New Specification

Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2018

Double Award Science: Biology

Unit B1

Higher Tier

GDW12

[GDW12]

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 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 **2**.

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

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Examiner Only	
Marks	Remark

1 **(a)** Diabetes is a condition in which the blood glucose control mechanism fails.

(i) Give **one** symptom of diabetes.

_____ [1]

(ii) Give **one** possible long-term effect of diabetes.

_____ [1]

There are two types of diabetes, Type 1 and Type 2.

(b) What changes in insulin production occur in the pancreas that result in each type of diabetes?

Type 1 _____

_____

_____

Type 2 _____

_____

_____ [2]

(c) How is Type 1 diabetes treated?

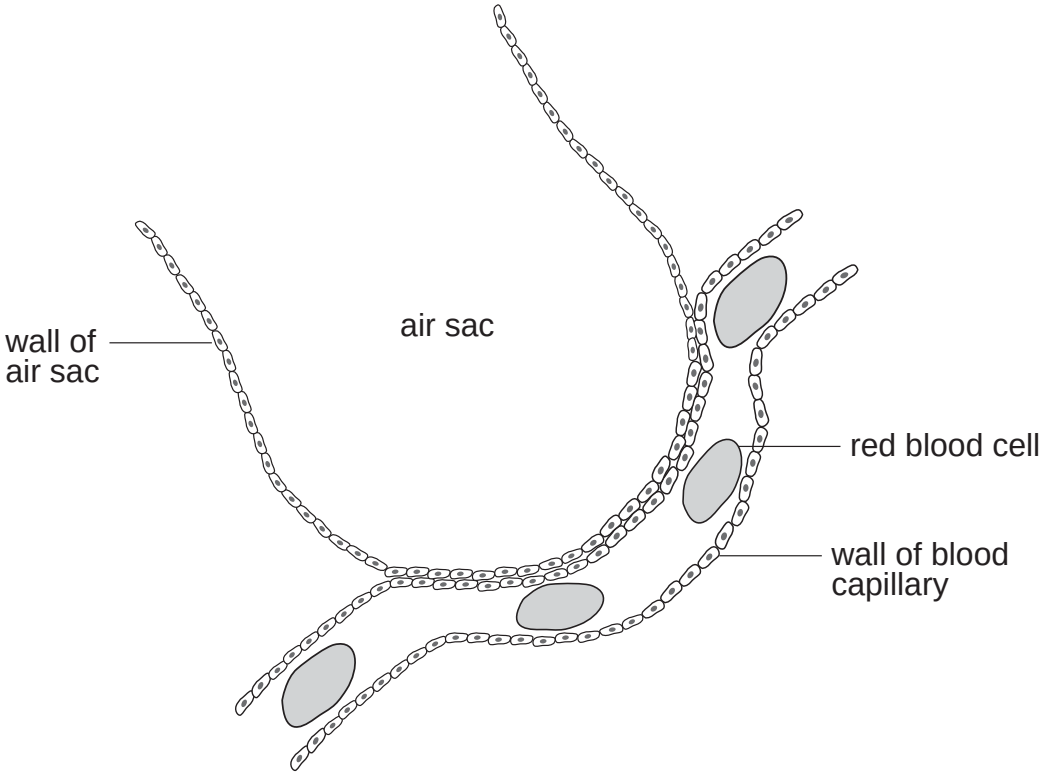
_____ [1]

Examiner Only	
Marks	Remark

2 Respiratory surfaces are the parts of the body where gas exchange takes place between the atmosphere and the blood.

In humans, gas exchange takes place across numerous air sacs in the lungs.

The diagram shows an air sac and a blood capillary.



Use the diagram to help describe how this respiratory surface is adapted for its function.

In the question you will be assessed on the quality of written communication including the use of scientific terms.

