



General Certificate of Secondary Education  
2017–2018

Centre Number

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Candidate Number

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# Double Award Science: Biology

Unit B1  
Higher Tier

[GSD12]



**WEDNESDAY 21 FEBRUARY 2018, 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 eight** 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 **2(b)**.

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

|                    |  |
|--------------------|--|
| <b>Total Marks</b> |  |
|--------------------|--|

1 (a) Insulin is a chemical messenger that controls blood glucose levels.

(i) What type of substance is insulin?

\_\_\_\_\_ [1]

(ii) How does insulin travel in the body?

\_\_\_\_\_ [1]

The steps **A** to **E** below describe how insulin controls blood glucose levels.

**A** Insulin is produced in the pancreas.

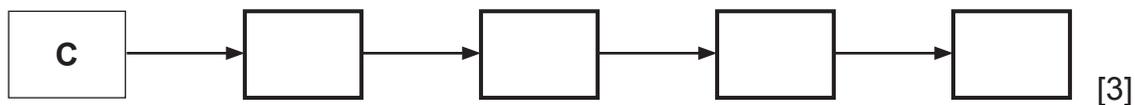
**B** Blood glucose levels decrease.

**C** Blood glucose levels increase.

**D** Insulin travels to the liver where it acts.

**E** Respiration increases and glucose is converted to glycogen.

(b) Use the letters to put the steps in the correct order in the boxes below.  
The first step is given.



| Examiner Only |        |
|---------------|--------|
| Marks         | Remark |
|               |        |

The photograph below shows a girl injecting insulin to control her blood glucose levels.



© Voisin / Phanie / Science Photo Library

(c) What condition does the girl have?

\_\_\_\_\_ [1]

(d) The central nervous system (CNS) is part of the nervous system in the body.

(i) Name the parts of the central nervous system.

\_\_\_\_\_ and \_\_\_\_\_ [2]

(ii) Complete the sentence below by writing the correct word in the space.

The central nervous system controls and coordinates the responses between \_\_\_\_\_ and effectors. [1]

(iii) Name an effector in the body.

\_\_\_\_\_ [1]

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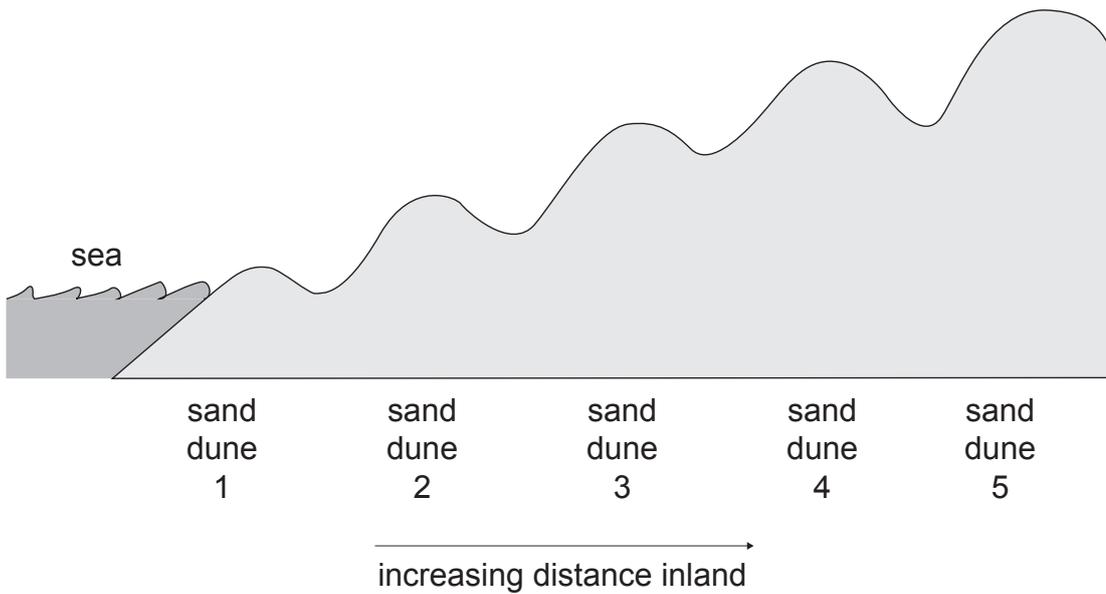
Marks Remark





3 A group of students investigated plant distribution in sand dunes.

The diagram shows the area where they carried out the investigation.



