GradeMax

Please check the examination details below before entering your candidate information

Candidate surname	Other names

Pearson Edexcel
International Advanced Level

Centre Number | | | | | |

Candidate Number | | | | |

Friday 15 January 2021

Morning (Time: 1 hour 20 minutes) | Paper Reference **WBI13/01**

Biology

International Advanced Subsidiary / Advanced Level
Unit 3: Practical Skills in Biology I

You must have:
Scientific calculator, ruler, HB pencil

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided – *there may be more space than you need.*
- **Show all your working in calculations and include units where appropriate.**

Information

- The total mark for this paper is 50.
- The marks for **each** question are shown in brackets – *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

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Pearson

Answer ALL questions.

Write your answers in the spaces provided.

1 Animal and plant cells can be observed using a light microscope.

The structure of human cheek cells was investigated.

(a) Describe a safe method to prepare and examine the structure of human cheek cells.

(4)

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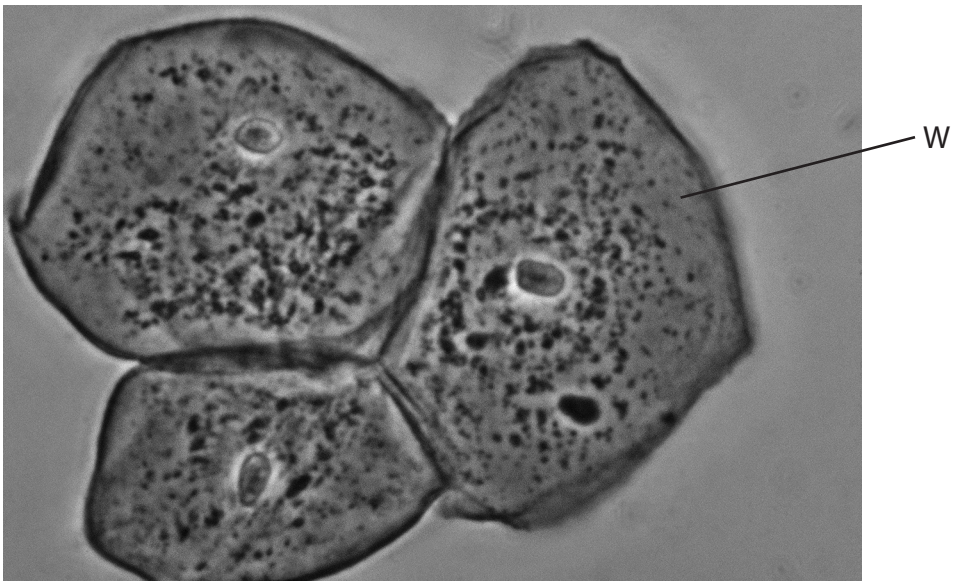
(b) The photograph shows three human cheek cells, seen using a light microscope.

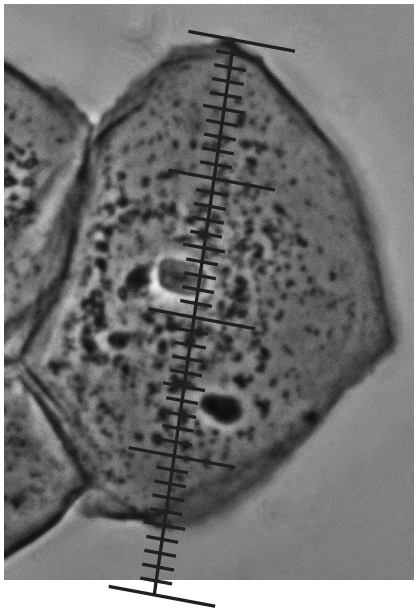


(Source: © BIOPHOTO ASSOCIATES/SCIENCE PHOTO LIBRARY)

(i) Draw the cell labeled W in the photograph. Label two structures on your drawing.

(2)

(ii) The photograph shows an eyepiece graticule over the widest part of this human cheek cell.



(Source: © BIOPHOTO ASSOCIATES/SCIENCE PHOTO LIBRARY)

Each of the smallest divisions on the graticule is 3×10^{-6} m.

Determine the largest width of the cell, using the graticule.

Give your answer in micrometres (μm).

(2)

Answer ..... μm

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(c) Human red blood cells contain a large number of haemoglobin molecules.

