Cambridge
O Level

Cambridge Assessment International Education
Cambridge Ordinary Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

BIOLOGY **5090/31**

Paper 3 Practical Test **October/November 2019**

1 hour 15 minutes

Candidates answer on the Question Paper.

Additional Materials: As listed in the Confidential Instructions.

READ THESE INSTRUCTIONS FIRST

Write your centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
Write your answers in the spaces provided on the Question Paper.

Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

For Examiner's Use	
1	
2	
3	
Total	

This document consists of **11** printed pages and **1** blank page.

Cambridge Assessment International Education

In order to plan the best use of your time, read through all the questions on this paper carefully before starting work.

1 Aquatic plants live in water and exchange gases with the water around them.

When water absorbs carbon dioxide it becomes more acidic.

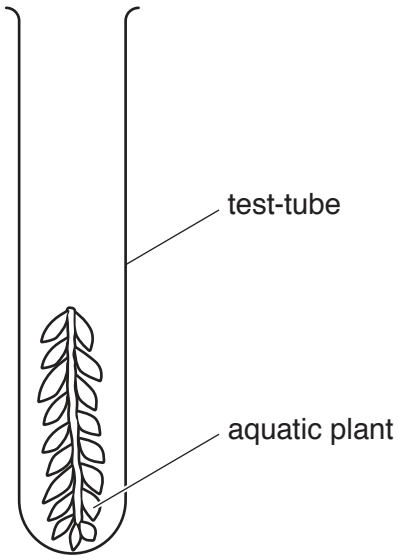
Hydrogencarbonate indicator (bicarbonate indicator) can be used to detect changes in the amount of carbon dioxide dissolved in water. It changes colour as follows:

high concentration of carbon dioxide	atmospheric concentration of carbon dioxide	low concentration of carbon dioxide
yellow	red	purple

You will be investigating gas exchange by two pieces of an aquatic plant using hydrogencarbonate indicator.

Air has been bubbled through the indicator so that it has the same level of dissolved carbon dioxide as the atmosphere.

- Place one piece of plant in a test-tube and carefully push it down so that one end touches the bottom of the test-tube as shown in the diagram below.



- Label this test-tube **A**.
- Use a measuring cylinder to add hydrogencarbonate indicator so that the plant is just covered by the indicator.

(a) (i) Record the volume of indicator that you added.

..... cm^3 [1]

- Place the second piece of plant in another test-tube and carefully push it down so that one end touches the bottom of the test-tube.
- Label this test-tube **B**.
- Add the same volume of indicator that you added to test-tube **A**, ensuring that it covers the plant.
- Place a bung in the top of both test-tubes.
- Wrap aluminium foil around test-tube **B** to prevent any light entering.
- Place both test-tubes together in a well-lit position and note the time.

time .....

Leave the test-tubes for 35 minutes.

During this time continue with question 1(a)(ii), 1(b) and questions 2 and 3.

Answer questions 1(a)(iii), (iv) and (v) after 35 minutes.

(ii) Label three test-tubes **C**, **D** and **E**.

- Add 10 cm^3 of hydrogencarbonate indicator to each test-tube.
- Add one drop of dilute hydrochloric acid (HC*l*) to the test-tube labelled **C**.
- Add one drop of dilute sodium hydroxide (NaOH) to the test-tube labelled **E**.
- Do not add anything to the test-tube labelled **D**.

Record the colour of the indicator in the table below.

colour of hydrogencarbonate indicator		
test-tube **C**	test-tube **D**	test-tube **E**

[3]

Answer the remaining parts of 1(a) after test-tubes A and B have been in a well-lit position for 35 minutes.

- **After 35 minutes** remove the foil from test-tube **B** and answer questions **(a)(iii)**, **(iv)** and **(v)** below.

(iii) Record the colour of the indicator in each test-tube.

	colour of hydrogencarbonate indicator
test-tube **A**	
test-tube **B**	

[2]

(iv) Describe what has happened to the concentration of carbon dioxide in test-tubes **A** and **B**.

test-tube **A** .....

.....

test-tube **B** .....

.....

[2]

(v) Suggest an explanation for the colour changes observed.

test-tube **A** .....

.....

.....

test-tube **B** .....

.....

.....

