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Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

BIOLOGY **0610/51**

Paper 5 Practical Test **October/November 2023**

1 hour 15 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	
Total	

This document has **16** pages. Any blank pages are indicated.

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1 Emperor penguins are large birds found in Antarctica where temperatures can be very low.

Fairy penguins are small birds that live in Australasia where temperatures are much warmer.

The body temperature of both species of penguin is maintained at approximately 38 °C.

You are going to investigate the rate of heat loss from a penguin with a large body compared with a penguin with a small body.

You will use the beaker to represent the emperor penguin and the test-tube to represent the fairy penguin.

Read all the instructions but DO NOT DO THEM until you have drawn a table for your results in the space provided in 1(a)(i).

You should use the safety equipment provided while you are doing the practical work.

Step 1 Label the beaker **A** and the test-tube **B**.

Step 2 Draw a line on beaker **A** and test-tube **B** 5 cm up from the bottom.

Step 3 Raise your hand when you are ready for hot water to be added to the beaker labelled **hot water**.

Step 4 Use the hot water to fill beaker **A** up to your 5 cm mark.

Step 5 Place the thermometer in the water in beaker **A**.

Once the reading on the thermometer has stopped rising, measure the temperature of the water. Record this as the starting temperature in your table in **1(a)(i)**.

Leave the thermometer in the water throughout the investigation.

Step 6 Start the stop-clock and leave it running.

Step 7 After one minute, measure the temperature of the water in beaker **A** and record it in your table in **1(a)(i)**.

Step 8 Measure the temperature of the water in beaker **A** every minute for a total of five minutes. Record these values in your table in **1(a)(i)**.

Step 9 Empty the beaker labelled **hot water** into the container labelled **waste**. Reset the stop-clock to zero.

Step 10 Raise your hand to get the beaker labelled **hot water** refilled with hot water.

Step 11 Add hot water to test-tube **B** up to your 5 cm mark.

Step 12 Repeat steps **5** to **8** using test-tube **B** instead of beaker **A**.

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(a) (i) Prepare a table for your results.

[4]

(ii) The rate of heat loss can be calculated using the equation:

$$\text{rate of heat loss} = \frac{\text{change in temperature}}{\text{time}}$$

Using your results, calculate the rate of heat loss in beaker **A** and the rate of heat loss in test-tube **B** during the five minutes of the investigation.

Include the units.

Space for working.

rate of heat loss in beaker **A** .....

rate of heat loss in test-tube **B** .....
[3]

(iii) Suggest the effect of penguin body size on the rate of heat loss.

.....

.....

..... [1]

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(b) (i) Identify the independent variable in this investigation.

..... [1]

(ii) Identify **one** variable that should be kept constant in this investigation.

..... [1]

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(c) (i) Cubes of agar jelly can be used as model cells.

Agar jelly cubes are colourless and can be stained pink with an indicator. When placed in an acid solution, the acid diffuses into the agar jelly cubes and the pink colour starts to disappear. When the acid has reached the centre of the agar jelly cube, the agar is completely colourless. This is shown in Fig. 1.1.

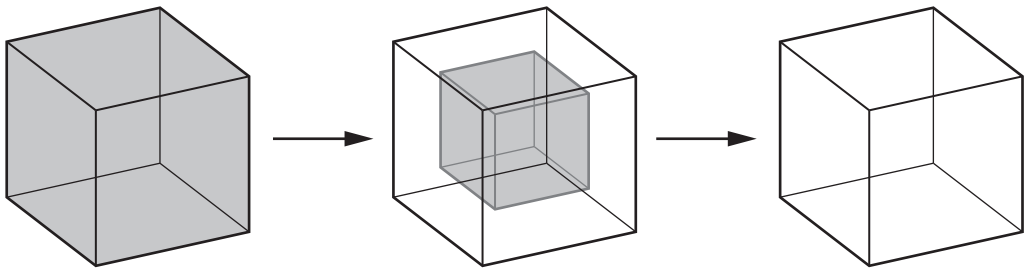


Fig. 1.1

Plan an investigation to determine the effect of temperature on the **rate** of diffusion in model cells.

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..... [6]

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(ii) The length of a side of a cube of agar jelly is 1 cm.

Calculate the surface area to volume ratio of this cube.

surface area ..... : volume .....
[2]

[Total: 18]

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2 **(a)** Fig. 2.1 is a photograph of a lizard.



magnification ×0.6

Fig. 2.1

Line **CD** represents the length of the lizard.

