Multiple Choice Questions (MCQ) topic quiz

Photosynthesis

Instructions and answers for teachers

These instructions cover the learner activity section which can be found on page 16.

This Lesson Element supports OCR AS and A Level Biology A (H020, H420) and Biology B (Advancing Biology) (H022, H422).

When distributing the activity section to the learners either as a printed copy or as a Word file you will need to remove the teacher instructions section.

The Activity

This Lesson Element is a teaching and learning resource containing 20 multiple choice questions (MCQs) on the theme of photosynthesis. Some questions might require synoptic thinking, using knowledge and ideas from various topics across the full A Level content.

This resource can be used to test and consolidate understanding at the end of a topic or to revisit and refresh knowledge at a later point in the course.

Introduction

Multiple choice questions allow rapid coverage of a wide range of sub-topics.

Contrary to a widespread belief among students, multiple choice questions are not necessarily easy – they can be easy, moderate or difficult.

The questions are written so that the incorrect answers are plausible distractors based on common errors or misconceptions.

The questions in this quiz cover topics mainly from specification section:

Biology A
5.2.1 Photosynthesis

Biology B (Advancing Biology)
4.3.1 Photosynthesis, food production and management of the environment.

Multiple Choice Questions (MCQ) topic quiz - answers

1 Which two reactions occur during photophosphorylation?

A ATP is hydrolysed and NADP is reduced.

B ATP is hydrolysed and NADPH is oxidised.

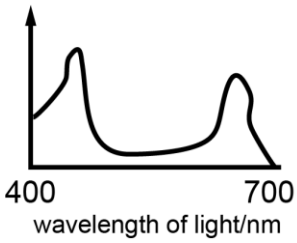
C ATP is synthesised and NADP is reduced.

D ATP is synthesised and NADPH is oxidised.

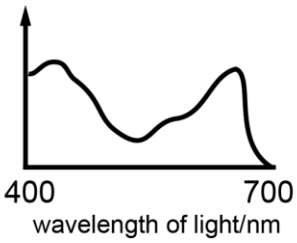
Your answer C

2 Graphs 1 – 4 relate to photosynthesis. Three show the absorption spectra of different photosynthetic pigments, with light absorbance on each *y* axis. One is the action spectrum of a plant containing these three pigments, with the rate of photosynthesis on the *y* axis.

graph 1



graph 2



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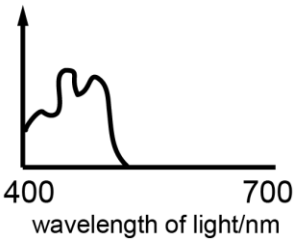

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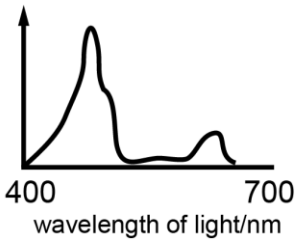


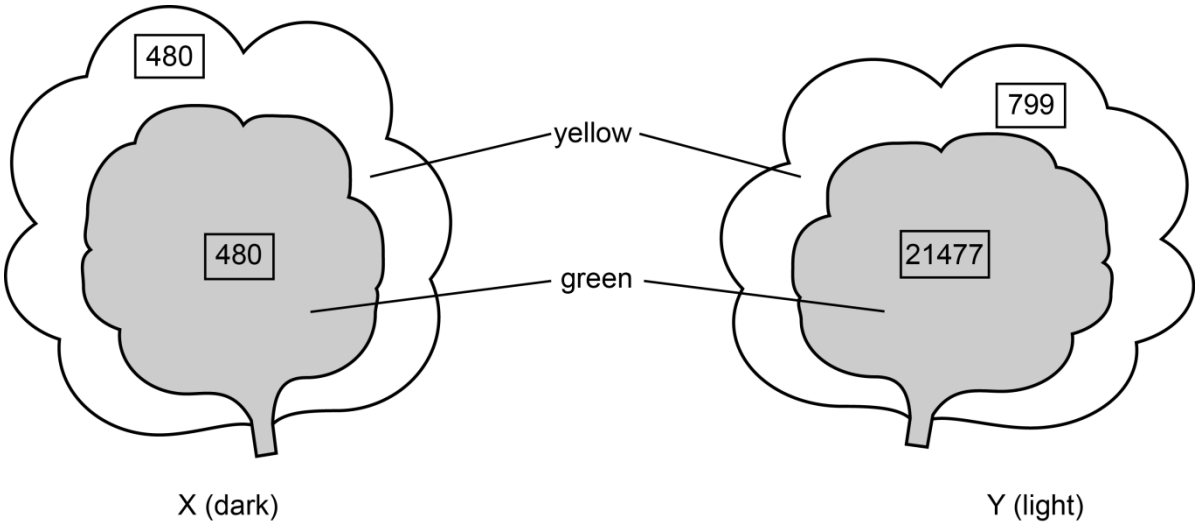
Which letter correctly identifies the four graphs?

	absorption spectrum			action spectrum
	chlorophyll a	**chlorophyll b**	**carotenoids**	
A	1	3	2	4
B	1	4	3	2
C	2	3	1	4
D	2	4	3	1

Your answer B

3 Two plants with variegated leaves were supplied with air containing radioactive carbon dioxide ($^{14}CO_2$). After 24 hours a leaf from plant **X**, which had been kept in the dark, and a leaf from plant **Y**, which had been kept in the light, were compared by measuring the radioactivity in the leaves.

