

3: Plant nutrition and transport – Topic questions **Paper 4**

The questions in this document have been compiled from a number of past papers, as indicated in the table below.

Use these questions to formatively assess your learners' understanding of this topic.

Question	Year	Series	Paper number
4	2016	June	43
6	2016	June	41
6	2016	November	43

The mark scheme for each question is provided at the end of the document.

You can find the complete question papers and the complete mark schemes (with additional notes where available) on the School Support Hub at www.cambridgeinternational.org/support

- (c) Mammals have a transport system for carbon dioxide. Plants absorb carbon dioxide from their surroundings to use in photosynthesis.

Explain how a molecule of carbon dioxide from the atmosphere reaches the site of photosynthesis in a leaf.

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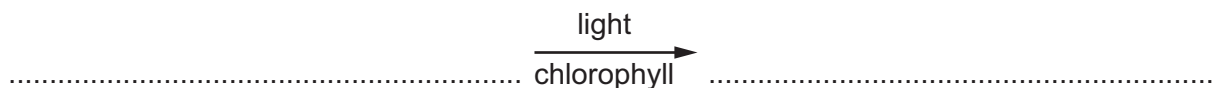
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..... [4]

[Total: 17]

- 6 (a) State the balanced chemical equation for photosynthesis.



[2]

A student investigated the effect of different wavelengths of light on the rate of photosynthesis of the water plant, *Cabomba*.

The student used the apparatus shown in Fig. 6.1.

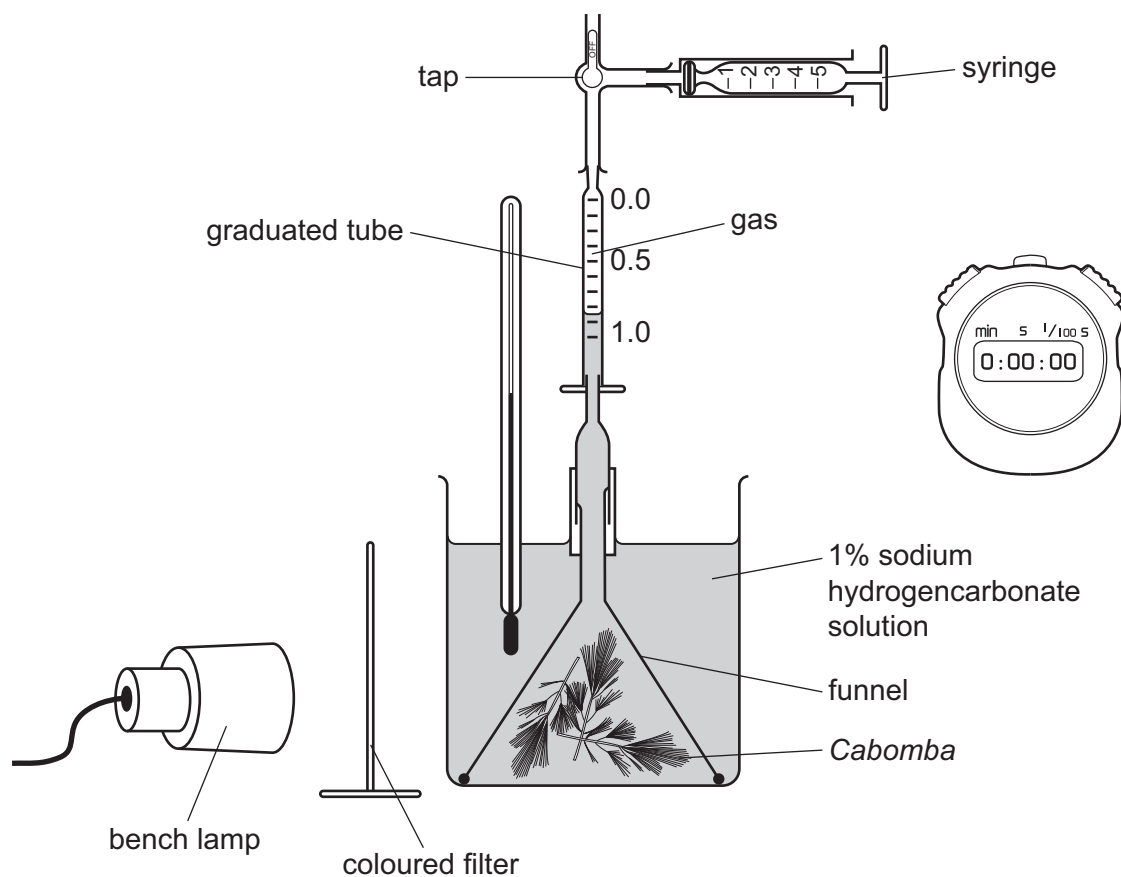


Fig. 6.1

- (b) The student collected the gas produced by the plant for five minutes. The results are shown in Table 6.1.

Table 6.1

colour of filter	wavelength of light / nm	volume of gas collected / cm ³
violet	400	0.80
blue	475	0.80
green	550	0.20
yellow	600	0.40
red	675	0.90

Describe the effect of wavelength of light on the rate of photosynthesis as shown in the student's results in Table 6.1.

You will gain credit if you use data from the table.

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..... [3]

- (c) State how the student would calculate the rates of photosynthesis from the results in Table 6.1.

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..... [1]

(d) State why the student:

(i) kept the lamp at the same distance during the investigation,

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.....
.....

[1]

(ii) used sodium hydrogencarbonate solution.