Source: Principal Examiner

The students estimated the number of species of plants growing in each sand dune.

They also collected a soil sample from each sand dune.

They measured the moisture content, mineral content and pH of the soil.

The table shows the students' results.

| Sand dune | Number of species of plants | Soil moisture content/% | Soil mineral content/ arbitrary units | pH  |
|-----------|-----------------------------|-------------------------|---------------------------------------|-----|
| 1         | 2                           | 7.7                     | 8.2                                   | 7.9 |
| 2         | 7                           | 8.4                     | 9.8                                   | 7.6 |
| 3         | 12                          | 16.9                    | 20.4                                  | 7.4 |
| 4         | 13                          | 29.8                    | 36.1                                  | 7.0 |
| 5         | 17                          | 33.5                    | 46.1                                  | 6.5 |

Source: Principal Examiner

| Examiner Only |        |
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| Marks         | Remark |
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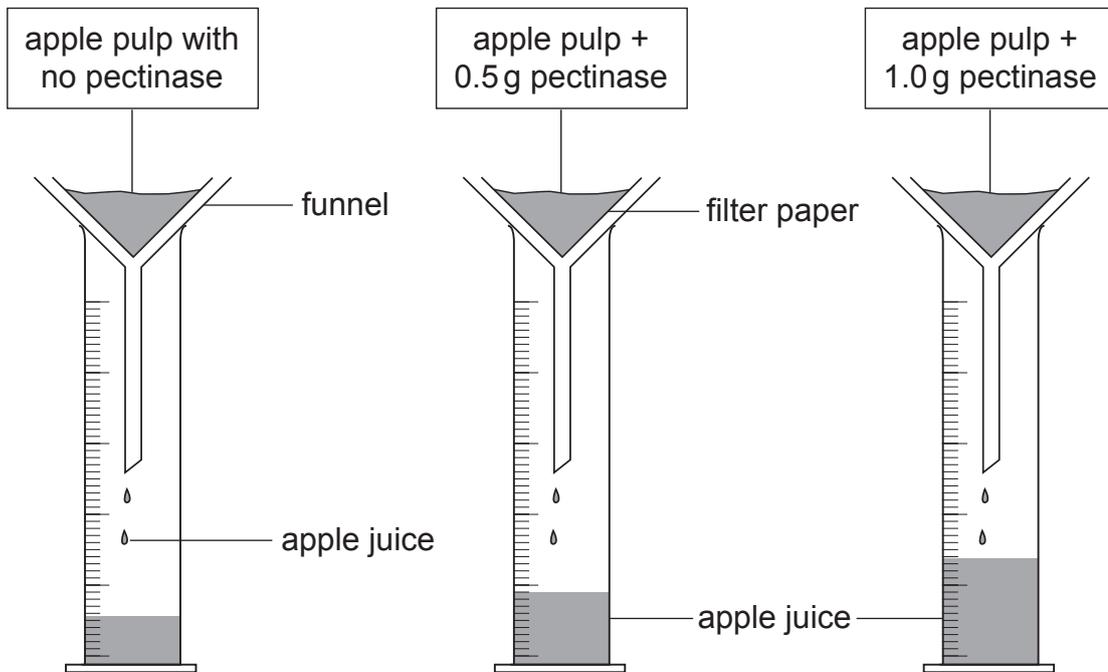


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- 4 Pectinase is an enzyme used in the production of fruit juice from fruit pulp. Pectinase acts on the substrate pectin in plant cell walls. This causes more fruit juice to be produced from fruit pulp.

Pupils investigated the effect of adding different masses of pectinase to the same amount of apple pulp.

The diagram shows the experimental set up.

