Cambridge
O Level

Cambridge Assessment International Education
Cambridge Ordinary Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

0123456789

BIOLOGY **5090/61**

Paper 6 Alternative to Practical **October/November 2019**

1 hour

Candidates answer on the Question Paper.

No Additional Materials are required.

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.

This document consists of **10** printed pages and **2** blank pages.

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Answer **all** questions in the spaces provided.

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

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

A student carried out an investigation into the gas exchange of an aquatic plant using hydrogencarbonate indicator.

He took some fresh hydrogencarbonate indicator and bubbled air through it until there was the same level of dissolved carbon dioxide in the indicator as in the atmosphere.

A piece of aquatic plant was placed in test-tube **A**. 10 cm^3 of the indicator was poured into the test-tube to cover the plant. The test-tube was then sealed with a bung.

(a) (i) Name a suitable piece of apparatus the student could use to measure 10 cm^3 of indicator.

..... [1]

A similar piece of the same aquatic plant was placed in test-tube **B** and covered with the same volume of indicator. This test-tube was sealed with a bung.

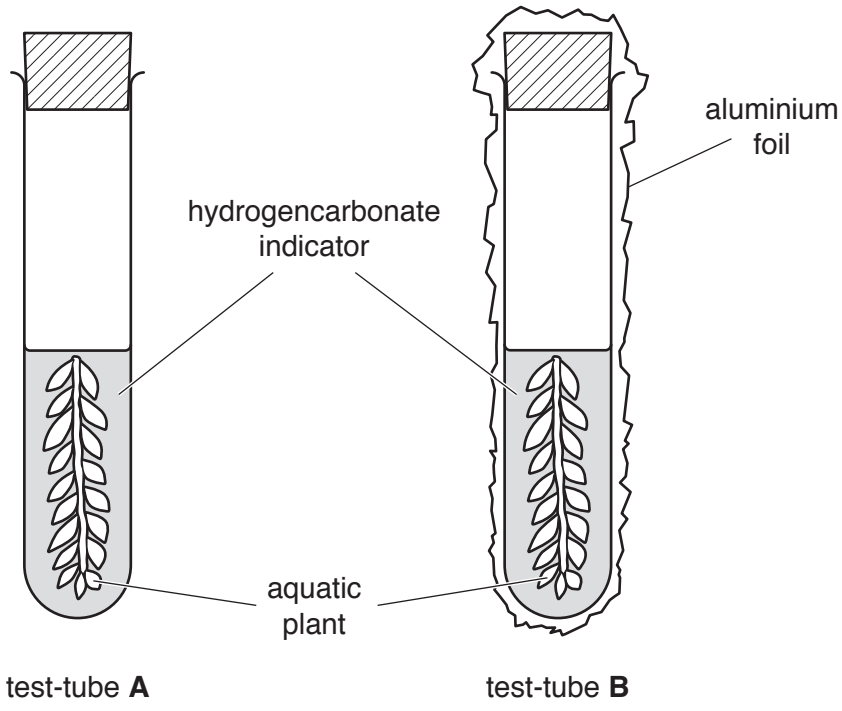
Aluminium foil was then wrapped around test-tube **B** to prevent any light from entering.

Both test-tubes were placed in a well-lit location and left for 45 minutes.

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[Turn over

The arrangement is shown in the diagram below.



After 45 minutes the student removed the aluminium foil from test-tube **B**.

He observed the colour of the indicator in both test-tubes and recorded his results in the table below.

	test-tube A	**test-tube B**
colour	purple	yellow

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

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

.....

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

.....

[2]

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

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

.....

.....

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

.....

.....

[4]

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(iv) Explain why a bung was added to test-tubes **A** and **B**.

.....

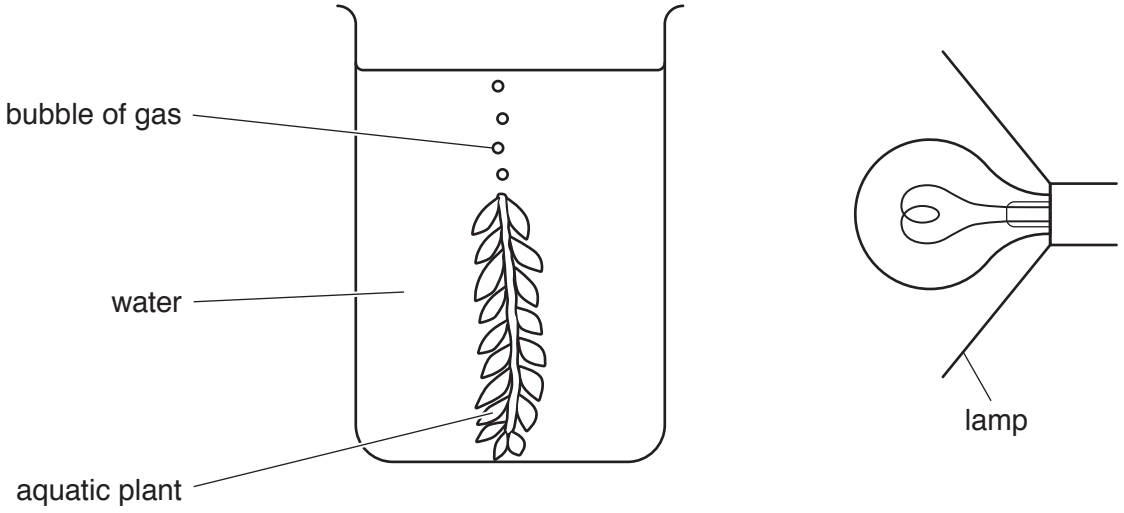
..... [1]

(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.