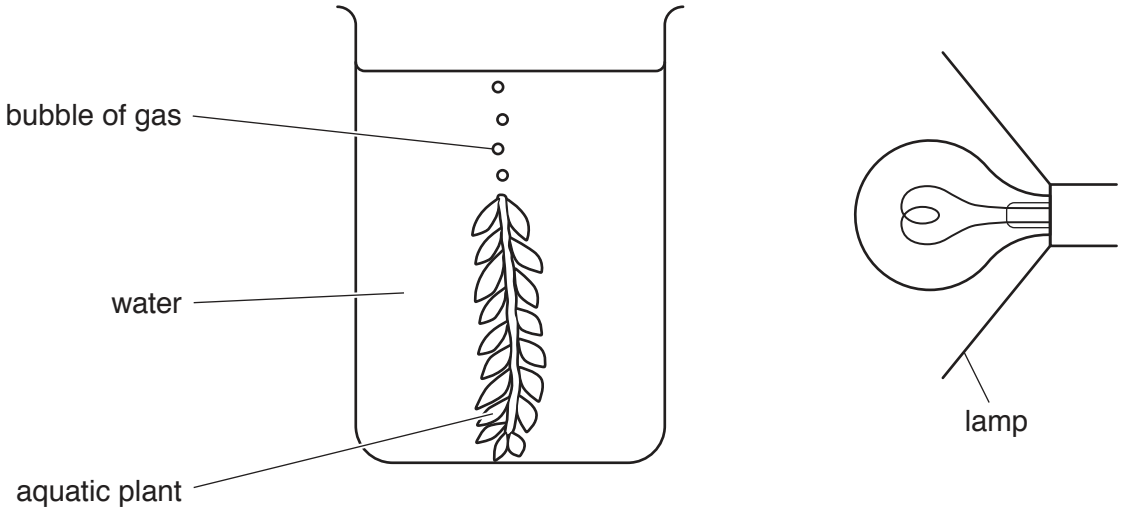
[4]

(b) Some students investigated the effect of light intensity on the rate of photosynthesis. A piece of the stem of the aquatic plant was placed in a beaker with the cut end uppermost and covered with water.

In a dark room, a lamp was used to shine light on it.

Bubbles of gas were seen coming out of the cut end of the stem as the plant photosynthesised.

The apparatus is shown in the diagram below.



They left the plant for five minutes. After five minutes they counted the number of bubbles of gas given off in one minute.

They varied the light intensity by moving the lamp to different distances from the plant, and repeated the process.

(i) State **one** factor that the students should control in this investigation. Explain how the students could control this factor.

factor .....

explanation .....

.....

[2]

(ii) Explain how the students could ensure that the result for each light intensity was reliable.

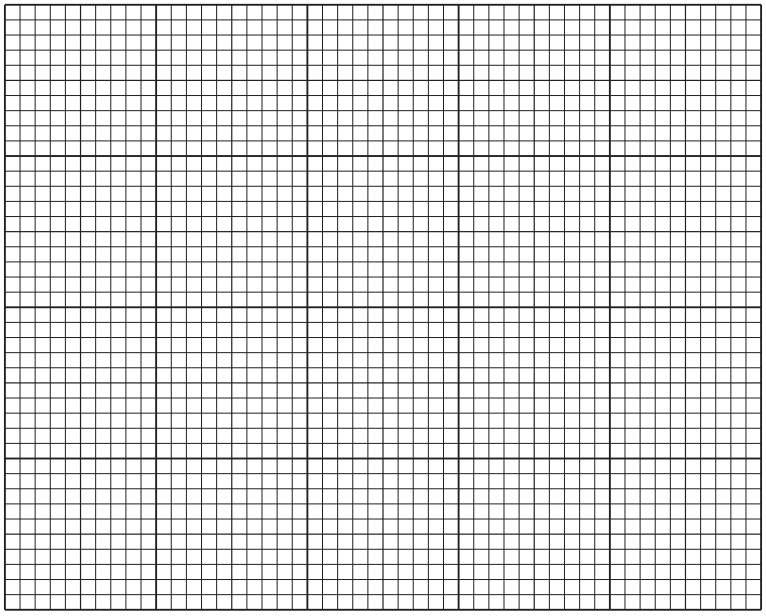
.....