The results are shown on the diagrams.



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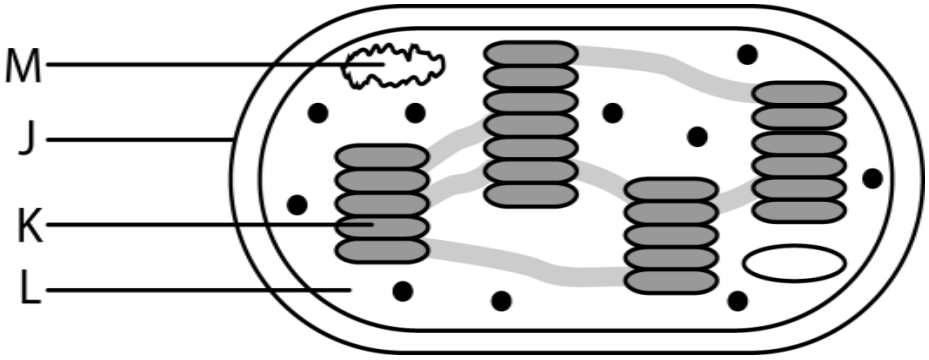
Your answer C

4 The diagram shows a chloroplast.



Which line in the table shows the locations of processes occurring within a chloroplast?

	photophosphorylation	regeneration of RuBP	transcription
A	J	L	K
B	J	M	L
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Your answer C

5 Which reaction is catalysed by the enzyme RuBisCO?

A carboxylation of ribulose bisphosphate (RuBP)

B conversion of triose phosphate (TP) to ribulose phosphate (RuP)

C oxidation of glycerate-3-phosphate (GP)

D reduction of glycerate-3-phosphate (GP)

Your answer A

6 Which pair of areas within a chloroplast will show the steepest pH gradient between them?

A DNA and stroma

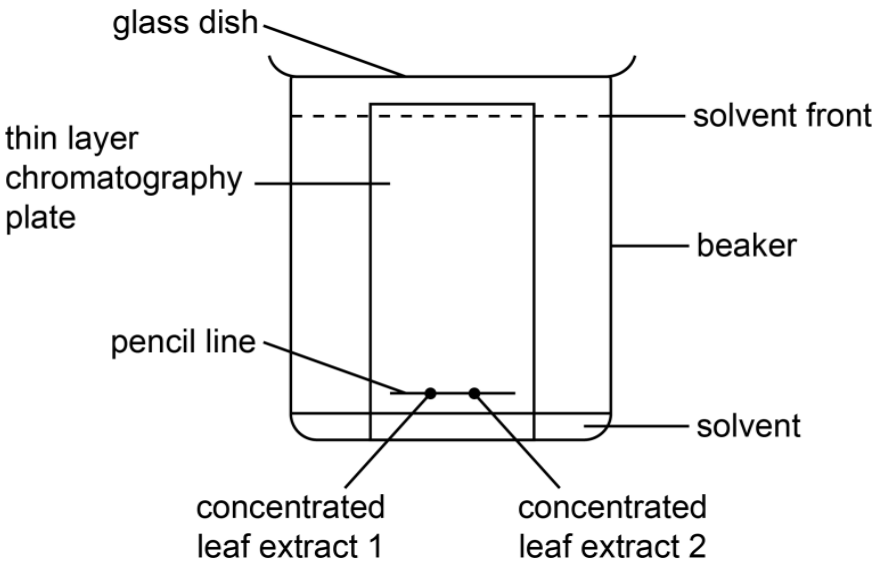
B ribosome and stroma

C stroma and the space between the outer and inner membrane

D stroma and the thylakoid space within the thylakoid membrane

Your answer D

7 The diagram shows apparatus for carrying out thin layer chromatography to investigate the photosynthetic pigments contained in two types of leaf. As the solvent rises up the plate, the pigments are carried up and separated, producing a vertical line of coloured spots for each leaf type.



What distances need to be measured to prove via calculated Rf values whether the pigments in each leaf are different or the same?

A from the spot at leaf extract 1 to the mid-point of each coloured spot

B from the pencil line to the top of each coloured spot and to the solvent front

C from the top of the solvent to the bottom of each coloured spot and to the solvent front

D from the base of the plate to its top and from the pencil line to the top of each coloured spot

Your answer B

8 Sampling a suspension of isolated chloroplasts at intervals allows the measurement of the concentrations of photosynthetic intermediates to take place. Measurements are taken before and after removing the source of carbon dioxide to the chloroplasts.