Measure the length of line **CD** on Fig. 2.1.

length of line **CD** ..... mm

Calculate the actual length of the lizard using the formula and your measurement.

$$\text{magnification} = \frac{\text{length of line } \mathbf{CD}}{\text{actual length of the lizard}}$$

Give your answer to **three** significant figures.

Space for working.

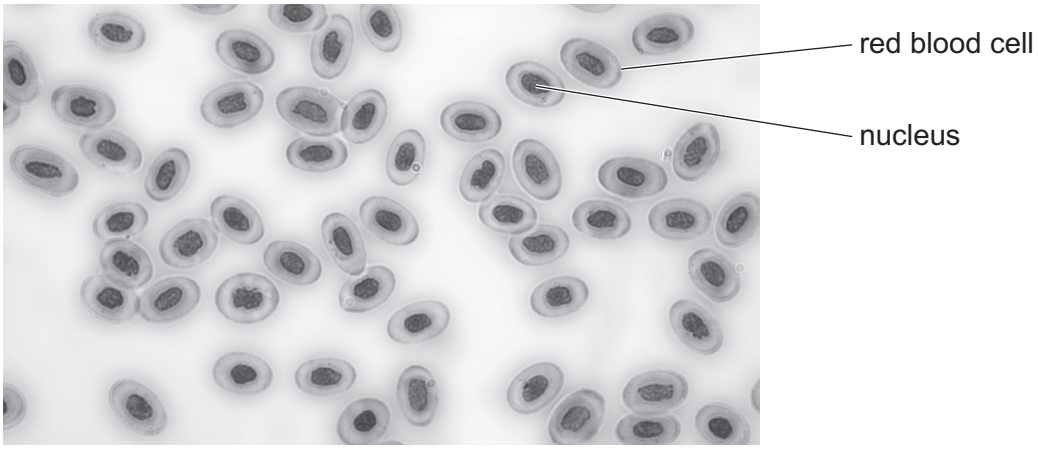
..... mm
[3]

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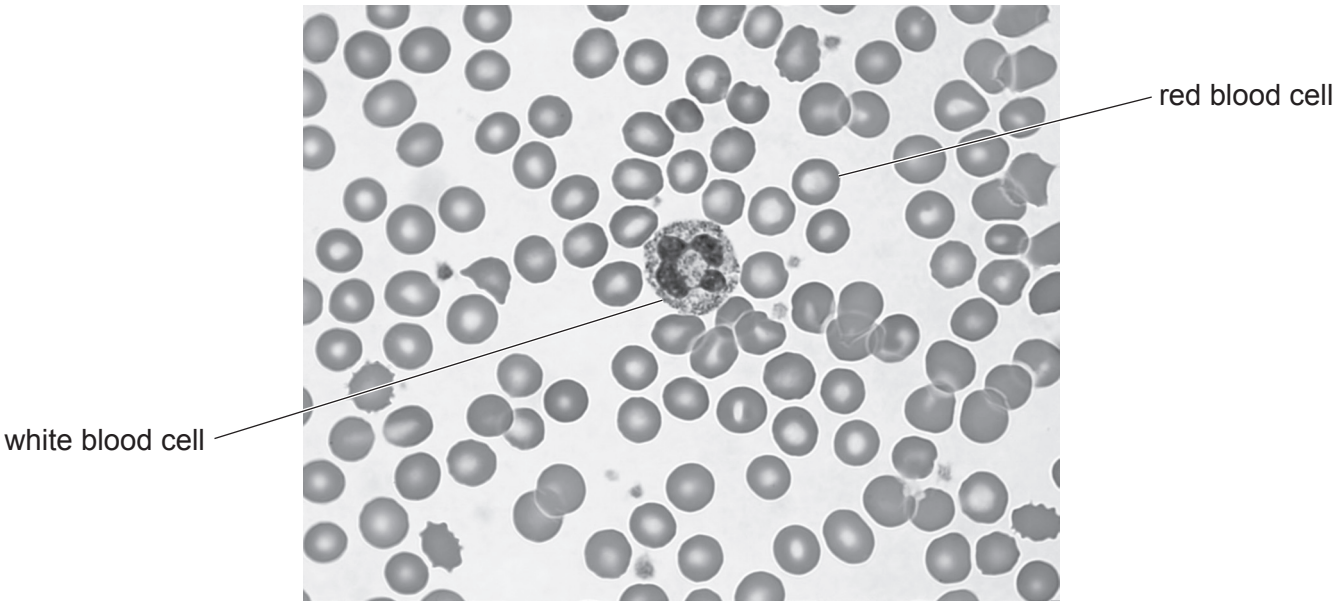
(b) Fig. 2.2 is a photomicrograph of lizard blood cells.



magnification ×400

Fig. 2.2

Fig. 2.3 is a photomicrograph of human blood cells.



magnification ×900

Fig. 2.3

(i) State **two** ways the lizard blood cells shown in Fig. 2.2 are different from the human blood cells shown in Fig. 2.3.

