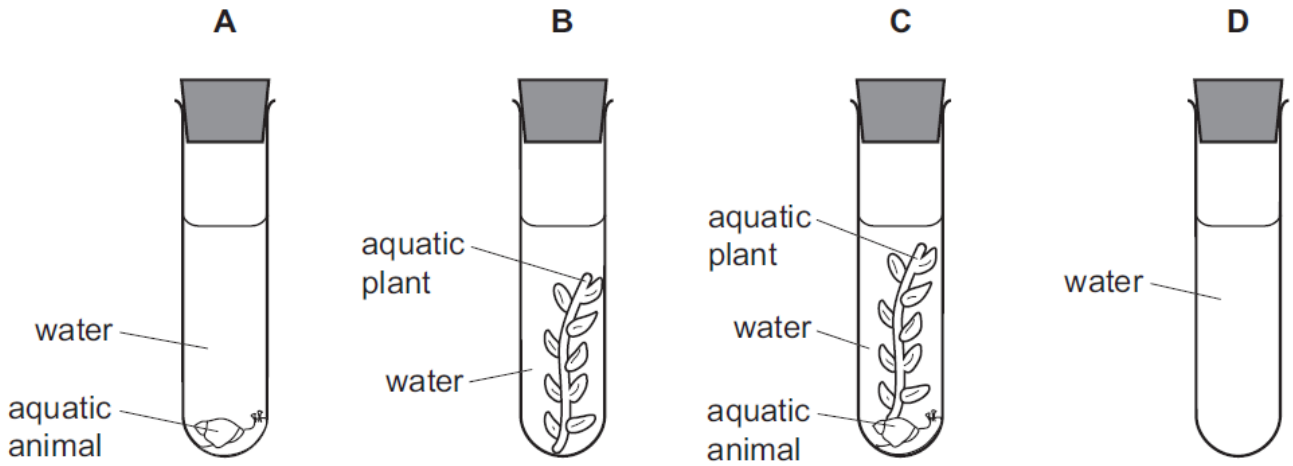
D transpiration

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6. June/2023/Paper_0610/13/No.12

Four test-tubes are set up as shown and left in bright sunlight.

After several hours, which test-tube contains the most oxygen?



7. June/2023/Paper_0610/13/No.13

Which statement about photosynthesis is correct?

A Carbon dioxide and glucose are the raw materials.

B Carbon dioxide and glucose are produced.

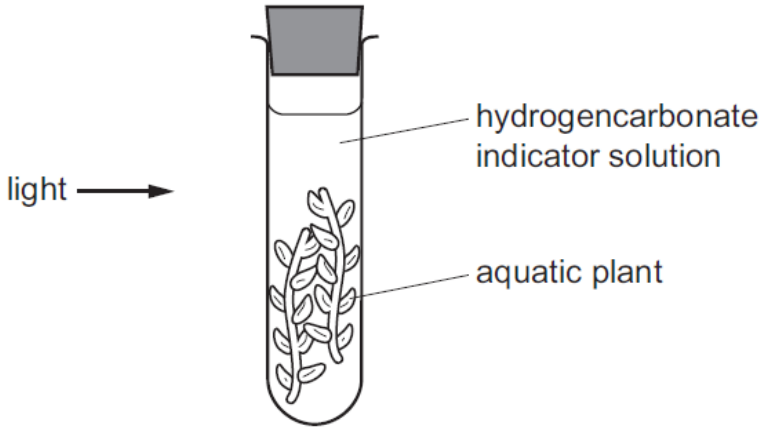
C Oxygen and glucose are produced.

D Oxygen and glucose are the raw materials.

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8. June/2023/Paper_0610/21/No.11

An experiment is set up to investigate gas exchange in aquatic plants.



The hydrogencarbonate indicator solution is orange at the start.

Which colour is it after three hours?

A blue-black

B orange

C purple

D yellow

9. June/2023/Paper_0610/21/No.12

Certain factors are needed for photosynthesis.

If a factor is in short supply, it limits the rate of photosynthesis.

Which of these could be limiting factors?

1 carbon dioxide

2 oxygen

3 light intensity

A 1 and 2 **B** 1 and 3 **C** 2 and 3 **D** 3 only

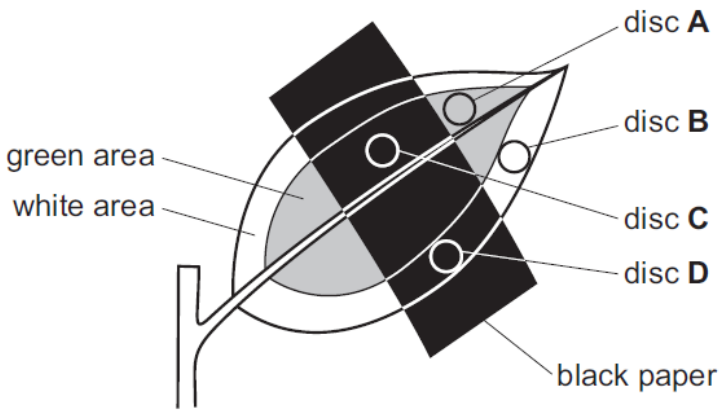
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10. June/2023/Paper_0610/22/No.11

The diagram shows a leaf on a plant used in a photosynthesis experiment. At the start of the experiment, there is no starch in the leaf.

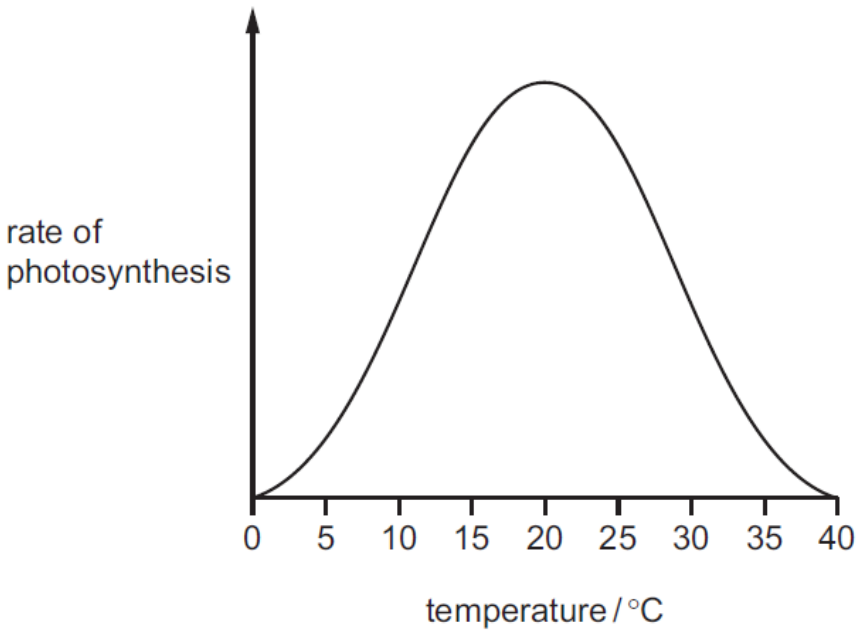
A piece of black paper is attached to the upper surface of the leaf. The plant is placed in bright light for 12 hours. Four discs are then cut from the leaf in the positions shown on the diagram. The discs are tested for starch.

Which disc contains starch?



11. June/2023/Paper_0610/22/No.12

The graph shows the effect of temperature on the rate of photosynthesis.



Which statement explains the change in rate of photosynthesis between 15 °C and 20 °C?

A Chlorophyll is able to transfer more energy in chemicals to energy in light.

B Enzymes involved in photosynthesis have denatured.

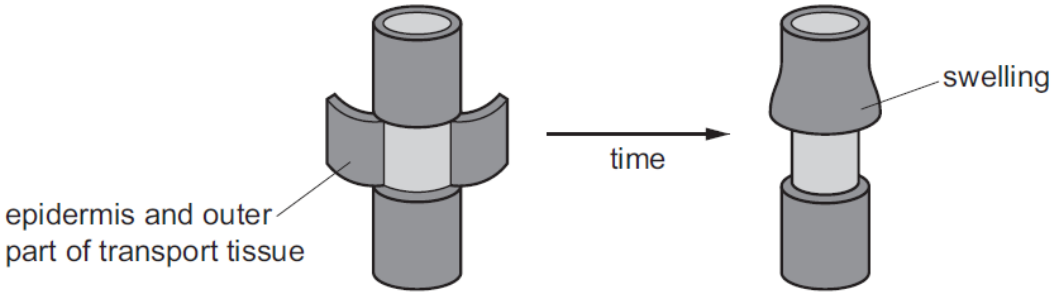
C Kinetic energy of molecules is increasing, resulting in more effective collisions.

D Light intensity and **not** temperature is limiting the rate of photosynthesis.

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12. June/2023/Paper_0610/22/No.16

During an investigation into the movement of substances in a plant, a ring of tissue containing the outer part of the transport tissue is removed, as shown.



Which statement explains why a swelling develops in the stem?

A Phloem has been removed causing a build up of sucrose and amino acids.

B Phloem has been removed causing a build up of water and mineral ions.

C Xylem has been removed causing a build up of sucrose and amino acids.

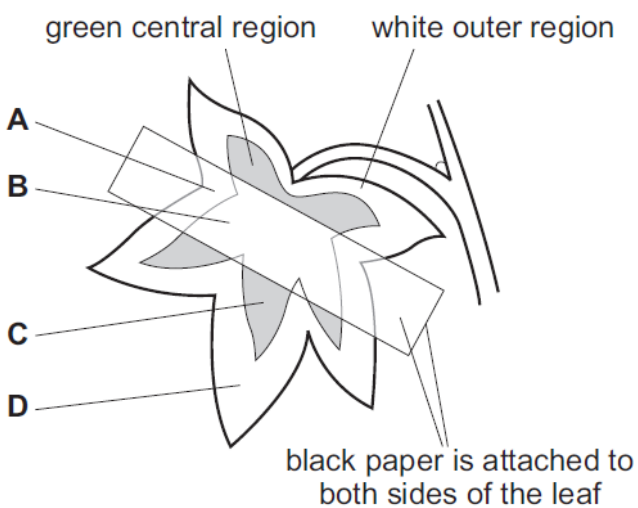
D Xylem has been removed causing a build up of water and mineral ions.

13. June/2023/Paper_0610/23/No.11

A plant with variegated leaves was placed in a dark cupboard for 48 hours so that all the starch was removed from the leaves. The variegated leaves have green parts and white parts.

Black paper was then fixed on one leaf and the plant was exposed to the light.

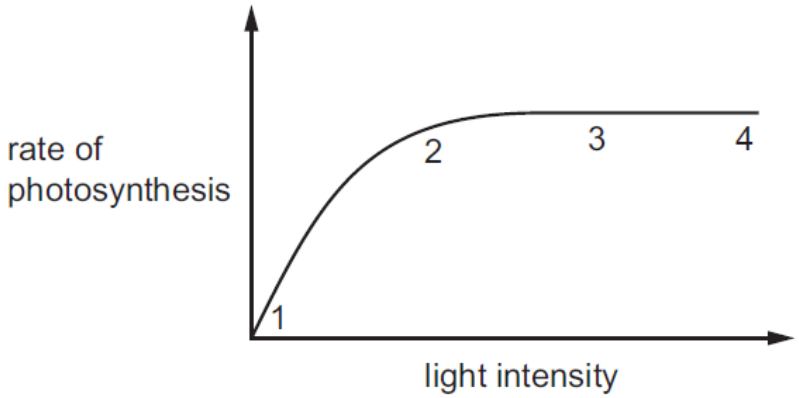
After 24 hours, which region of the leaf contained starch?



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14. June/2023/Paper_0610/23/No.12

The graph shows the rate of photosynthesis with increasing light intensity.



Where is light intensity a limiting factor for photosynthesis?

A between 1 and 2

B between 1 and 3

C between 2 and 4

D between 3 and 4

15. June/2023/Paper_0610/41/No.2d

Explain the effect of a lack of magnesium ions on the colour of plant leaves.

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..... [2]

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16. June/2023/Paper_0610/41/No.4

(a) Fig. 4.1 shows the effect of light intensity on the rate of photosynthesis at different temperatures and concentrations of carbon dioxide.

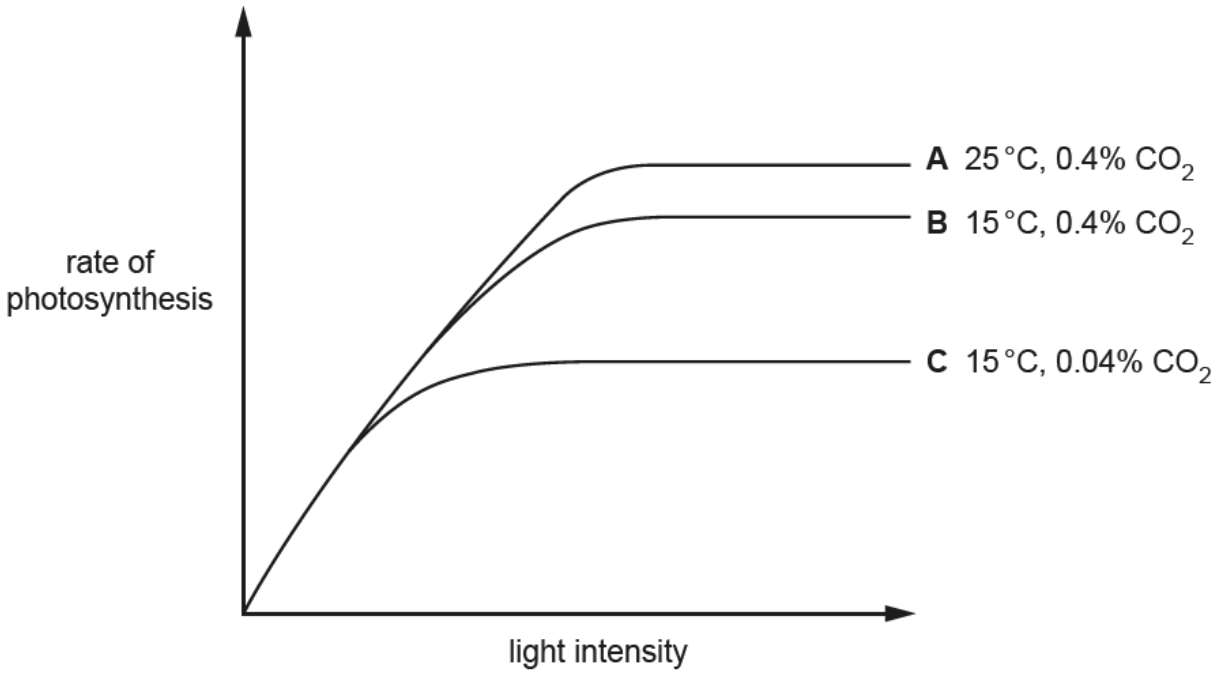


Fig. 4.1

Describe **and** explain the reasons for the shape of lines **B** and **C** in Fig. 4.1.

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..... [6]

(b) $C_6H_{12}O_6$ is one of the products of photosynthesis.

State the chemical formula of the **other** product.

..... [1]

(c) Outline how the carbohydrates made during photosynthesis are used in plants.

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..... [4]

[Total: 11]

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17. June/2023/Paper_0610/42/No.1

Fig. 1.1 is a diagram of part of a cross-section of a leaf.

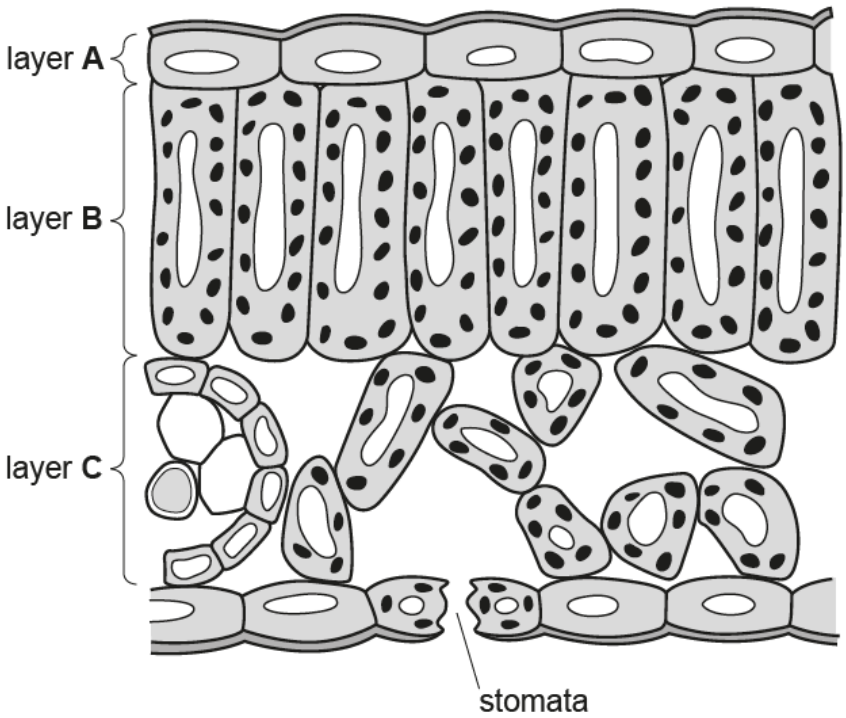


Fig. 1.1

(a) Explain why a leaf is considered to be an organ.

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.....

..... [2]

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(b) Explain how layer **B** and layer **C** in Fig. 1.1 are adapted for their functions.

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..... [6]

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(c) A student placed a plant in a very hot room for 12 hours. There was a bright light in the room and the plant was not given any water during the 12-hour period.

Fig. 1.2 shows a series of sketches that the student made of the stomata during the investigation.

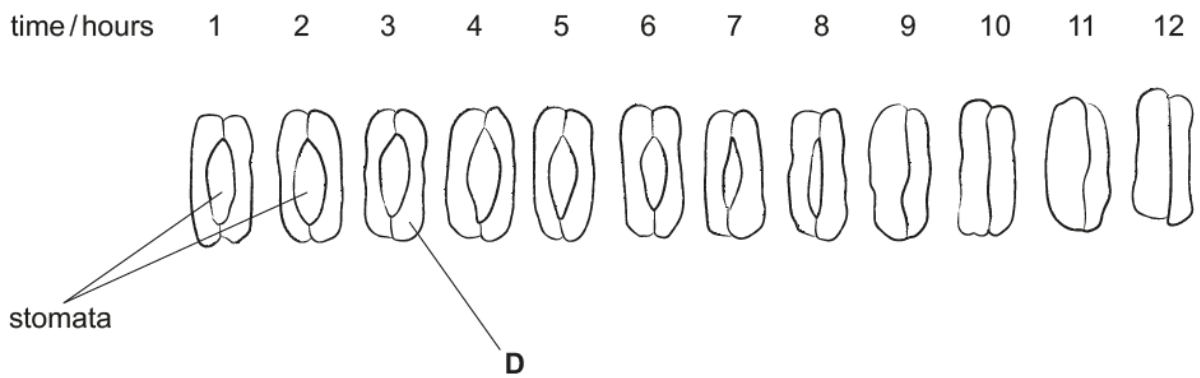


Fig. 1.2

(i) Identify the cell labelled **D** on Fig. 1.2.

..... [1]

(ii) State the main function of the stomata.

..... [1]

(iii) State the advantage to the plant of the change to the stomata shown in Fig. 1.2.

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.....

..... [1]

(d) The student increased the humidity in the room and repeated the investigation.

Predict and explain the effect of high humidity on the stomata.

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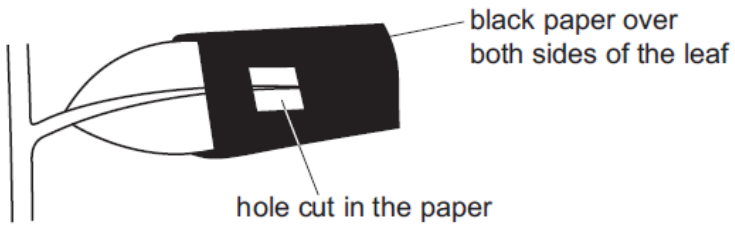
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[Total: 14]

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18. March/2023/Paper_ 0610/12,22/No.12,11

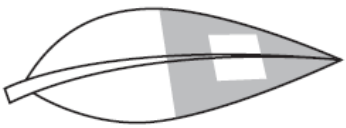
A plant is placed in the dark until all its stored starch is used up. The plant is placed in light with black paper over part of one green leaf.



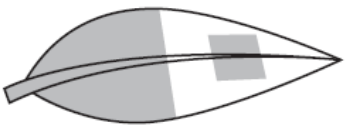
After eight hours, the leaf is tested for starch.

Which diagram shows the appearance of the leaf after this test?

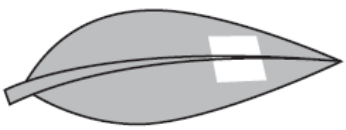
A



B



C



D



key

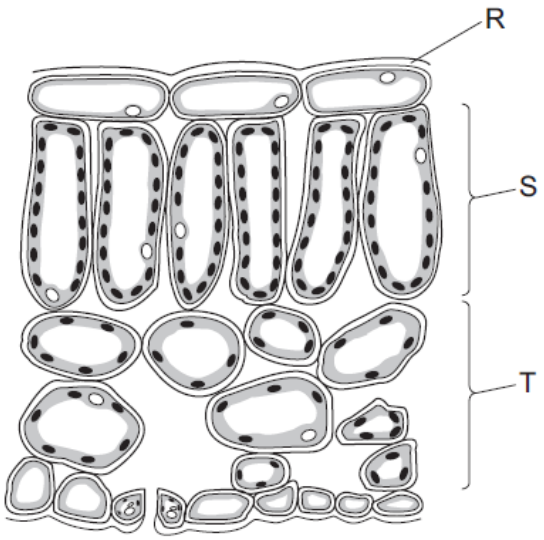
= starch present

= starch **not** present

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19. March/2023/Paper_ 0610/12/No.13

The diagram shows part of a cross-section of a leaf.



Which row shows the correct labels?

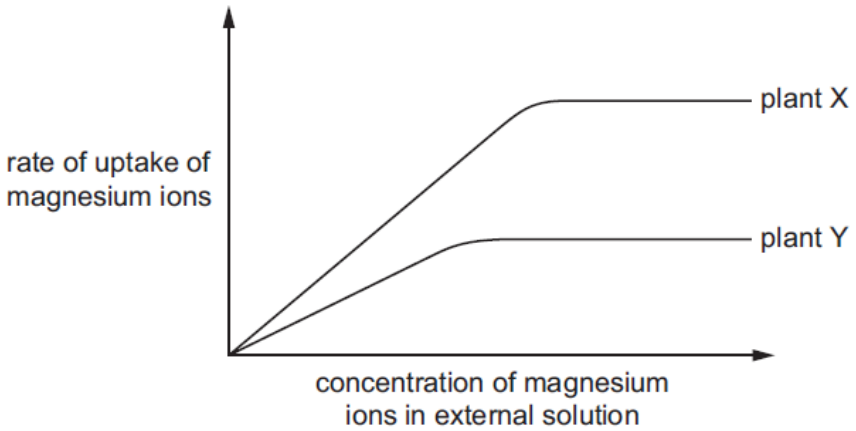
	R	S	T
A	cuticle	palisade mesophyll	spongy mesophyll
B	cuticle	spongy mesophyll	palisade mesophyll
C	epidermis	palisade mesophyll	spongy mesophyll
D	epidermis	spongy mesophyll	palisade mesophyll

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20. March/2023/Paper_ 0610/22/No.6

The graph shows the rate of uptake of magnesium ions by two similar plants, X and Y.