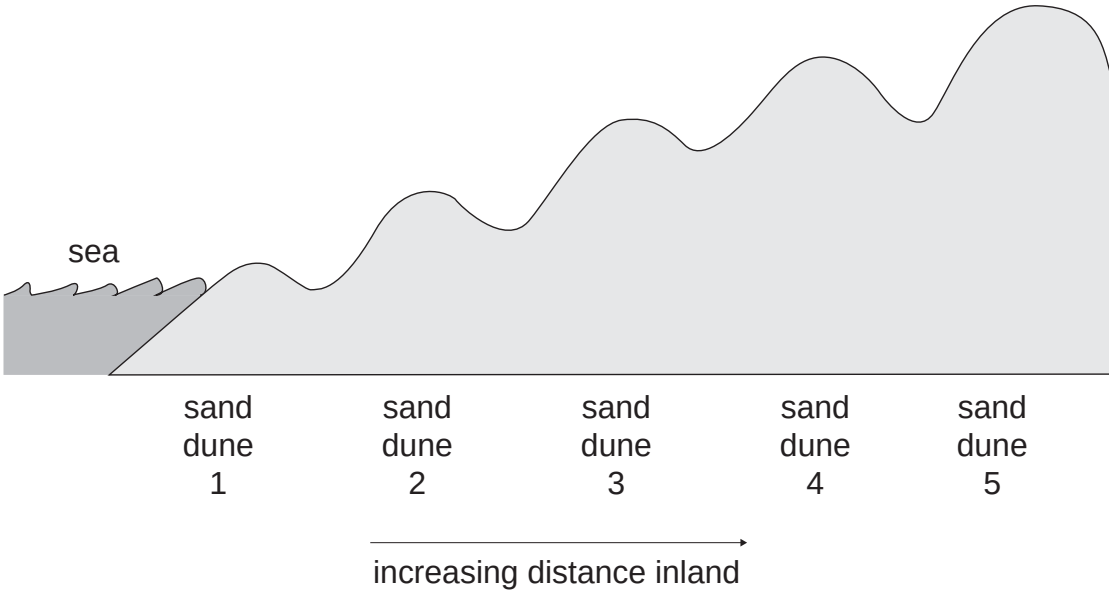
Examiner Only	
Marks	Remark

[6]

Examiner Only	
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	
Marks	Remark

(a) pH is one factor that affects plant distribution in sand dunes.

(i) Give the term used to describe this type of factor.

_____ [1]

(ii) Use the table opposite to describe how the pH changed with increasing distance inland.

_____

_____ [1]

(b) Suggest **one** biotic factor that would affect plant distribution in sand dunes.

_____ [1]

The number of species of plants in sand dune 5 was higher than in sand dune 1.

(c) Use the information in the table opposite to suggest why.

_____

_____

_____

_____

_____

_____ [2]

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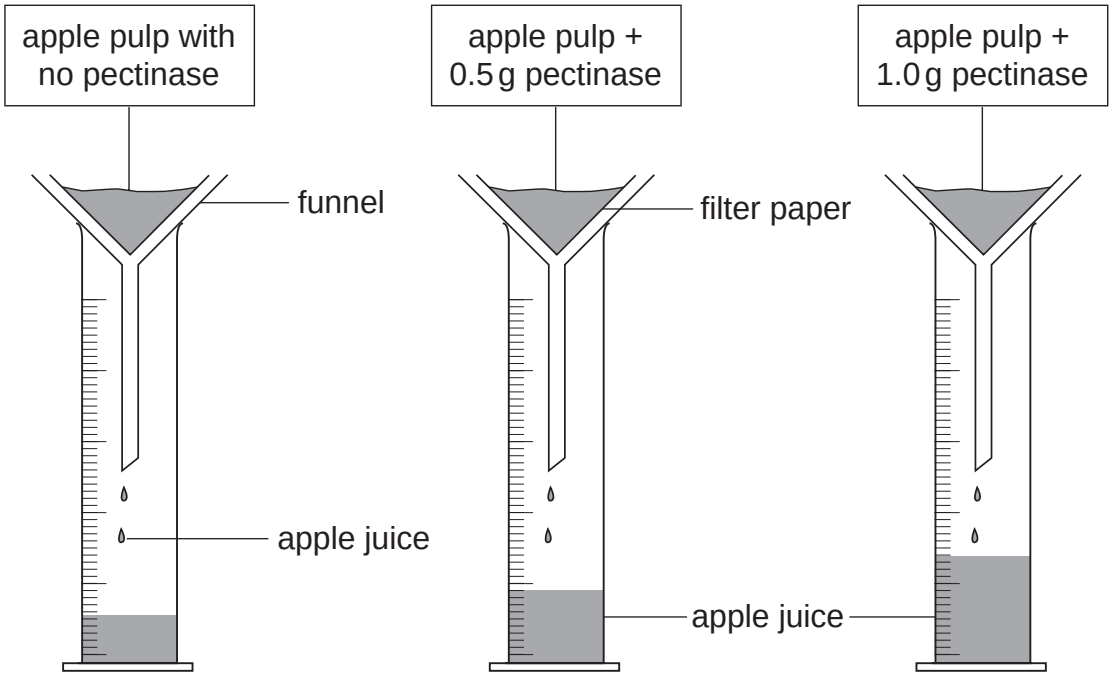
Examiner Only	
Marks	Remark