Which line of the table shows how the concentrations of ribulose bisphosphate (RuBP) and triose phosphate (TP) are expected to change when the source of carbon dioxide is removed?

	ribulose bisphosphate (RuBP)	**triose phosphate (TP)**
A	decreases	no change
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Your answer B

9 Which statement correctly outlines some of the main events in photosynthesis?

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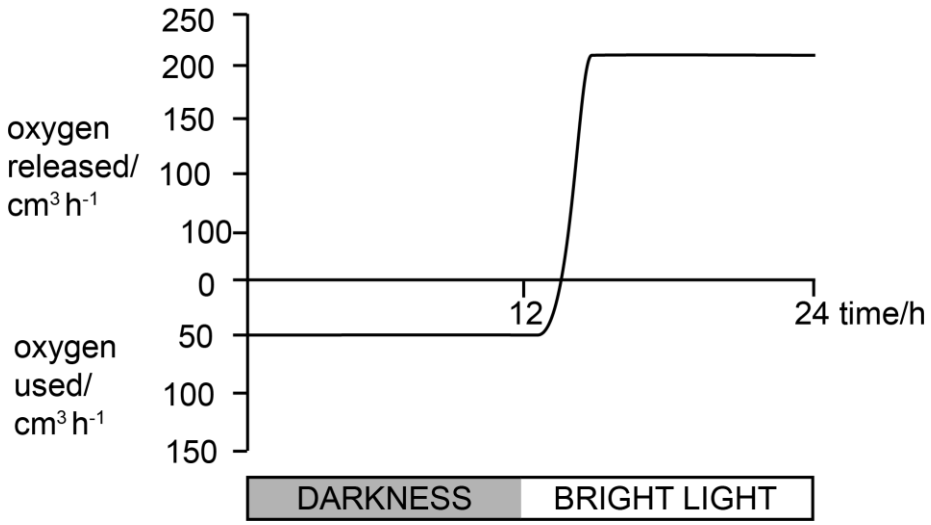
B A 3C carbohydrate is regenerated and reduced by hydrogen molecules derived from photophosphorylation.

C Photolysis uses light to produce reduced NADP and oxygen which are used to reduce a 3C carbohydrate.

D Photolysis produces NADPH and ATP which are used to reduce a 5C carbohydrate.

Your answer A

10 Oxygen use and release by a plant was monitored for 12 hours of darkness and 12 hours of bright light. Temperature and all other variables were kept constant. The results are shown in the graph.



Calculate the volume of oxygen used by the plant in respiration over the duration of the experiment.

A 50 cm^3

B 600 cm^3

C 650 cm^3

D 1200 cm^3

Your answer D

Working: Read from graph that oxygen take-up is 50 cm^3 h^{-1} and multiply by 24 hours. Distractor A reads value from graph but does not calculate for 24 h period. Distractor B multiplies by 12 only (roughly corresponding to the time when 50cm3 take up is shown). Distractor D multiplies by the length of time before compensation point, 13 h).

11 Which chemicals are both the products of respiration and the raw materials of photosynthesis?

A carbon dioxide, ATP and oxygen

B carbon dioxide and water

C glucose and oxygen

D glucose, ATP and oxygen

Your answer B

12 What name is given to an assembly of several hundred accessory pigment molecules around a molecule of chlorophyll a?

A photolysis cluster

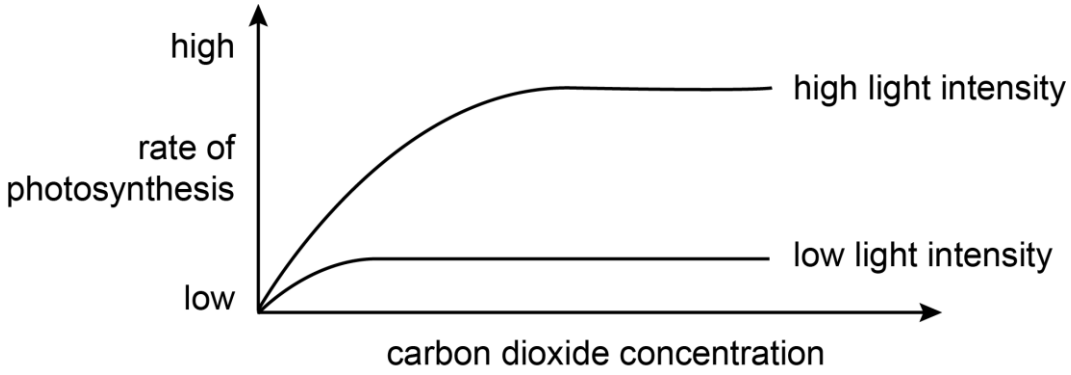
B photoreaction centre

C photosystem

D photophosphorylation

Your answer C

13 The graph shows the interaction of two factors that affect the rate of photosynthesis.



Which of the following statements correctly describe(s) the relationships shown on the graph?