..... [1]

The results of the students' investigation are shown in the table below.

light intensity / arbitrary units	rate of photosynthesis / bubbles per minute
4	6
7	10
11	14
16	16
28	18
50	19

(iii) Construct a line graph of the data in the table on the grid below. Join your plotted points with a smooth curve.



[5]

(iv) Use your graph to find the rate of photosynthesis at a light intensity of 20 arbitrary units.

Show your working on your graph.

..... bubbles per minute [2]

(v) Describe the effect of increasing light intensity on the rate of photosynthesis in this investigation.

.....

.....

.....

..... [2]

(vi) Suggest an explanation for the shape of the graph above a light intensity of 28 arbitrary units.

.....

..... [1]

[Total: 25]

2 You are provided with several germinating seeds.

Carefully observe these without removing them from the black paper.

(a) Make a large drawing of **one** of the germinating seeds in the space below.

Label the root hairs on your drawing.

[4]

(b) Measure the length of the developing root **of your specimen**. Record this length.

..... mm

On your drawing clearly mark the two points between which you measured the length of the root. Label these points **F** and **G**.

Measure the distance between **F** and **G** on your drawing and record it.

..... mm

Calculate the magnification of your drawing compared with the actual length of the root. Show your working.

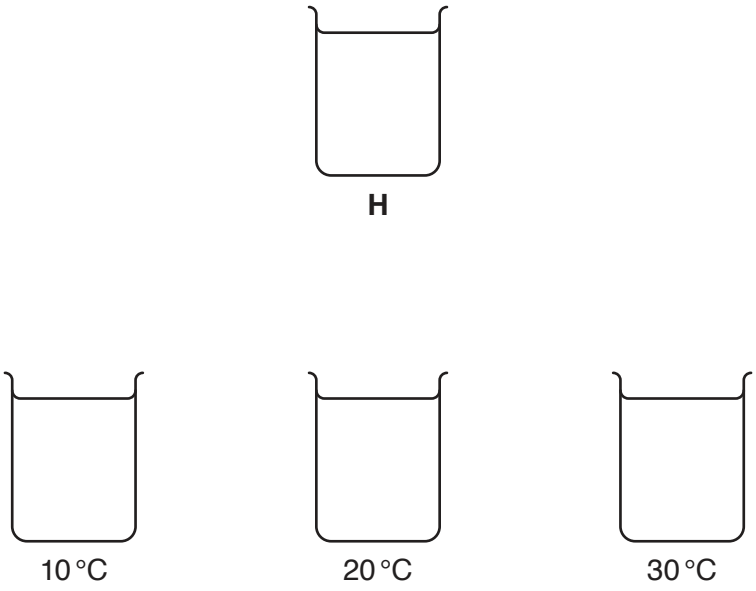
magnification × ..... [5]

[Total: 9]

Question 3 starts on page 10.

3 Two students investigated the sensitivity of skin to temperature.

One set up a beaker, **H**, containing water at 30 °C. She then set up three more beakers, one with water at 10 °C, one with water at 20 °C and one with water at 30 °C. These are shown in the diagram below.



The other student closed her eyes throughout the investigation. This student was helped to place her finger in the water in beaker **H**. She kept it there for two minutes.

She was then helped to place the same finger in the beaker of water at 10 °C and asked what the temperature of the water felt like.

Her finger was then placed in beaker **H** for two minutes and then in water at 20 °C. She described what the temperature of the water felt like.

This was repeated with her finger in beaker **H** for two minutes and then in water at 30 °C.

The temperature of the water in **H** was then changed to 20 °C and the whole procedure repeated again, keeping the temperature of the water in the other beakers at 10 °C, 20 °C and 30 °C as before.

Finally the temperature of the water in **H** was changed to 10 °C and the procedure repeated.

The results are shown in the table below.

water temperature in beaker H / °C	**temperature of water into which finger was then placed / °C**		
	30	**20**	**10**
30	felt the same	felt colder	felt colder
20	felt hotter	felt the same	felt colder
10	felt hotter	felt hotter	felt the same

(a) Suggest why the student being tested kept her eyes closed.

.....

..... [1]

(b) Describe the results obtained when her finger was placed in water at 20 °C after having been in the three different temperatures of water in beaker **H**.

.....

.....

.....

.....

.....

..... [3]

(c) Suggest what the results show about the sensitivity of skin compared to the sensitivity of a thermometer.

.....

.....

.....

..... [2]

[Total: 6]

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