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

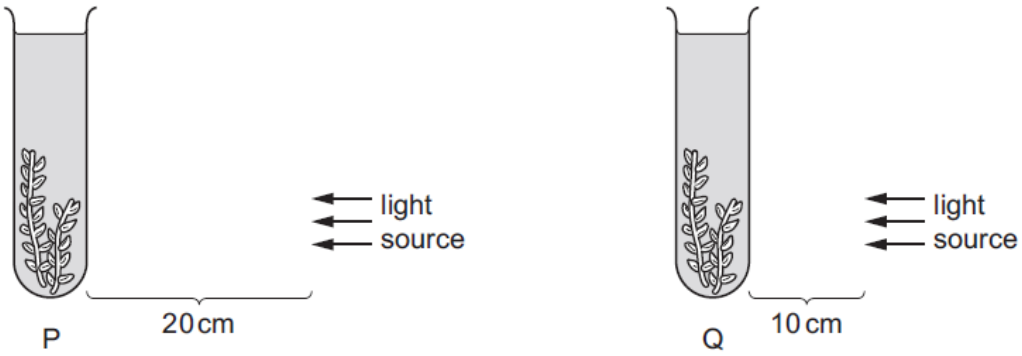
B to produce starch to build cell walls

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.



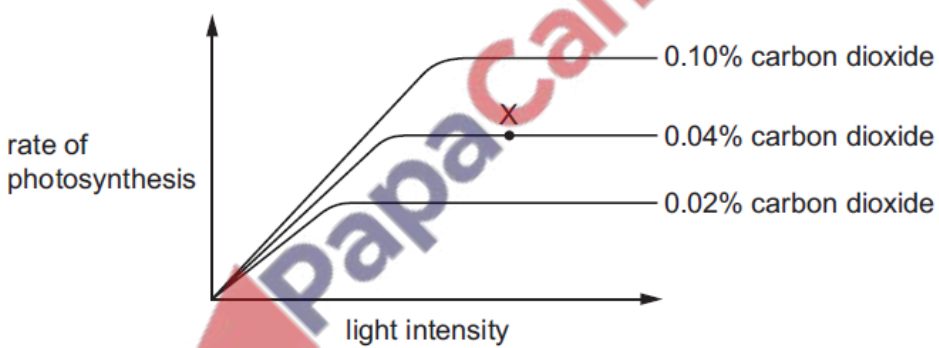
Photosynthesis occurred in both test-tube P and test-tube Q. Both test-tubes were kept at the same temperature. The number of bubbles produced in test-tube P was 12 bubbles per minute.

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

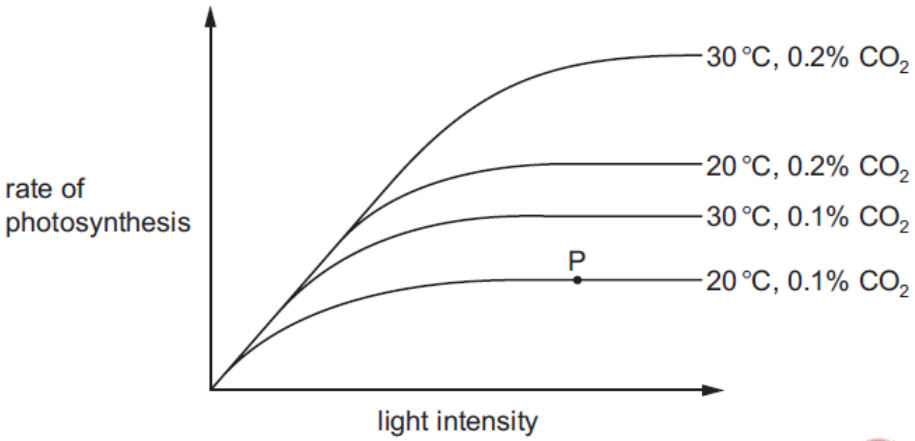
C surface area of the plant

D temperature

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.



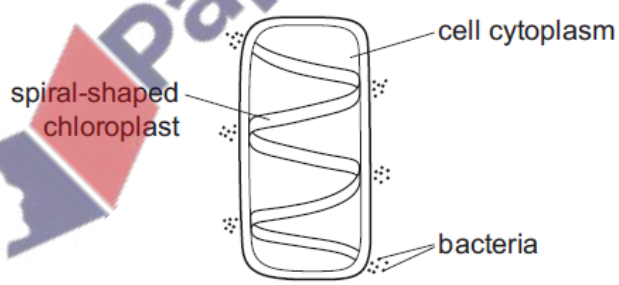
What limits the rate of photosynthesis at point P?