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 released from fruit pulp.

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

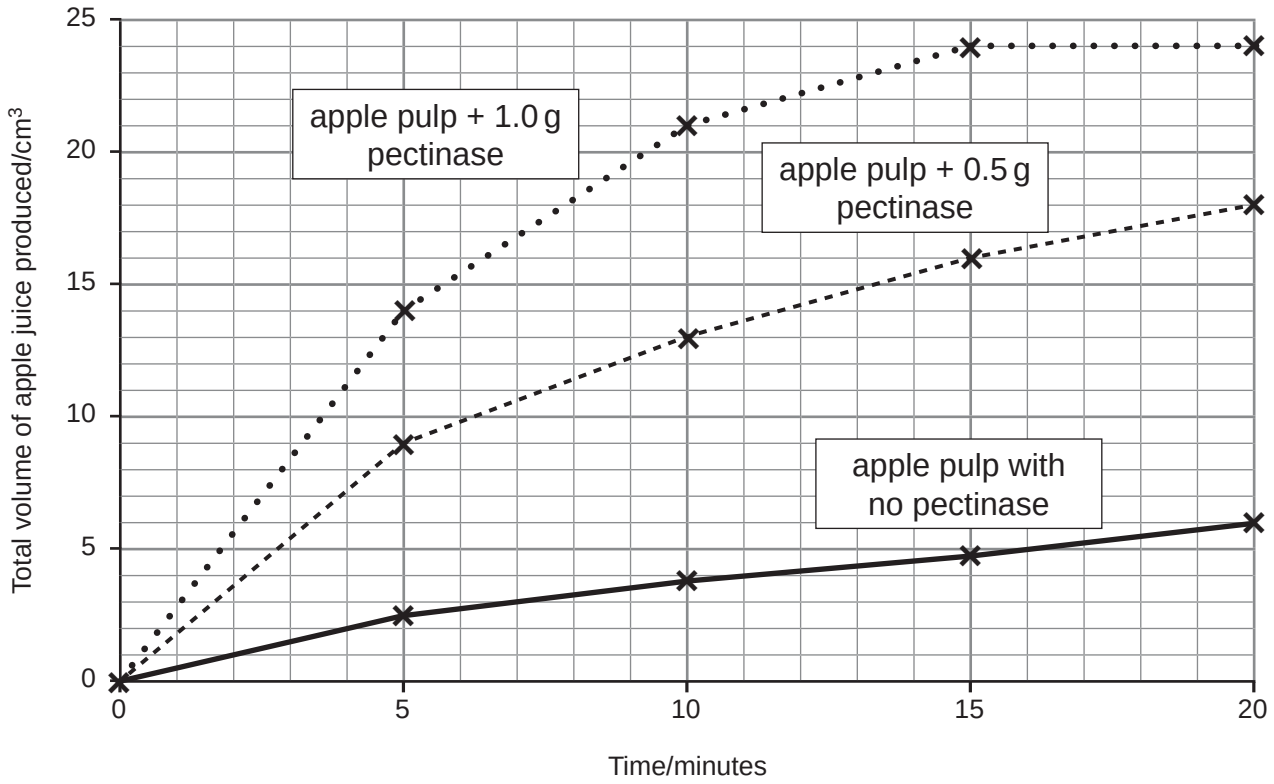
The diagram shows the experimental set up.



Source: Principal Examiner

(a) The pupils recorded the total volume of apple juice produced in each of the three measuring cylinders every five minutes for 20 minutes.

The graph below shows the results.



