Cambridge Assessment International Education

# Cambridge O Level

| CANDIDATE NAME | |
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| CENTRE NUMBER | | | | | | CANDIDATE NUMBER | | | | |
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*2272525682*

**BIOLOGY** **5090/32**

Paper 3 Practical Test **October/November 2023**

**1 hour 30 minutes**

You must answer on the question paper.

You will need: The materials and apparatus listed in the confidential instructions

**INSTRUCTIONS**

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You may use a calculator.
- You should show all your working and use appropriate units.

**INFORMATION**

- The total mark for this paper is 40.
- The number of marks for each question or part question is shown in brackets [ ].

| For Examiner's Use | |
|---|---|
| 1 | |
| 2 | |
| 3 | |
| Total | |

This document has **12** pages. Any blank pages are indicated.

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

**1** Some animals that live in cold climates need to reduce the loss of heat from their bodies.

You are going to investigate the effect of an insulating material on heat loss from an animal. You will use a test-tube containing hot water to represent an animal.

You are supplied with two test-tubes, a beaker (or similar container) and cotton wool to use as the insulating material.

- Draw a line 2 cm below the top of each test-tube. This indicates the level to which hot water will be added to the test-tubes.
- Arrange the cotton wool around one test-tube in the beaker as shown in Fig. 1.1.
- Support the other test-tube in a test-tube rack.

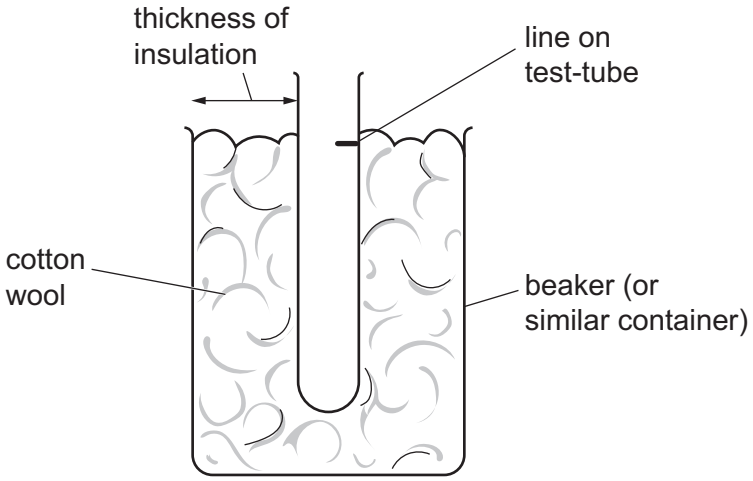


**Fig. 1.1**

**(a)** Measure and record:

- the thickness of the insulation in your apparatus

  ..... mm

- the air temperature of the room you are working in.

  ..... °C

[1]

**(b) (i)** The two test-tubes will be filled with hot water.

You are going to measure and record the temperature of the water in each test-tube as soon as you start timing and then at two-minute intervals for 12 minutes.

When you are ready, raise your hand and the Supervisor will add hot water to each of your test-tubes up to the lines that you have marked.

**Caution – the water will be hot.**

- Start timing.
- Immediately (at 0 minutes) measure the temperature of the water in each test-tube to the nearest 0.5 °C.
- Record these temperatures in Table 1.1.
- Measure and record the temperature to the nearest 0.5 °C in each test-tube at two-minute intervals for 12 minutes.

**Table 1.1**

| time / minutes | water temperature / °C | |
|---|---|---|
| | test-tube with insulation | test-tube without insulation |
| 0 | | |
| 2 | | |
| 4 | | |
| 6 | | |
| 8 | | |
| 10 | | |
| 12 | | |

[4]

**(ii)** Use your results from Table 1.1 to describe the loss of heat from the test-tubes and the effect of the insulation.

.....

.....

.....

.....

.....

..... [3]

**(c)** Humpback whales are large aquatic mammals that maintain a constant body temperature of 38 °C. They spend part of the year in cold polar water and part of the year in warm equatorial water.

Design an investigation that you could carry out to discover the effect of different surrounding water temperatures on the loss of heat by the humpback whale. Use a test-tube filled with water to represent the humpback whale.

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..... [6]

[Total: 14]

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**2** A pulse oximeter is a device that fits on the end of a finger. It measures the heart rate (pulse rate) in beats per minute and the percentage of oxygen in the blood (%SpO2).

Fig. 2.1 shows a photograph of a pulse oximeter.

**Fig. 2.1**

A student used a pulse oximeter to investigate the effect of exercise on heart rate and the percentage of oxygen in the blood.

The student recorded three readings from the pulse oximeter before exercise (0, 1 and 2 minutes). They then exercised for five minutes. At the end of five minutes they recorded four readings at one minute intervals (7, 8, 9 and 10 minutes).