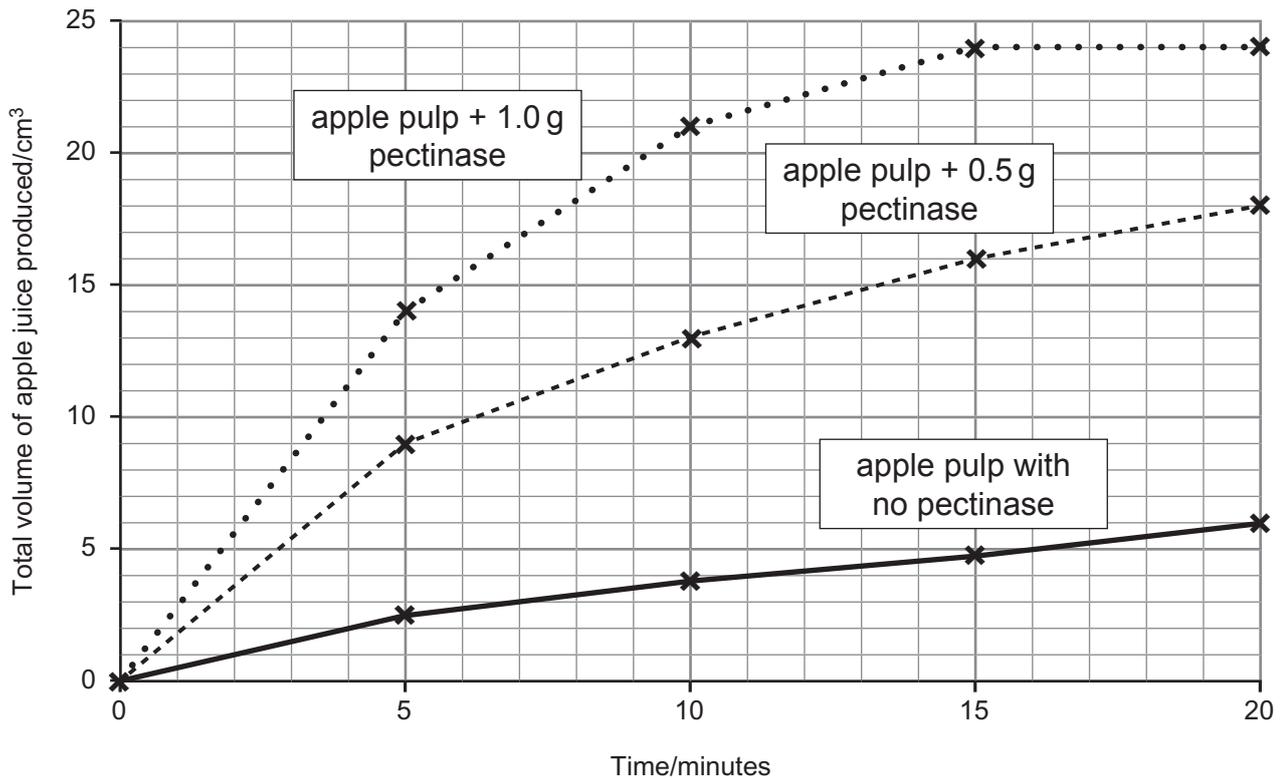


Source: Principal Examiner

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| Marks         | Remark |
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(a) The pupils recorded the total volume of apple juice produced in each measuring cylinder every five minutes for 20 minutes.

The graph below shows the results.



Source: Principal Examiner

Use the graph to answer the following questions.

(i) The highest volume of apple juice was produced from the apple pulp when 1 g of pectinase was used.

Use your knowledge of enzymes to explain why.

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[2]

| Examiner Only |        |
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| Marks         | Remark |
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- (ii) Calculate the **percentage increase** in the total volume of apple juice produced over 20 minutes when 1 g of pectinase was used, compared to the total volume of apple juice produced when no pectinase was used.

**Show your working.**

\_\_\_\_\_ % [3]

- (b) When 1 g of pectinase was used, no more apple juice was produced after 15 minutes.  
Suggest why.

\_\_\_\_\_  
\_\_\_\_\_ [1]

- (c) The pupils repeated the experiment with the same amount of apple pulp and 1 g of a **different enzyme**.  
This enzyme does not act on the substrate pectin.

- (i) Use the results from the **graph** opposite to give the total volume of apple juice that would be produced over 20 minutes using this different enzyme.

\_\_\_\_\_ cm<sup>3</sup> [1]