The roots of each plant were placed in a range of solutions. Each solution contained a different concentration of magnesium ions. All other conditions were kept constant.



What is a possible explanation for the difference in the results for the two plants?

A Plant Y has fewer protein carriers for magnesium ions in its cell membranes.

B Plant Y has a higher rate of respiration.

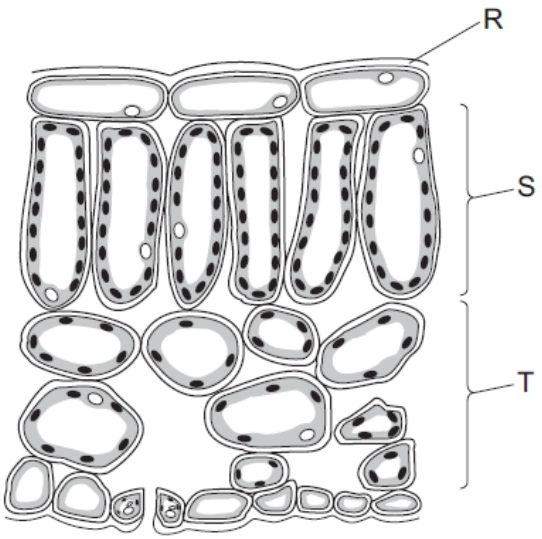
C Plant Y has more root hair cells.

D The root hair cells in plant Y have a lower water potential.

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21. March/2023/Paper_ 0610/22/No.12

The diagram shows part of a cross-section of a leaf.



Which row shows the correct labels?

	R	S	T
A	cuticle	palisade mesophyll	spongy mesophyll
B	cuticle	spongy mesophyll	palisade mesophyll
C	epidermis	palisade mesophyll	spongy mesophyll
D	epidermis	spongy mesophyll	palisade mesophyll

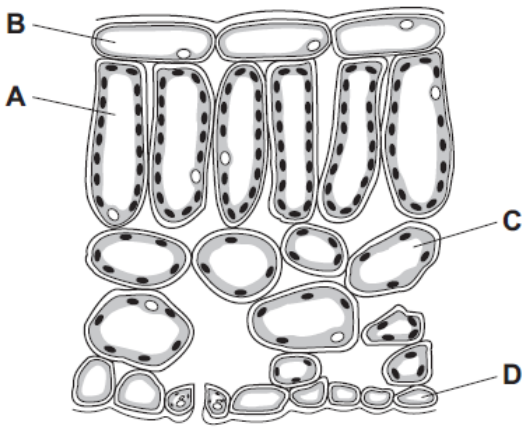
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Plant nutrition – 2022 November IGCSE 0610 Biology

1. Nov/2022/Paper_11/No.5

The diagram shows a cross-section of part of a leaf.

Which type of cell carries out the most photosynthesis?



2. Nov/2022/Paper_11/No.6

A plant cell is viewed using a microscope with a magnification of ×500. The image of the cell has a width of 20 mm.

What is the actual width of the cell?

A 0.04 mm **B** 0.2 mm **C** 4 mm **D** 25 mm

3. Nov/2022/Paper_11/No.7

Particles can move into and out of cells by diffusion.

Which statement about diffusion is correct?

A Particles move from a region of lower concentration to a region of higher concentration.

B Particles only move into cells by diffusion.

C The net movement of particles is against a concentration gradient.

D The process involves the random movement of particles.

4. Nov/2022/Paper_11/No.12

The substances listed are found in the leaf of a plant.

Which substance is obtained from the soil?

A carbon dioxide

B chlorophyll

C glucose

D mineral ions

5. Nov/2022/Paper_11/No.13

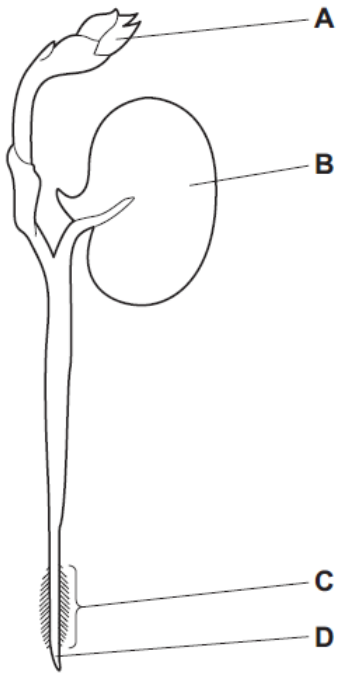
Which row shows what is needed for photosynthesis?

	carbon dioxide	chlorophyll	light	oxygen
A	yes	yes	yes	no
B	yes	no	yes	yes
C	no	no	no	yes
D	no	yes	no	no

6. Nov/2022/Paper_11/No.17

The diagram shows a bean seedling soon after it has germinated.

Where is most water absorbed?



7. Nov/2022/Paper_12/No.12

The substances listed are found in the leaf of a plant.

Which substance is obtained from the soil?

A carbon dioxide

B chlorophyll

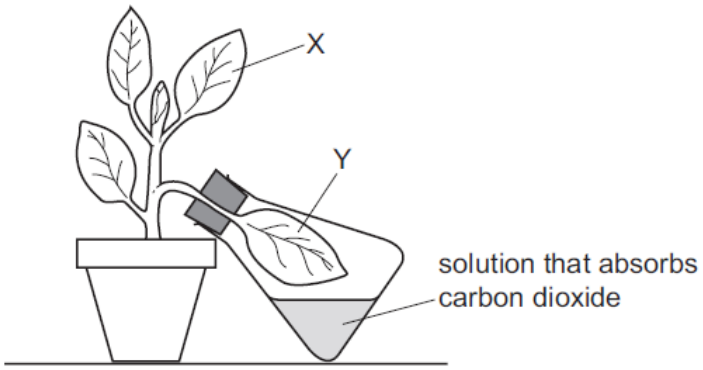
C glucose

D mineral ions

8. Nov/2022/Paper_12/No.13

The diagram shows an experiment to find out if carbon dioxide is necessary for photosynthesis.

The plant is kept in the dark for 48 hours to remove any starch. Then it is set up in the light, as shown.



After 10 hours, leaves X and Y were tested for starch.

What is the expected result?

	presence of starch	
	in leaf X	in leaf Y
A	✓	✓
B	✗	✗
C	✓	✗
D	✗	✓

key
✓ = present
✗ = absent

9. Nov/2022/Paper_13/No.12

The substances listed are found in the leaf of a plant.

Which substance is obtained from the soil?

A carbon dioxide

B chlorophyll

C glucose

D mineral ions

10. Nov/2022/Paper_13/No.13

What is the word equation for photosynthesis?

A carbon dioxide + oxygen → glucose + water

B carbon dioxide + water → glucose + oxygen

C oxygen + glucose → carbon dioxide + water

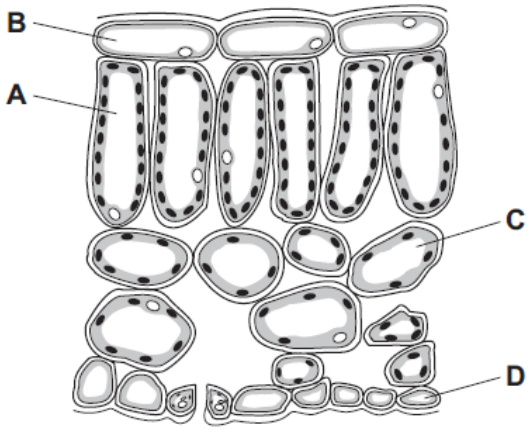
D oxygen + water → glucose + carbon dioxide

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11. Nov/2022/Paper_21/No.4

The diagram shows a cross-section of part of a leaf.

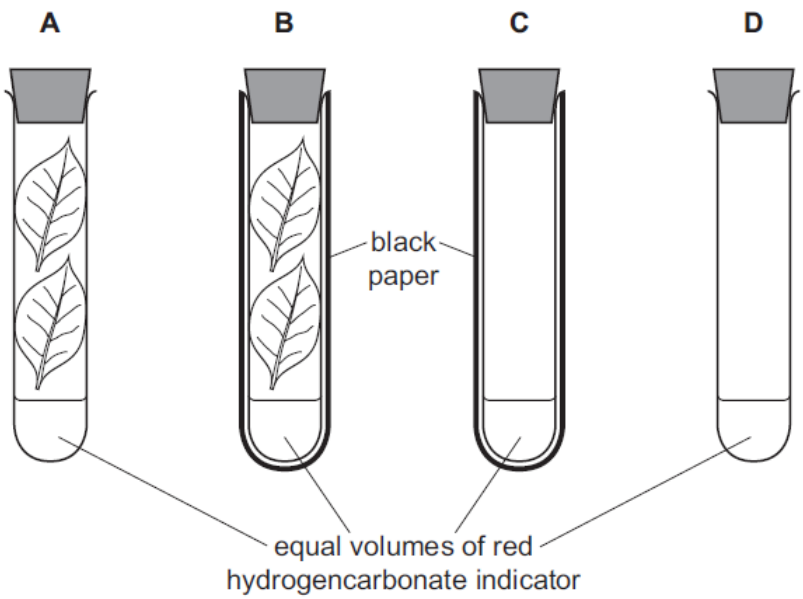
Which type of cell carries out the most photosynthesis?



12. Nov/2022/Paper_21/No.11

Four test-tubes are set up as shown. The test-tubes are kept at 20 °C in a water-bath, in the light, for two hours.

In which test-tube does the hydrogencarbonate indicator turn yellow?



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13. Nov/2022/Paper_21/No.12

The substances listed are found in the leaf of a plant.

Which substance is obtained from the soil?

A carbon dioxide

B chlorophyll

C glucose

D mineral ions

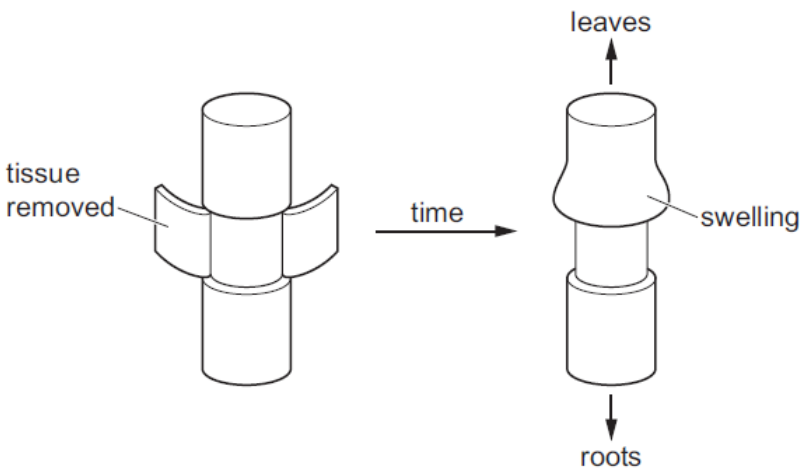
14. Nov/2022/Paper_21/No.16

Scientists investigate the movement of substances in a plant.

They cut a ring of tissue from the stem.

Removing the tissue removes some of the transport vessels found around the edge of the stem.

A few days later they notice swelling above the area where the tissue has been removed.



What causes the swelling?

A Phloem vessels have been removed and sucrose cannot move to the sink.

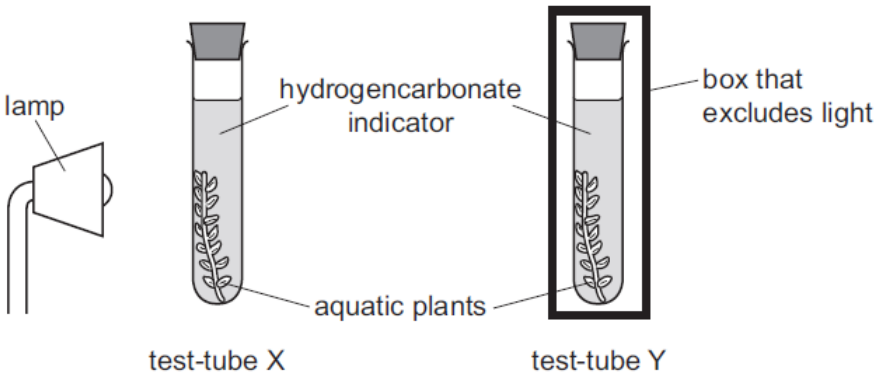
B Phloem vessels have been removed and sucrose cannot move to the source.

C Xylem vessels have been removed and minerals cannot move to the sink.

D Xylem vessels have been removed and minerals cannot move to the source.

15. Nov/2022/Paper_22/No.11

Two test-tubes were filled with hydrogencarbonate indicator. An aquatic plant was placed into each test-tube and the test-tubes were sealed with bungs, as shown.



Test-tube X was illuminated and test-tube Y was kept in the dark. The results are shown.

test-tube	colour of the hydrogencarbonate indicator	
	at the start of the investigation	at the end of the investigation
X	orange	red
Y	orange	yellow

What causes the colour changes in the hydrogencarbonate indicator in X and Y?

	X	Y
A	a decrease in the concentration of carbon dioxide	an increase in the concentration of carbon dioxide
B	a decrease in the concentration of oxygen	an increase in the concentration of oxygen
C	an increase in the concentration of carbon dioxide	a decrease in the concentration of carbon dioxide
D	an increase in the concentration of oxygen	a decrease in the concentration of oxygen

16. Nov/2022/Paper_22/No.12

The substances listed are found in the leaf of a plant.

Which substance is obtained from the soil?

A carbon dioxide

B chlorophyll

C glucose

D mineral ions

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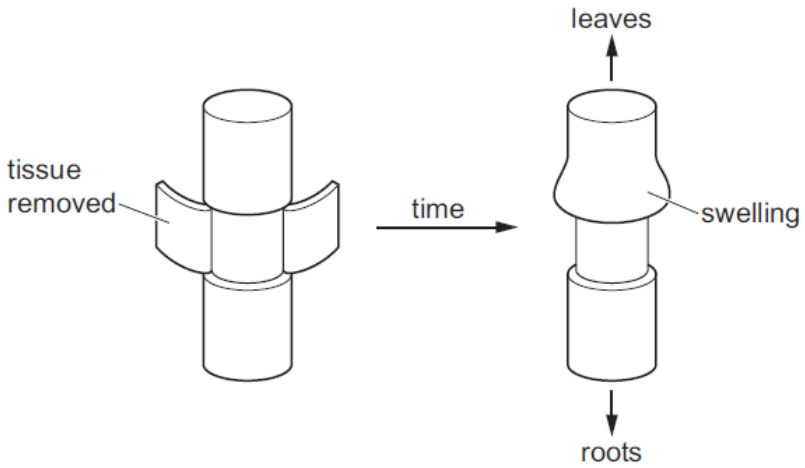
17. Nov/2022/Paper_22/No.16

Scientists investigate the movement of substances in a plant.

They cut a ring of tissue from the stem.

Removing the tissue removes some of the transport vessels found around the edge of the stem.

A few days later they notice swelling above the area where the tissue has been removed.



What causes the swelling?

A Phloem vessels have been removed and sucrose cannot move to the sink.

B Phloem vessels have been removed and sucrose cannot move to the source.

C Xylem vessels have been removed and minerals cannot move to the sink.

D Xylem vessels have been removed and minerals cannot move to the source.

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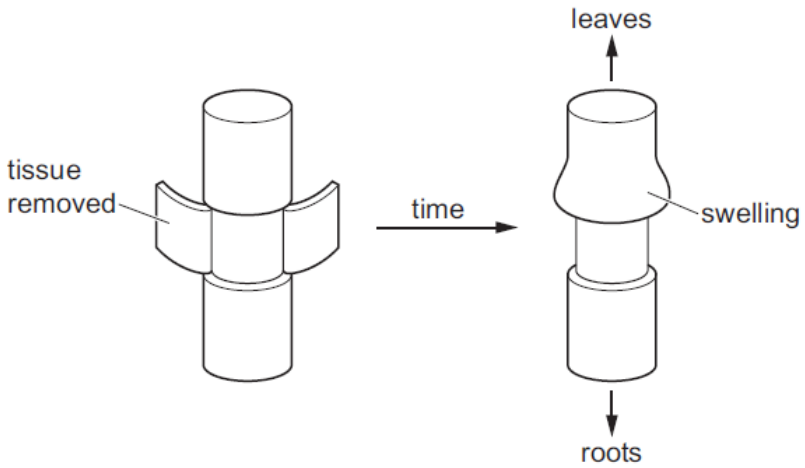
18. Nov/2022/Paper_23/No.16

Scientists investigate the movement of substances in a plant.

They cut a ring of tissue from the stem.

Removing the tissue removes some of the transport vessels found around the edge of the stem.

A few days later they notice swelling above the area where the tissue has been removed.



What causes the swelling?

A Phloem vessels have been removed and sucrose cannot move to the sink.

B Phloem vessels have been removed and sucrose cannot move to the source.

C Xylem vessels have been removed and minerals cannot move to the sink.

D Xylem vessels have been removed and minerals cannot move to the source.

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19. Nov/2022/Paper_31/No.6

(a) Fig. 6.1 is a diagram of a section through a plant leaf.

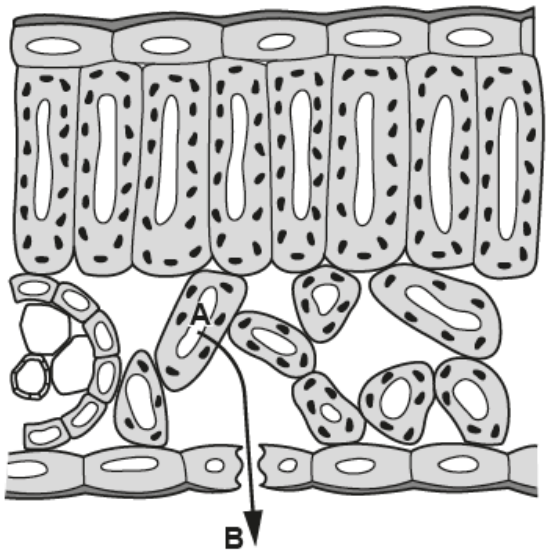


Fig. 6.1

(i) Draw a label line and a label to identify:

- a palisade mesophyll cell
- a vacuole.

[2]

(ii) Complete the sentence about the diffusion of gases.

Gases diffuse between the leaf and the surrounding air from a ..... concentration to a ..... concentration by ..... movement of particles.

[2]

(iii) State the name of the main gas that will diffuse from inside cell **A** to position **B** in Fig. 6.1 on a **sunny**, humid day.

..... [1]

(iv) State the name of the **cell** component through which substances diffuse as they enter or leave the cell.

..... [1]

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(b) A group of students investigated the effect of light intensity on the rate of photosynthesis.

They used this method:

- An aquatic plant was placed in a test-tube containing water.
- A lamp was placed 10 cm from the aquatic plant.
- The number of bubbles of gas produced in one minute was counted and recorded in Table 6.1.
- The investigation was repeated with the lamp at different distances from the aquatic plant.

Fig. 6.2 is a diagram of the equipment used.

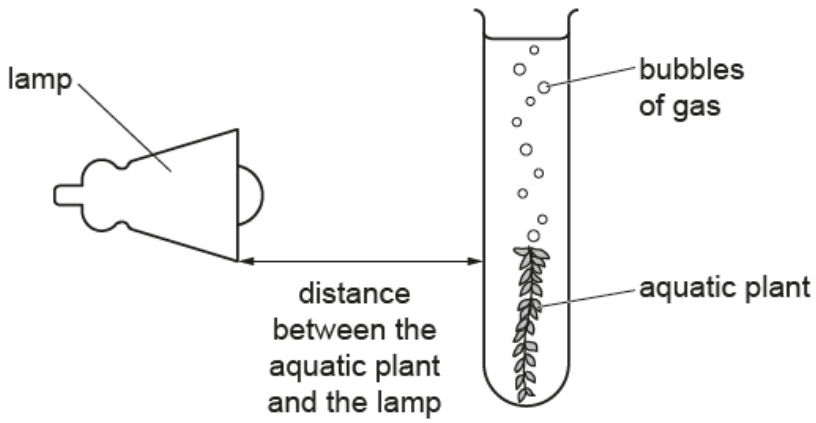


Fig. 6.2

The results are shown in Table 6.1.

Table 6.1

distance from the aquatic plant / cm	number of bubbles produced in one minute
10	90
15	85
20	75
40	50
50	30

(i) State the distance which gives the highest rate of photosynthesis.

..... cm [1]

(ii) Describe the effect of increasing light intensity on the rate of photosynthesis.

.....

.....

..... [1]

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(iii) The student repeated the investigation but added a source of carbon dioxide to the water in the test-tube.

Suggest how this would affect the rate of photosynthesis.

.....

.....

..... [1]

(c) (i) State the name of **two** large carbohydrate molecules found in plants that can be made from glucose.

1 .....

2 .....

[2]

(ii) Plants can make glucose and proteins.

Using the words from the list, complete Table 6.2 to show **all** of the chemical elements that are found in glucose and all proteins.

Each word may be used once, more than once or not at all.

carbon **hydrogen** **oxygen**

nitrogen **magnesium**

Table 6.2

glucose	all proteins

[2]

[Total: 13]

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20. Nov/2022/Paper_41/No.3

(a) Fig. 3.1 shows some apparatus that was used to investigate water loss from a leafy shoot.

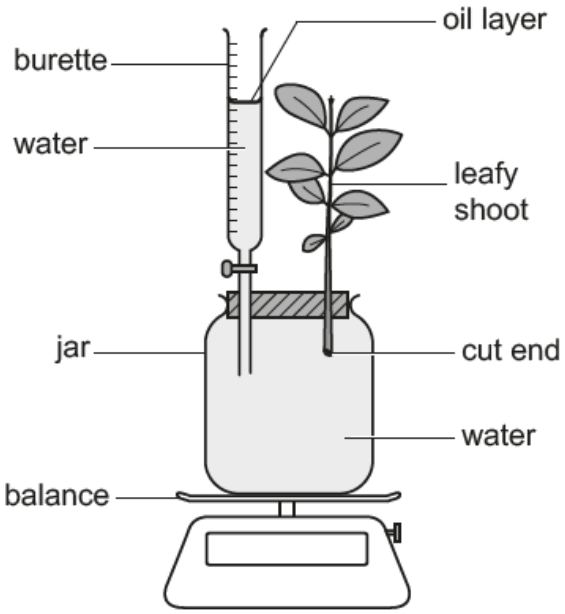


Fig. 3.1

(i) State the name of the process by which leafy shoots lose water.

..... [1]

(ii) Before the leafy shoot is inserted into the jar shown in Fig. 3.1, it must be recut under water.

Suggest why the end of the leafy shoot was cut under water.

.....

.....

..... [1]

(iii) State the purpose of the oil layer on top of the water in the burette.