Source: Principal Examiner

Use the graph to answer the following questions.

Examiner Only	
Marks	Remark

(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.

_____

_____

_____

_____

_____

_____

_____ [2]

Examiner Only	
Marks	Remark

(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^3 [1]

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

_____

_____

_____

_____

_____

_____

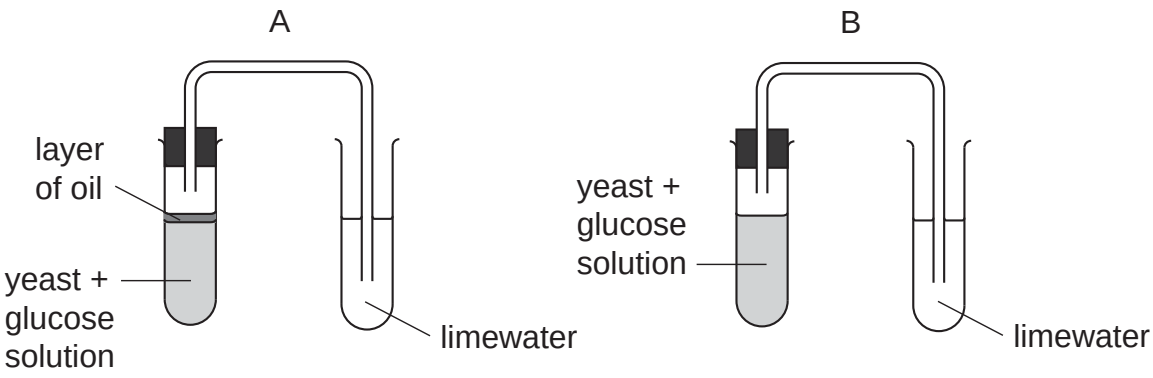
_____

[2]

Examiner Only	
Marks	Remark

5 Pupils investigated anaerobic and aerobic respiration in yeast at room temperature.

The diagrams below show two sets of apparatus A and B at the start of the investigation.



Source: Principal Examiner

(a) Give the function of the glucose in the boiling tubes.

_____

_____ [1]

The glucose solution had been boiled and cooled before the apparatus was set up.

(b) Why was the glucose solution boiled?

_____

_____ [1]

(c) Give **two** changes that occurred in the boiling tube containing the yeast and glucose solution in apparatus A during the investigation.

1 _____

2 _____ [2]

Examiner Only	
Marks	Remark

(d) Anaerobic respiration occurred in apparatus A but not in apparatus B. Explain why.

_____

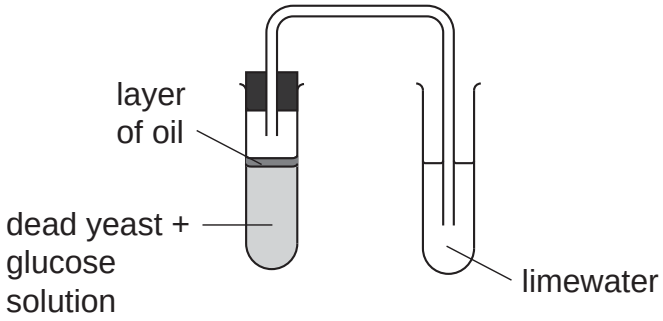
_____

_____

_____ [2]

During the investigation a pupil added the yeast to the glucose solution before it had cooled. This killed the yeast.

The diagram shows the apparatus the pupil used.



Source: Principal Examiner

Limewater is clear in normal atmospheric conditions. It turns cloudy if carbon dioxide is bubbled through it.

(e) Describe and explain the appearance of limewater in the above apparatus at the end of his investigation.