Some of the results are shown in Table 2.1.

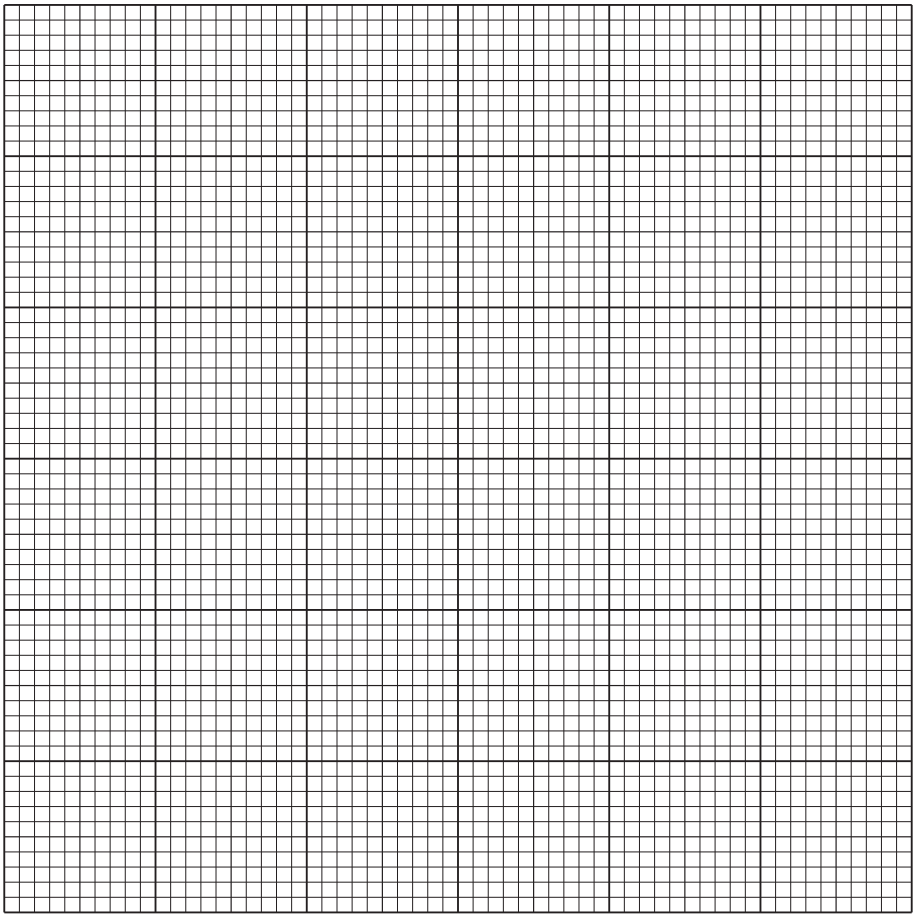
**Table 2.1**

| time / minutes | heart rate / beats per minute | percentage blood oxygen |
|---|---|---|
| 0 | 65 | 99 |
| 1 | | |
| 2 | 66 | 99 |
| 7 | 110 | 98 |
| 8 | 96 | 99 |
| 9 | 85 | 98 |
| 10 | 66 | 99 |

The photograph in Fig. 2.1 shows the pulse oximeter readings at 1 minute.

**(a)** **(i)** Record readings for 1 minute in Table 2.1. [1]

**(ii)** On the grid below construct a line graph of the **heart rate** against time. Join the points with ruled straight lines.



[4]

**(iii)** Identify the period of exercise on your graph by drawing **two** lines.

- Draw one beginning from the point at which exercise started and finishing at the axis. Label this line **S**.
- Draw one beginning from the point at which exercise ended and finishing at the axis. Label this line **E**.

[2]

**(iv)** Suggest why it would **not** be valid to use the graph to determine the heart rate at 5 minutes.

.....

.....

.....

..... [2]

**(b)** **(i)** Describe any changes in heart rate and the percentage of oxygen in the blood during the investigation, using the data in your graph and Table 2.1.

heart rate .....

.....

.....

.....

percentage oxygen .....

.....

.....
[3]

**(ii)** The student thought that changes in their breathing could have affected the percentage of oxygen in their blood during exercise. Suggest **two** changes in breathing that could be measured to help explain the percentage oxygen levels during the investigation.

1 .....

2 .....
[2]

[Total: 14]

**3** When a seed germinates, the radicle emerges to start developing into the root. A student decided to investigate the growth of the radicle as a seed germinated.

The student used a seed that had been germinating for a few days. Eight equally spaced lines were marked on the radicle as shown in Fig. 3.1.

The seed was then placed in suitable conditions in the dark with the radicle pointing vertically downwards. Two days later, the radicle had grown as shown in Fig. 3.1.