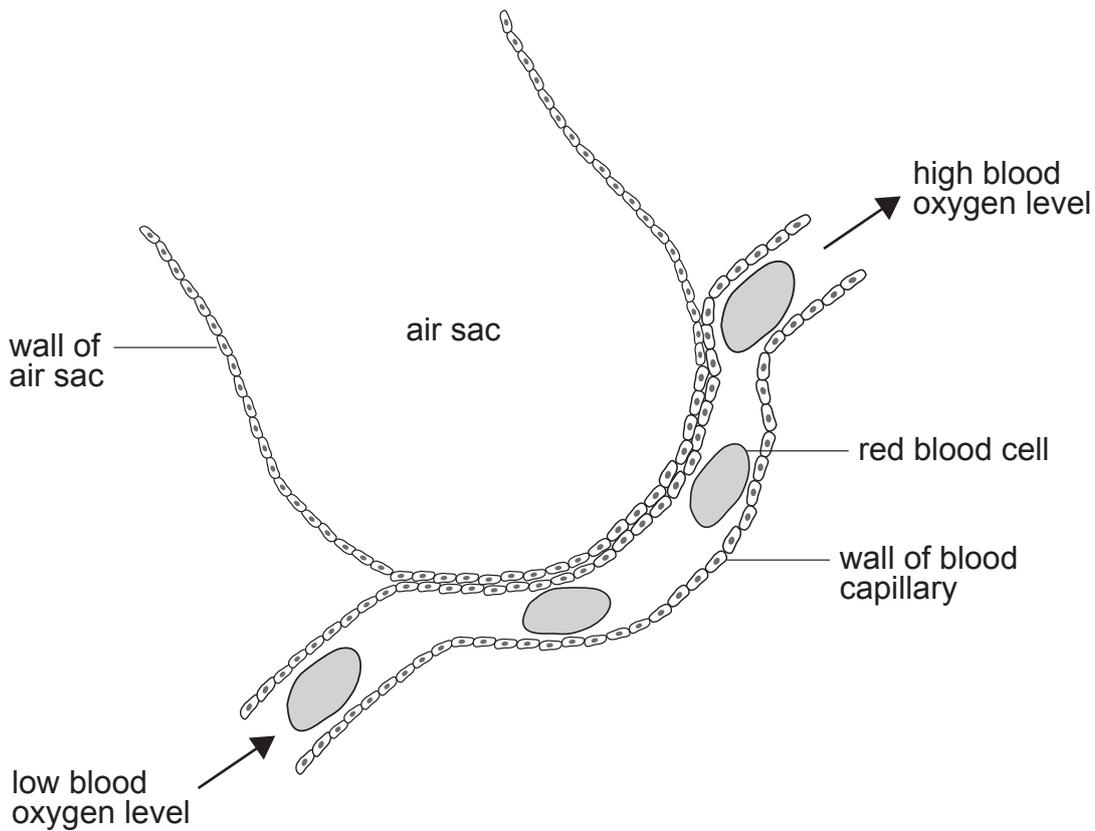
- (ii) Use your knowledge of enzyme structure to explain why this different enzyme does not act on the substrate pectin.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_ [3]

| Examiner Only |        |
|---------------|--------|
| Marks         | Remark |
|               |        |

- 5 (a) In humans, gas exchange takes place across numerous air sacs in the lungs.

The diagram shows an air sac and a blood capillary.



- (i) The capillary provides a good blood supply for the air sac. Explain how this adaptation helps in the diffusion of oxygen into the blood.

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[2]

- (ii) Give **two other** adaptations of the air sac that help in the diffusion of oxygen into the blood.

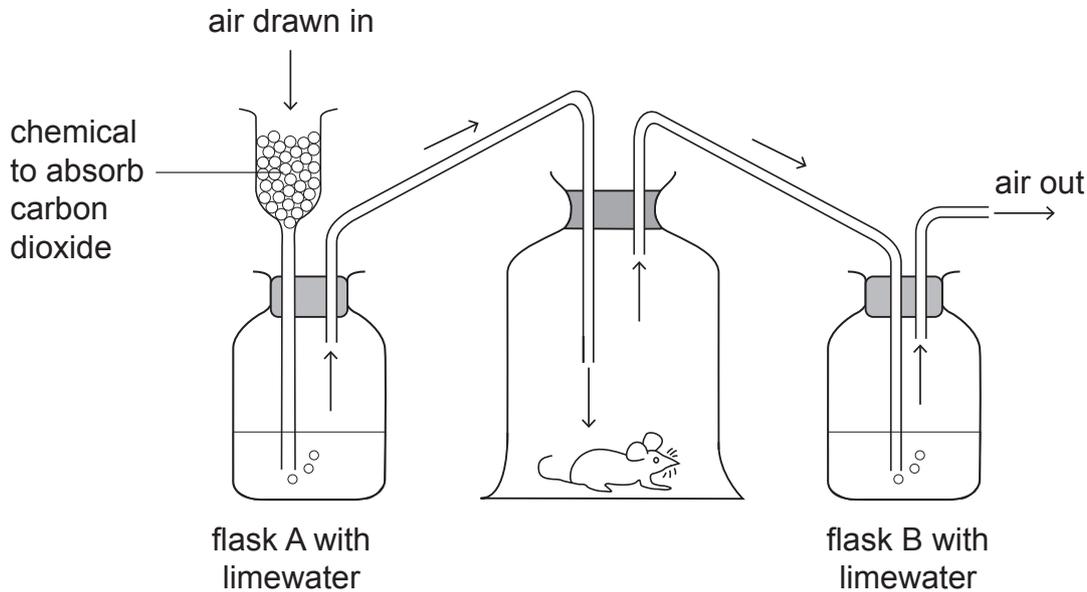
1. \_\_\_\_\_

2. \_\_\_\_\_ [2]