Each haemoglobin molecule is a sphere with a diameter of 5 nm.

(i) Calculate the volume of a haemoglobin molecule.

The equation for the volume of a sphere (V) is

$$V = \frac{4}{3}\pi r^3$$

(1)

Answer ..... nm^3

(ii) A human red blood cell has a volume of 80 μm^3.

Calculate how many times larger the volume of a red blood cell is than the volume of a haemoglobin molecule.

Give your answer in standard form.

(2)

Answer .....

(iii) State **two** differences you would observe between a plant cell and a human red blood cell when using a light microscope.

(2)

1 .....

.....

.....

2 .....

.....

.....

(Total for Question 1 = 13 marks)

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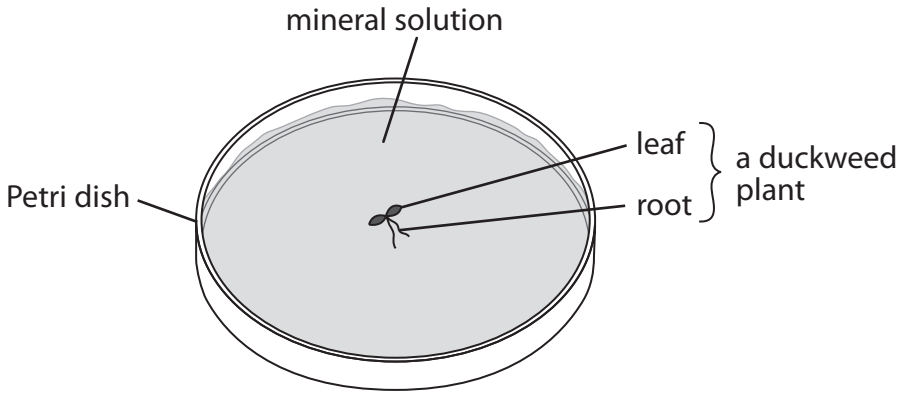
2 Duckweed is a water plant. These plants multiply by producing buds that become separate plants.

The effect of minerals on the growth of duckweed plants was investigated.

A single duckweed plant was placed in each of seven Petri dishes containing 20 cm^3 of a mineral solution, as shown in the diagram.



Each mineral solution was missing one of the minerals that plants need to grow.

The number of duckweed plants in each dish was counted after 14 days.

(a) (i) Describe the contents of two more Petri dishes that could be controls for this investigation.

(2)

Dish 1 .....

.....

Dish 2 .....

.....

(ii) In this investigation, temperature and pH are variables that need to be controlled.

Describe how these variables could be controlled in this investigation.

(2)

Temperature .....

.....

.....

pH .....

.....