.....

.....

..... [1]

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(iv) Using the information in Fig. 3.1, describe **one** method that can be used to determine how much water is lost from the leafy shoot.

.....

.....

..... [1]

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(b) The apparatus shown in Fig. 3.1 was used to investigate the effect of temperature on the rate of water loss in a species of plant. The results are shown in Fig. 3.2.

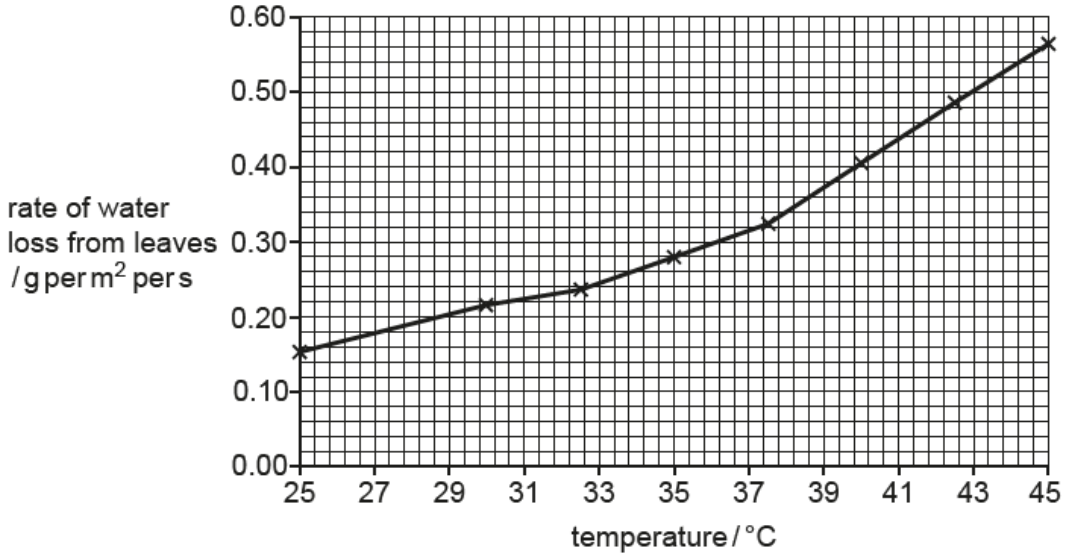


Fig. 3.2

(i) Using the information in Fig. 3.2, calculate how much water would be lost from 1 m^2 of leaves in 12 hours if the plants were kept at 35 °C. Include the unit.

.....

[3]

(ii) Using the information in Fig. 3.2, describe **and** explain the effect of increasing temperature on the rate of water loss in this species of plant.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... [5]

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(c) The apparatus shown in Fig. 3.1 can also be used to investigate the effects of changing humidity on water loss in plants.

(i) Suggest why the mass of water in the apparatus does **not** change when the leafy shoot is kept at 100% relative humidity.

.....

.....

.....

.....

..... [2]

(ii) Even at extremely low relative humidities the leafy shoot did not wilt.

Explain why the leafy shoot shown in Fig. 3.1 did **not** wilt.

.....

.....

..... [1]

(iii) The investigation on the effect of temperature was done at a relative humidity of 20%.

The investigation was repeated at a relative humidity of 80% and all other conditions were kept the same.

Predict how the water loss will differ from the trend shown in Fig. 3.2.

Sketch your prediction **on Fig. 3.2**.

[1]

[Total: 16]

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21. Nov/2022/Paper_42/No.3(c)

(c) Sucrose travels from the stem to other parts of the plant known as sinks, where it is used.

(i) State **two** parts of a plant that are sinks for sucrose.

1 .....

2 .....

[2]

(ii) Sucrose is used in the cells of the sinks in a plant.

Describe the uses of sucrose by sinks.

.....

.....

.....

.....

.....

.....

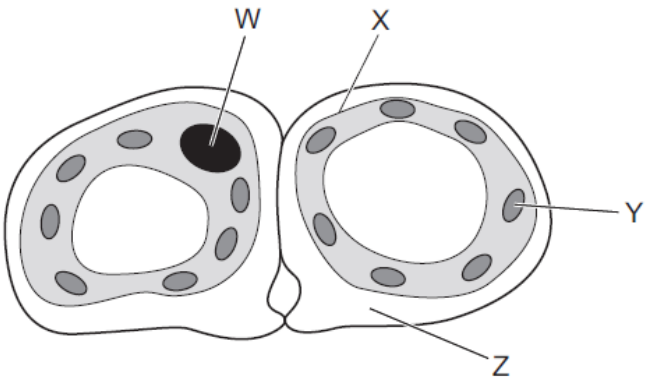
..... [3]

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Plant nutrition – 2022 June IGCSE 0610

1. June/2022/Paper_ 11/No.4

The diagram shows a cross-section through two guard cells of a leaf.



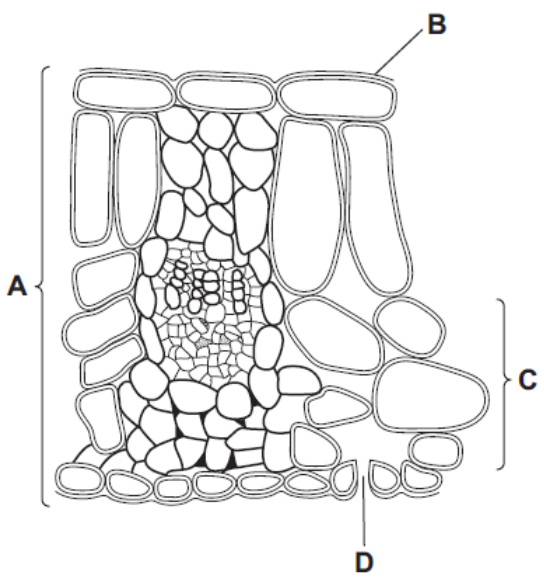
Which labelled structures would also be found in an animal cell?

A W and X **B** X and Y **C** Y and Z **D** Z and W

2. June/2022/Paper_ 11/No.5

The diagram shows a cross-section through a leaf.

Which label shows a tissue?

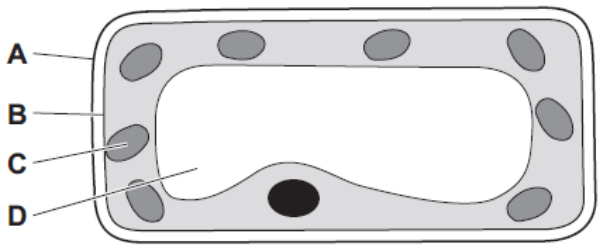


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3. June/2022/Paper_ 11/No.8

The diagram shows a section through a mesophyll cell of a leaf.

Which part is partially permeable?



4. June/2022/Paper_ 11/No.12

Which chemical is a product of photosynthesis that moves out of a green leaf through its stomata?

A carbon dioxide

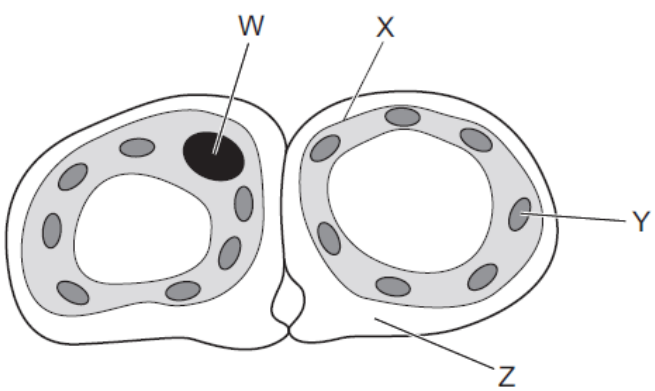
B glucose

C oxygen

D water

5. June/2022/Paper_ 12/No.4

The diagram shows a cross-section through two guard cells of a leaf.



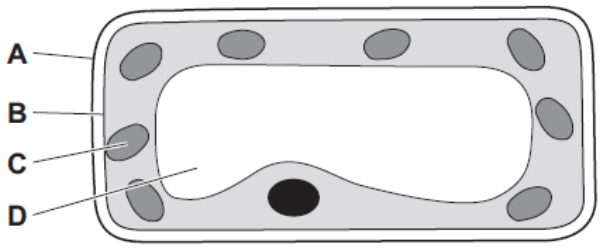
Which labelled structures would also be found in an animal cell?

A W and X **B** X and Y **C** Y and Z **D** Z and W

6. June/2022/Paper_ 12/No.8

The diagram shows a section through a mesophyll cell of a leaf.

Which part is partially permeable?



7. June/2022/Paper_ 12/No.12

Which chemical is a product of photosynthesis that moves out of a green leaf through its stomata?

A carbon dioxide

B glucose

C oxygen

D water

8. June/2022/Paper_ 12/No.13

In a leaf, water moves from the surface of a mesophyll cell and then out of the leaf into the atmosphere.

What is the correct order of the processes involved?

A active transport → osmosis

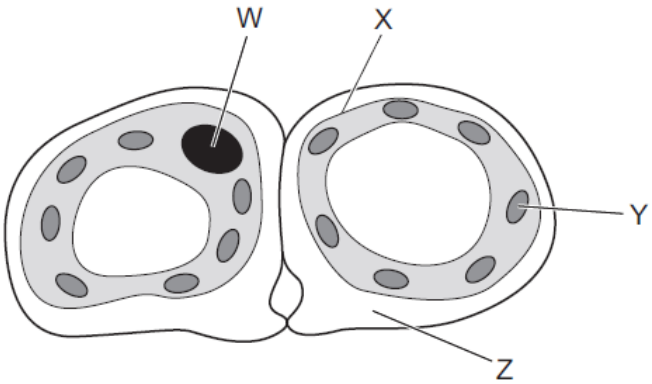
B diffusion → evaporation

C evaporation → diffusion

D osmosis → active transport

9. June/2022/Paper_ 13/No.4

The diagram shows a cross-section through two guard cells of a leaf.



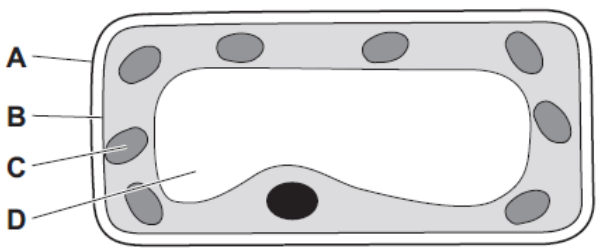
Which labelled structures would also be found in an animal cell?

A W and X **B** X and Y **C** Y and Z **D** Z and W

10. June/2022/Paper_ 13/No.8

The diagram shows a section through a mesophyll cell of a leaf.

Which part is partially permeable?



11. June/2022/Paper_ 13/No.12

Which chemical is a product of photosynthesis that moves out of a green leaf through its stomata?

A carbon dioxide

B glucose

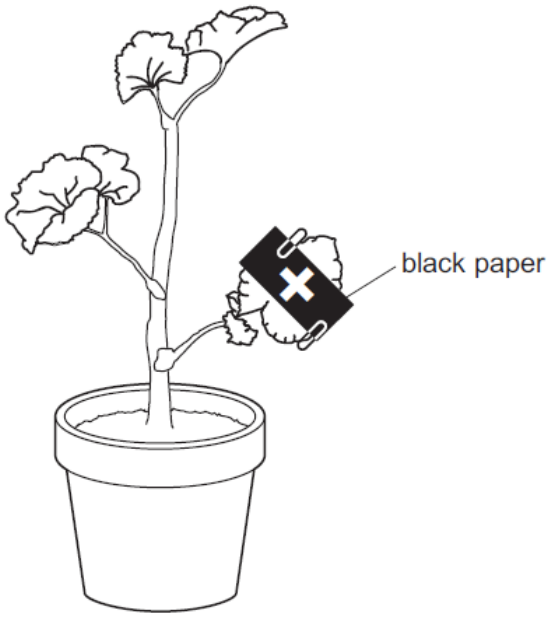
C oxygen

D water

12. June/2022/Paper_ 13/No.13

A student investigated one of the factors that affects photosynthesis.

Part of a leaf was covered with black paper, as shown.



After two days the student tested the leaf for the presence of starch.

Which factor did the student investigate?

A carbon dioxide

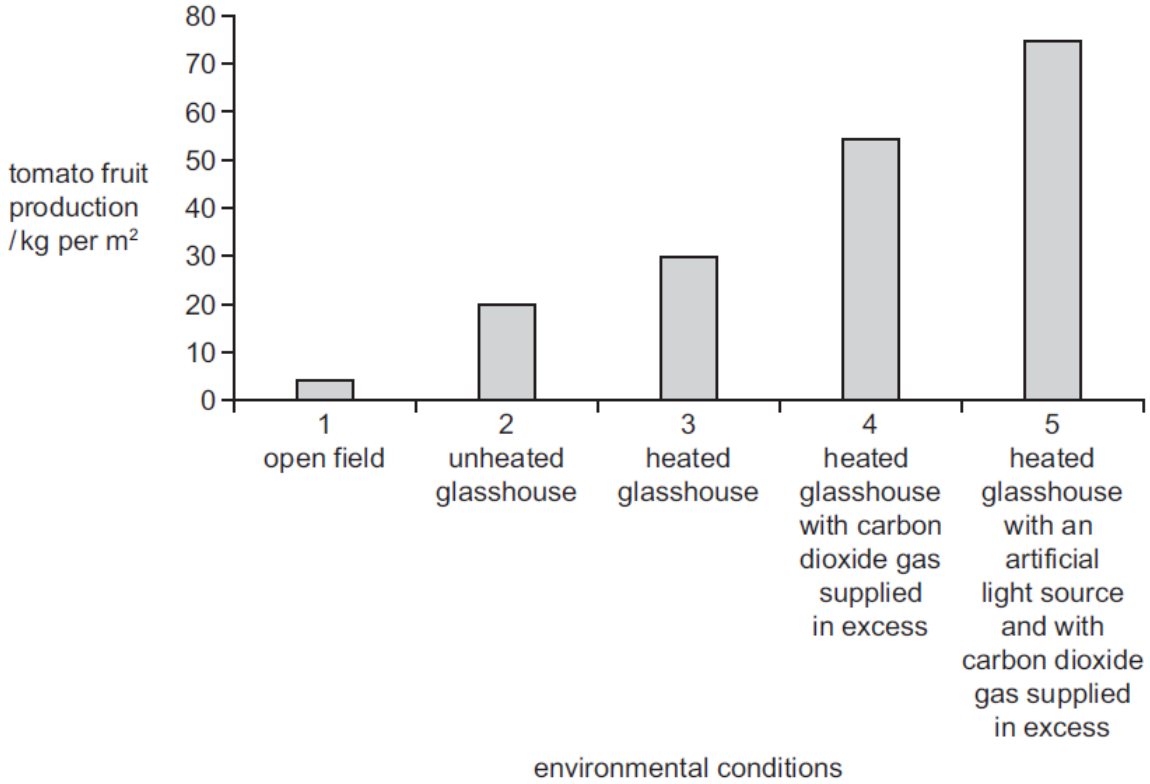
B chlorophyll

C light

D oxygen

13. June/2022/Paper_ 21/No.11

Tomato fruit production was measured in five different environmental conditions.



What is a correct conclusion for the data shown in the graph?

A There are no limiting factors in 1, so tomato fruit production is the lowest.

B Temperature is the limiting factor in 3.

C Carbon dioxide is the limiting factor in all five environmental conditions.

D Light is the limiting factor in 4.

14. June/2022/Paper_ 21/No.12

How do the air spaces in the spongy mesophyll of a leaf help to adapt it for photosynthesis?

A They act as a store of oxygen.

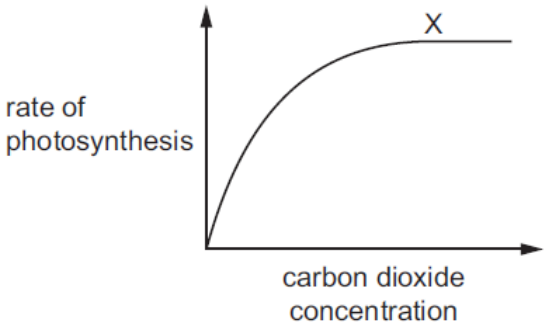
B They allow carbon dioxide gas to diffuse through the leaf more rapidly.

C They increase the surface area for absorption of light energy.

D They let rainwater enter the leaf tissues.

15. June/2022/Paper_ 23/No.11

The graph shows the rate of photosynthesis at different carbon dioxide concentrations.



What could be the limiting factor of photosynthesis at X on the graph?

A oxygen

B carbon dioxide

C glucose

D light intensity

16. June/2022/Paper_ 23/No.12

The list shows features of a plant leaf.

1 air spaces between spongy mesophyll cells

2 chloroplasts in mesophyll cells

3 contains a natural insecticide

4 xylem vessels close to mesophyll cells

Which features are adaptations for photosynthesis?

A 1, 2 and 3 **B** 1, 2 and 4 **C** 1, 3 and 4 **D** 2, 3 and 4

17. June/2022/Paper_ 32/No.7(c)

(c) Complete the sentences.

Seeds contain proteins for the ..... of developing shoots and roots. Proteins contain the elements ..... , oxygen, ... and nitrogen.

The new leaves of a seedling need the mineral ion ..... to make the green pigment ..... .

This green pigment is needed to carry out the process of ....., in the presence of light.

[6]

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18. June/2022/Paper_ 33/No.2(a_ c)

Photosynthesis is a process that occurs in plant cells.

(a) **(i)** State the word equation for photosynthesis.

..... [2]

(ii) State the type of energy required for photosynthesis.

..... [1]

(b) Fig. 2.1 is a diagram of a section through a leaf.

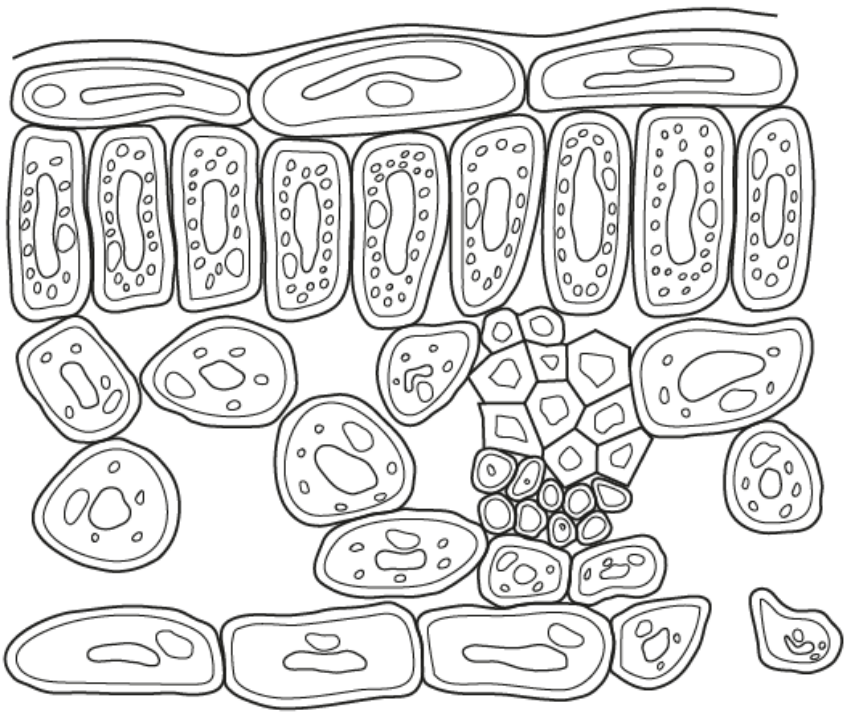


Fig. 2.1

(i) On Fig. 2.1:

- label with a label line **and** the letter **A** the type of cell where most photosynthesis takes place.
- label with a label line **and** the letter **B** the type of cell which conducts water through the plant.

[2]

(ii) State the name of the cell structure where photosynthesis happens.

..... [1]

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(c) A student investigated the rate of photosynthesis in a plant at different temperatures.

The results are shown in Table 2.1.

Table 2.1

temperature / °C	rate of photosynthesis / arbitrary units
20	42
25	61
30	77
35	92
40	45

(i) State the temperature at which the rate of photosynthesis is highest.

..... °C [1]

(ii) Calculate the percentage increase in the rate of photosynthesis from 20 °C to 30 °C.

Give your answer to **three** significant figures.

Space for working.

..... %
[3]

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19. June/2022/Paper_ 43/No.5(a_ b)

Glasshouses are designed to maximise crop plant yield.

(a) (i) Explain why carbon dioxide enrichment is used in many glasshouses to increase crop plant yield.

.....

.....

.....

.....

.....

.....

..... [3]

(ii) Suggest how the carbon dioxide concentration in a glasshouse can be enriched.

.....

.....

..... [1]

(iii) Outline how carbon dioxide in a glasshouse moves into leaves.

.....

.....

.....

.....

..... [2]

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(b) Additional lighting is often installed in glasshouses in countries with temperate climates.

Table 5.1 summarises some of the factors that are considered by plant growers when choosing the type of lamps to install in a glasshouse.

Table 5.1

type of lamp	electrical energy used by the lamp / J per s	light intensity output / arbitrary units	notes
sodium	1041	1767	• releases lots of heat • best when used in addition to sunlight
LED	423	378	• releases very little heat • can be used as an alternative to sunlight
metal halide	651	817	• releases some heat • can be used as an alternative to sunlight
fluorescent	394	374	• releases some heat • best when used in addition to sunlight

(i) Calculate the percentage increase in the energy used by the metal halide lamp compared to the energy used by the fluorescent lamp.

Give your answer to **two** significant figures.

Space for working.

..... %
[2]

(ii) State which type of lamp has the highest light intensity output per unit of electrical energy used.

..... [1]

STEMUP.CO.UK

(iii) Some types of lamp release a lot of heat.

Explain the possible effects of excessive heat on the plants in a glasshouse.

.....

.....

.....

.....

.....

.....

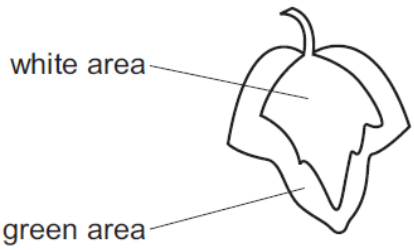
..... [3]

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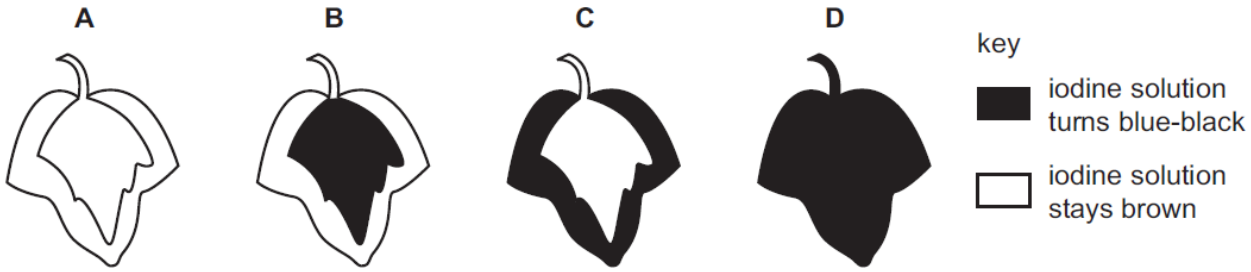
1. Nov/2021/Paper_11/No.9

In a photosynthesis experiment, a plant is left in bright sunlight for several hours. A leaf is then removed from the plant and tested for starch, using iodine solution.