| Examiner Only |        |
|---------------|--------|
| Marks         | Remark |

- (b) A scientist investigated aerobic respiration in a mouse using limewater. Limewater is a colourless liquid in normal atmospheric levels of carbon dioxide. It turns cloudy when the levels of carbon dioxide increase.

The diagram shows the apparatus at the **start** of the investigation.



Source: Principal Examiner

- (i) Describe and explain the appearance of the limewater in **flask A** after five minutes.

Description \_\_\_\_\_

Explanation \_\_\_\_\_

[2]

- (ii) Describe and explain the appearance of the limewater in **flask B** after five minutes.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

[3]

| Examiner Only |        |
|---------------|--------|
| Marks         | Remark |
|               |        |

- (c) (i) How does the amount of energy released in aerobic respiration differ from that released in anaerobic respiration?

\_\_\_\_\_ [1]

- (ii) Other than energy, name the product of anaerobic respiration in muscles.

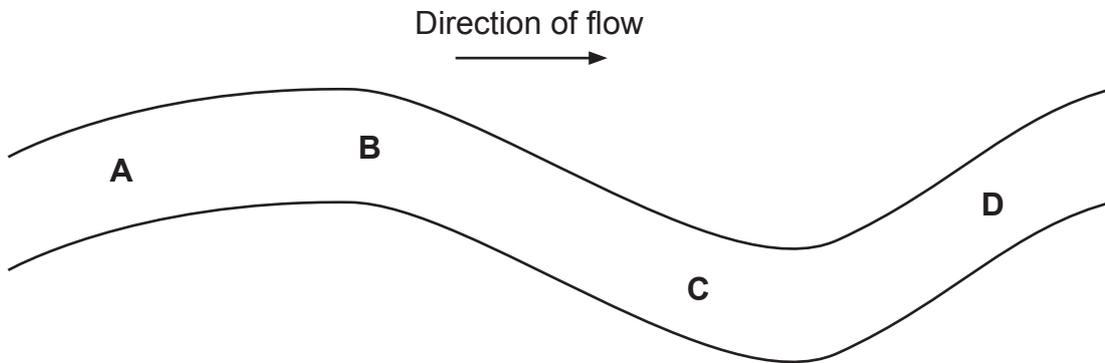
\_\_\_\_\_ [1]

| Examiner Only |        |
|---------------|--------|
| Marks         | Remark |
|               |        |

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**(Questions continue overleaf)**

- 6 A scientist collected three water samples from sites A, B, C and D along a river.

The diagram shows the sites where the scientist collected the water samples.



The scientist calculated the average number of aquatic animal species for each site.

The table shows the results.

| Site | Average number of aquatic animal species |
|------|--|
| A    | 12                                       |
| B    | 11                                       |
| C    | 13                                       |
| D    | 1  |

- (a) Suggest why the scientist calculated the average number of aquatic animal species for each site.

\_\_\_\_\_

\_\_\_\_\_ [1]

Examiner Only

Marks Remark

(b) Sewage had entered the river before the scientist collected the water samples.

(i) Write a tick (✓) in the box that identifies where sewage had entered the river.

Between sites:

| A and B | B and C | C and D |
|---------|---------|---------|
|         |         |         |

[1]

(ii) Use **data** from the table opposite to support your answer in (b)(i).

