



General Certificate of Secondary Education
2016–2017

Centre Number

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Candidate Number

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Double Award Science: Biology

Unit B1
Higher Tier

[GSD12]



WEDNESDAY 22 FEBRUARY 2017, MORNING

TIME

1 hour.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.

Write your answers in the spaces provided in this question paper.
Answer **all nine** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 70.

Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.

Quality of written communication will be assessed in Question **5(a)**.

For Examiner's use only	
Question Number	Marks
1	
2	
3	
4	
5	
6	
7	
8	
9	
Total Marks	

1 Glucose made in photosynthesis can be converted into starch in leaves.

The steps A–E in testing a leaf for starch are given.

The steps are not in the correct order.

- A Place the leaf in warm water.
- B Add iodine solution to the leaf.
- C Spread the leaf on a white tile.
- D Place the leaf in boiling water.
- E Place the leaf in boiling alcohol.

(a) Use the letters to put the steps in the correct order in the boxes below.

The first step has been given.



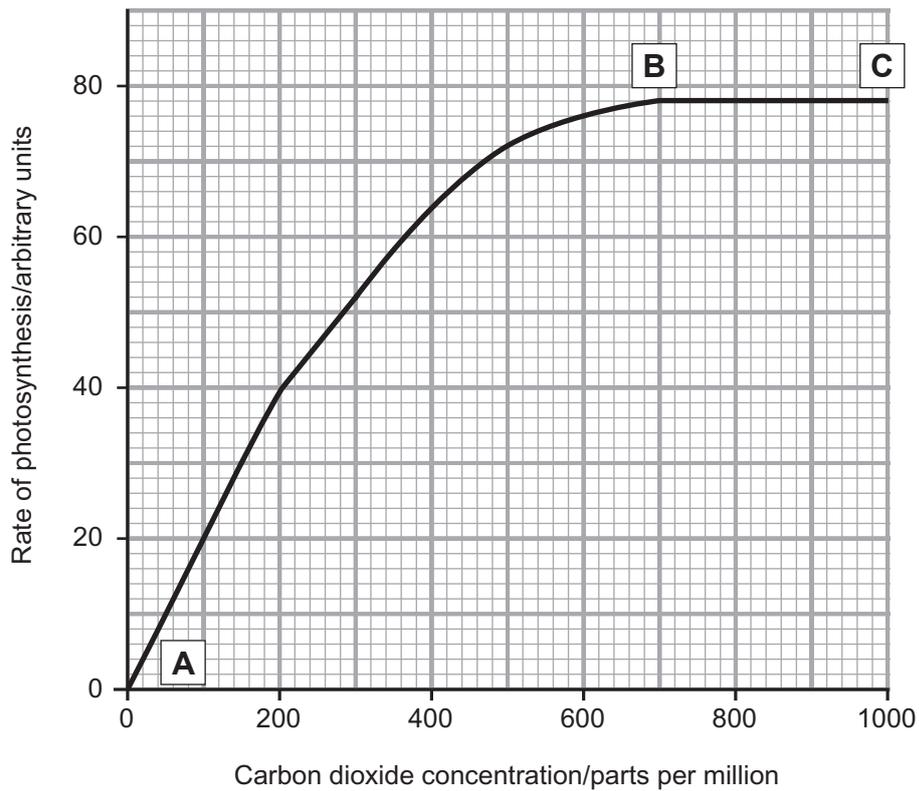
[2]

(b) Apart from being converted into starch in leaves, give **one other** way glucose is used in plants.

_____ [1]

Examiner Only	
Marks	Remark

- (c) The graph shows the effect of carbon dioxide concentration on the rate of photosynthesis in tomato plants grown in a glasshouse.



- (i) What factor limits the rate of photosynthesis between **A** and **B**?

_____ [1]

- (ii) Suggest **one** factor that might limit the rate of photosynthesis between **B** and **C**.