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[1]

(e) State **three** uses in a plant of the carbohydrate produced in photosynthesis.

1.....
2.....
3.....

[3]

[Total: 11]

- 6 (a) Name **one** feature of dicotyledonous leaves that distinguishes them from monocotyledonous leaves.

.....[1]

- (b) Explain why a leaf is an organ.

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.....[1]

- (c) Photosynthesis occurs in leaves.

State the balanced chemical equation for photosynthesis.

.....[3]

- (d) Fig. 6.1 is an image of a section through a dicotyledonous leaf from a scanning electron microscope.

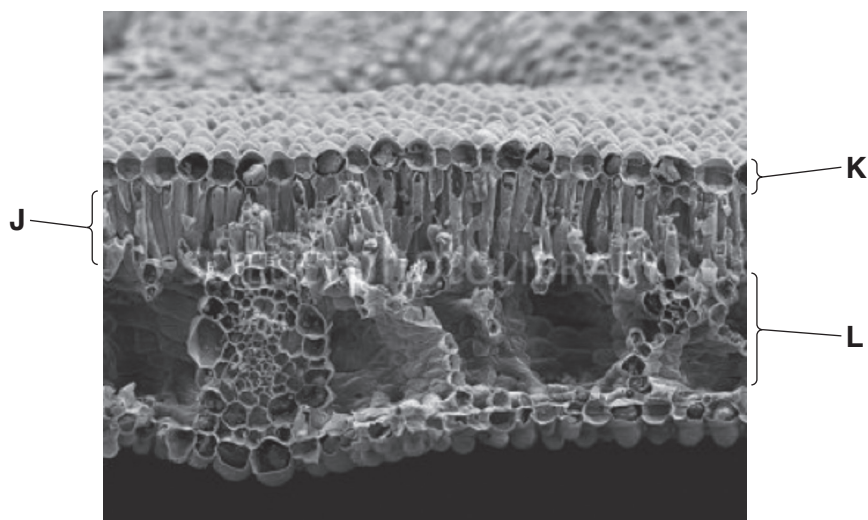


Fig. 6.1

Identify the layers labelled in Fig. 6.1 and explain how their adaptations allow photosynthesis to occur in the leaf.

(i) layer J
adaptation for photosynthesis
..... [2]

(ii) layer K
adaptation for photosynthesis
..... [2]

(iii) layer L
adaptation for photosynthesis
..... [2]

(e) Plants need nitrate ions for growth.

Explain why.

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..... [3]

[Total: 14]

Abbreviations used in the Mark Scheme:

;	separates marking points
/	alternatives
I	ignore
R	reject
A	accept (for answers correctly cued by the question, or guidance for examiners)
AW	alternative wording (where responses vary more than usual)
AVP	any valid point
ecf	credit a correct statement / calculation that follows a previous wrong response
ora	or reverse argument
()	the word / phrase in brackets is not required, but sets the context
<u>underline</u>	actual word given must be used by candidate (grammatical variants excepted)
max	indicates the maximum number of marks that can be given

Question	Answer	Marks
4 (c)	diffusion ; down concentration gradient ; (diffuses) through stoma / stomata ; (through) (intercellular) air space / (between) spongy mesophyll ; into / reached, palisade, mesophyll / cell ; chloroplast ; AVP ; e.g. dissolve / diffuse, through cell wall / cell membrane / cytoplasm	[4]
		[Total: 4]

Question	Answer	Marks
6 (a)	$6\text{CO}_2 + 6\text{H}_2\text{O} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$;;	[2]
6 (b)	as wavelength increases, rate (of photosynthesis) decreases and increases ; high rates in, blue and violet and red / 400–475 nm and 675 nm ; low(est) rate in, green and yellow / 550–600 nm ; either maximum rate = 0.9 cm ³ , at 675 nm / red or minimum rate = 0.2 cm ³ , at 550 nm / green ;	[max 3]
6 (c)	divide the volumes by, five (minutes) / time ;	[1]
6 (d) (i)	to keep the light intensity the same ;	[1]
6 (d) (ii)	to provide carbon dioxide / so carbon dioxide is not a limiting factor / so the only limiting factor is wavelength ;	[1]
6 (e)	for, respiration / energy ; converted to sucrose ; used to make, nectar / fruits ; used to make, cellulose / lignin ; used in cell walls ; used to make, starch / oils / fats ; storage ; used to make, amino acids ; used to make, chlorophyll ;	[max 3]
[Total: 11]		
6 (a)	(branching) veins; ora shape / broad (leaves); ora	[1]
6 (b)	it is (made of a group of) tissues working together to perform specific function(s);	[1]
6 (c)	$6\text{CO}_2 + 6\text{H}_2\text{O}$ (LHS); $\text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$ (RHS); energy / light / chlorophyll;	[3]
6 (d) (i)	palisade (mesophyll / tissue / cells / parenchyma); tightly packed / contain many chloroplast / stacked upright;	[2]
6 (d) (ii)	(upper) epidermis / epidermal cells; transparent / allows light to pass through / thin;	[2]
6 (d) (iii)	spongy, mesophyll / tissue / cells / parenchyma / layer; air spaces / loosely packed / gas exchange / diffusion of gases;	[2]
6 (e)	nitrate is useable source of nitrogen; needed to make amino acids; (amino acids) to make proteins; protein / DNA, needed for growth; to make DNA / RNA / nucleotides / bases; other suitable named use of organic nitrogenous compounds found in plants;	[3]
[Total: 14]		