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A 1, 2 and 3

B Only 1 and 2

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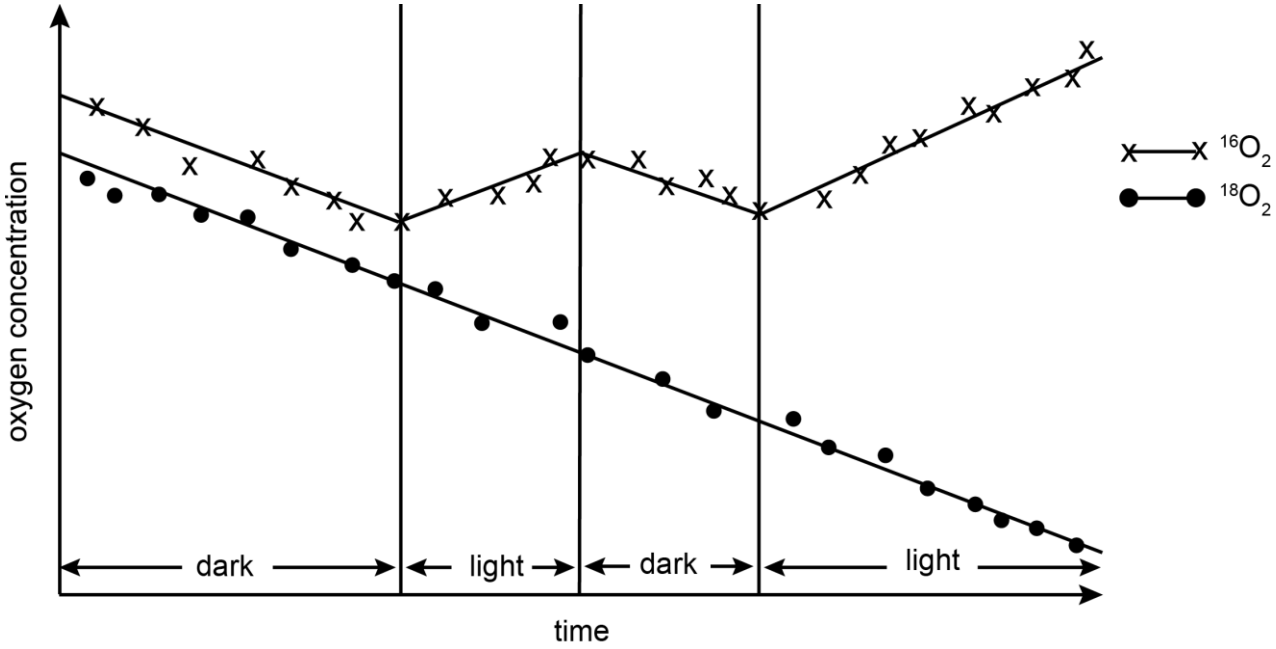
Your answer B

14 Unicellular algae were grown in a culture supplied with oxygen gas (O_2) and water (H_2O) containing the ^{16}O oxygen isotope. The algae were then briefly supplied with oxygen gas containing a mixture of the ^{16}O isotope and the ^{18}O isotope. Over the course of the next hour lighting conditions were varied and the concentrations of the two isotopes in the culture were measured.



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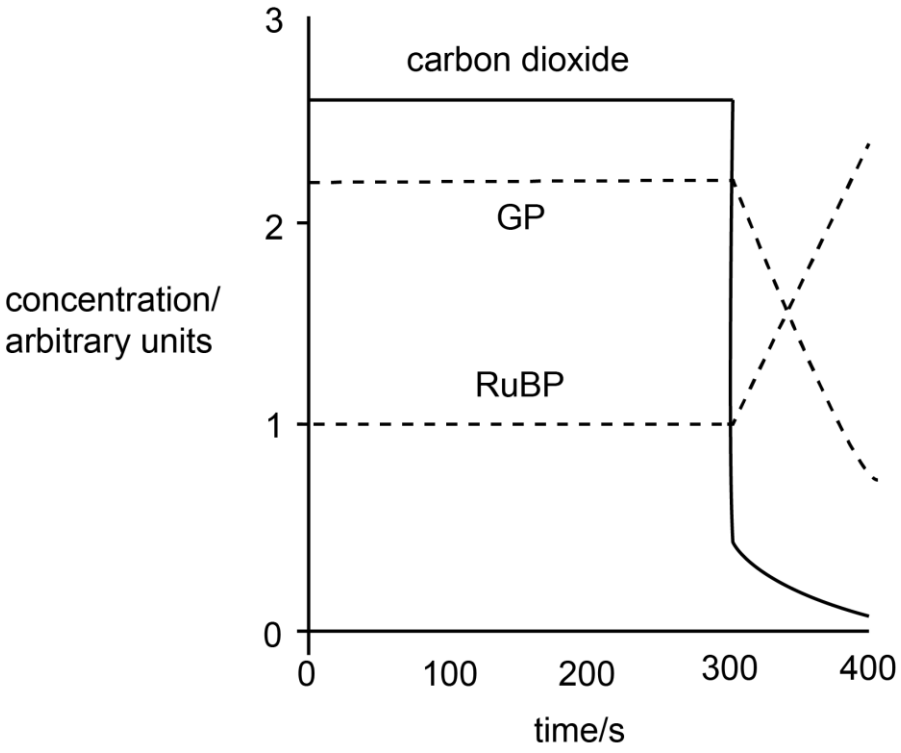
Your answer C