_____ [1]

Examiner Only	
Marks	Remark

- (d) There is no advantage in adding extra carbon dioxide in the glasshouse at night.

Explain why.

[2]

One way of adding extra carbon dioxide to a glasshouse is to burn a fuel such as natural gas.

- (e) Suggest why it is better to use several small gas burners at different places in the glasshouse rather than one large burner placed at one end.

[1]

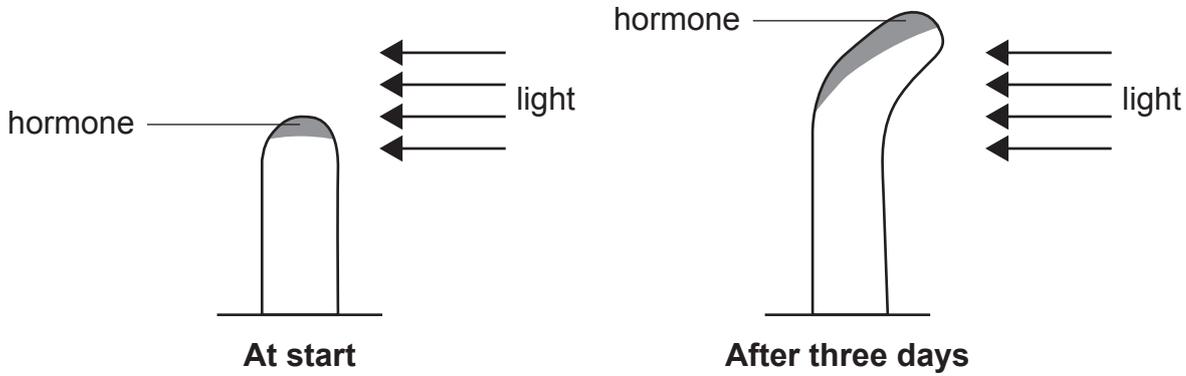
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Marks	Remark

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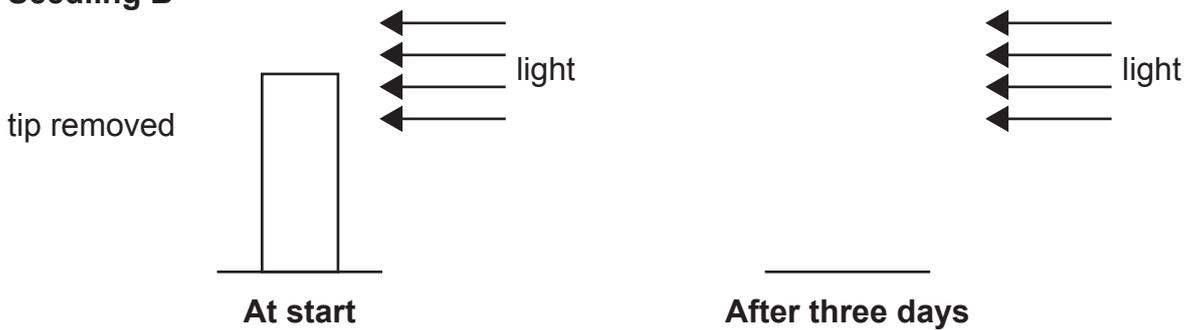
2 The diagram shows an experiment where light shines from one direction on two plant seedlings, A and B.

A hormone is made in the tip and moves down the shoot.

Seedling A



Seedling B



Source: Principal Examiner

Examiner Only	
Marks	Remark

After three days, seedling A had bent towards the light.

(a) Name this response.

[1]

(b) Use the diagram and your knowledge to explain why seedling A had bent towards the light.