This 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) Explain why the students placed the apparatus in a dark room.

.....

..... [1]

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

factor .....

explanation .....

.....

[2]

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

.....

..... [1]

(iv) Explain why the plant was left for five minutes at each light intensity before counting bubbles.

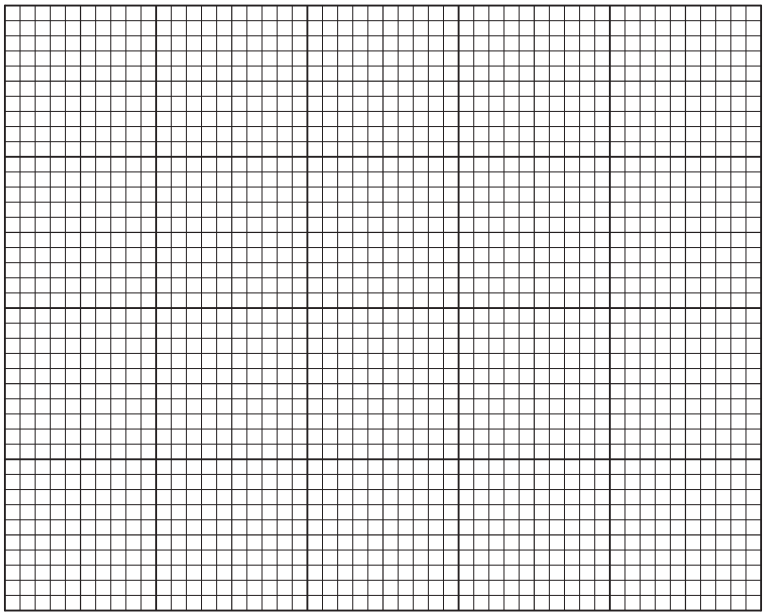
.....

..... [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

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



[5]

(vi) 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]

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

.....

.....

.....

..... [2]

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

.....

..... [1]

(ix) The students found it difficult to count bubbles accurately and thought that some bubbles were bigger than others.

Suggest a modification to the investigation that would allow the **volume** of gas produced to be recorded.

.....

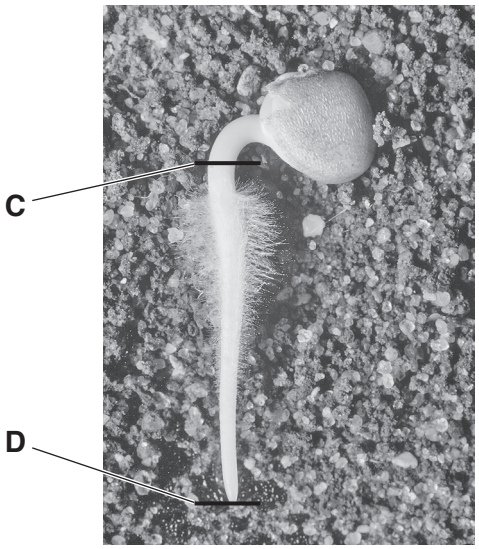
..... [1]

[Total: 24]

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[Turn over

2 The photograph below shows a germinating seed.



(a) Make a large drawing of this germinating seed in the space below.

Label the root hairs on your drawing.

[5]

(b) The actual length of the root between **C** and **D** is 13 mm.

On your drawing mark and label lines **C** and **D** in the same positions as in the photograph.

Measure the distance between these points on your drawing and record it.

..... mm

Use your measurement to calculate the magnification of your drawing compared with the actual length of the root. Show your working.

magnification × ..... [4]

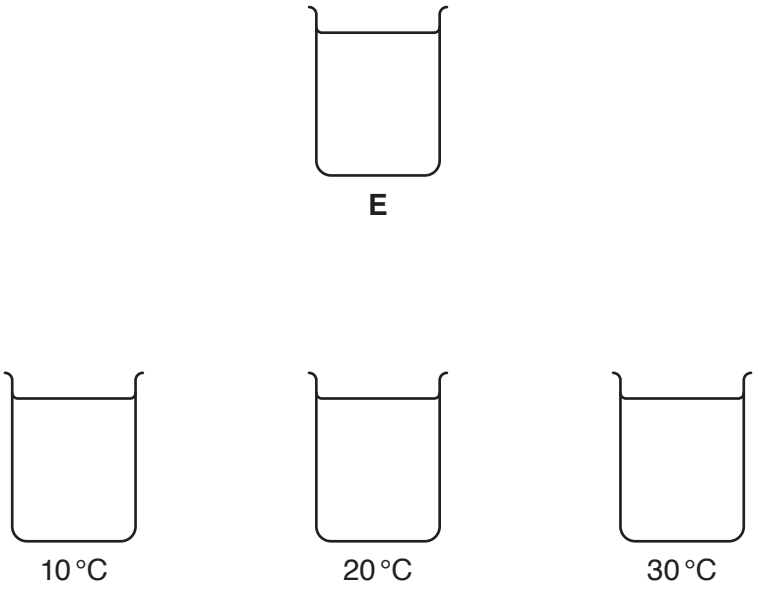
(c) State what apparatus you could use to examine the original living specimen of the germinating seed more closely.

..... [1]

[Total: 10]

3 Two students investigated the sensitivity of skin to temperature.

One set up a beaker, **E**, 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 **E**. 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 **E** 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 **E** for two minutes and then in water at 30 °C.

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

The results are shown in the table below.

water temperature in beaker E / °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

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(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 **E**.

.....

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.....

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.....

..... [3]

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

.....

.....

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..... [2]

[Total: 6]

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