The diagram shows the leaf from the plant that was used in the experiment.



Which diagram shows the result of the experiment?



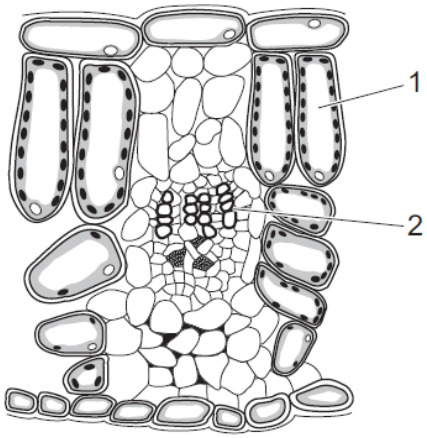
2. Nov/2021/Paper_11/No.12

Which row shows the raw materials needed for photosynthesis and the products of photosynthesis?

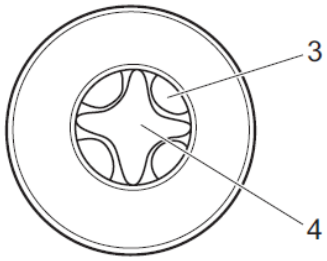
	raw materials	products
A	water + chlorophyll	carbon dioxide + glucose
B	carbon dioxide + water	chlorophyll + oxygen
C	oxygen + carbon dioxide	water + glucose
D	water + carbon dioxide	glucose + oxygen

3. Nov/2021/Paper_11/No.17

The diagrams show sections of a leaf and a root.



section of a leaf



not to scale

section through a root

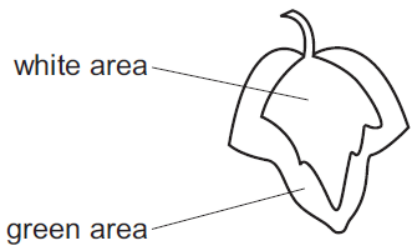
Which two labelled structures identify xylem?

A 1 and 4 **B** 2 and 3 **C** 1 and 3 **D** 2 and 4

4. Nov/2021/Paper_12/No.9

In a photosynthesis experiment, a plant is left in bright sunlight for several hours. A leaf is then removed from the plant and tested for starch, using iodine solution.

The diagram shows the leaf from the plant that was used in the experiment.



Which diagram shows the result of the experiment?

A



B



C



D



key

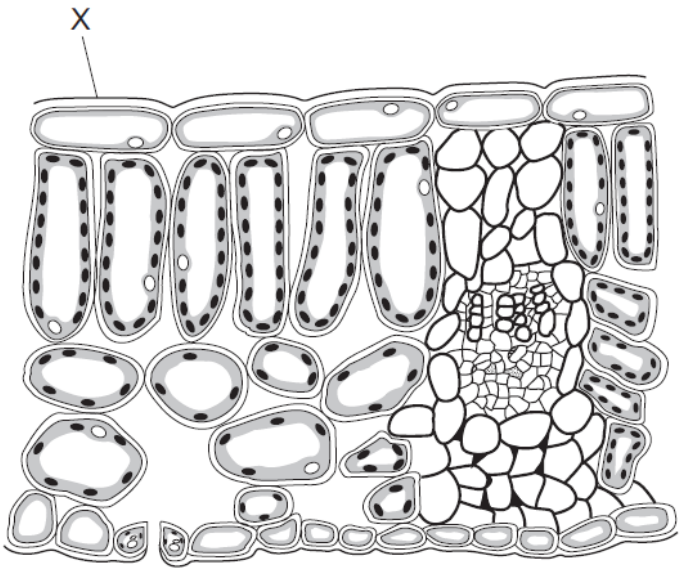
iodine solution turns blue-black

iodine solution stays brown

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5. Nov/2021/Paper_12/No.12

The diagram shows a cross-section through a leaf.



What is the structure labelled X?

A cuticle

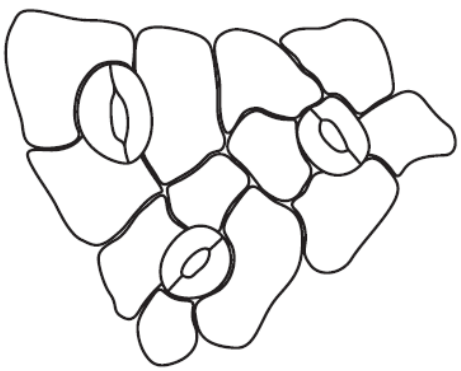
B palisade mesophyll

C spongy mesophyll

D stomata

6. Nov/2021/Paper_12/No.13

The diagram shows the surface view of part of the epidermis of a leaf.



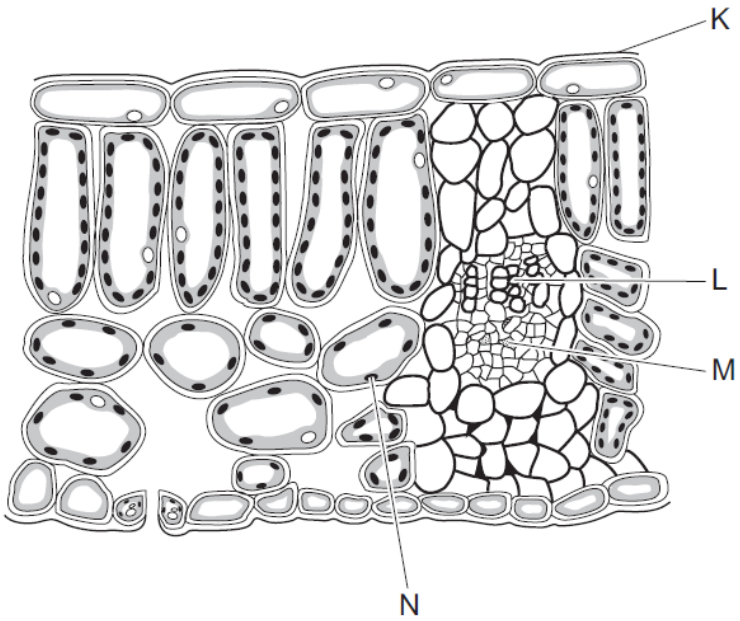
How many guard cells are present?

A 0 **B** 3 **C** 6 **D** 12

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7. Nov/2021/Paper_13/No.12

The diagram shows a section through a leaf.



What are structures K, L, M and N?

	K	L	M	N
A	cuticle	phloem	xylem	spongy mesophyll
B	cuticle	xylem	phloem	spongy mesophyll
C	xylem	phloem	spongy mesophyll	cuticle
D	xylem	spongy mesophyll	cuticle	phloem

8. Nov/2021/Paper_13/No.17

By which method is water absorbed by root hair cells?

A active transport

B evaporation

C osmosis

D transpiration

9. Nov/2021/Paper_13/No.38

Which process releases carbon dioxide into the atmosphere?

A decomposition

B fossilisation

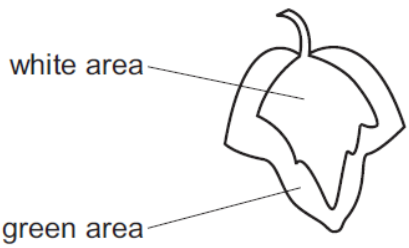
C photosynthesis

D transpiration

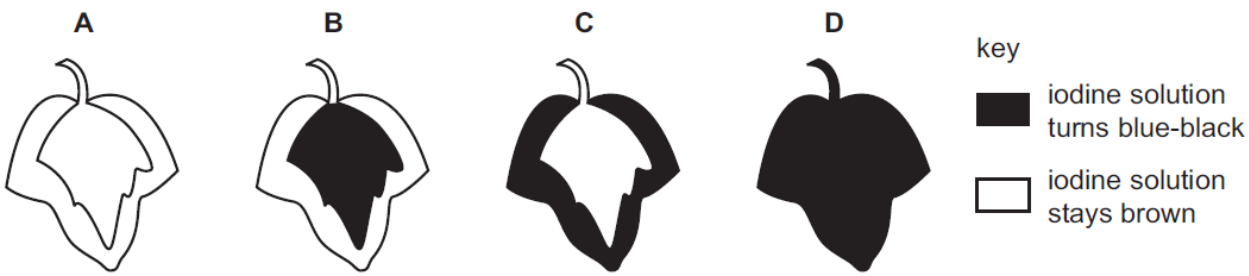
10. Nov/2021/Paper_21/No.9

In a photosynthesis experiment, a plant is left in bright sunlight for several hours. A leaf is then removed from the plant and tested for starch, using iodine solution.

The diagram shows the leaf from the plant that was used in the experiment.



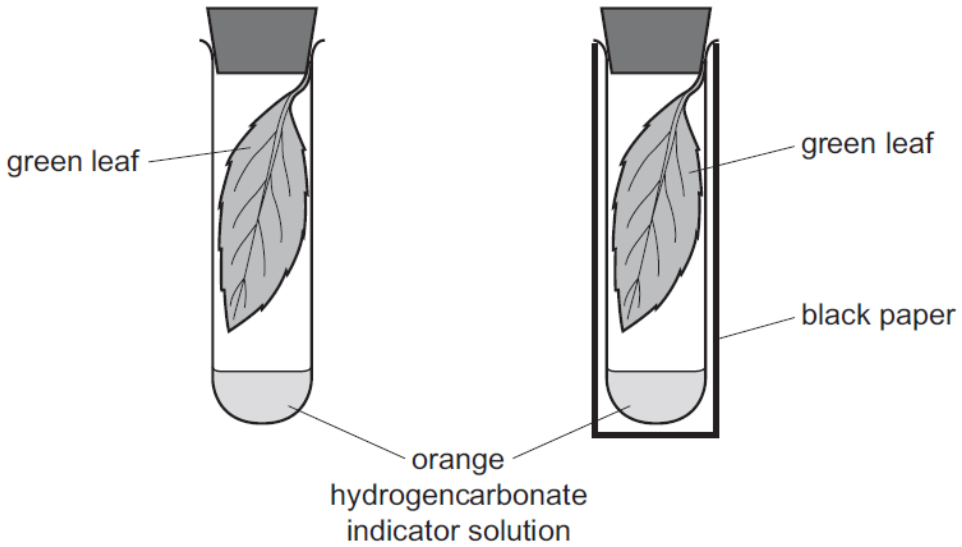
Which diagram shows the result of the experiment?



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11. Nov/2021/Paper_21/No.12

Two similar leaves are set up in test-tubes as shown. One is exposed to light, while the other is kept in the dark.



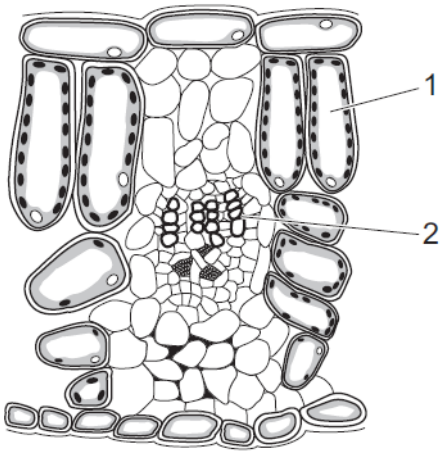
After a few hours, which colour would the hydrogencarbonate indicator solution be in each test-tube?

	light	dark
A	colourless	blue-black
B	purple	yellow
C	red	blue
D	yellow	purple

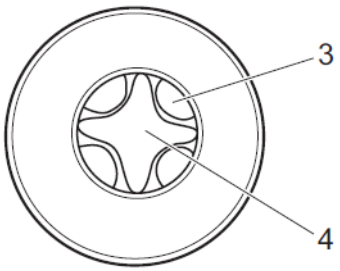
STEMUP.CO.UK

12. Nov/2021/Paper_21/No.16

The diagrams show sections of a leaf and a root.



section of a leaf



section through a root

not to scale

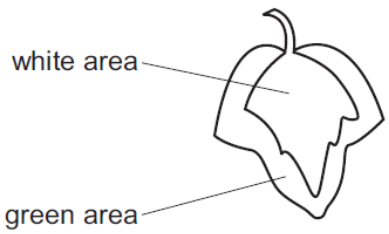
Which two labelled structures identify xylem?

A 1 and 4 **B** 2 and 3 **C** 1 and 3 **D** 2 and 4

13. Nov/2021/Paper_22/No.9

In a photosynthesis experiment, a plant is left in bright sunlight for several hours. A leaf is then removed from the plant and tested for starch, using iodine solution.

The diagram shows the leaf from the plant that was used in the experiment.



Which diagram shows the result of the experiment?

A



B



C



D



key

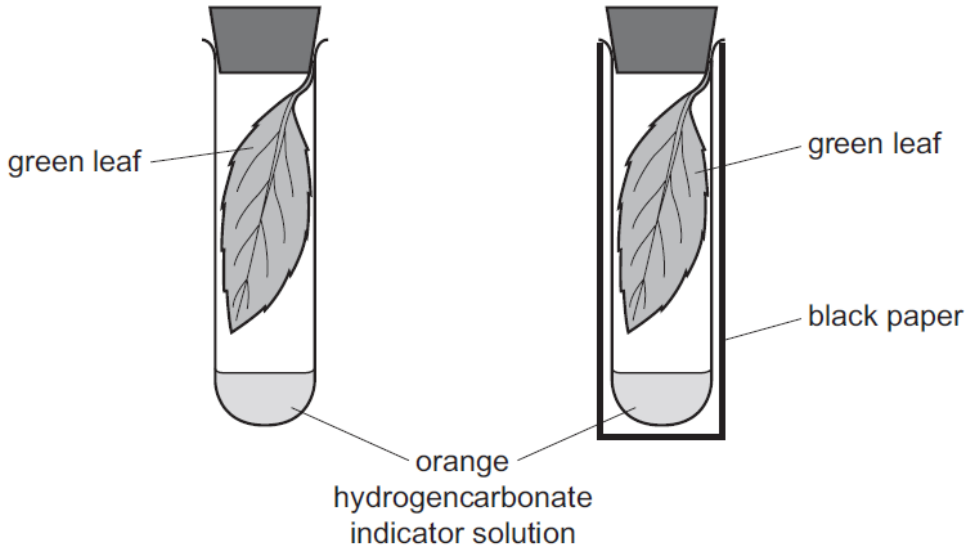
iodine solution turns blue-black

iodine solution stays brown

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14. Nov/2021/Paper_22/No.12

Two similar leaves are set up in test-tubes as shown. One is exposed to light, while the other is kept in the dark.

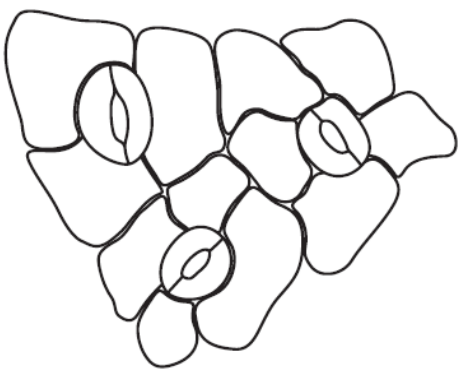


After a few hours, which colour would the hydrogencarbonate indicator solution be in each test-tube?

	light	dark
A	colourless	blue-black
B	purple	yellow
C	red	blue
D	yellow	purple

15. Nov/2021/Paper_22/No.13

The diagram shows the surface view of part of the epidermis of a leaf.



How many guard cells are present?

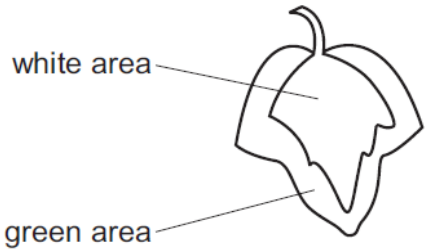
A 0 **B** 3 **C** 6 **D** 12

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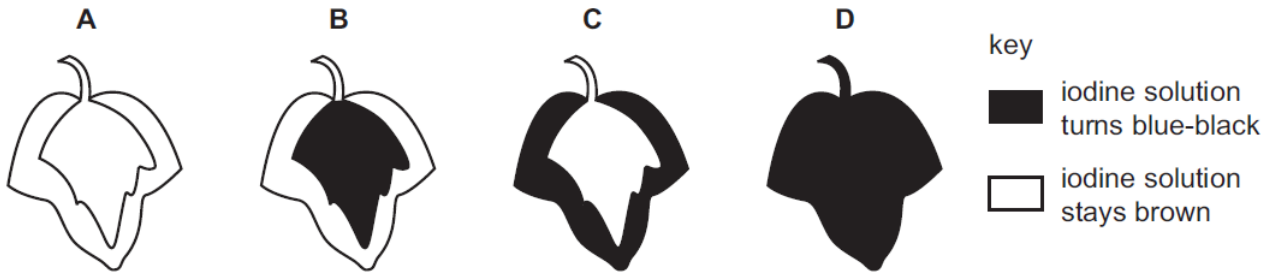
16. Nov/2021/Paper_23/No.9

In a photosynthesis experiment, a plant is left in bright sunlight for several hours. A leaf is then removed from the plant and tested for starch, using iodine solution.

The diagram shows the leaf from the plant that was used in the experiment.



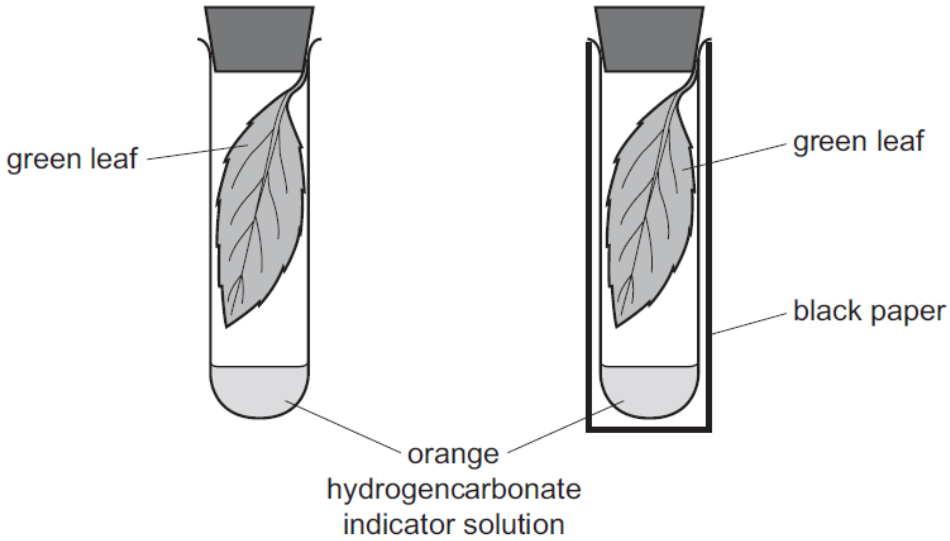
Which diagram shows the result of the experiment?



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17. Nov/2021/Paper_23/No.12

Two similar leaves are set up in test-tubes as shown. One is exposed to light, while the other is kept in the dark.



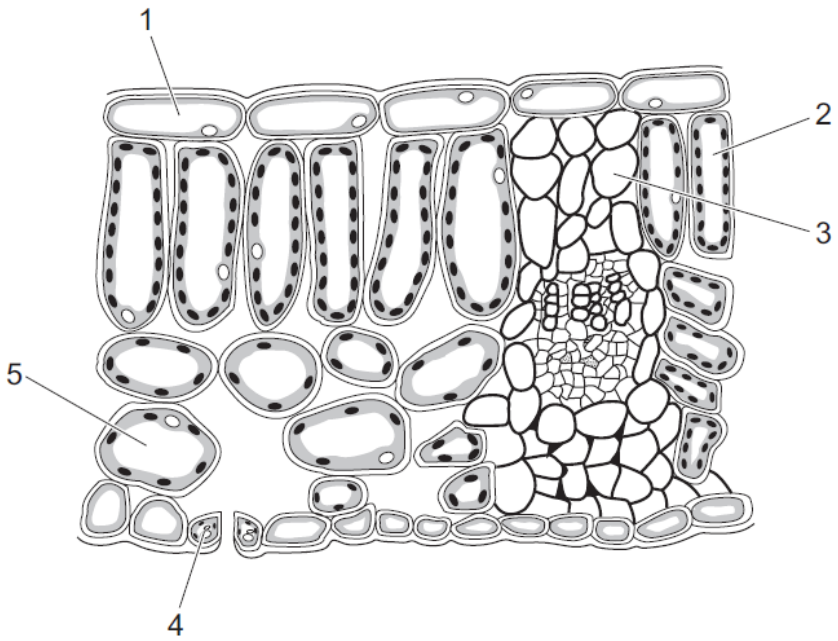
After a few hours, which colour would the hydrogencarbonate indicator solution be in each test-tube?

	light	dark
A	colourless	blue-black
B	purple	yellow
C	red	blue
D	yellow	purple

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18. Nov/2021/Paper_23/No.13

The diagram shows part of a leaf cross-section.



Which cells can carry out photosynthesis?

A 1, 2 and 3 **B** 2, 3 and 4 **C** 2, 4 and 5 **D** 1, 3 and 5

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19. Nov/2021/Paper_33/No.3

(a) Fig. 3.1 shows a diagram of a cross-section through a leaf.

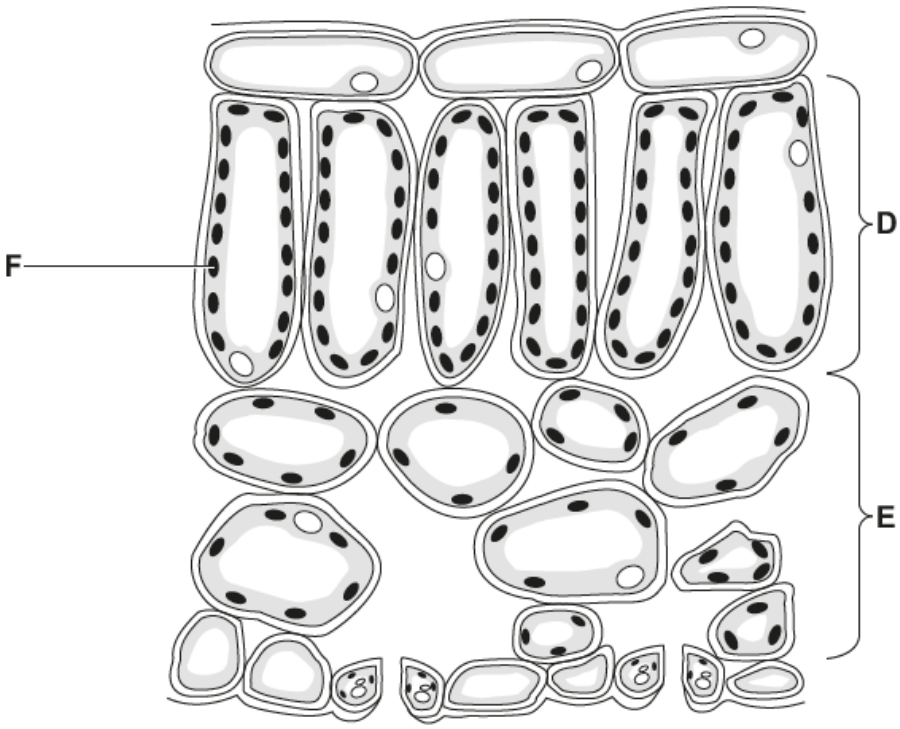


Fig. 3.1

(i) State the name of the tissues labelled **D** and **E**.