15 What fractions of triose phosphate (TP) produced should be directed to different biochemical pathways to give maximum sustainable growth in a plant?

	fraction used to make starch	fraction used to make ribulose bisphosphate (RuBP)	fraction used to make amino acids
A	0	5/6	1/6
B	0	1/6	5/6
C	1/6	5/6	0
D	5/6	1/6	0

Your answer A

16 The graph shows the results of an experiment using a culture of illuminated, photosynthesising algae. After 300 seconds the carbon dioxide supply was stopped. The concentrations of glycerate-3-phosphate (GP) and ribulose bisphosphate (RuBP) were measured over a 400 second time period.



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Statement 3: The rate of carbon fixation is falling.

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Your answer C

17 In an experiment to measure the rate of photosynthesis of a water plant, bubbles of oxygen produced by the cut end of the stem were collected under the funnel-shaped end of a glass tube. After 20 minutes, a syringe attached to the far end of the tube was used to draw the oxygen bubble up the tube so that its length could be measured against a mm scale.

The mean length of the bubble was 12 mm in a tube of diameter 0.5 mm.

What is the hourly rate of oxygen production in this plant?

A 7.1 mm^3 h^{-1}

B 22.2 mm^3 h^{-1}

C 28.3 mm^3 h^{-1}

D 56.5 mm^3 h^{-1}

Your answer | A |

Correct working in A = πr2 x 12 x 3 (3.14 x (0.25)2 x 36 = 7.065

Distractor B has squared both the radius and π. Distractor C has used the diameter 0.5 mm instead of the radius 0.25 mm. Distractor D has either used 2πr to calculate the area instead of πr2 or has multiplied 0.25 by 2 instead of squaring it.

18 In an experiment to investigate the effect of wavelength of light on photosynthesis, a student added blue DCPIP solution to a suspension of isolated chloroplasts. DCPIP turns from blue to colourless when it accepts hydrogen ions and electrons. The DCPIP/ chloroplast mixture was kept in the dark until needed, when a sample was drawn into a capillary tube and illuminated by coloured light of a known wavelength.

Which statements about the expected results of the experiment are correct?

Statement 1: DCPIP will decolorise at different rates in different wavelengths of light.

Statement 2: DCPIP will decolorise faster in red than in green wavelengths of light.

Statement 3: The end point of the reaction will be a colourless solution.

A 1, 2 and 3

B Only 1 and 2

C Only 2 and 3

D Only 1

Your answer | B |

19 Corals are colonies of marine animals that contain photosynthetic algae inside their cells. Environmental changes can result in coral bleaching, where the pigmented algae are lost from the corals.

Which statements support the idea that algal photosynthesis is important to corals?

Statement 1: Bleached corals grow more slowly.

Statement 2: Corals receive carbohydrates from the algae they host.

Statement 3: Carbon dioxide from coral respiration is used by the algae in their cells.

A 1, 2 and 3

B Only 1 and 2

C Only 2 and 3

D Only 1

Your answer B

20 Farmers can increase the yield of raspberries by growing the plants in plastic tunnels fitted with irrigation systems.

Which statements explain the improved yield of raspberries in a plastic tunnel?

Statement 1: Less air movement reduces transpiration.

Statement 2: Higher temperature in the tunnel increases the rate of the light independent reaction.

Statement 3: The tunnels exclude birds, reducing loss of fruit before picking.

A 1, 2 and 3

B Only 1 and 2

C Only 2 and 3

D Only 1

Your answer C

This formative assessment resource has been produced as part of our free Biology teaching and learning support package. All the Biology teaching and learning resources, including delivery guides, topic exploration packs, lesson elements and more are available on the qualification webpages.

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Multiple Choice Questions (MCQ) topic quiz

Photosynthesis

Learner Activity

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Your answer ☐

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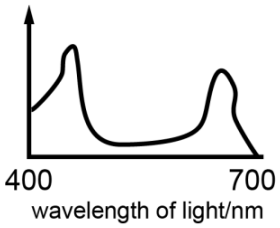
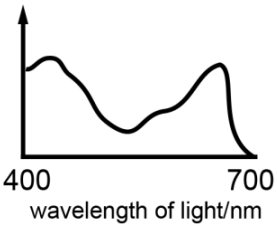
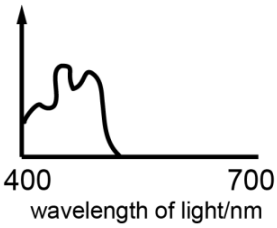


graph 2



graph 3



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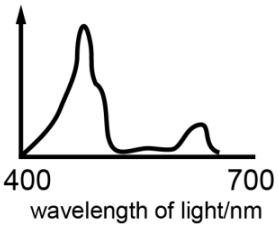