Description _____

Explanation _____

_____

_____

_____

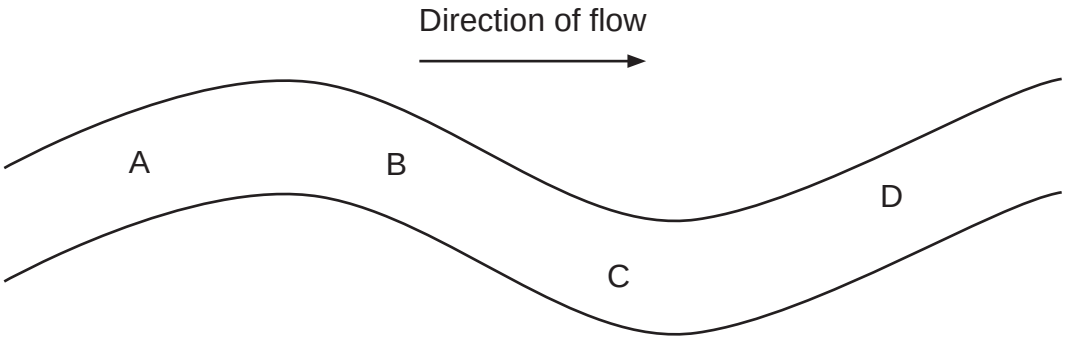
_____

_____ [3]

Examiner Only	
Marks	Remark

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]

(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]

Examiner Only	
Marks	Remark

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

_____

_____

_____ [1]

(c) When sewage entered the river it caused eutrophication.

(i) What is present in the sewage to cause eutrophication?

_____ [1]

(ii) Give **two** reasons why the aquatic plants and algae in the river die after an initial phase of rapid growth.

1 _____

_____

2 _____

_____ [2]

(iii) Explain why the number of bacteria increases as a result of eutrophication.

_____

_____ [1]

(iv) The level of oxygen in the river falls when the number of bacteria increases.
Explain why.

_____

_____

_____

_____

_____

_____ [2]

Examiner Only

Marks	Remark

7 **(a)** The kidney is part of the excretory system.

Complete the sentence below by writing in the blank spaces.

(i) The kidney _____ the blood and controls the _____ of water. [2]

(ii) Apart from drinking, give **one** other way a person takes in water.

_____ [1]

(iii) Name the process which **produces** water in the body.

_____ [1]

(b) In an investigation, three students, A, B and C, each drank 500 cm^3 of water at the same time.

Each student measured the volume of urine they produced at 10, 40, 70 and 100 minutes after drinking the water.

The table shows the volume of urine each student produced at the different times.

Student	Volume of urine produced at each time/ cm^3				Total volume of urine produced over 100 min/cm^3
	10 min	40 min	70 min	100 min	
A	35	45	85	95	260
B	35	40	75	90	240
C	20	25	35		130

Examiner Only	
Marks	Remark

(i) Use the data from the table to calculate the volume of urine Student C produced at 100 minutes.

Show your working.

_____ cm^3 [2]

(ii) Which student had exercised vigorously just before drinking the water?

Use **data**, in the table opposite, for the total volume of urine produced to support your choice.

Student _____

Data _____

_____ [2]

(iii) Suggest **two** reasons why vigorous exercise causes a change in urine production.

1. _____

_____

_____

2. _____

_____

_____ [2]

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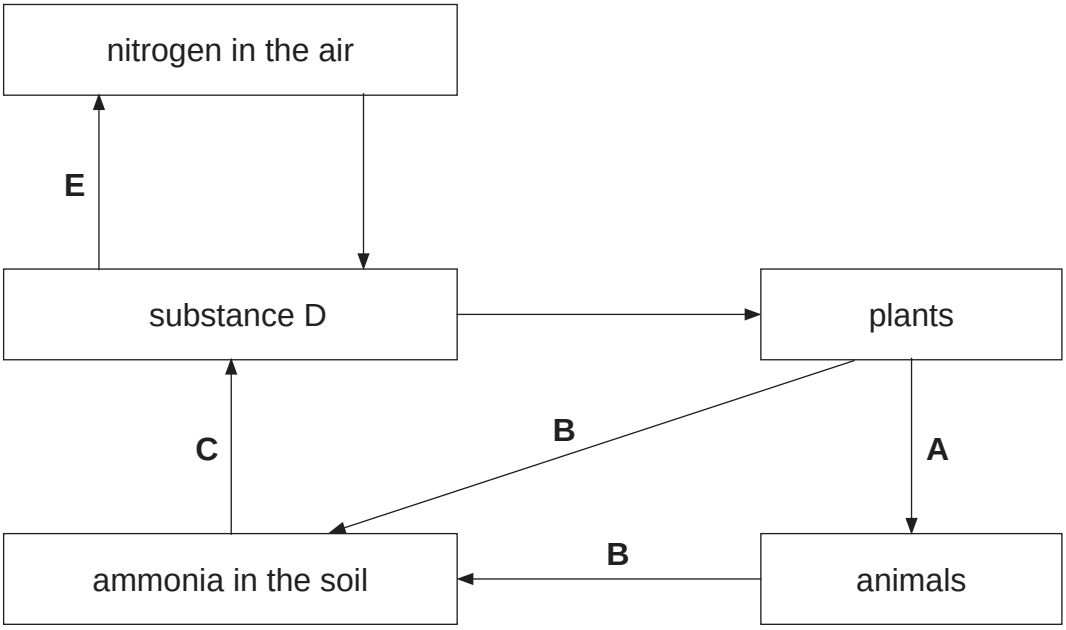
Examiner Only	
Marks	Remark