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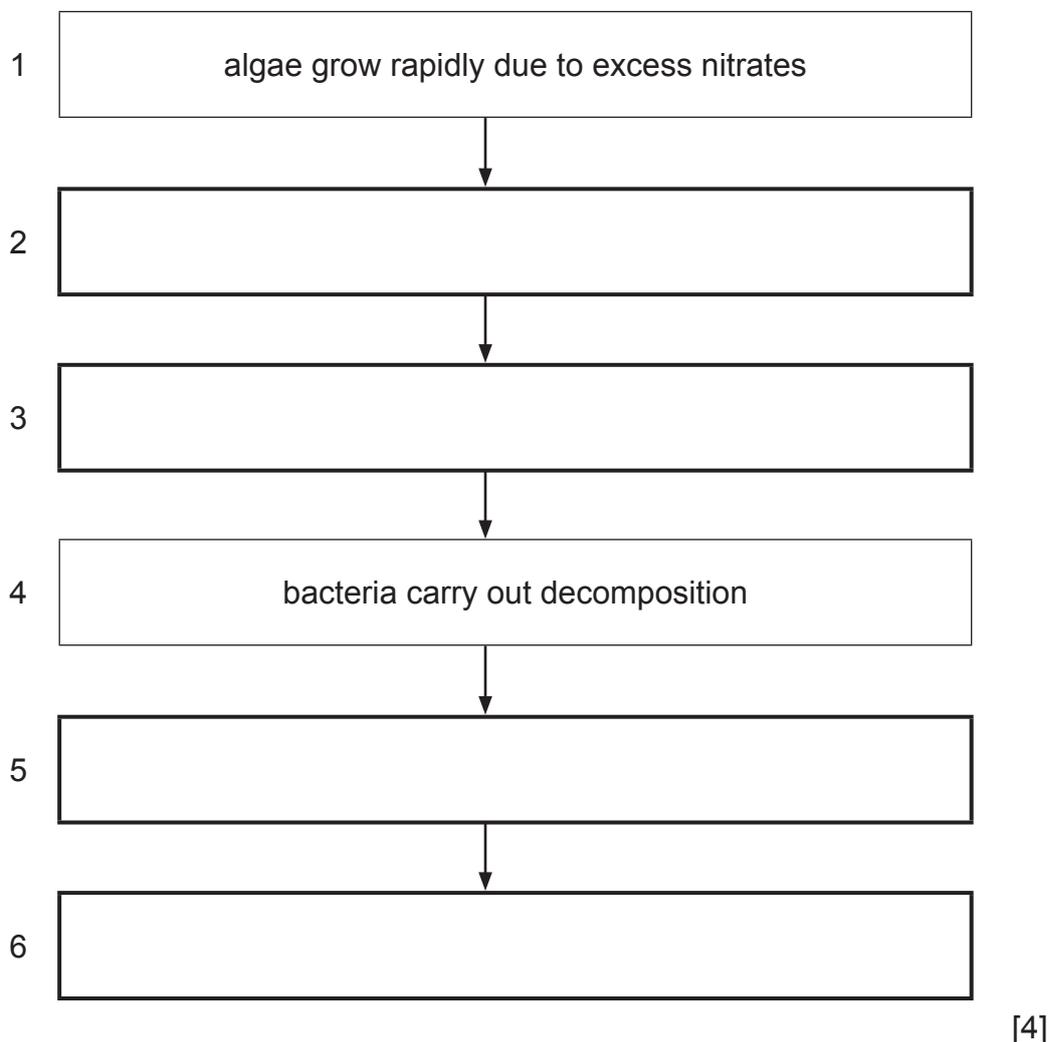


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[1]

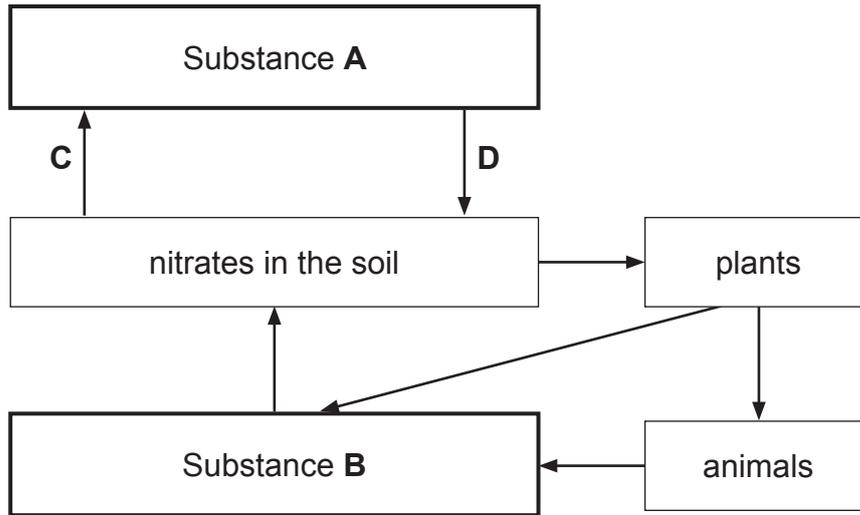
(c) When sewage entered the river it added excess nitrates to the river. This is called eutrophication.