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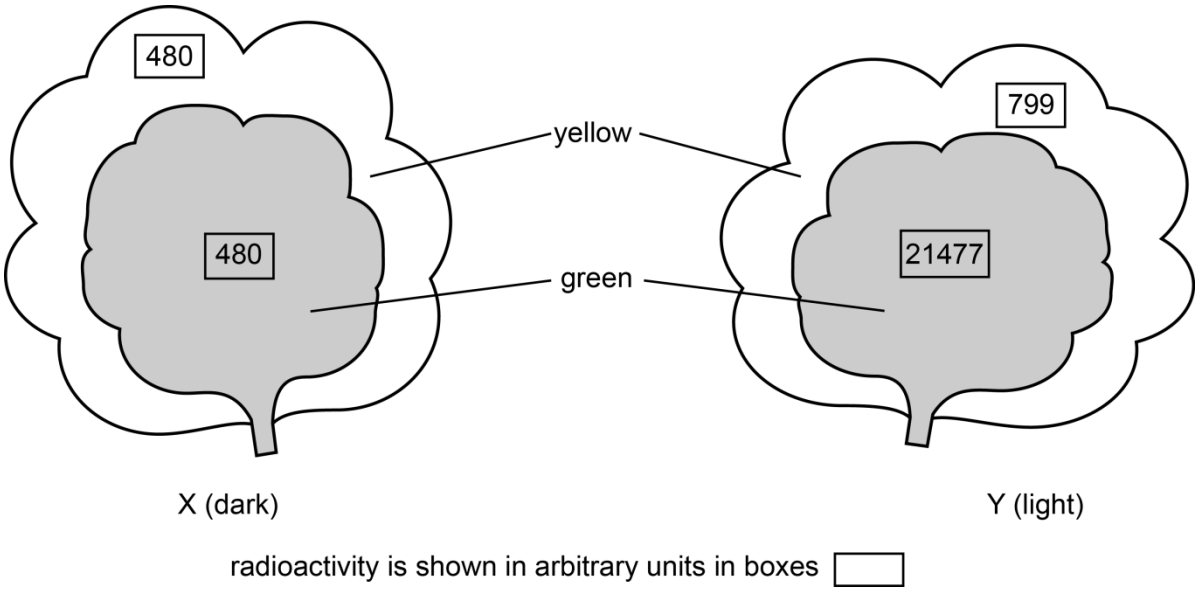

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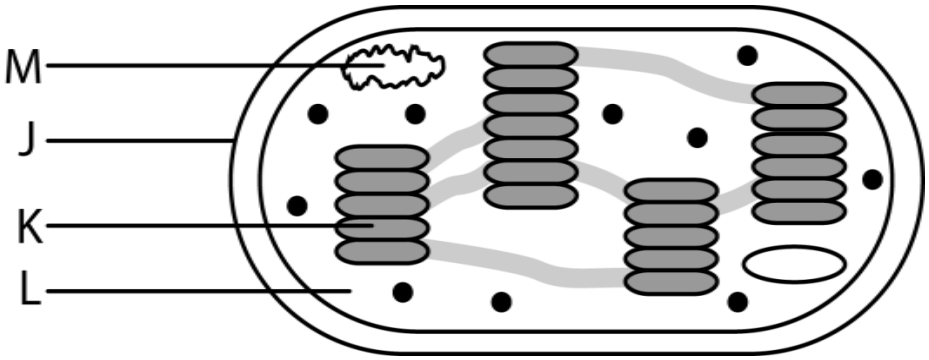

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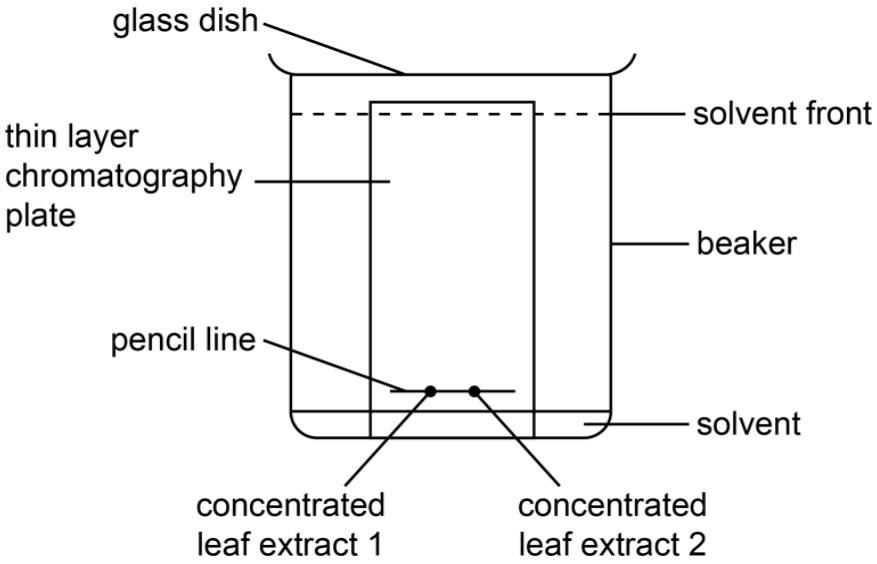