_____ [2]

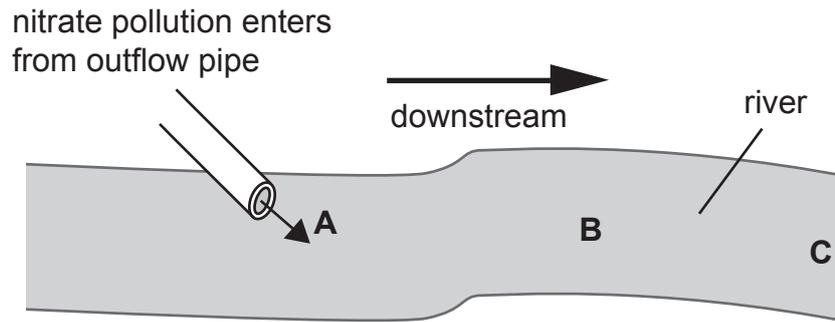
The shoot tip was removed in seedling B.

(c) In the space on the diagram **opposite**, draw how seedling B would appear **after three days**.

[2]

Examiner Only	
Marks	Remark

- 3 The diagram shows a river where nitrate pollution is entering the water at point A.

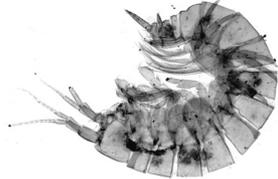


Source: Principal Examiner

The table shows the nitrate levels at three points A, B and C in the river.

Point in the river	Nitrate level mg/litre
A	30
B	15
C	0

The table below gives information on indicator species of water pollution.

Name of indicator species	Photograph of indicator species	Level of water pollution where indicator species is found in large numbers	Examiner Only	
			Marks	Remark
Freshwater shrimp	 <p>© Dr Keith Wheeler / Science Photo Library</p>	Medium to none		
Stonefly	 <p>© troutnut / iStock / Thinkstock</p>	None		
Bloodworm	 <p>© Nigel Cattlin / Science Photo Library</p>	High		

(a) Use the information given to name and explain which indicator species:

- would be found in **greatest** numbers at point A.

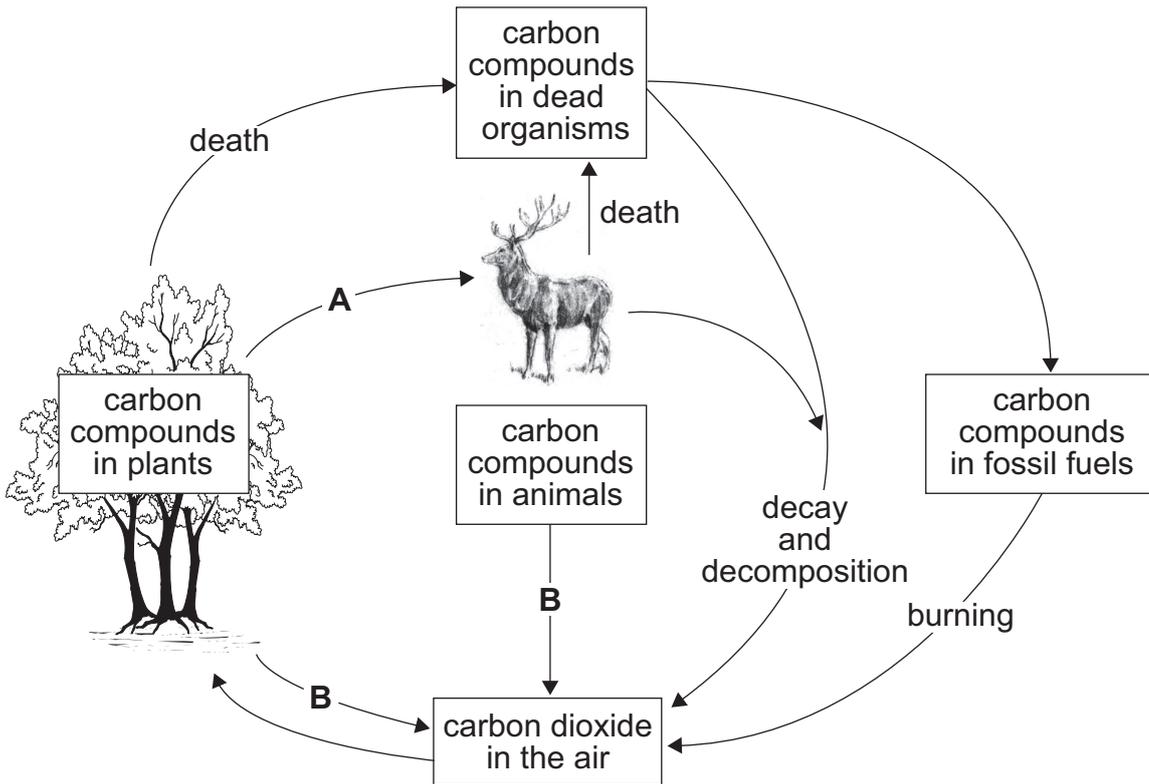
[2]