D .....

E .....
[2]

(ii) State the name of the cell structure labelled **F**.

..... [1]

(b) Plant cells photosynthesise.

State the word equation for photosynthesis.

..... [2]

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(c) A student investigated the effect of light on the rate of photosynthesis.

Fig. 3.2 shows the apparatus used.

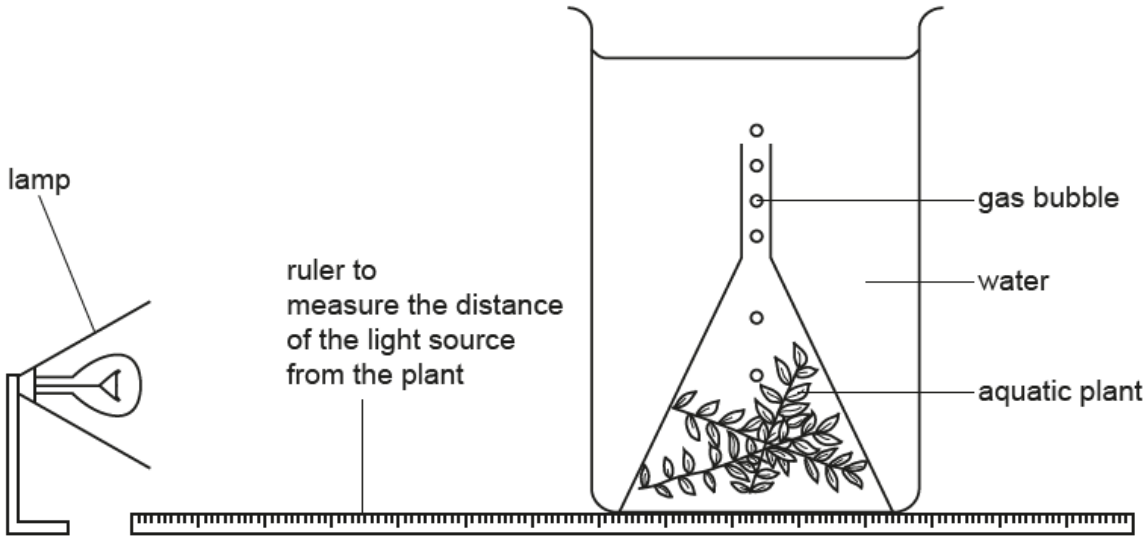


Fig. 3.2

A lamp was used as the only source of light. The lamp was placed 10 cm from the aquatic plant. The number of bubbles the aquatic plant produced in three minutes was counted and the rate of photosynthesis was calculated. This method was repeated at 10 cm intervals.

The results are shown in Table 3.1.

Table 3.1

distance of the lamp from the aquatic plant / cm	number of bubbles counted in three minutes	rate of photosynthesis / bubbles per minute
10	87	29
20	87	29
30	75	
40	48	16
50	24	8

(i) Use the information in Table 3.1 to calculate the rate of photosynthesis when the lamp was 30 cm from the aquatic plant.

..... bubbles per minute [1]

(ii) State the **two** distances between which the rate of photosynthesis halved.

.....cm and .....cm [1]

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(iii) State **two** distances which have the same rate of photosynthesis.

.....cm and .....cm [1]

(iv) Predict what would happen to the rate of photosynthesis if the lamp was switched off.

Give a reason for your answer.

prediction .....

.....

reason .....

.....

.....

[2]

[Total: 10]

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20. Nov/2021/Paper_43/No.2

Fig. 2.1 is a photomicrograph of the end of a plant root.

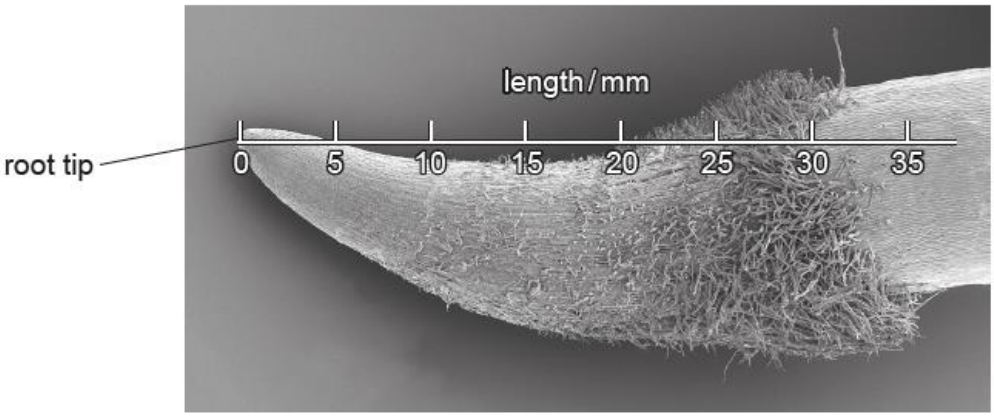


Fig. 2.1

Fig. 2.2 shows the results of a study on the rate of uptake of nitrate ions at different points along the root shown in Fig. 2.1.

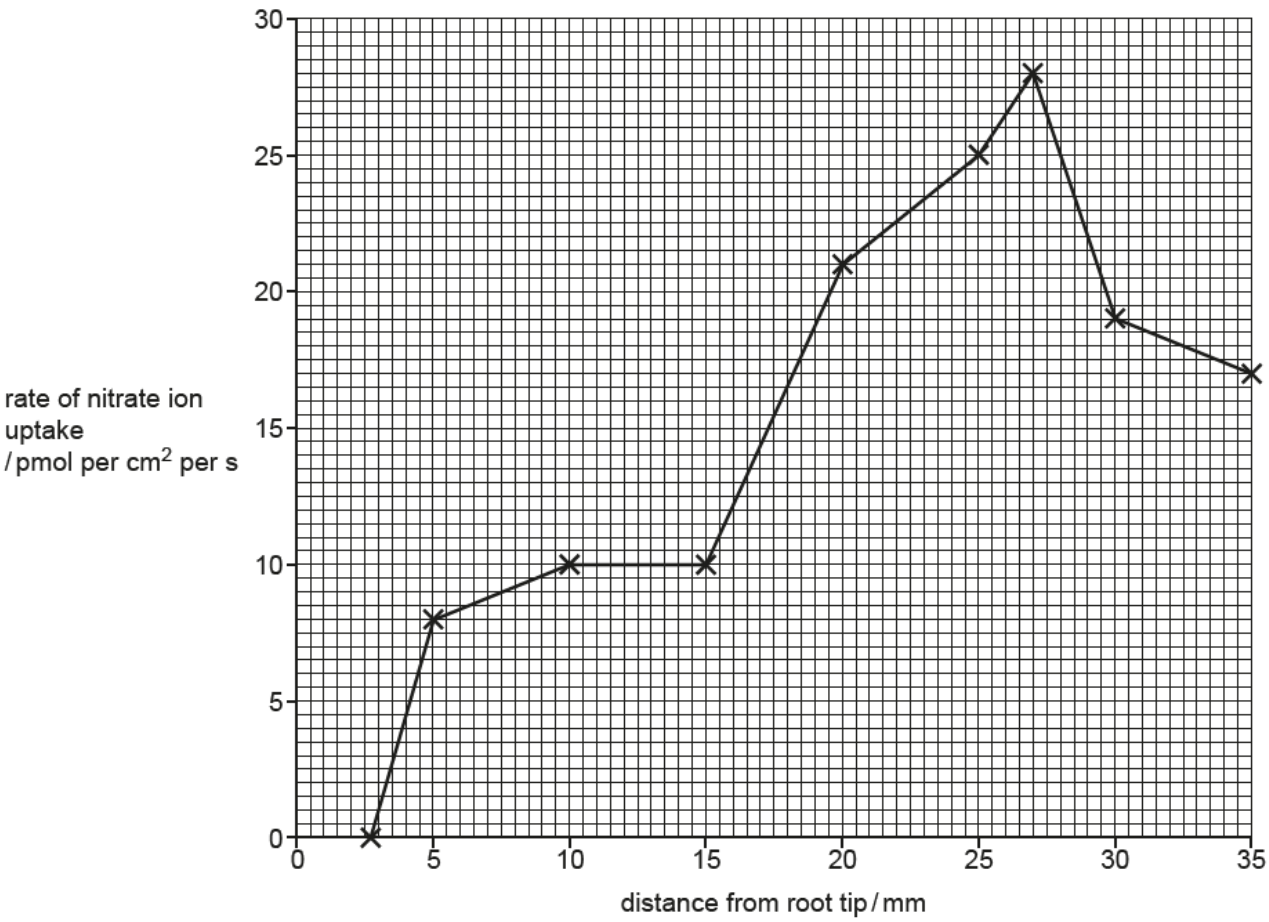


Fig. 2.2

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(a) (i) Describe the rate of uptake of nitrate ions along the root.

Use the information in Fig. 2.1 and Fig. 2.2 in your answer.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... [5]

(ii) Explain how nitrate ions move from the soil into roots.

.....

.....

.....

.....

.....

.....

.....

.....

..... [4]

(iii) Explain why the uptake of ions, such as nitrate, is important for the uptake of water in roots.

.....

.....

..... [1]

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(iv) Explain why plants need nitrate ions, **other than** for the uptake of water.

.....

.....

.....

.....

.....

.....

..... [3]

(v) Describe how nitrate ions are formed in the soil.

.....

.....

.....

.....

.....

.....

..... [3]

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(b) (i) Fig. 2.3 shows some of the events that occur when high concentrations of nitrate ions flow into lakes.

A	a decrease in the concentration of dissolved oxygen
B	a decrease in the population of consumers
C	a decrease in the population of producers
D	a decrease in light intensity at the bottom of the lake
E	an increase in the population of decomposers
F	an increase in the population of producers

Fig. 2.3

Put the events shown in Fig. 2.3 into the correct sequence.

[2]

(ii) State the name of the process summarised in Fig. 2.3.

..... [1]

[Total: 19]

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Plant nutrition – 2021 IGCSE 0610

1. March/2021/Paper_12/No.12

In which process is oxygen a waste product?

A active transport

B aerobic respiration

C anaerobic respiration

D photosynthesis

2. March/2021/Paper_12/No.2

Which species can breed with *Prunella vulgaris* to produce fertile offspring?

	Prunella modularis	*Vespula vulgaris*
A	✓	✓
B	✓	✗
C	✗	✓
D	✗	✗

key

✓ = yes

✗ = no

3. March/2021/Paper_32/No.5

(a) A student investigated the effect of the concentration of carbon dioxide on the rate of photosynthesis in an aquatic plant.

Table 5.1 shows the results of the investigation.

Table 5.1

concentration of carbon dioxide / ppm	rate of release of oxygen / cm^3 per hour
0	0.0
100	11.2
300	26.1

(i) Describe **and** explain the results shown in Table 5.1.

.....

.....

.....

.....

.....

.....

..... [3]

(ii) State why the temperature should have been kept constant during this investigation.

.....

.....

..... [1]

(b) Carbon dioxide is an example of a greenhouse gas.

(i) State the name of **one other** greenhouse gas.

..... [1]

(ii) State the name of the chemical used to test for the presence of carbon dioxide and state the result of a positive test.

chemical .....

positive result .....

[2]

(c) Farmers use fertilisers on crops to improve crop growth. These fertilisers can cause pollution when washed into rivers.

State the names of **two other** substances used to improve crop yield that can cause pollution.

1 .....

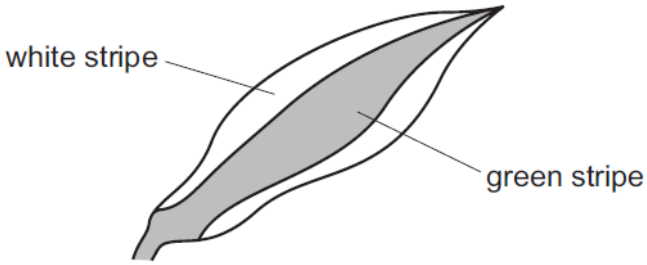
2 .....

[2]

[Total: 9]

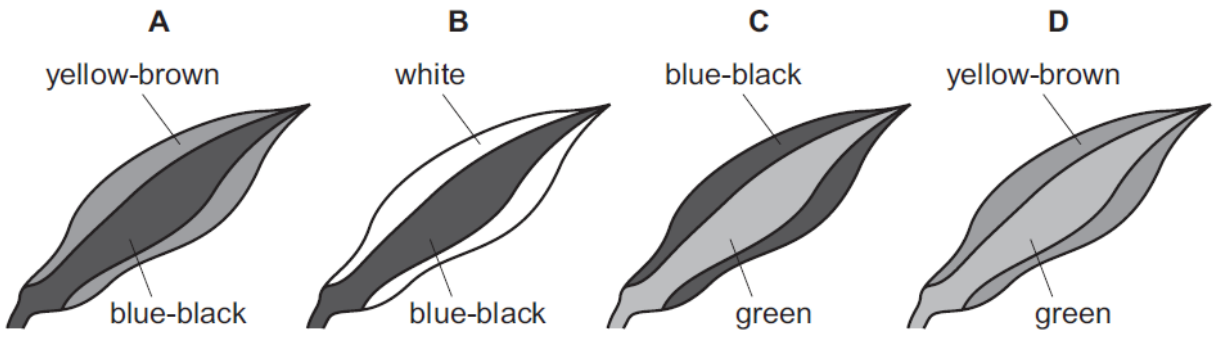
4. June/2021/Paper_11/No.12

A plant with striped leaves was kept in bright light for six hours.



A leaf was taken from the plant and the chlorophyll was removed. The leaf was then tested for starch using iodine solution.

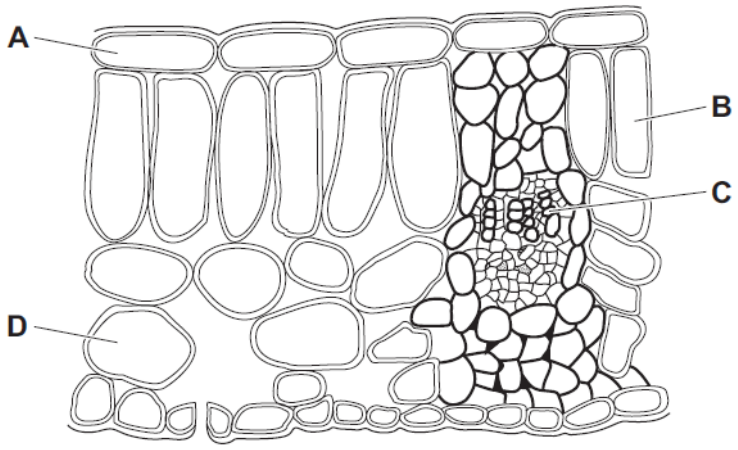
Which diagram shows the result of the test?



5. June/2021/Paper_11/No.13

The diagram shows a section through the leaf of a plant.

Which label shows a palisade mesophyll cell?



6. June/2021/Paper_12/No.4

Which part of a cell makes glucose?

A cell membrane

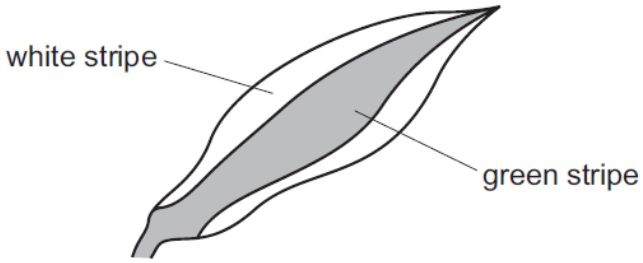
B chloroplast

C nucleus

D vacuole

7. June/2021/Paper_12/No.12

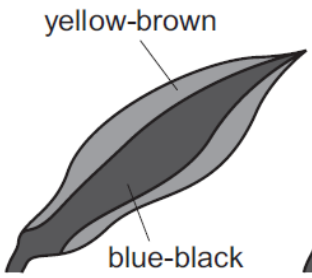
A plant with striped leaves was kept in bright light for six hours.



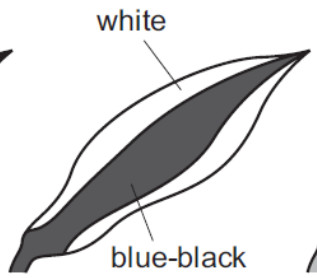
A leaf was taken from the plant and the chlorophyll was removed. The leaf was then tested for starch using iodine solution.

Which diagram shows the result of the test?

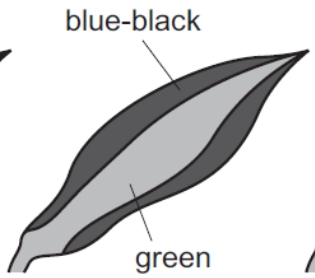
A



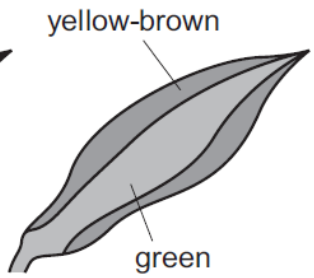
B



C

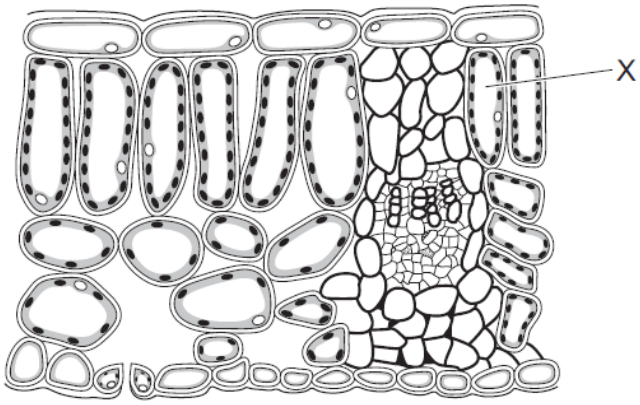


D



8. June/2021/Paper_12/No.13

The diagram shows a cross-section of a leaf.



What is the name of cell X?

A epidermal

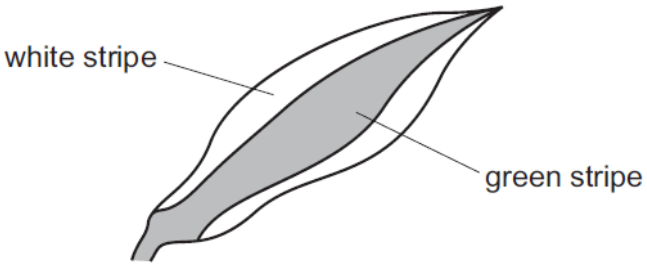
B guard

C palisade mesophyll

D spongy mesophyll

9. June/2021/Paper_13/No.12

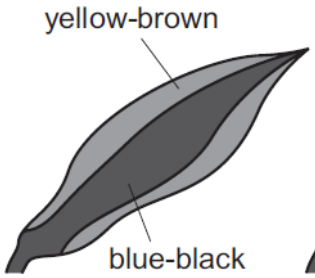
A plant with striped leaves was kept in bright light for six hours.



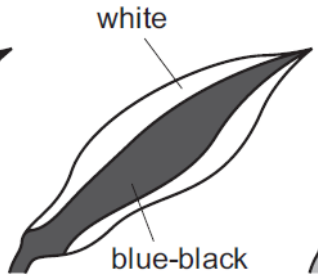
A leaf was taken from the plant and the chlorophyll was removed. The leaf was then tested for starch using iodine solution.

Which diagram shows the result of the test?

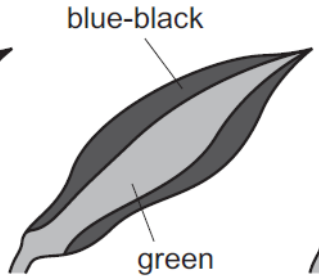
A



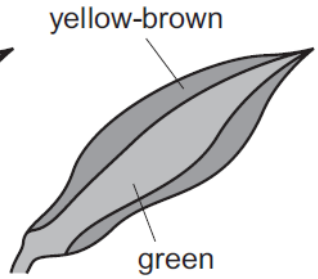
B



C



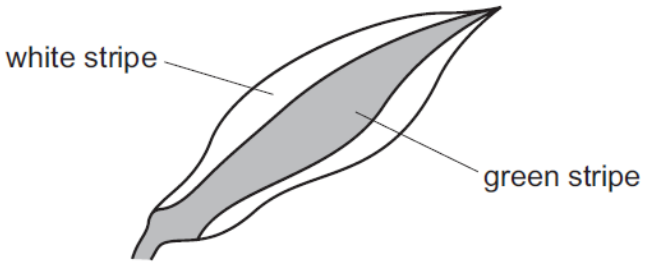
D



10. June/2021/Paper_13/No.13

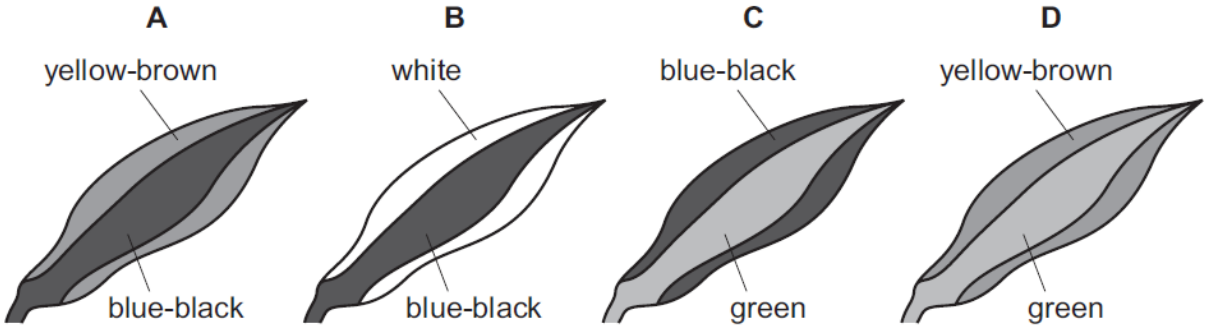
11. June/2021/Paper_21/No.13

A plant with striped leaves was kept in bright light for six hours.