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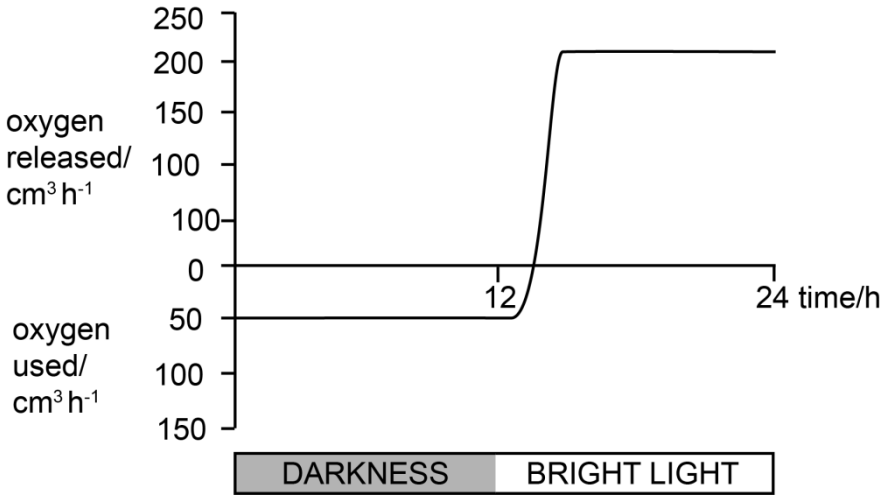

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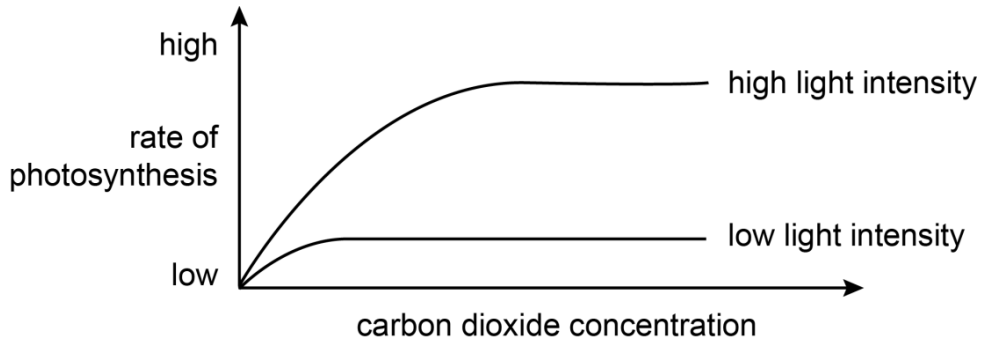

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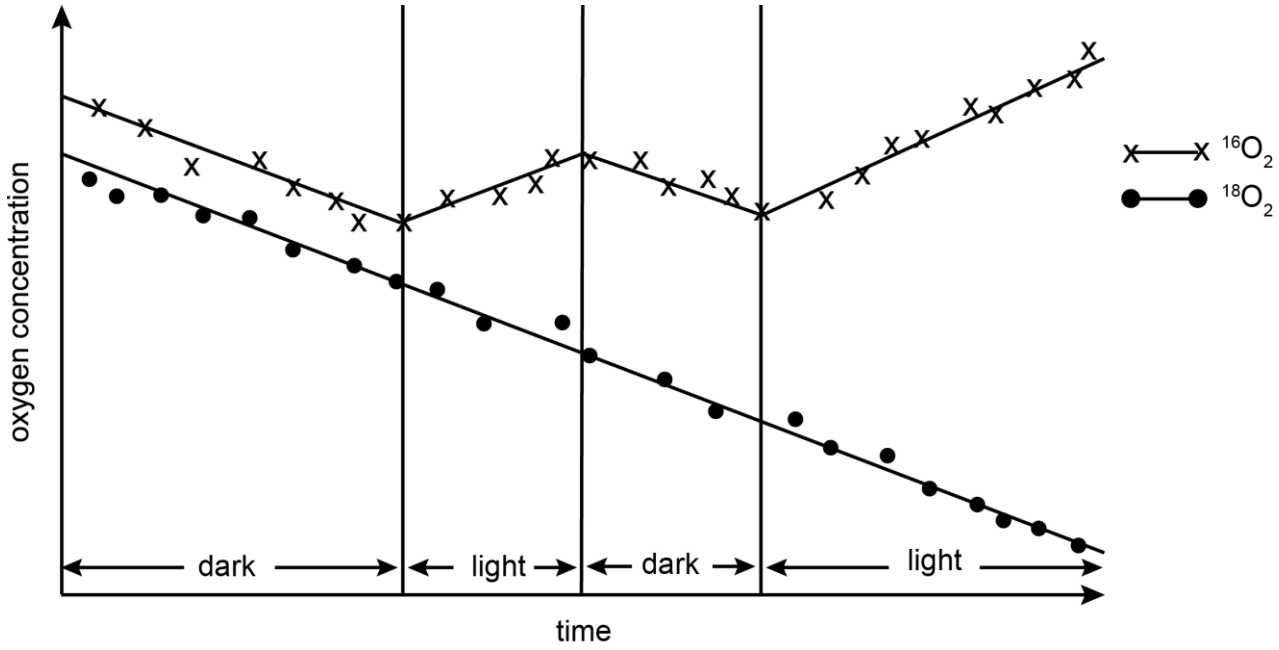