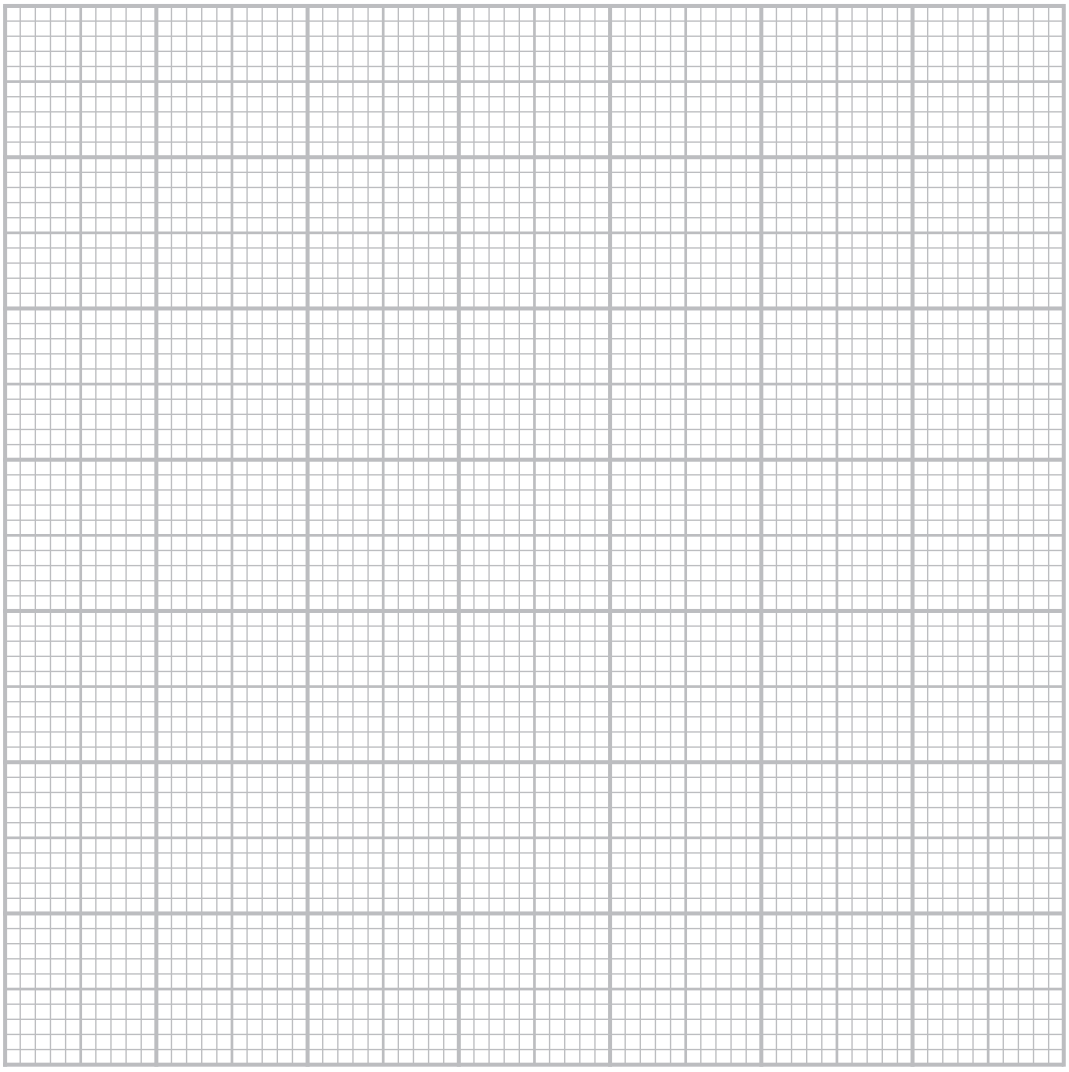
.....

(b) The table shows the results of this investigation.

Mineral missing from the solution	Number of duckweed plants after 14 days
calcium	10
iron	35
potassium	24
magnesium	12
nitrate	5
phosphate	14
sulfate	27

(i) Plot a suitable graph to show the results of this investigation.

(4)



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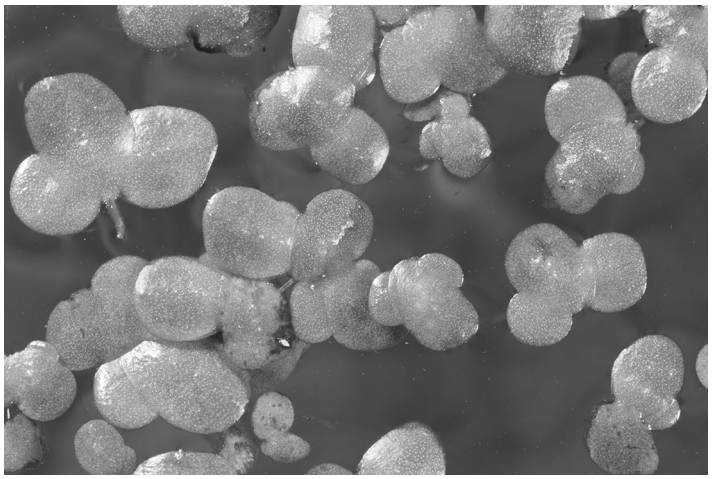
(ii) Explain the difference in duckweed growth in the mineral solution missing nitrate and the mineral solution missing phosphate.

Use the information in the table to support your answer.

(3)

(c) The photograph shows several duckweed plants in one of the Petri dishes.



Magnification × 2

(Source: © BOB GIBBONS / SCIENCE PHOTO LIBRARY)

(i) Suggest why counting plants will give an inaccurate result for the growth of duckweed after 14 days.

Use the information in the photograph to support your answer.