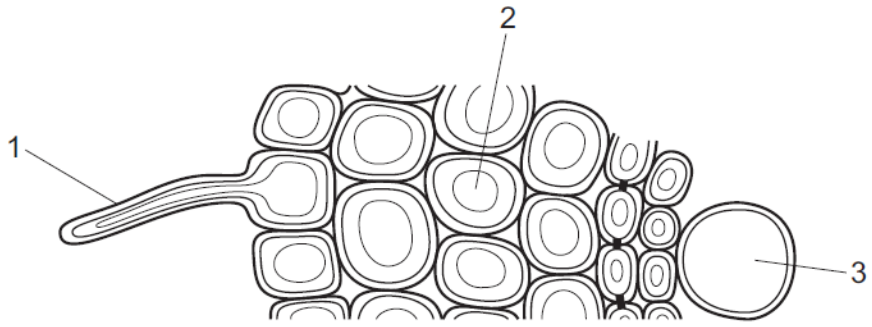
A leaf was taken from the plant and the chlorophyll was removed. The leaf was then tested for starch using iodine solution.

Which diagram shows the result of the test?



12. June/2021/Paper_21/No.18

The diagram shows part of a cross-section of a root.



What are cells 1, 2 and 3?

	1	2	3
A	root cortex cell	root hair cell	mesophyll cell
B	root hair cell	root cortex cell	xylem
C	root hair cell	root cortex cell	mesophyll cell
D	root cortex cell	root hair cell	xylem

13. June/2021/Paper_22/No.4

Which part of a cell makes glucose?

A cell membrane

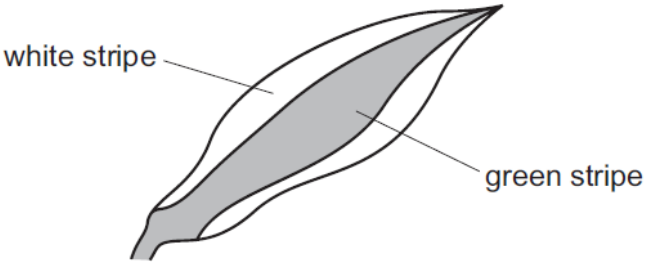
B chloroplast

C nucleus

D vacuole

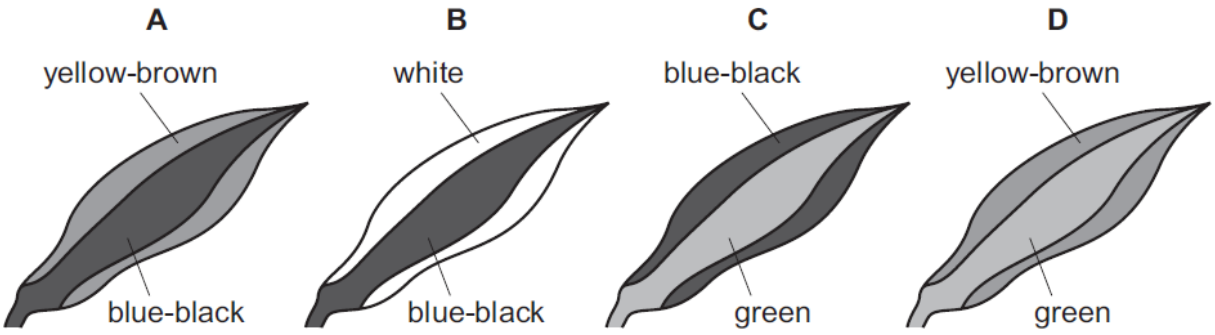
14. June/2021/Paper_22/No.13

A plant with striped leaves was kept in bright light for six hours.



A leaf was taken from the plant and the chlorophyll was removed. The leaf was then tested for starch using iodine solution.

Which diagram shows the result of the test?



15. June/2021/Paper_23/No.4

In which part of a cell does photosynthesis take place?

A vacuole

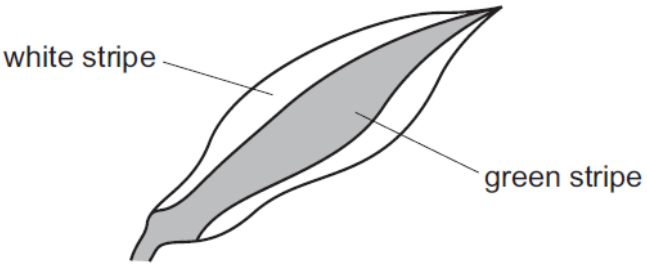
B nucleus

C chloroplast

D cytoplasm

16. June/2021/Paper_23/No.13

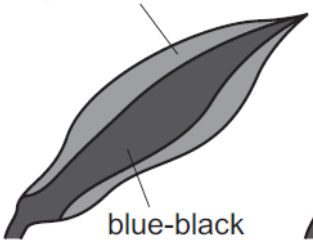
A plant with striped leaves was kept in bright light for six hours.



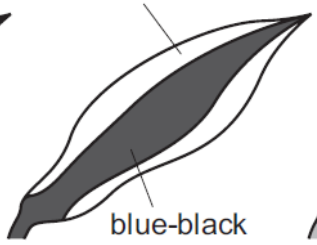
A leaf was taken from the plant and the chlorophyll was removed. The leaf was then tested for starch using iodine solution.

Which diagram shows the result of the test?

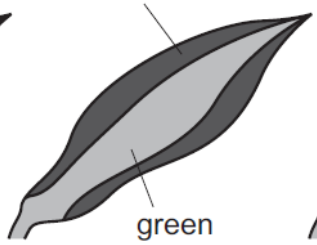
A



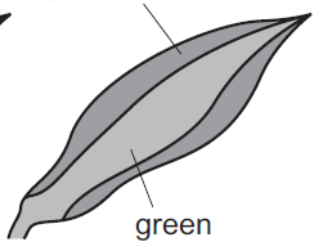
B



C



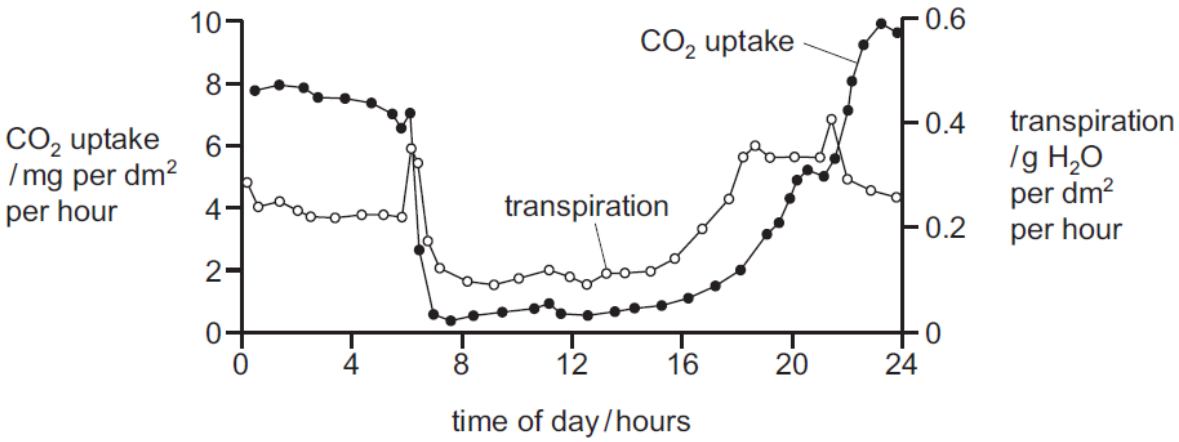
D



17. June/2021/Paper_23/No.14

The graph shows daily carbon dioxide uptake and transpiration by the plant *Agave americana*.

The plant is adapted to live in very dry conditions.



What can be concluded from this graph?

A More stomata are closed during dark periods.

B More stomata are closed during light periods.

C There is no carbon dioxide uptake during dark periods.

D There is no water uptake during light periods.

18. June/2021/Paper_32/No.2

(a) **(i)** List the chemical elements in a carbohydrate.

..... [1]

(ii) State the name of **one** chemical element that is found in a protein but is **not** found in a carbohydrate.

..... [1]

(b) Fig. 2.1 shows a variegated leaf which uses photosynthesis to make carbohydrates.

A variegated leaf has green parts that contain chlorophyll and white parts that do **not** contain chlorophyll.



Fig. 2.1

(i) State the word equation for photosynthesis.

..... [2]

(ii) The carbohydrate produced by photosynthesis can be stored as starch in the leaf.

A plant with variegated leaves used up its store of starch because it was placed in the dark.

Explain why the plant used up its store of starch when it was placed in the dark.

.....

.....

.....

.....

..... [2]

(iii) The plant with variegated leaves was then left in a warm, sunny place. After a few days, a leaf from this plant was removed and tested for starch.

Predict the results of the starch test by placing ticks (✓) in Table 2.1.

Table 2.1

part of leaf	starch present	starch absent
green		
white		

[1]

(iv) State the name of the mineral ion that is needed to make chlorophyll.

..... [1]

(c) Starch is a large molecule.

The boxes on the left show the names of some other large molecules.

The boxes on the right show some sentence endings.

Draw **five** lines to make five correct sentences.

large molecule	**sentence endings**
Cellulose	
	is made from amino acids.
DNA	
	is made from fatty acids and glycerol.
Glycogen	
	is made from glucose.
Oil	
	is the genetic material.
Protein	

[5]

[Total: 13]

19. June/2021/Paper_33/No.2

(a) **(i)** State the name of the process that occurs in the presence of chlorophyll.

..... [1]

(ii) State the name of the mineral ion the plant needs to make chlorophyll.

..... [1]

(iii) State the name of the structure that contains chlorophyll in a plant cell.

..... [1]

(b) Fig. 2.1 shows a diagram of a cross-section of a leaf.

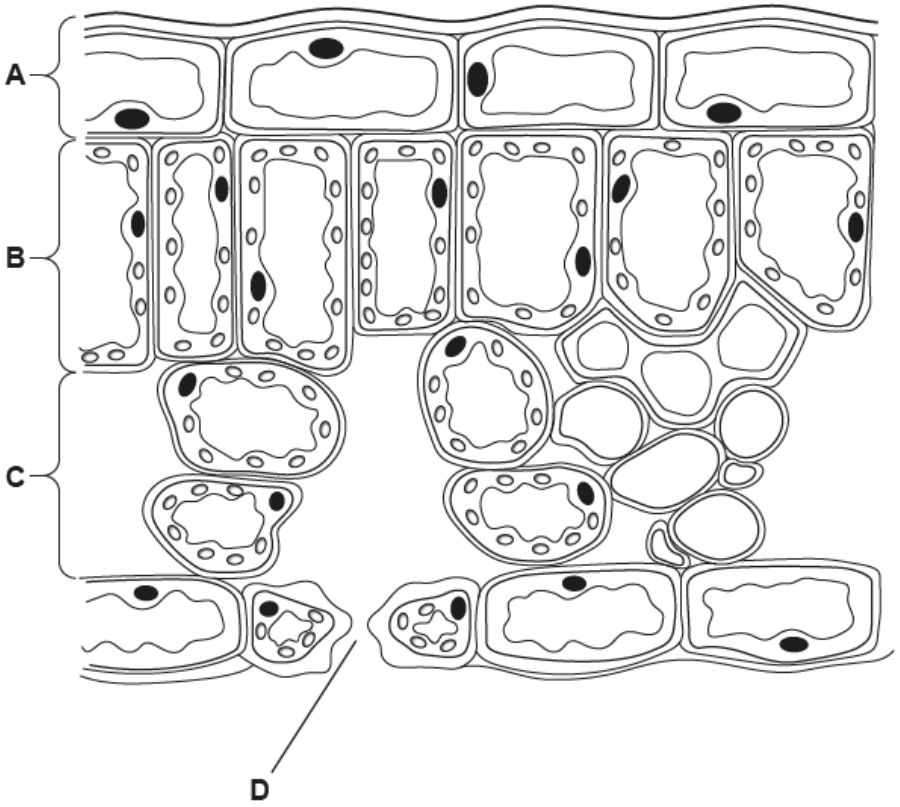


Fig. 2.1

(i) State the letter that identifies the part of the leaf that contains the most chlorophyll in Fig. 2.1.

..... [1]

(ii) State the name of the tissue in the leaf that does **not** contain chlorophyll.

..... [1]

[Total: 5]

20. June/2021/Paper_43/No.3

(ii) Explain why the rate of photosynthesis will decrease if the humidity in the apparatus becomes very low.

.....

.....

.....

.....

.....

.....

..... [3]

(iii) The apparatus was left for 15 minutes.

Explain how the scientists would use the readings for the concentration of carbon dioxide in chambers 1 and 3 to calculate the rate of photosynthesis.

.....

.....

.....

.....

..... [2]

(b) The scientists carried out another investigation using the same apparatus at different temperatures.

They measured the rate of uptake of carbon dioxide in the light and then they measured the rate of release of carbon dioxide in the dark.

The results are shown in Fig. 3.2.

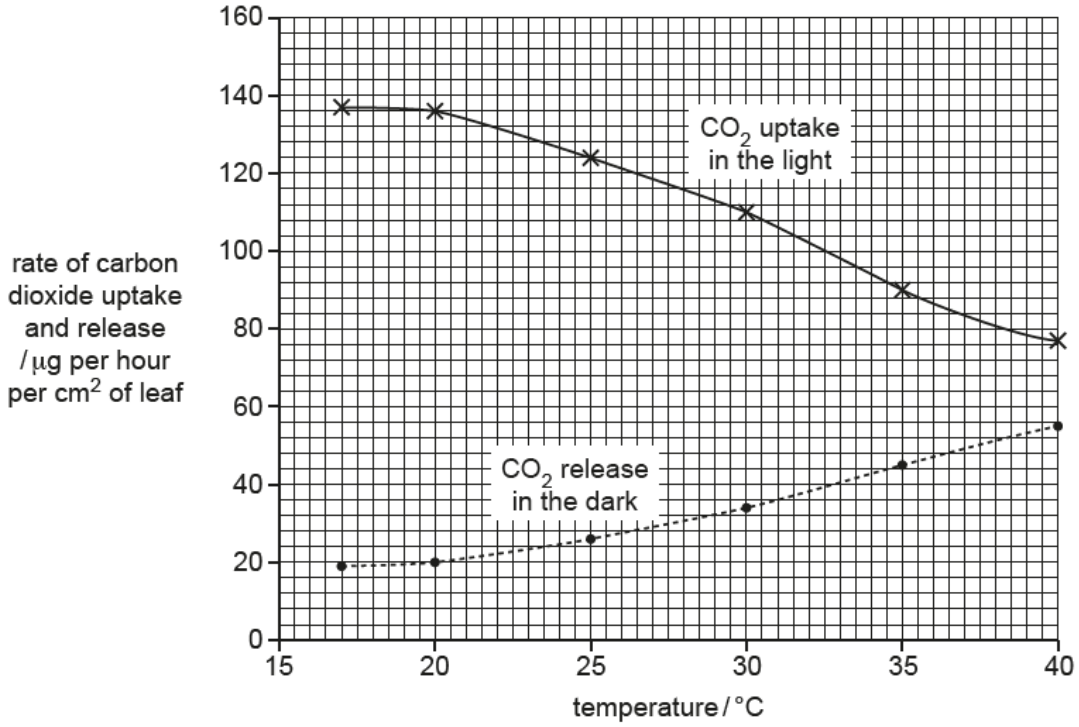


Fig. 3.2

(i) Use the information in Fig. 3.2 to complete Table 3.1.

Table 3.1

temperature / °C	rate of uptake of carbon dioxide in the light / μg per hour per cm^2 of leaf	rate of release of carbon dioxide in the dark / μg per hour per cm^2 of leaf
20		
35	90	45

[2]

(ii) The scientists determined that photosynthesis in the leaves at 35 °C used carbon dioxide at a rate of 135 μg per hour per cm^2 of leaf. Fig. 3.2 shows that the rate of carbon dioxide uptake at 35 °C was 90 μg per hour per cm^2 of leaf.

Explain why the rate at which carbon dioxide is used in photosynthesis is greater than the rate of carbon dioxide uptake.

.....

.....

.....

.....

..... [2]

(iii) Explain why the results in Table 3.1 are expressed as 'per cm^2 of leaf' rather than 'per leaf'.

.....

.....

..... [1]

(c) Some crops are grown in controlled environments. Glasshouses are an example of a controlled environment. Fig. 3.3 shows a glasshouse where lettuces are growing.



Fig. 3.3

Discuss the advantages of growing crops in glasshouses.

.....

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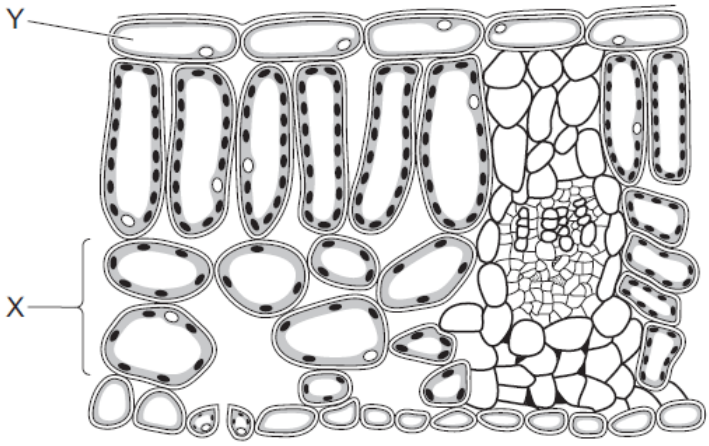
..... [6]

[Total: 20]

Plant nutrition – 2020 IGCSE 0610

1. Nov/2020/Paper_11/No.13

The diagram shows a section through a leaf.

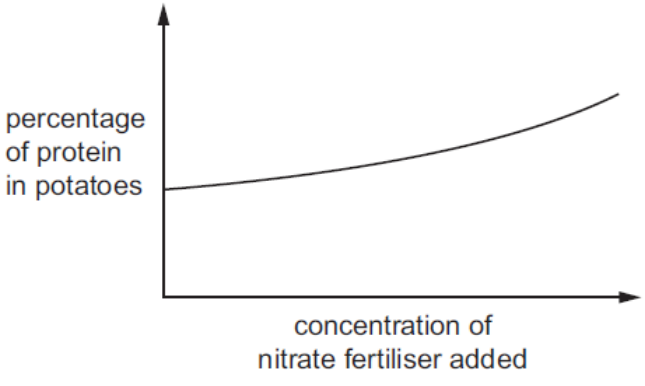


Which row correctly identifies tissues X and Y?

	X	Y
A	palisade mesophyll	cuticle
B	palisade mesophyll	upper epidermis
C	spongy mesophyll	cuticle
D	spongy mesophyll	upper epidermis

2. Nov/2020/Paper_12/No.13

The graph shows how the percentage of protein found in potatoes was affected by the concentration of nitrate fertiliser added to the crop when it was growing.



These results suggest that greater concentrations of nitrate fertiliser allow the potatoes to make more

A amino acids.

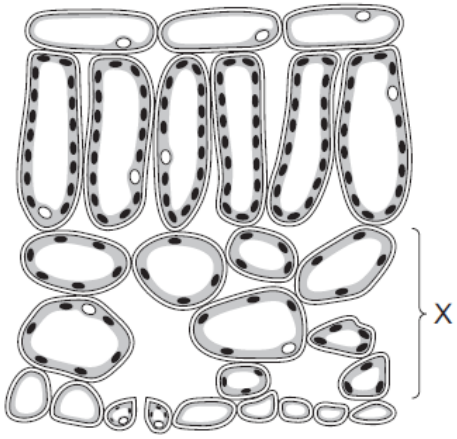
B cellulose.

C lipid.

D starch.

3. Nov/2020/Paper_13/No.13

The diagram shows part of a leaf.



What is layer X?

A lower epidermis

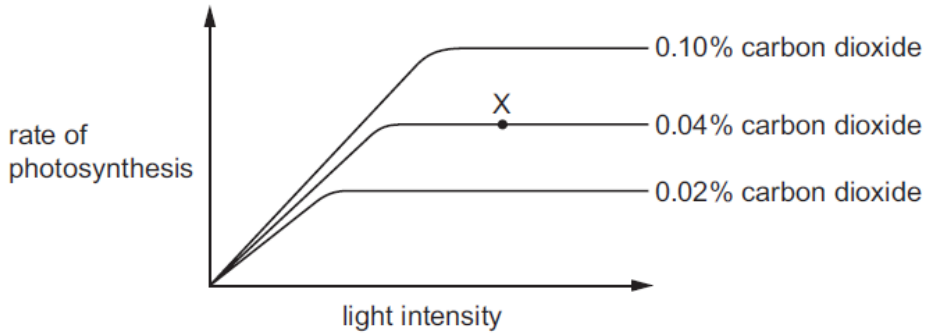
B palisade mesophyll

C spongy mesophyll

D vascular bundle

4. Nov/2020/Paper_21/No.11

The graph shows how the rate of photosynthesis of a plant changes with light intensity, at three different carbon dioxide concentrations. In each case the temperature is 15 °C.



What is the limiting factor for the rate of photosynthesis at point X on the graph?

A carbon dioxide concentration

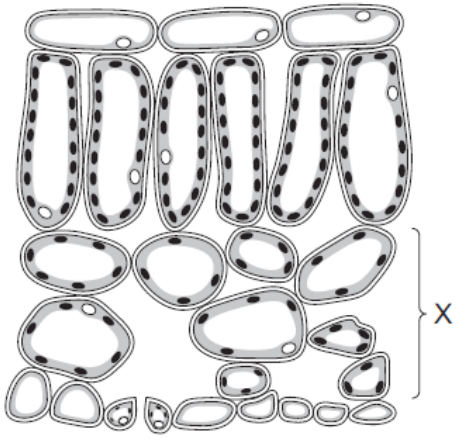
B light intensity

C surface area of the plant

D temperature

5. Nov/2020/Paper_21/No.12

The diagram shows part of a leaf.



What is layer X?

A lower epidermis

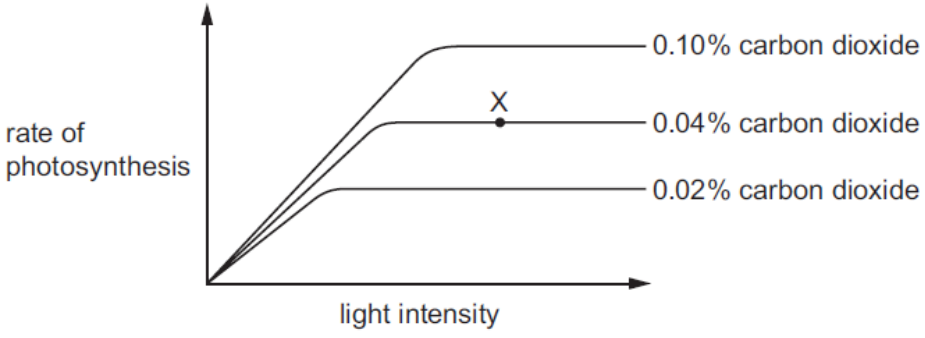
B palisade mesophyll

C spongy mesophyll

D vascular bundle

6. Nov/2020/Paper_22/No.11

The graph shows how the rate of photosynthesis of a plant changes with light intensity, at three different carbon dioxide concentrations. In each case the temperature is 15 °C.



What is the limiting factor for the rate of photosynthesis at point X on the graph?