	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

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

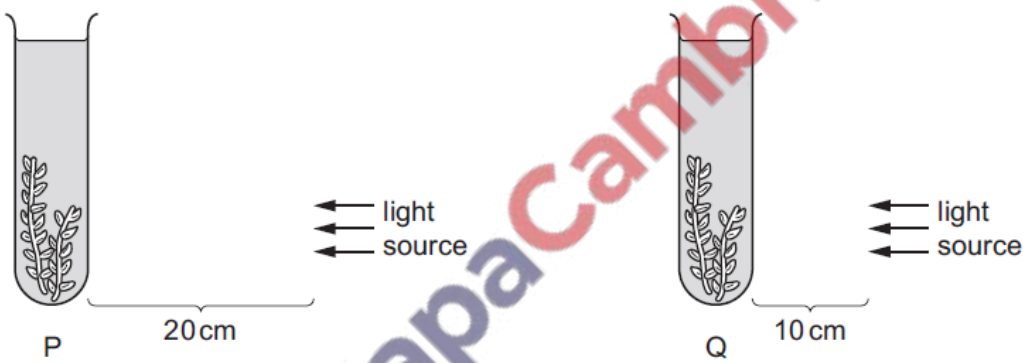
During growth, potato plants produce flowers and underground storage organs called tubers.

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

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]

(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.

.....

.....

.....

.....

.....

.....

..... [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]

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]

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

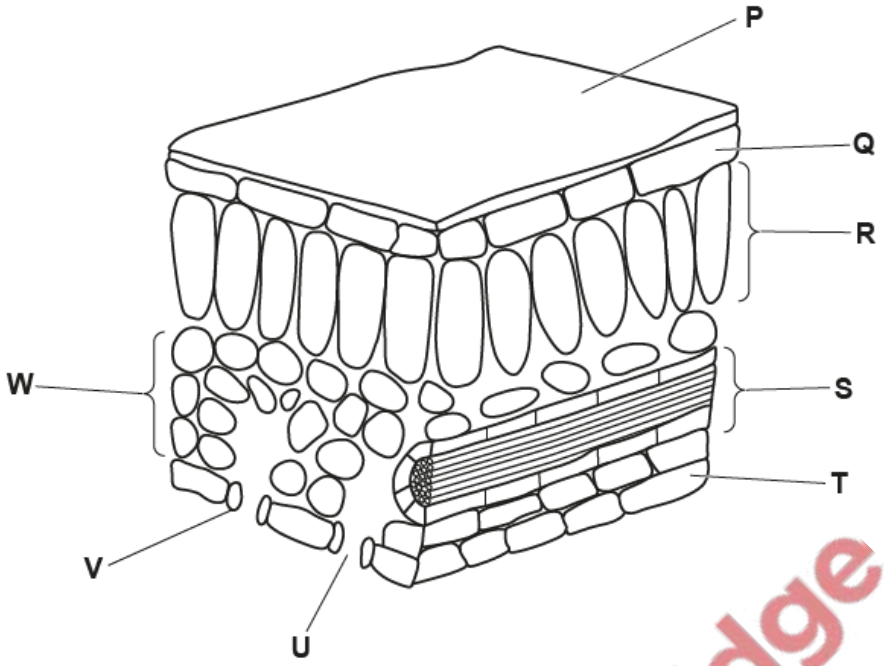


Fig. 3.2

(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]

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.

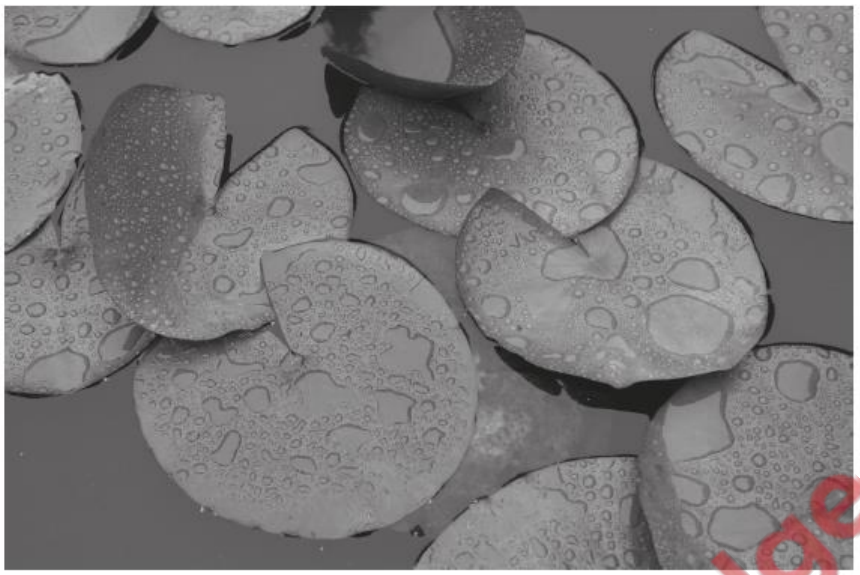


Fig. 2.1

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

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.....

.....