(2)

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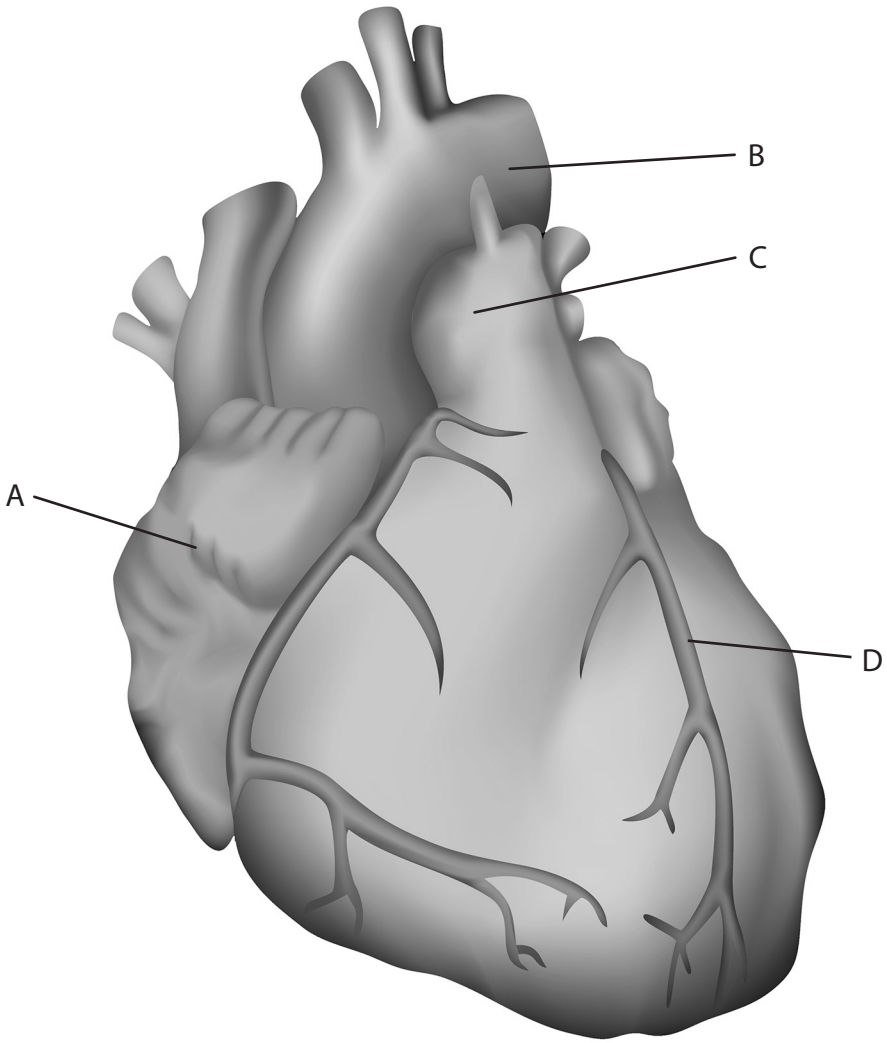
(ii) Explain how this investigation could be modified to provide an accurate measure of the growth rate of duckweed.

(4)

(Total for Question 2 = 17 marks)

3 The structure of a heart can be investigated by dissection.

(a) The drawing shows an external view of a mammalian heart.



(Source: © VERONIKA ZAKHAROVA / SCIENCE PHOTO LIBRARY)

(i) Name the structures A, B, C and D shown in the diagram.

(2)

A .....

B .....

C .....

D .....