1 .....

.....

2 .....

.....

[2]

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(ii) Fig. 2.4 shows one white blood cell.

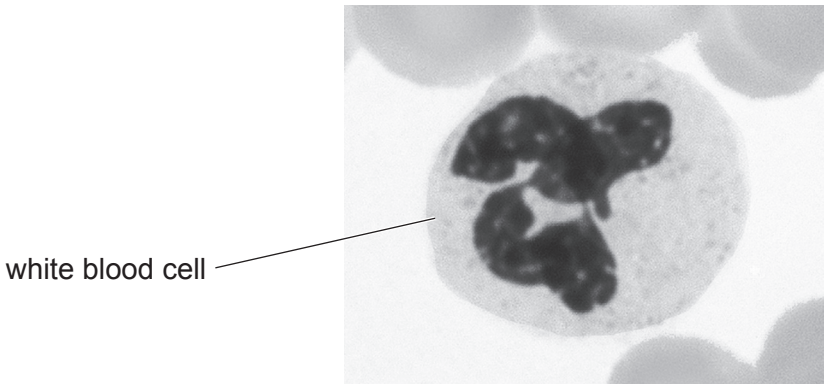


Fig. 2.4

Draw a large diagram of the white blood cell shown in Fig. 2.4.

[4]

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(c) Haemoglobin is a protein found in human red blood cells. Haemoglobin carries oxygen.

Athletes from a low altitude (height above sea level) location train at high altitude in order to temporarily increase their haemoglobin levels.

Scientists studied how long the increase lasted once the athletes returned to the low altitude location.

Table 2.1 shows the results of the study.

Table 2.1

number of days after returning to low altitude	mean mass of haemoglobin per athlete / g
2	650
7	650
14	650
21	630
28	624
33	605
40	604

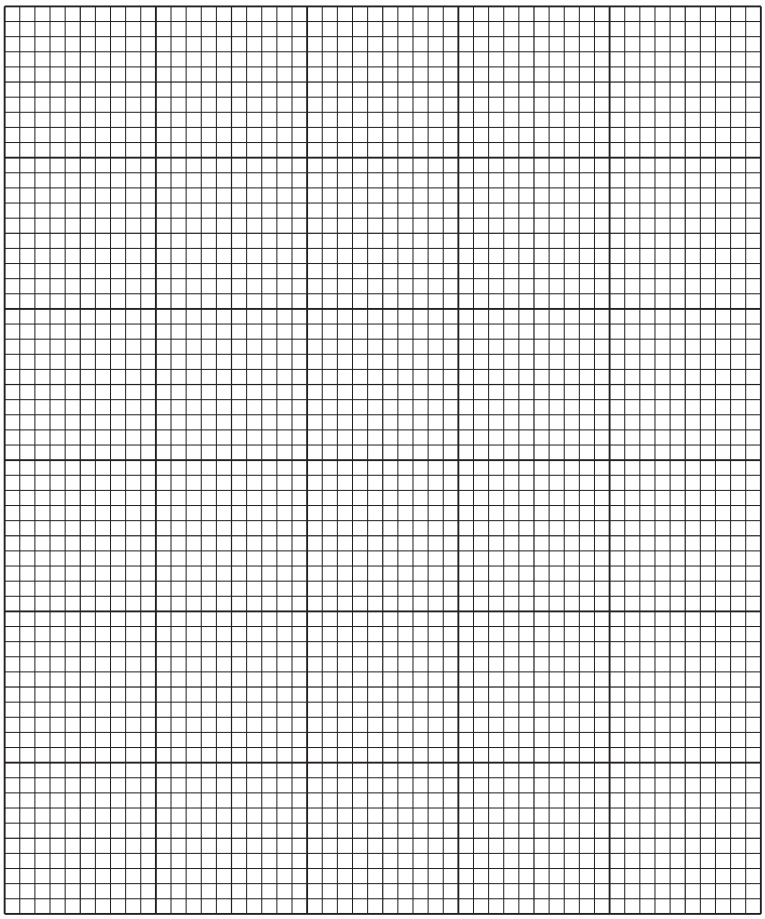
(i) Identify the dependent variable in this investigation.