- could be found in **large** numbers at point C.

[2]

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4 (a) The diagram shows the carbon cycle.



Source: Principal Examiner

(i) Name process **A**.

[1]

(ii) Name process **B**.

[1]

Examiner Only	
Marks	Remark

Deforestation is the cutting down of trees in large numbers to make land available for other uses.

The photograph shows deforestation.



© Marek Mnich / Hemera / Thinkstock

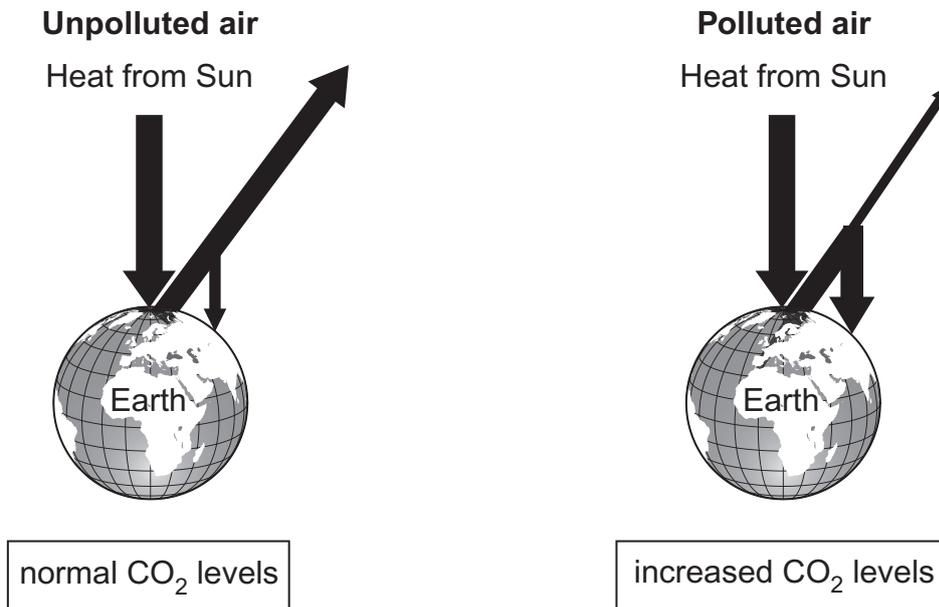
(b) Explain why deforestation leads to an increase in atmospheric carbon dioxide levels.

[2]

Examiner Only	
Marks	Remark

(c) Carbon dioxide (CO₂) is a greenhouse gas.

The diagram shows what happens to heat from the Sun in unpolluted air and polluted air.



Source: Principal Examiner

(i) Use the diagram and your knowledge to explain how polluted air has caused an increase in global warming.

[2]

(ii) Give **two** environmental effects of global warming.

1. _____

2. _____ [2]

Examiner Only	
Marks	Remark

- (d) The table gives information on carbon dioxide emissions for China and the United States of America (USA) in 2013.

Country	Average mass of carbon dioxide produced per person /tonnes	Percentage of total world emissions of carbon dioxide
China	7.2	28
USA	16.4	14

© Global Carbon Budget 2014 by Global Carbon Project. Published 21 September 2014.