A carbon dioxide concentration

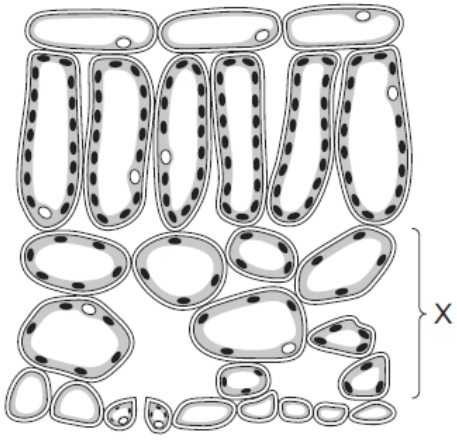
B light intensity

C surface area of the plant

D temperature

7. Nov/2020/Paper_22/No.12

The diagram shows part of a leaf.



What is layer X?

A lower epidermis

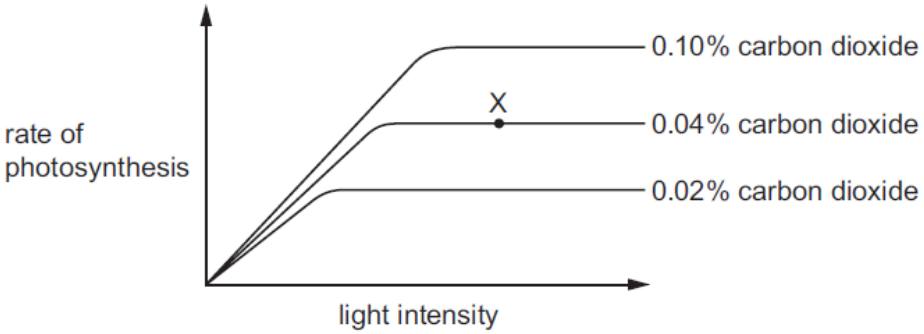
B palisade mesophyll

C spongy mesophyll

D vascular bundle

8. Nov/2020/Paper_23/No.11

The graph shows how the rate of photosynthesis of a plant changes with light intensity, at three different carbon dioxide concentrations. In each case the temperature is 15 °C.



What is the limiting factor for the rate of photosynthesis at point X on the graph?

A carbon dioxide concentration

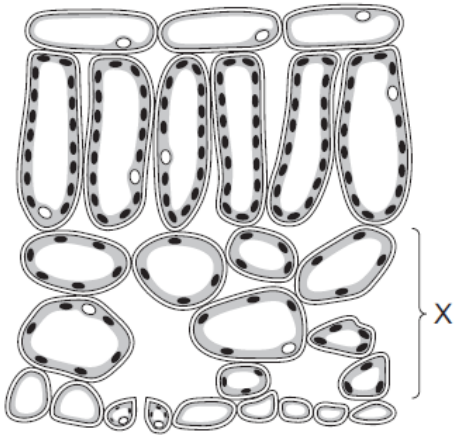
B light intensity

C surface area of the plant

D temperature

9. Nov/2020/Paper_23/No.12

The diagram shows part of a leaf.



What is layer X?

A lower epidermis

B palisade mesophyll

C spongy mesophyll

D vascular bundle

10. Nov/2020/Paper_32/No.8

Plants carry out photosynthesis.

(a) State the names of **two** substances produced by photosynthesis.

1 .....

2 .....

[2]

(b) A student investigated how temperature affects the rate of photosynthesis. The concentration of carbon dioxide was kept constant during the investigation.

The results are shown in Fig. 8.1.

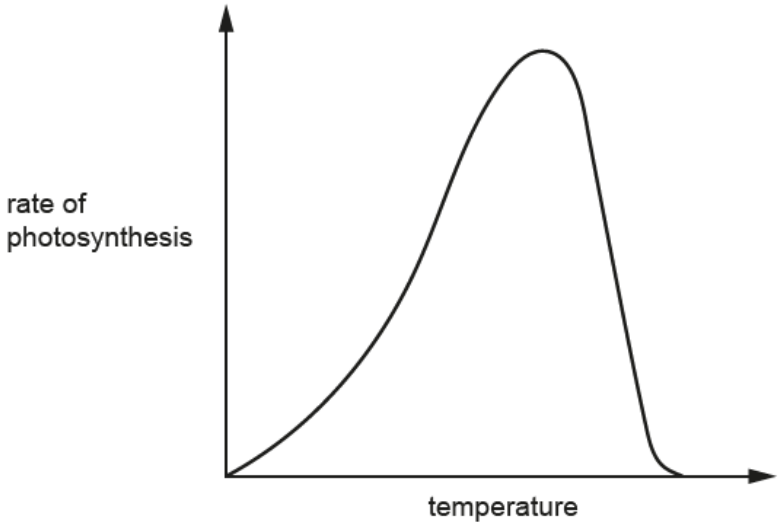


Fig. 8.1

(i) Predict how the rate of photosynthesis will change when carbon dioxide concentration increases and the temperature is kept constant at 20 °C.

.....

.....

..... [1]

(ii) State **one** factor other than temperature and carbon dioxide concentration that will affect the rate of photosynthesis.

..... [1]

(c) In another investigation students used a plant which had variegated leaves.

One of the leaves from this plant is shown in Fig. 8.2.



Fig. 8.2

Complete Table 8.1 to show where the processes of photosynthesis and respiration occurred in this variegated leaf when the plant was in the light.

Place a tick (✓) in each correct box.

Table 8.1

process	area **A**	area **B**
photosynthesis		
respiration		

[2]

(d) Cells in the mesophyll layers of a leaf carry out photosynthesis.

State the names of **two** leaf layers that light must pass through to reach the spongy mesophyll cells.

1 .....

2 .....

[2]

(e) Plants absorb mineral ions from the soil.

(i) State the name of the tissue that transports mineral ions in plants.

..... [1]

(ii) State the name of the mineral ion that is used to make chlorophyll.

..... [1]

(iii) State the name of the mineral ion that is used to make amino acids.

..... [1]

(f) Plants are involved in nutrient cycles in ecosystems.

Describe the role of plants in the carbon cycle and the water cycle.

.....

.....

.....

.....

.....

.....

.....

.....

..... [4]

[Total: 15]

11. Nov/2020/Paper_33/No.1

(a) Fig. 1.1 is a photograph of a strawberry plant growing in a glasshouse. It photosynthesises and produces fruit.



Fig. 1.1

(i) State the names of the products of photosynthesis.

..... [1]

(ii) State the name of the structure in plant cells which contains chlorophyll.

..... [1]

(b) Scientists investigated the effect of carbon dioxide concentration on the rate of photosynthesis of strawberry plants grown in a glasshouse.

Fig. 1.2 is a graph of the results of the investigation.

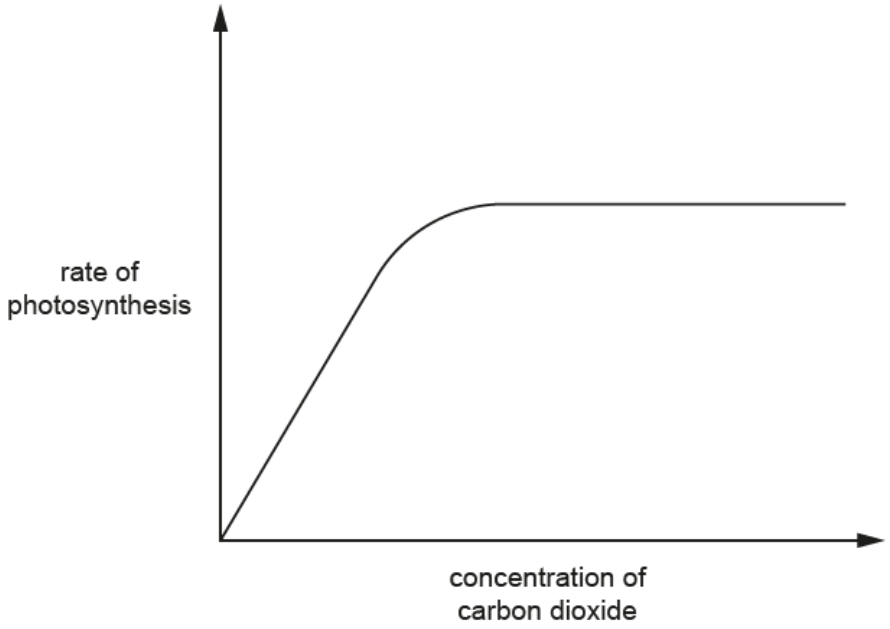


Fig. 1.2

(i) Describe the trend shown in the graph in Fig. 1.2.

.....

.....

..... [1]

(ii) The investigation on the effect of carbon dioxide concentration on the rate of photosynthesis was repeated at a higher light intensity.

Sketch, **on the graph in Fig. 1.2**, a second line to show the expected results of this second investigation. [2]

(iii) Place ticks (✓) in the correct boxes to identify **three** substances or conditions that would be supplied to the strawberry plants to maximise photosynthesis.

glucose	
lipase	
magnesium ions	
warm temperature	
water	
very low light intensity	

[3]

(c) Plants are an important part of the water cycle.

Fig. 1.3 is a diagram of the water cycle.

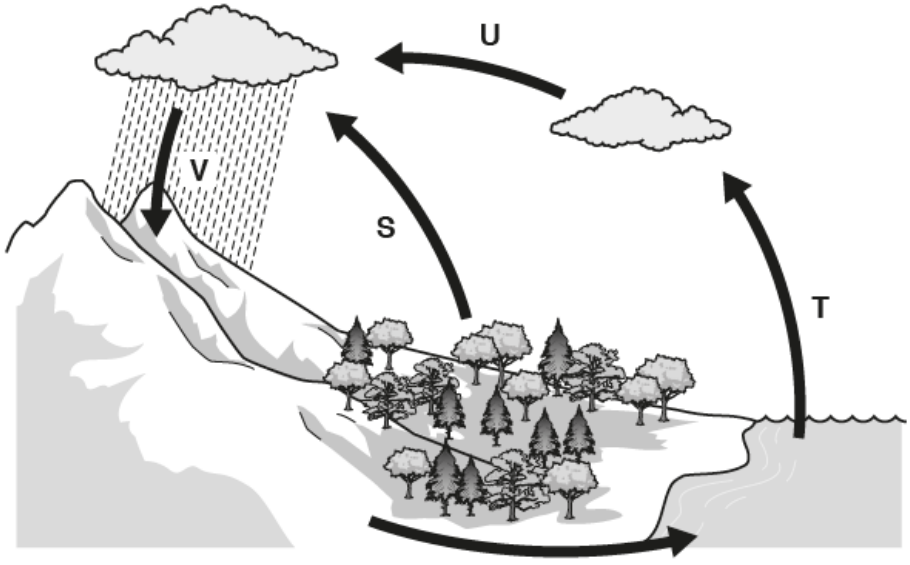


Fig. 1.3

Table 1.1 shows the letters from Fig. 1.3, and descriptions of the stages in the water cycle.

Complete Table 1.1 by writing the name of each stage in the correct boxes.

Table 1.1

letter from Fig. 1.3	name of stage	description of stage
S		loss of water vapour from plant leaves
T		heat from the Sun causes liquid water to change into water vapour
U		water vapour in the air changes to liquid water in the clouds
V		the liquid water falls to the ground

[4]

[Total: 12]

12. Nov/2020/Paper_41/No.1

Water is an essential molecule for life.

(a) Complete the statements.

Water moves into and out of cells by ..... .

Water is known as a ..... because it can dissolve solutes.

[2]

(b) A leaf cell was put into a solution. The water potential of the solution was lower than the water potential of the contents of the cell.

Fig. 1.1 is a sketch of the cell after three hours in the solution.

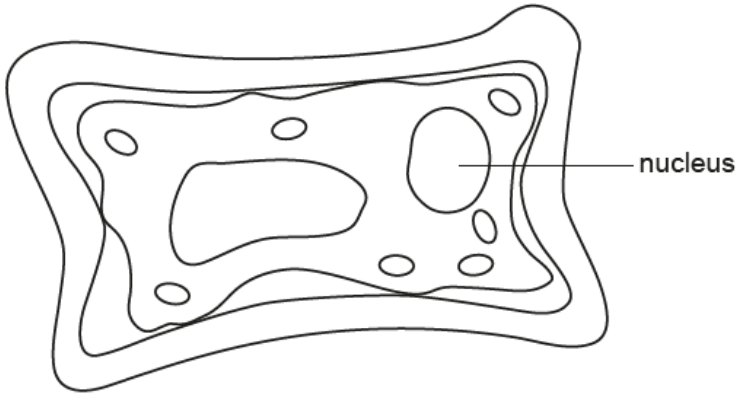


Fig. 1.1

The leaf cell was transferred into pure water.

Sketch the expected appearance of the cell after it had been in the pure water for three hours.

Draw **one** arrow on your sketch to show the direction of water movement.

[3]

(c) A plant was **not** watered for one week.

Fig. 1.2 shows a series of photographs of the plant during the week.



day 0 day 3 day 7

Fig. 1.2

Explain how the lack of water has affected the support of the leaves of the plant shown in Fig. 1.2.

Use the term *turgor pressure* in your answer.

.....

.....

.....

.....

.....

.....

..... [3]

[Total: 8]

Plant nutrition – 2020 IGCSE 0610

1. March/2020/Paper_12/No.12

A student drew a diagram to show the substances used and produced in photosynthesis in a leaf.

1 + 2 are used by the leaf



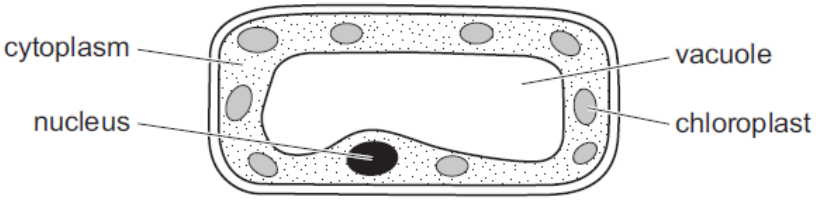
3 + 4 are produced by the leaf

Which row shows the correct labels for the diagram?

	1	2	3	4
A	carbon dioxide	glucose	oxygen	water
B	water	carbon dioxide	glucose	oxygen
C	oxygen	water	carbon dioxide	glucose
D	glucose	oxygen	water	carbon dioxide

2. March/2020/Paper_12/No.13

The diagram shows a type of plant cell.



In which tissue is this cell found?

A leaf epidermis

B palisade mesophyll

C root epidermis

D xylem

3. March/2020/Paper_22/No.12

A student drew a diagram to show the substances used and produced in photosynthesis in a leaf.

1 + 2 are used by the leaf



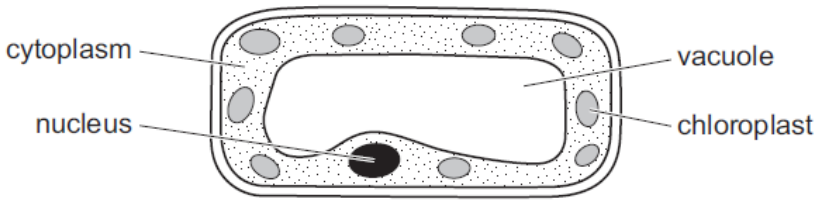
3 + 4 are produced by the leaf

Which row shows the correct labels for the diagram?

	1	2	3	4
A	carbon dioxide	glucose	oxygen	water
B	water	carbon dioxide	glucose	oxygen
C	oxygen	water	carbon dioxide	glucose
D	glucose	oxygen	water	carbon dioxide

4. March/2020/Paper_22/No.13

The diagram shows a type of plant cell.



In which tissue is this cell found?

A leaf epidermis

B palisade mesophyll

C root epidermis

D xylem

5. June/2020/Paper_13/No.10

Why do plants need nitrate ions?

A to make amino acids

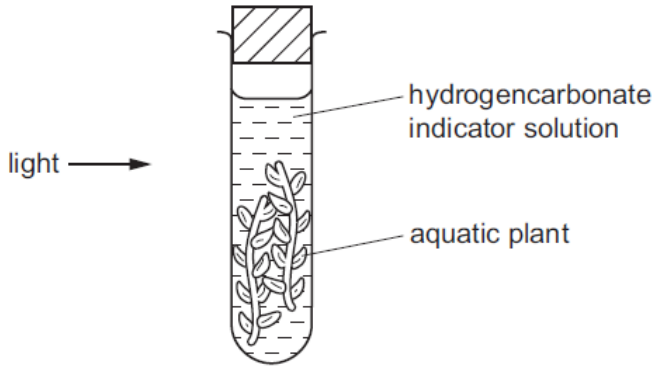
B to make fats

C to make glucose

D to make starch

6. June/2020/Paper_21/No.10

An experiment is set up to investigate gas exchange in aquatic plants.



The hydrogencarbonate indicator solution is orange at the start.

Which colour is it after three hours?

A blue-black

B orange

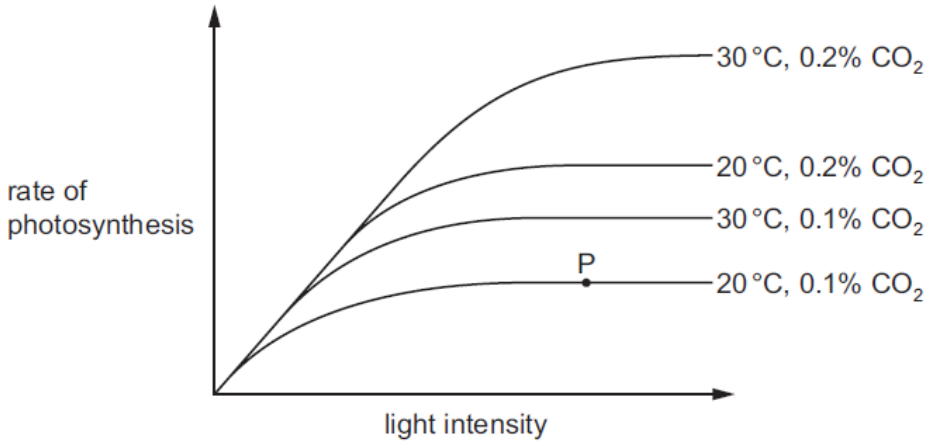
C purple

D yellow

7. June/2020/Paper_22/No.11

The diagram shows how the rate of photosynthesis varies with light intensity.

The four curves show different conditions of temperature and carbon dioxide concentration.



What limits the rate of photosynthesis at point P?

	light intensity	carbon dioxide concentration	temperature
A	✓	✓	✗
B	✓	✗	✗
C	✗	✓	✓
D	✗	✗	✓

key

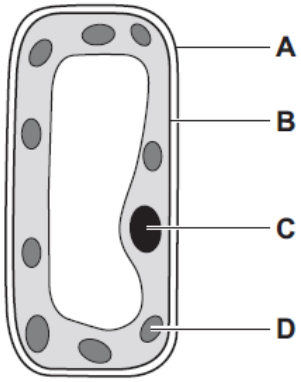
✓ = yes

✗ = no

8. June/2020/Paper_22/No.12

The diagram shows a plant cell.

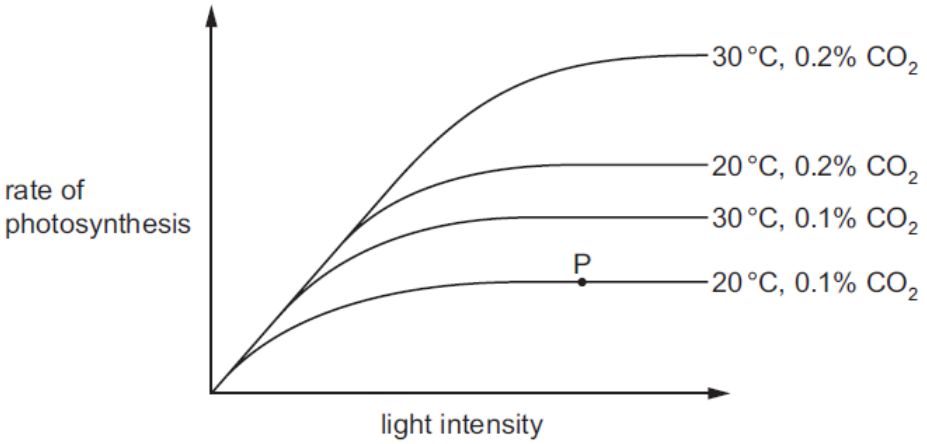
In which part of the cell does photosynthesis occur?



9. June/2020/Paper_23/No.11

The diagram shows how the rate of photosynthesis varies with light intensity.

The four curves show different conditions of temperature and carbon dioxide concentration.



What limits the rate of photosynthesis at point P?

	light intensity	carbon dioxide concentration	temperature
A	✓	✓	✗
B	✓	✗	✗
C	✗	✓	✓
D	✗	✗	✓

key
✓ = yes
✗ = no

10. June/2020/Paper_23/No.12

Why do plants need nitrate ions?

A to make amino acids

B to make fats

C to make glucose

D to make starch

11. June/2020/Paper_31/No.4

Fig. 4.1 shows a photomicrograph of a cross-section of part of a leaf.

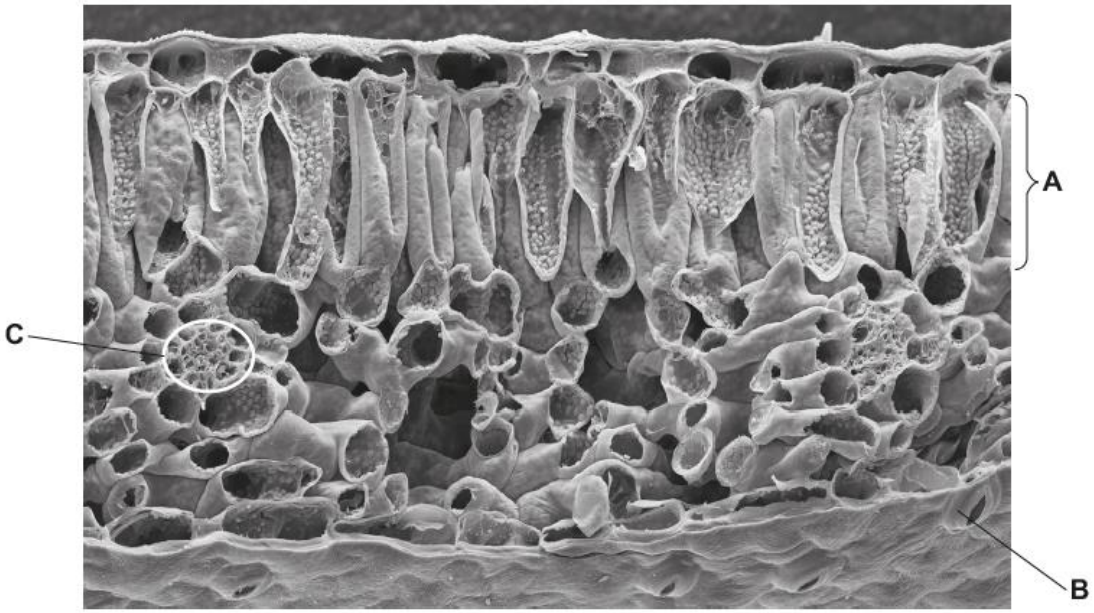


Fig. 4.1

(a) (i) Identify tissue **A** on Fig. 4.1 and state the name and function of this tissue.

name .....

function .....

.....