..... [1]

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(ii) Using the data in Table 2.1, plot a line graph on the grid to show the effect of returning to low altitude on the mean mass of haemoglobin per athlete.



[4]

(iii) Use your graph to estimate the mean mass of haemoglobin per athlete 17 days after returning to low altitude.

Indicate on your graph how you obtained your estimate.

..... g
[2]

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(d) Scientists investigated the effect of different amounts of carbohydrate in the diet on the length of time an athlete can continue to exercise until exhausted.

The results of the investigation are shown in Fig. 2.5.

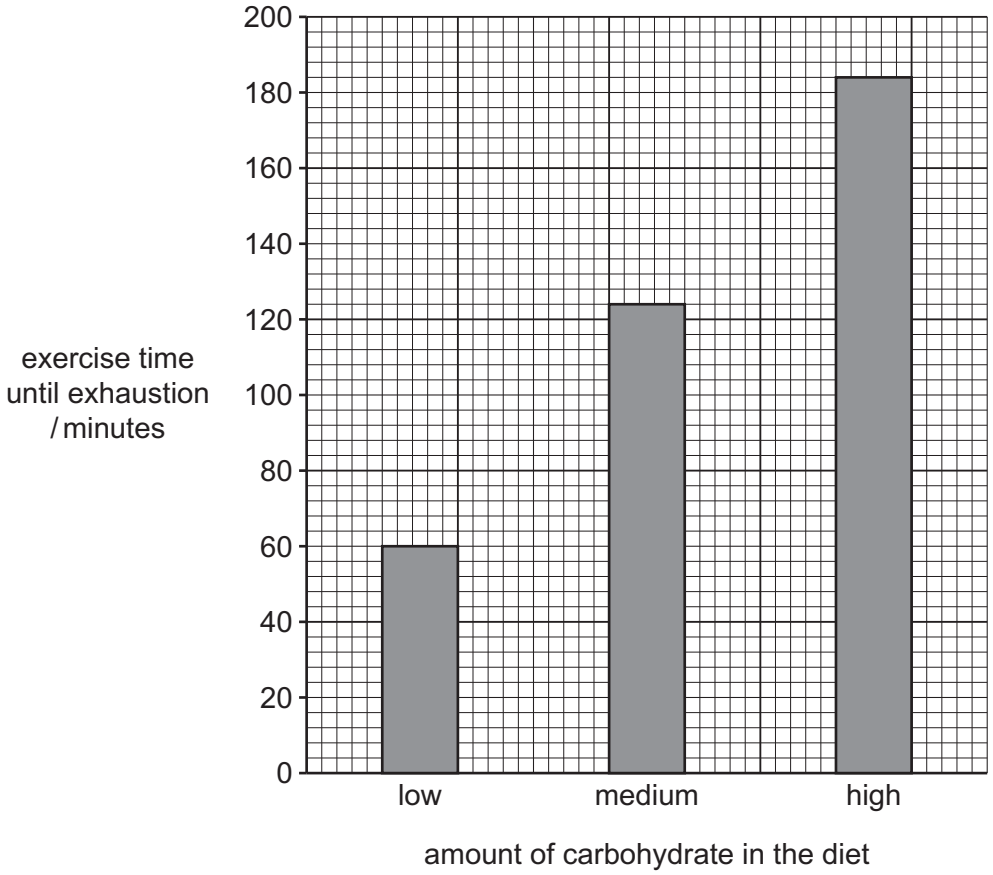


Fig. 2.5

(i) State a conclusion for this investigation.

.....

.....

..... [1]

(ii) The scientists carefully selected athletes for the three groups in their study.

It was important that the data from the three groups were comparable.

Describe **two** variables that the scientists should have considered when selecting athletes.

1 .....

.....

2 .....

.....

[2]

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(e) Starch is broken down into reducing sugars.

(i) Describe the method you would use to test for the presence of reducing sugars.

.....

.....

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..... [2]

(ii) State the reagent used to test for the presence of starch.

..... [1]

[Total: 22]

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