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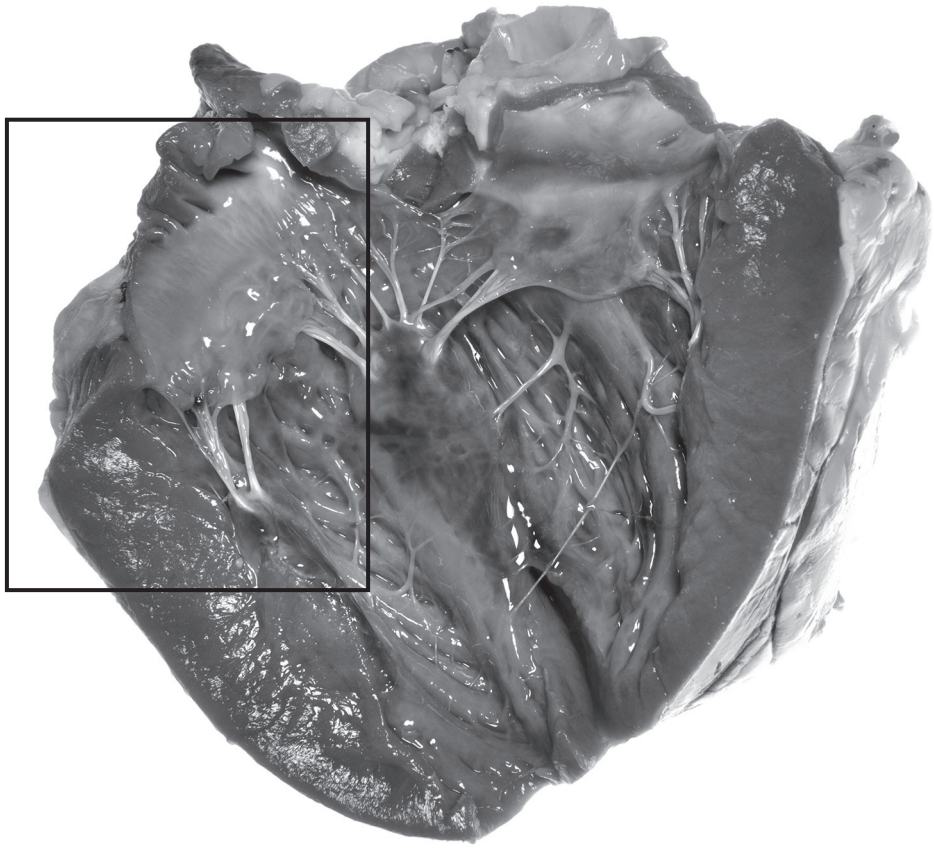
(ii) The photograph shows a heart after it has been dissected.



(Source: © PjrStudio / Alamy Stock Photo)

Draw a plan of the structures within the rectangle shown on the photograph and label two of these structures on your drawing.

(3)

(iii) State the function of the **two** structures labelled on your drawing.

(2)

Label .....

Function .....

.....

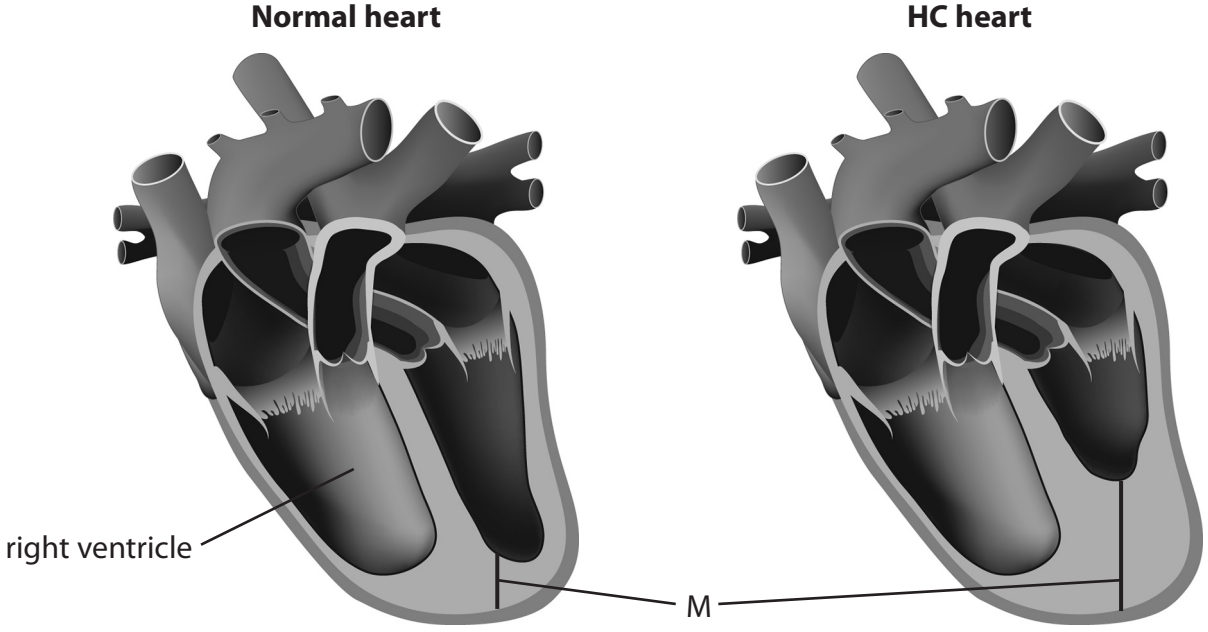
Label .....