[2]

(ii) Structure **C** in Fig. 4.1 is part of the transport system in the leaf.

State the names of **two** tissues that structure **C** contains.

1 .....

2 .....

[2]

(iii) Identify and state the name of cell **B** in Fig. 4.1.

..... [1]

(b) A plant is in bright sunlight and has plenty of water.

Gases move into and out of its leaves.

Complete Table 4.1 to show the net direction of movement for the named gases.

Place a tick (✓) in each correct box.

Table 4.1

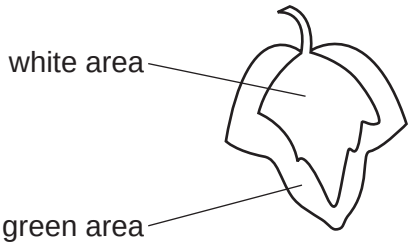
name of gas	moves into leaves	moves out of leaves
carbon dioxide		
oxygen		
water vapour		

[3]

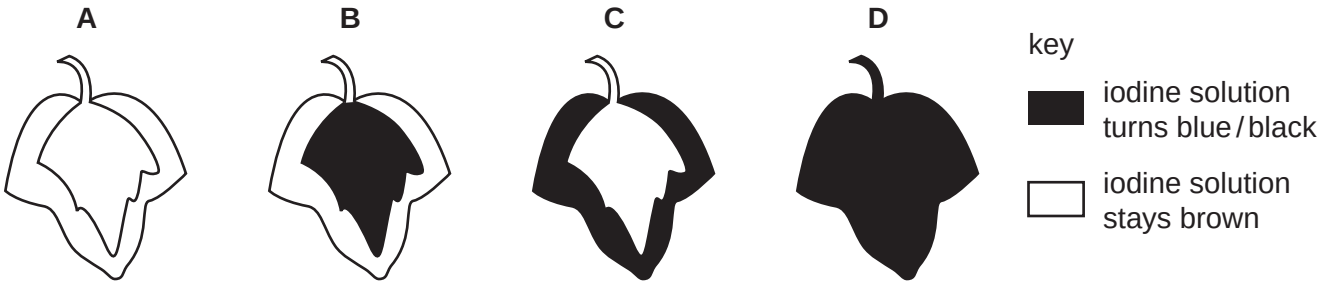
[Total: 8]

1. In a photosynthesis experiment, a plant is left in bright sunlight for several hours. A leaf is then removed from the plant and tested for starch, using iodine solution.

   The diagram shows the leaf from the plant that was used in the experiment.



   Which diagram shows the result of the experiment?



2. Which substance, needed for protein synthesis, is carried into a leaf from the stem?

   A carbon dioxide

   B nitrate

   C oxygen

   D starch

3. Which two substances are the products of photosynthesis?

   A carbon dioxide and glucose

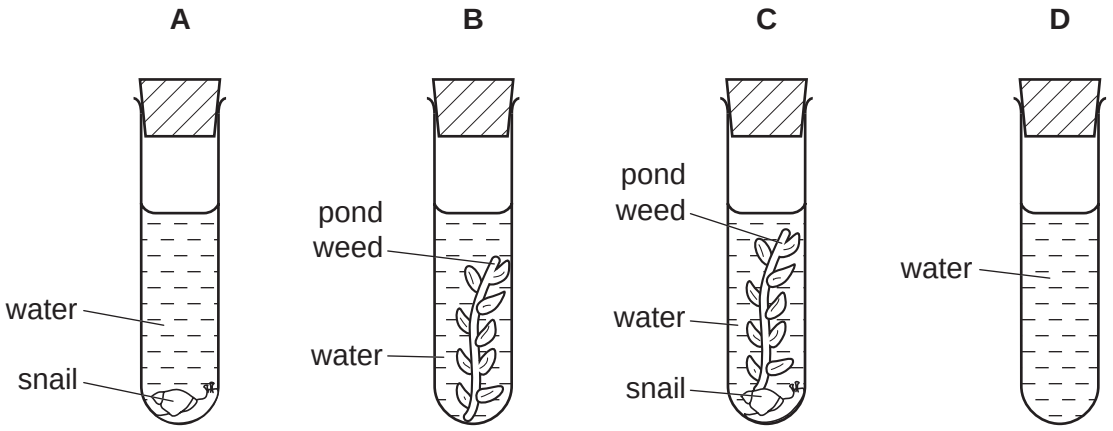
   B carbon dioxide and water

   C oxygen and carbon dioxide

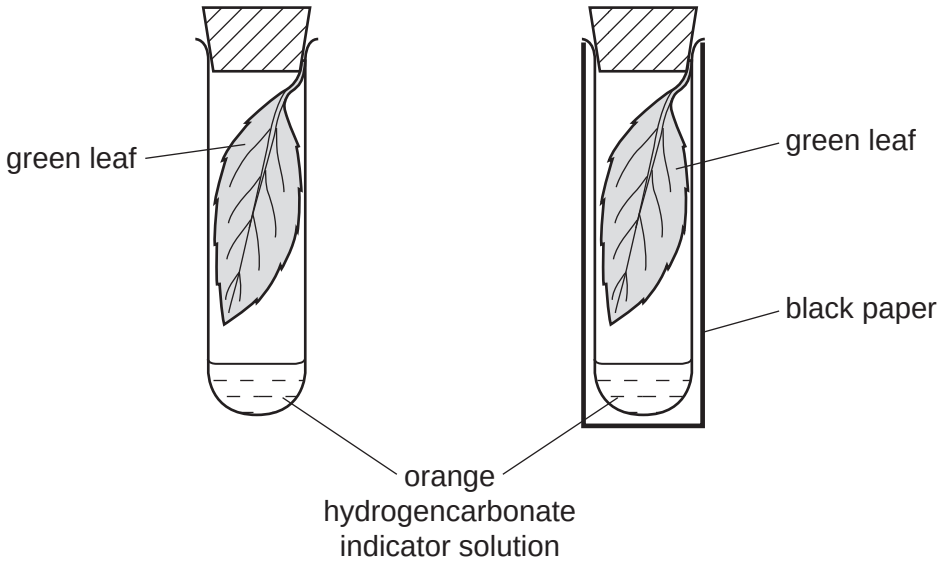
   D oxygen and glucose

4. Four test-tubes are set up as shown in the diagram and left in full sunlight.

After several hours, which test-tube contains the most dissolved oxygen?



5. Two similar leaves are set up in test-tubes as shown. One is exposed to light, while the other is kept in the dark.



After a few hours, which colour would the hydrogencarbonate indicator solution be in each tube?

	light	dark
A	colourless	blue-black
B	purple	yellow
C	red	blue
D	yellow	purple

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6 For the stomata of a leaf to open, the guard cells accumulate more potassium ions than the surrounding cells.

Which row describes what happens?

	movement of potassium ions	movement of water in relation to guard cells	final state of the guard cells
A	active transport	in	turgid
B	active transport	out	flaccid
C	diffusion	in	plasmolysed
D	diffusion	out	no change

7. Plants manufacture their own supplies of carbohydrate.

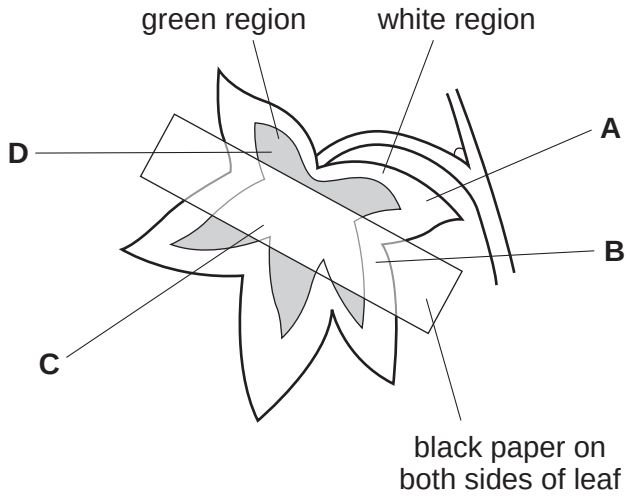
What are the raw materials and the waste product of this process?

	raw materials	waste product
A	carbon dioxide and chlorophyll	oxygen
B	carbon dioxide and water	oxygen
C	oxygen and chlorophyll	carbon dioxide
D	oxygen and water	carbon dioxide

8. A plant with variegated leaves has the starch removed from its leaves by placing it in a dark cupboard for 48 hours.

Black paper is then fixed on one leaf as shown and the plant is exposed to light.

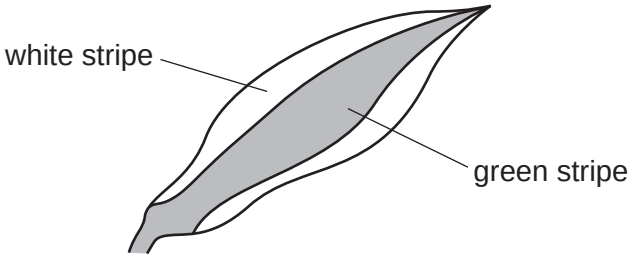
After 24 hours, which part of the leaf contains starch?



9. Which row shows the effects of deficiencies in nitrate and magnesium ions on plant growth?

	effect of nitrate ion deficiency	effect of magnesium ion deficiency
A	green leaves	long roots
B	long roots	thin stem
C	stunted growth	yellow leaves
D	thick stem	large leaves

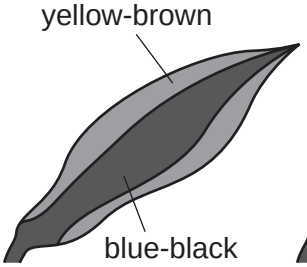
10. A plant with striped leaves similar to the one below was kept in bright light for six hours.



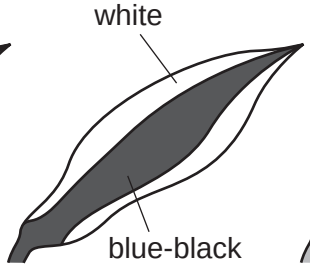
A leaf was taken from the plant and the chlorophyll removed. It was then tested for starch using iodine solution.

Which diagram shows the result of the test?

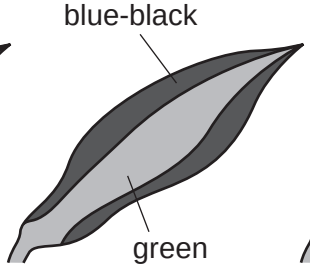
A



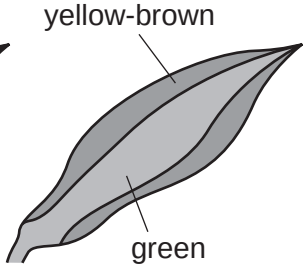
B



C

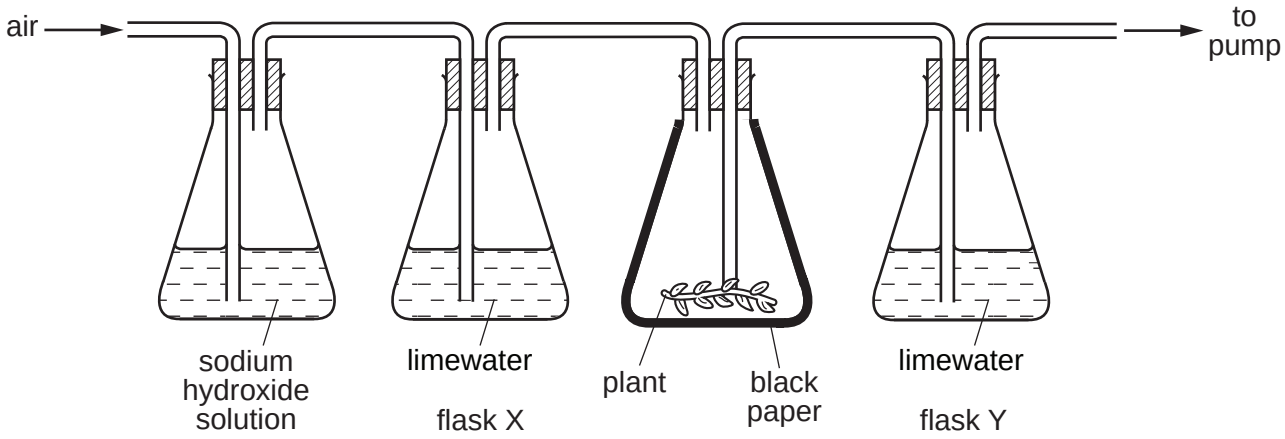


D



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11. Apparatus was set up as shown.



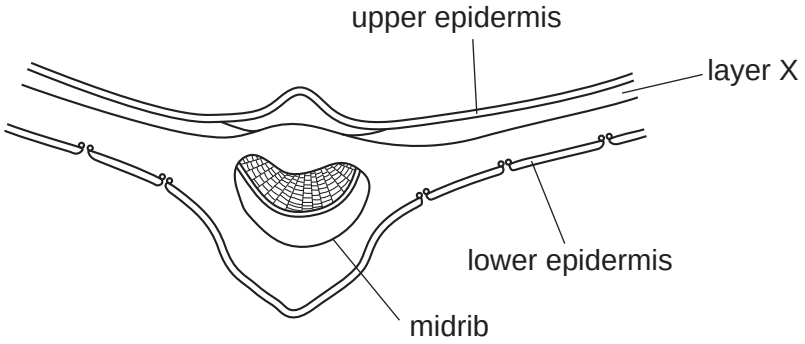
Sodium hydroxide removes carbon dioxide from the air. Limewater goes cloudy if carbon dioxide is bubbled through it.

What happens to the limewater in flasks X and Y when the pump is switched on?

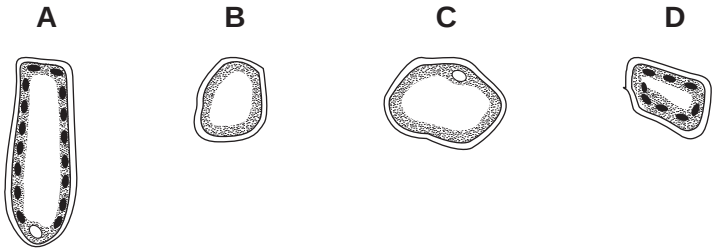
	flask X	flask Y
A	goes cloudy	goes cloudy
B	goes cloudy	stays clear
C	stays clear	goes cloudy
D	stays clear	stays clear

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12. The diagram shows a cross-section of part of a leaf.



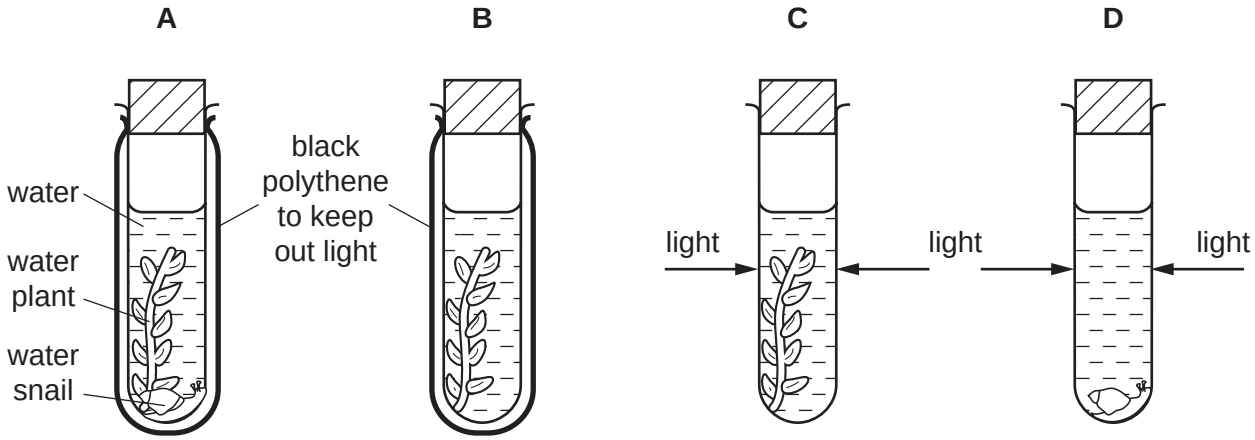
Which type of cell is found in layer X?



13. An experiment was done using the apparatus shown in the diagram.

The carbon dioxide content of the water in each tube was measured at the start and again three hours later.

In which tube would there be a **decrease** in carbon dioxide content?



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14. What is formed first in a leaf as a result of photosynthesis?

A chlorophyll

B glucose

C starch

D water

15. Which product of photosynthesis moves out of a green leaf through its stomata?

A carbon dioxide

B glucose

C oxygen

D water

16. Which two substances are needed for photosynthesis?

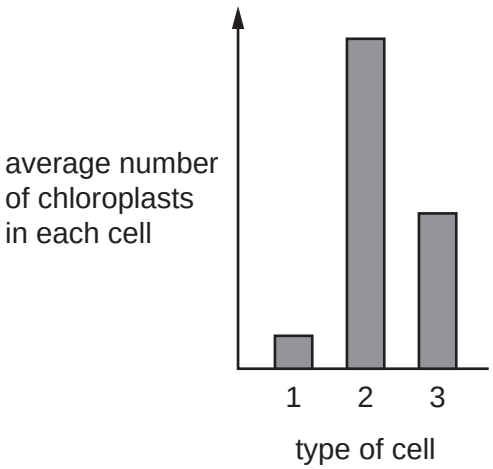
A carbon dioxide and glucose

B carbon dioxide and water

C oxygen and glucose

D oxygen and water

17. The bar chart shows the average number of chloroplasts in each of three different types of leaf cell.



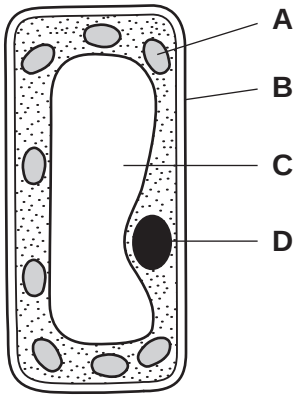
What are the three types of cell?

	1		
A	guard cell	palisade mesophyll cell	spongy mesophyll cell
B	palisade mesophyll cell	spongy mesophyll cell	guard cell
C	spongy mesophyll cell	guard cell	palisade mesophyll cell
D	spongy mesophyll cell	palisade mesophyll cell	guard cell

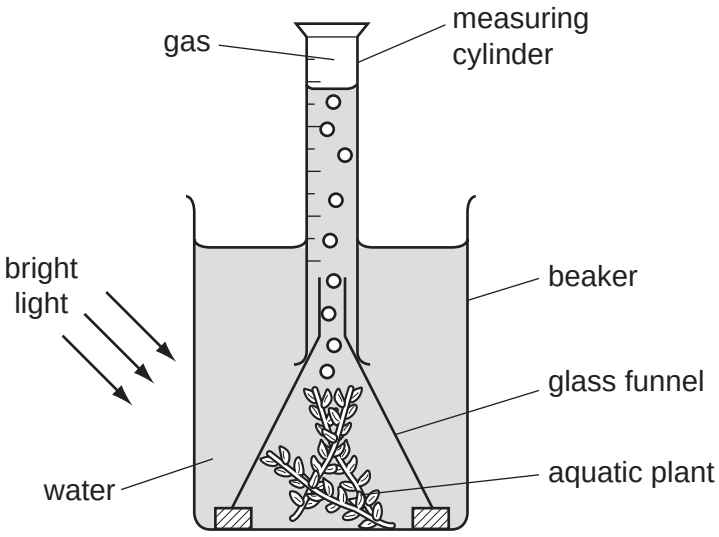
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18. The diagram shows a palisade cell.

In which region is starch stored?



19. The diagram shows the apparatus used in an investigation to measure the rate of oxygen production during photosynthesis.



The investigation was repeated several times and the average amount of gas collected was calculated.

Which **two** factors must be kept constant during this investigation?

A the amount of water in the beaker and the height of the measuring cylinder

B the size of aquatic plant and the amount of gas in the measuring cylinder

C the size of aquatic plant and the duration of exposure to light

D the size of the beaker and the funnel

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20. Which form of energy is stored within glucose molecules made during photosynthesis?

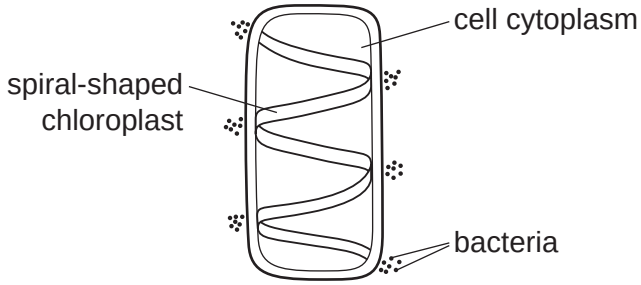
A chemical

B heat

C light

D mechanical

21. The diagram shows a cell with groups of bacteria around its edge.



The bacteria move to areas of high oxygen concentration.

Which process in the cell causes the bacteria to form these groups?

A digestion

B photosynthesis

C reproduction

D respiration

22. The roots of plants take up nitrates from the soil.

What are the nitrates used to make?

A fat

B glucose

C protein

D starch

23. What does photosynthesis form in a leaf first?

A cellulose

B protein

C starch

D sugar

24. What is formed first in a leaf as a result of photosynthesis?

A cellulose

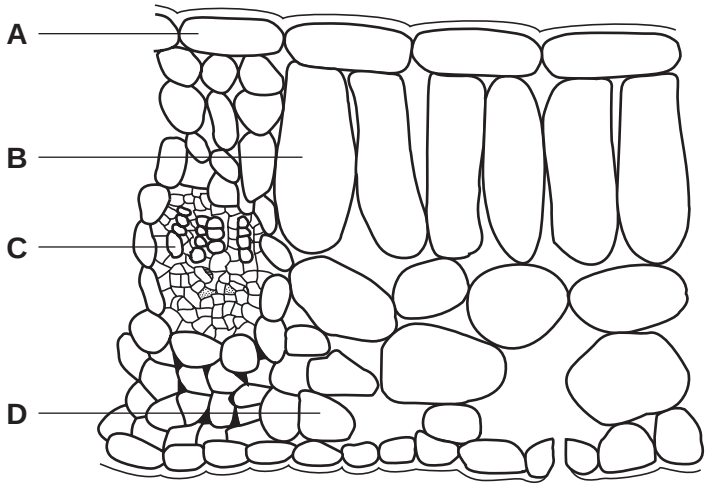
B protein

C starch

D sugar

25. The diagram shows a section through a leaf.

Which cell type absorbs the most carbon dioxide during the day?



26. Which element is found in a molecule of chlorophyll?

A calcium

B iron

C lead

D magnesium

27. Which substances do root hairs take from the soil?

A water and carbon dioxide

B water and mineral ions

C carbon dioxide and oxygen and mineral ions

D carbon dioxide and oxygen and water

28. Which cell type contains the **most** chloroplasts?

A palisade mesophyll

B phloem

C spongy mesophyll

D xylem

29. What does a plant make with the nitrates it absorbs?

A carbohydrates

B fats

C mineral salts

D proteins

30. The diagram shows a section through a leaf, seen under the microscope.

In which part is the carbon dioxide concentration **lowest** on a warm sunny day?