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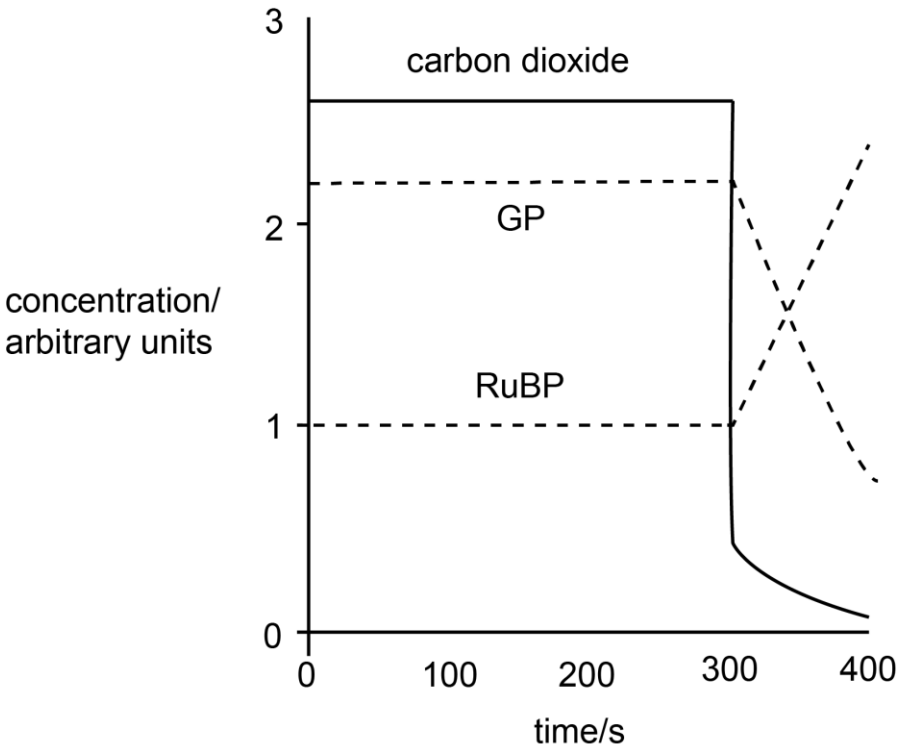

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D Only 1

Your answer

17 In an experiment to measure the rate of photosynthesis of a water plant, bubbles of oxygen produced by the cut end of the stem were collected under the funnel-shaped end of a glass tube. After 20 minutes, a syringe attached to the far end of the tube was used to draw the oxygen bubble up the tube so that its length could be measured against a mm scale.

The mean length of the bubble was 12 mm in a tube of diameter 0.5 mm.

What is the hourly rate of oxygen production in this plant?

A 7.1 $mm^3\ h^{-1}$

B 22.2 $mm^3\ h^{-1}$

C 28.3 $mm^3\ h^{-1}$

D 56.5 $mm^3\ h^{-1}$

Your answer ☐

18 In an experiment to investigate the effect of wavelength of light on photosynthesis, a student added blue DCPIP solution to a suspension of isolated chloroplasts. DCPIP turns from blue to colourless when it accepts hydrogen ions and electrons. The DCPIP/ chloroplast mixture was kept in the dark until needed, when a sample was drawn into a capillary tube and illuminated by coloured light of a known wavelength.

Which statements about the expected results of the experiment are correct?

Statement 1: DCPIP will decolorise at different rates in different wavelengths of light.

Statement 2: DCPIP will decolorise faster in red than in green wavelengths of light.

Statement 3: The end point of the reaction will be a colourless solution.

A 1, 2 and 3

B Only 1 and 2

C Only 2 and 3

D Only 1

Your answer ☐

19 Corals are colonies of marine animals that contain photosynthetic algae inside their cells. Environmental changes can result in coral bleaching, where the pigmented algae are lost from the corals.

Which statements support the idea that algal photosynthesis is important to corals?

Statement 1: Bleached corals grow more slowly.

Statement 2: Corals receive carbohydrates from the algae they host.

Statement 3: Carbon dioxide from coral respiration is used by the algae in their cells.

A 1, 2 and 3

B Only 1 and 2

C Only 2 and 3

D Only 1

Your answer ☐

20 Farmers can increase the yield of raspberries by growing the plants in plastic tunnels fitted with irrigation systems.

Which statements explain the improved yield of raspberries in a plastic tunnel?

Statement 1: Less air movement reduces transpiration.

Statement 2: Higher temperature in the tunnel increases the rate of the light independent reaction.

Statement 3: The tunnels exclude birds, reducing loss of fruit before picking.

A 1, 2 and 3

B Only 1 and 2

C Only 2 and 3

D Only 1

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