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..... [2]

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

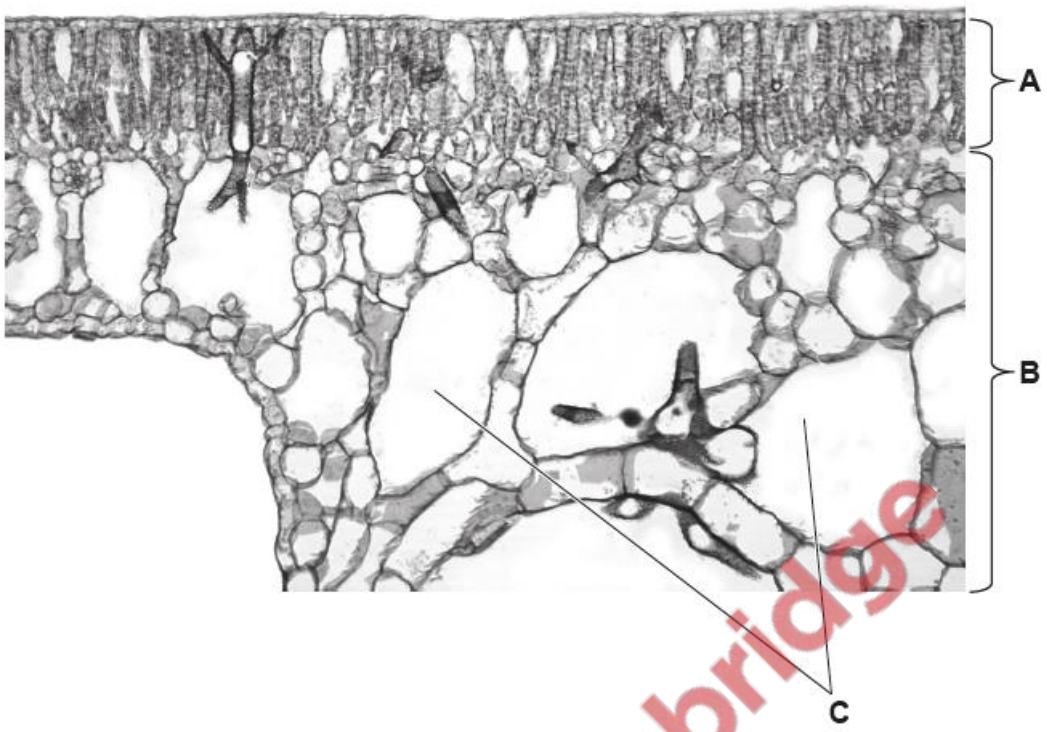

Fig. 2.2

(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]

(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]

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

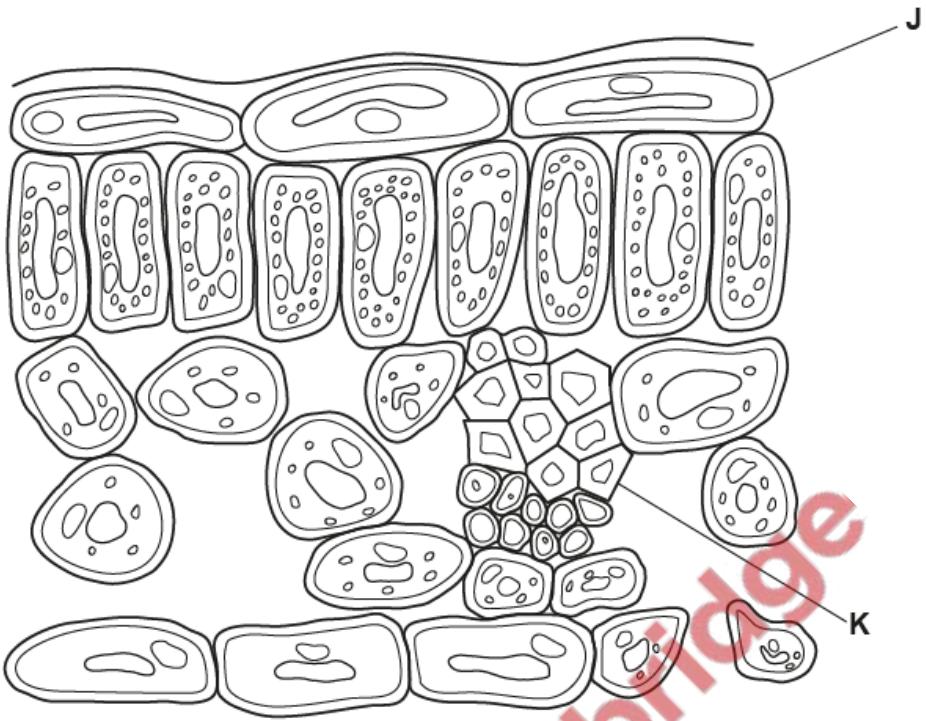

Fig. 2.1

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

J .....

.....

.....

.....

K .....

.....

.....

.....

[4]

(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]