- (i) Suggest why the average mass of carbon dioxide produced per person in the USA is greater than that of a person in China.

_____ [1]

- (ii) Suggest why the percentage of total world emissions of carbon dioxide is greater for China than the USA.

_____ [1]

Examiner Only

Marks Remark

[6]

James had predicted that lemon juice contains more vitamin C than grapefruit juice.
The results showed that his prediction was **wrong**.

(b) Describe the results James obtained.

[1]

Examiner Only	
Marks	Remark

6 (a) Meat is a rich source of protein in our diet.

(i) Describe how you would carry out a food test to show that a small lump of meat contains protein.

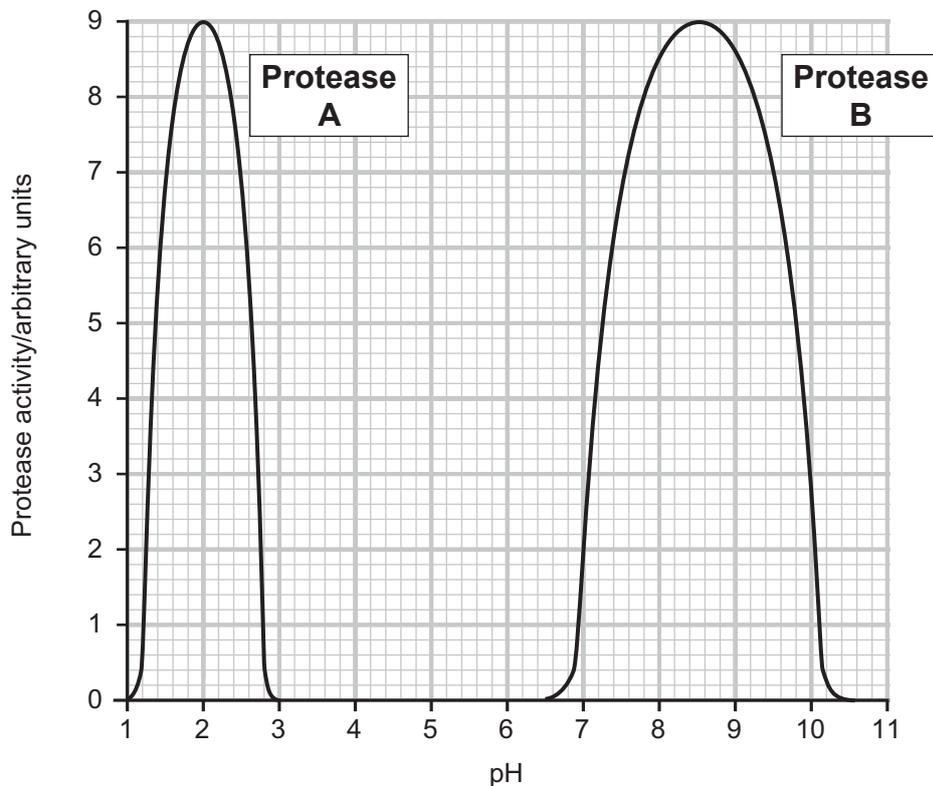
_____ [2]

(ii) Give the colour change for a positive result for protein.

_____ to _____ [1]

Two different protease enzymes break down protein in the digestive system.

The graph shows the activity of the two proteases over different pH ranges.