Write in the boxes below to give the sequence of events that occurs as a result of eutrophication.



| Examiner Only |        |
|---------------|--------|
| Marks         | Remark |
|               |        |

7 (a) The diagram shows part of the nitrogen cycle.



(i) Name substances **A** and **B**.

A \_\_\_\_\_

B \_\_\_\_\_

[2]

(ii) Name processes **C** and **D**.

C \_\_\_\_\_

D \_\_\_\_\_

[2]

(iii) Name the cells in plants that absorb the nitrates from the soil.

\_\_\_\_\_

[1]

(iv) What substance do plants make with the nitrates they absorb?

\_\_\_\_\_

[1]

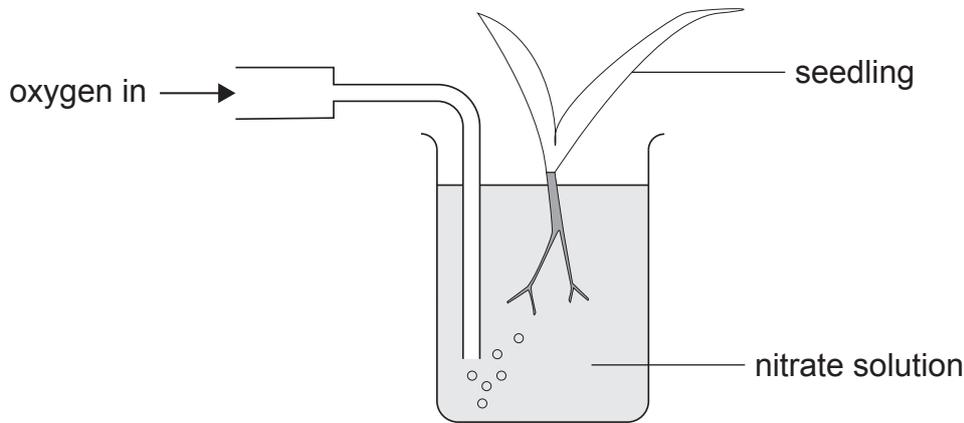
| Examiner Only |        |
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**(Questions continue overleaf)**

(b) Plant seedlings can absorb nitrates from nitrate solution. Students investigated the effect of changing the oxygen concentration on nitrate uptake from nitrate solution.

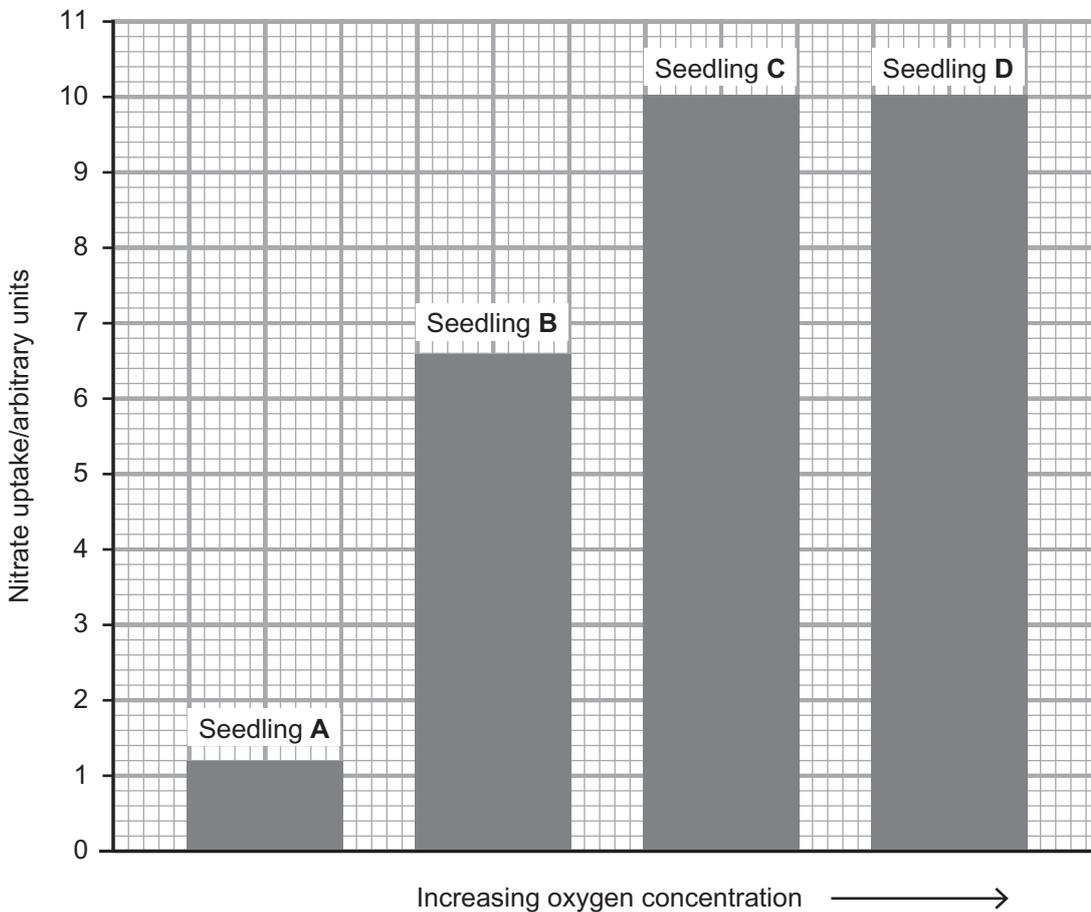
The diagram shows the experimental set up.