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



(i) Name processes A and B.

A _____

B _____ [2]

(ii) Name substance D shown in the diagram.

_____ [1]

(iii) Name the type of nitrogen bacteria that carry out process C.

_____ [1]

Process E occurs in waterlogged soil.

(iv) Explain why.

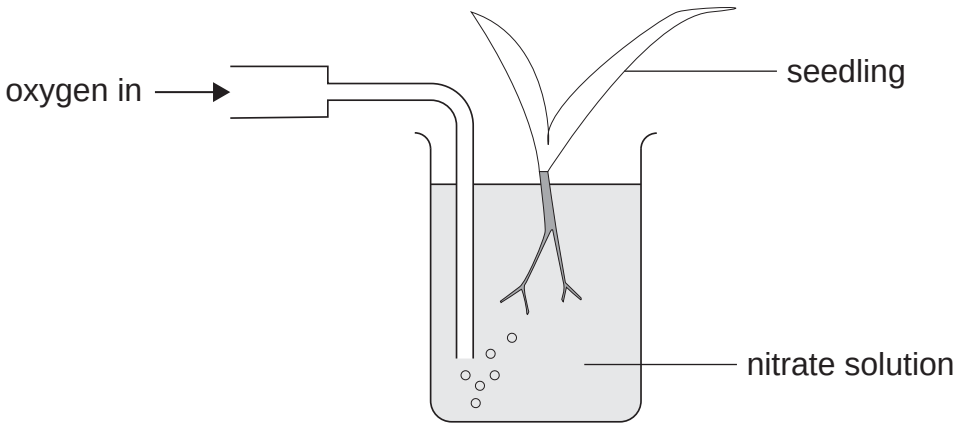
_____

_____ [1]

Examiner Only	
Marks	Remark

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

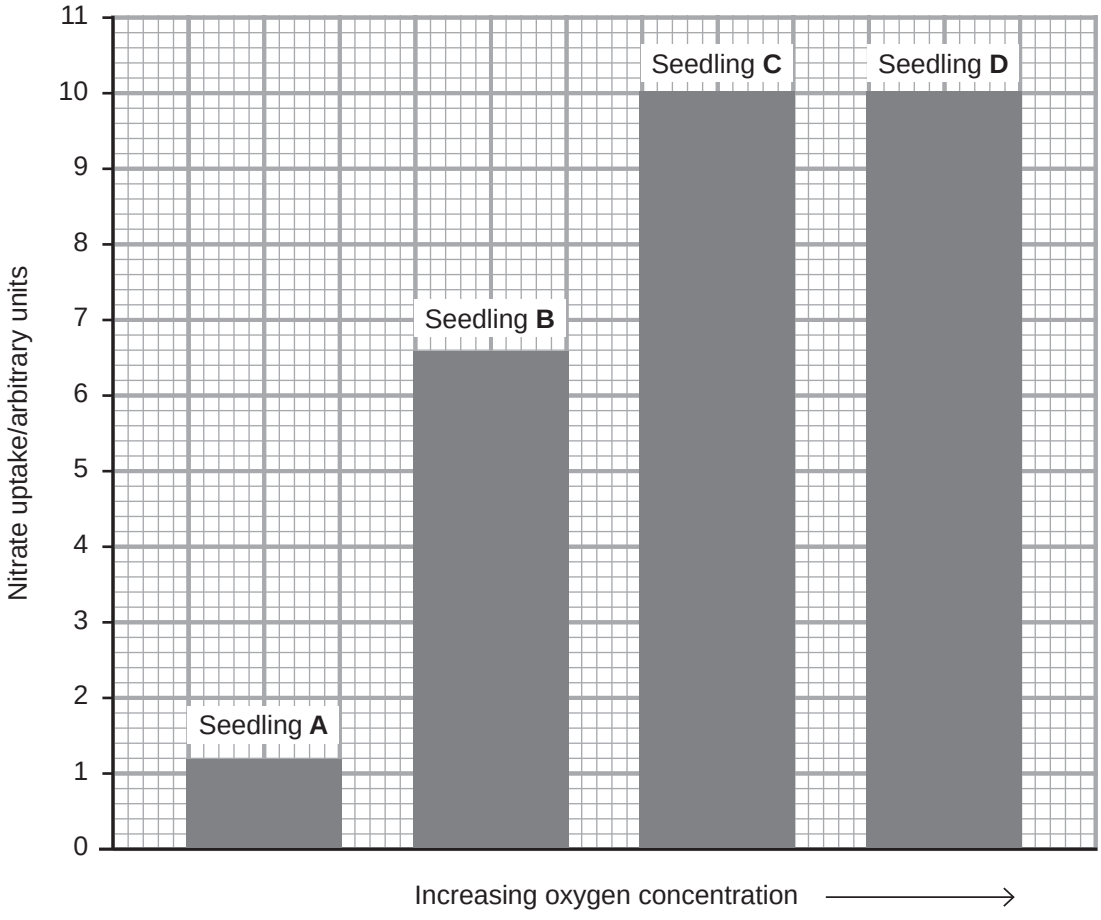
The diagram shows the experimental set up.



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	
Marks	Remark

(i) Explain the difference in nitrate uptake of seedlings A and B.

[3]

(ii) Describe and suggest an explanation for the nitrate uptake of seedlings C and D.

Description