(b) Where in the digestive system would you find

protease **A**? _____

protease **B**? _____

[2]

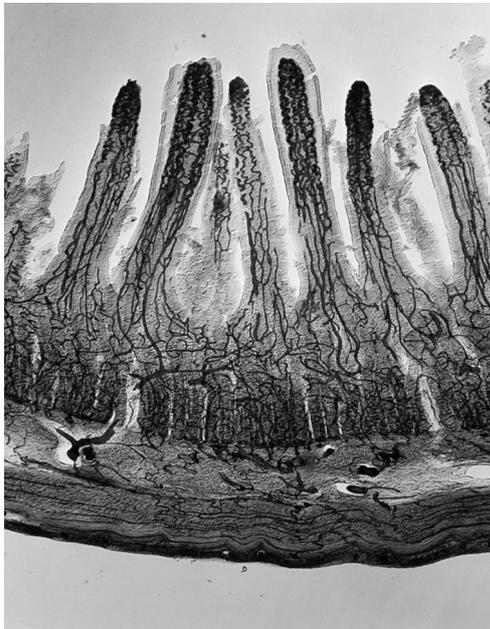
Examiner Only	
Marks	Remark

(c) (i) Name the breakdown products of protein digestion.

[1]

The breakdown products of protein digestion are absorbed by the villi.

The photograph shows villi.



© Biophoto Associates / Science Photo Library

(ii) Give **three** ways the villi are adapted for efficient absorption of the breakdown products of protein digestion.

1. _____

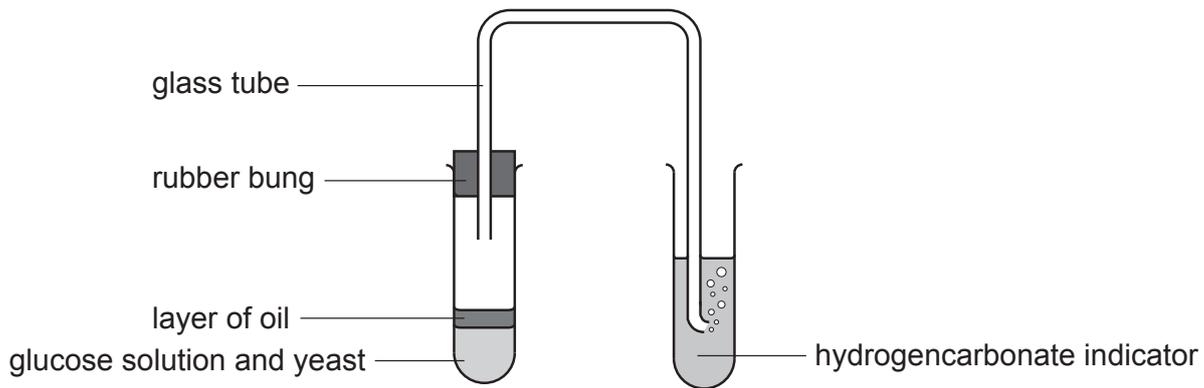
2. _____

3. _____

_____ [3]

Examiner Only	
Marks	Remark

- 7 The diagram shows the apparatus Laura used to investigate anaerobic respiration in yeast.



Source: Principal Examiner

- (a) What is the function of the layer of oil?

[1]

- (b) Laura boiled and then cooled the glucose solution before she added the yeast.
Explain why.

[2]

Examiner Only	
Marks	Remark

Laura left the experiment for one hour.

(c) Describe and explain the colour change in the hydrogencarbonate indicator after one hour.

Red to _____

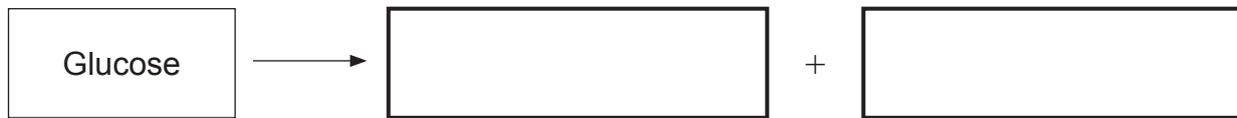
Explanation _____

_____ [2]

Examiner Only	
Marks	Remark

Mammalian muscle can also carry out anaerobic respiration.

(d) Complete the equation for this process by writing in the boxes.