Source: CCEA

The bar chart shows the results for the nitrate uptake in four identical seedlings, A, B, C and D.

The concentration of the nitrate solution was the same for each seedling at the start of the investigation.



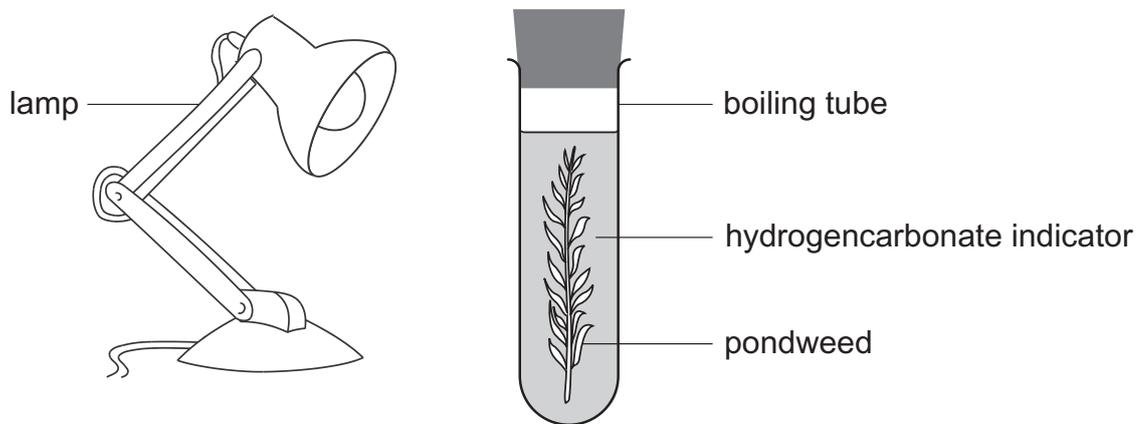
Source: Principal Examiner

| Examiner Only |        |
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| Marks         | Remark |
|               |        |



- 8 Philip carried out an investigation into photosynthesis and respiration in pondweed.

The diagram shows how he set up his apparatus.



Source: Principal Examiner

Philip changed the light intensity by changing the distance between the lamp and the boiling tube.

For each distance, he left the boiling tube in the light for 45 minutes. After 45 minutes he recorded the colour of the hydrogencarbonate indicator.

The table shows Philip's results.

| Distance between pondweed and the lamp/cm | Colour of hydrogencarbonate indicator after 45 minutes |
|---|--|
| 10  | purple   |
| 20  | red  |
| 40  | yellow   |

- (a) Give **one** variable that Philip controlled in this investigation.

\_\_\_\_\_ [1]

| Examiner Only |        |
|---------------|--------|
| Marks         | Remark |
|               |        |

- (b) Use your knowledge of **photosynthesis and respiration** to explain the colours of the hydrogencarbonate indicator shown in the table opposite.

**At 10 cm**

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[2]

**At 20 cm**

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[2]

**At 40 cm**

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[2]

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**THIS IS THE END OF THE QUESTION PAPER**

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Marks

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