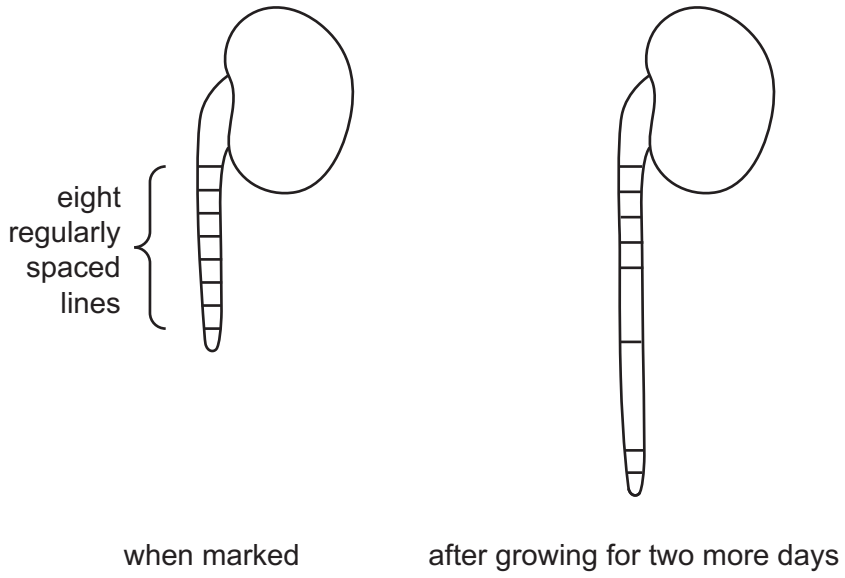



**Fig. 3.1**

**(a)** **(i)** Describe the observable changes that occurred in the two days after marking the radicle.

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.....

.....

..... [2]

**(ii)** Suggest why the student placed the seed with the radicle pointing vertically downwards instead of horizontally.

.....

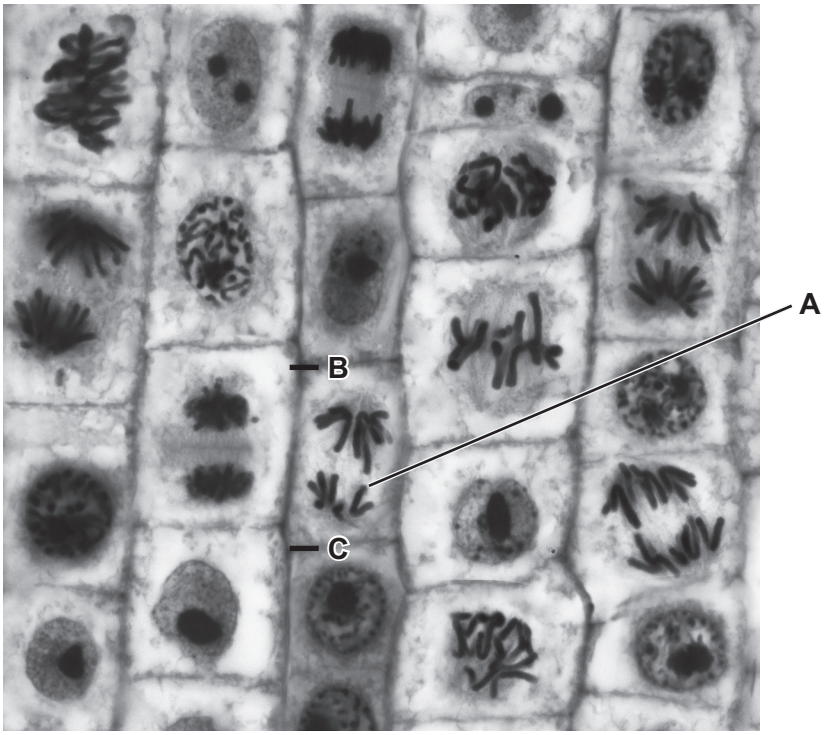
..... [1]

**(iii)** State **two** environmental conditions, other than light, that the student could control to ensure maximum growth of the radicle.

1 .....

2 .....
[2]

**(b)** The student examined a section of a root tip under the microscope and saw cells undergoing mitosis as shown in the photomicrograph in Fig. 3.2.




magnification ×600

**Fig. 3.2**

**(i)** In the space below make a large drawing of the cell labelled **A** as it appears in the photomicrograph in Fig. 3.2.

[4]

**(ii)** Lines **B** and **C** indicate the length of cell **A**. Draw a straight line **on the photomicrograph** to join **B** and **C**. Measure the length of this line and record it.

.....

Calculate the actual length of the cell and record it to the nearest two decimal places.

Space for working.

..... mm [3]

[Total: 12]

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