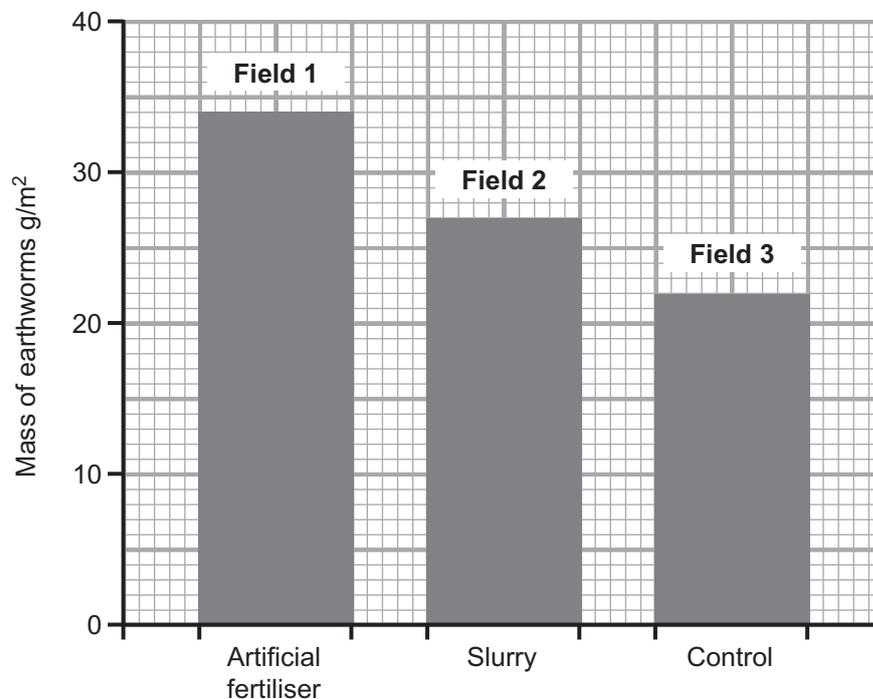
[2]

Examiner Only	
Marks	Remark

- 8 (a) Scientists investigated the effect of applying artificial fertiliser, natural fertiliser (slurry) and no fertiliser on the mass of earthworms in three different grass fields.

No fertiliser was applied as the control.

The bar graph shows the results.



© "Reprinted from *Applied Soil Ecology*. Archie K. Murchie, Rod P. Blackshaw, Alan W. Gordon and Peter Christie, *Responses of earthworm species to long-term application of slurry*, pages 60-67, Copyright 2015, with permission from Elsevier"

Use the results in the bar graph to answer the following questions.

- (i) Explain the role of the control.

[1]

Examiner Only	
Marks	Remark

(ii) Give **two** conclusions that can be drawn from the results of this investigation.

Give **data** to support your answer.

1. _____

2. _____

_____ [3]

Examiner Only	
Marks	Remark

(b) The photograph shows an earthworm burrowing through the soil.



© Dr Jeremy Burgess / Science Photo Library

- (i) Use the photograph to help name the group of animals that the earthworm belongs to.

[1]

When earthworms burrow, it increases the oxygen levels in the soil.

- (ii) Use the information given and your knowledge to explain how earthworms affect the **uptake** of nitrates by plant root hair cells.

[2]

Examiner Only	
Marks	Remark

The burrowing of earthworms increases the **level** of nitrates in the soil by causing an increase in nitrogen fixation.

(iii) Name and describe **one other** process in the nitrogen cycle in which the burrowing of earthworms increases the level of nitrates in the soil.

[2]

Examiner Only	
Marks	Remark

- 9 Phytoplankton are microscopic plants.
The photograph shows phytoplankton found in pondwater.