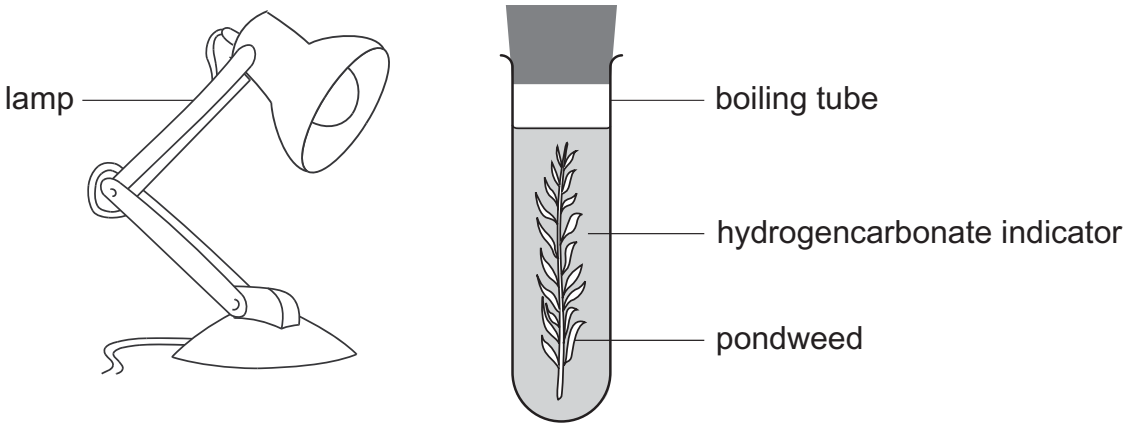
Explanation

[2]

Examiner Only	
Marks	Remark

9 A student carried out an investigation into photosynthesis and respiration in pondweed.

The diagram shows how she set up her apparatus.



Source: Principal Examiner

The student changed the light intensity by changing the distance between the lamp and the boiling tube.
For each distance, she left the boiling tube in the light for 45 minutes.
After 45 minutes she recorded the colour of the hydrogencarbonate indicator.

The table shows her results.

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

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

Examiner Only	
Marks	Remark

At 10 cm

[2]

At 20 cm

[2]

At 40 cm

[2]

THIS IS THE END OF THE QUESTION PAPER