Function .....

.....

(b) Some people inherit a type of heart disease called hypertrophic cardiomyopathy (HC).

In HC some of the muscle in the heart becomes thickened, as shown in the diagram.



© designua/123rf

(i) Calculate the percentage increase in thickness of the muscle in the HC heart compared with the normal heart, using the lines labelled M.

Give your answer to two significant figures.

(2)

..... %

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(ii) Compare and contrast these two hearts.

(4)

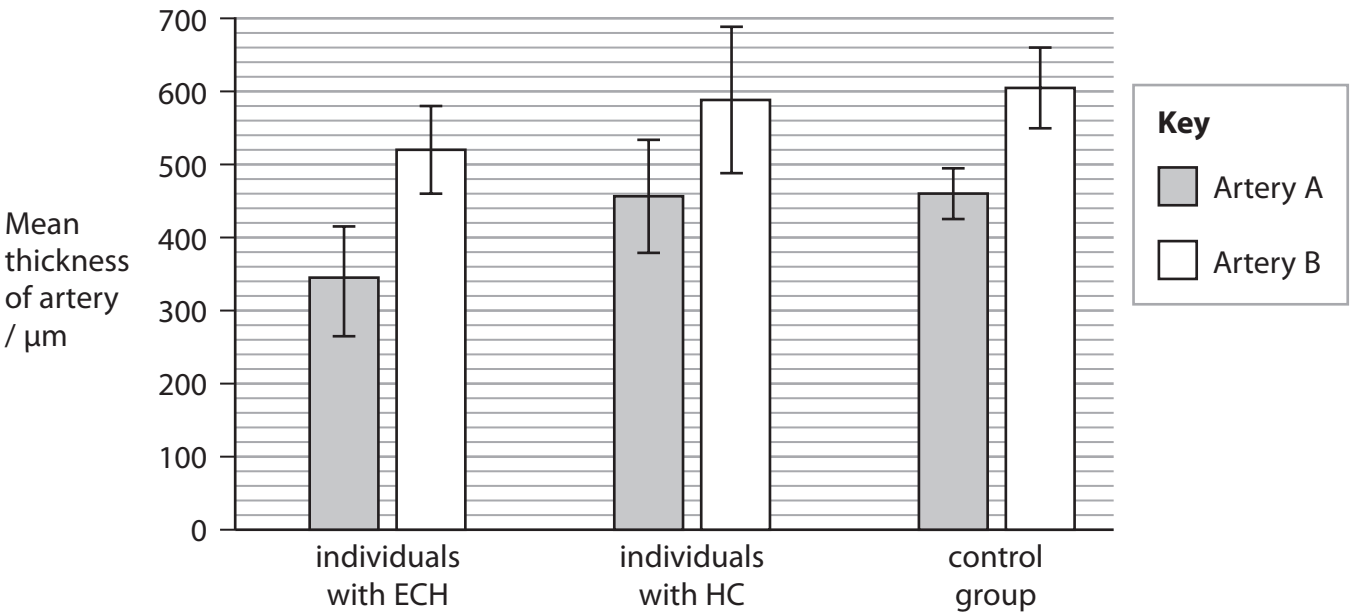
(iii) Athletes can also develop cardiac hypertrophy as a result of exercise programmes (ECH).

Individuals with HC and individuals with ECH show changes in the thickness of the walls of some of their arteries.

In a study, the thickness of the walls of two of these arteries was measured in three groups:

- individuals with ECH
- individuals with HC
- a control group without ECH or HC.

The graph shows the results of this study.



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Draw a table to show the results of this study.

(3)

(iv) Determine the effects of ECH and HC on artery thickness.

(4)

(Total for Question 3 = 20 marks)

TOTAL FOR PAPER = 50 MARKS

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