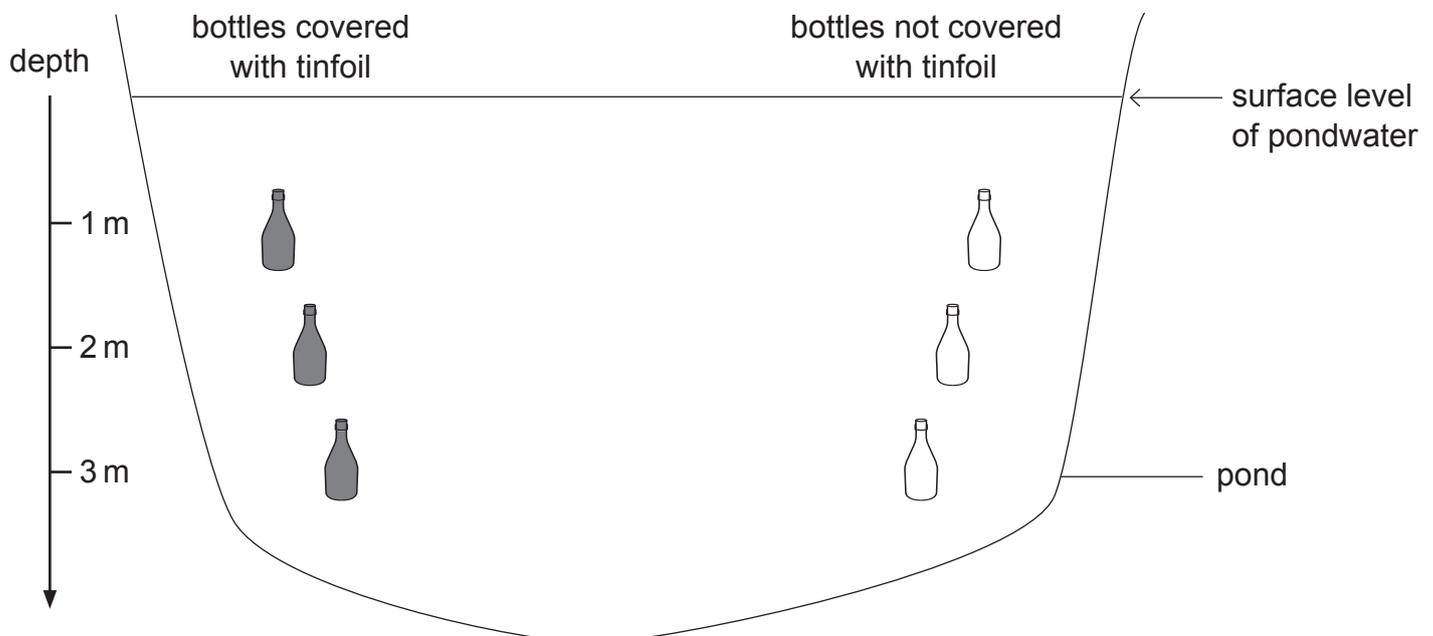
© John Durham / Science Photo Library

John investigated the effect of light on **photosynthesis** and **respiration** in phytoplankton found in pondwater.

He filled six clear glass bottles of the same size with pondwater containing phytoplankton.

He placed a stopper on each of the six bottles.

The diagram shows how he set up his experiment.



Source: Principal Examiner

The oxygen concentration in all the bottles was the same when John placed the bottles in the pond at 10 am on a bright summer's day.

He recorded the change in the **oxygen concentration** in the bottles at 2 pm on the same day.

The table shows the results.

Depth bottle placed in pond/m	Change in oxygen concentration /arbitrary units	
	Bottle covered with tinfoil	Bottle not covered with tinfoil
1	-4	+9
2	-4	+7
3	-4	+5

Use the information given and your knowledge to answer the following questions.

- (a) Explain why the oxygen concentration has decreased in the bottles **covered** with tinfoil.

[3]

- (b) Explain why the oxygen concentration has increased in the bottles **not covered** with tinfoil.

[3]

Examiner Only

Marks Remark

(c) The smallest change in oxygen concentration in the bottles **not covered** with tinfoil occurred at 3 m depth. Suggest why.

[2]

Examiner Only	
Marks	Remark

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