A

Surname _____

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Centre Number _____

Candidate Number _____

Candidate Signature _____

I declare this is my own work.

GCSE
BIOLOGY

F

Foundation Tier Paper 1F

8461/1F

Tuesday 16 May 2023 Morning

Time allowed: 1 hour 45 minutes

[Turn over]

At the front of this book, write your surname and forename(s), your centre number, your candidate number and add your signature.

MATERIALS

For this paper you must have:

- **a ruler**
- **a scientific calculator.**

INSTRUCTIONS

- **Use black ink or black ball-point pen.**
- **Pencil should only be used for drawing.**
- **Answer ALL questions in the spaces provided.**
- **If you need extra space for your answer(s), use the lined pages at the end of this book. Write the question number against your answer(s).**

- **Do all rough work in this book. Cross through any work you do not want to be marked.**
- **In all calculations, show clearly how you work out your answer.**

INFORMATION

- **The maximum mark for this paper is 100.**
- **The marks for questions are shown in brackets.**
- **You are expected to use a calculator where appropriate.**
- **You are reminded of the need for good English and clear presentation in your answers.**

DO NOT TURN OVER UNTIL TOLD TO DO SO

Answer ALL questions in the spaces provided.

0 1

Plants are made of cells, tissues and organs.

0 1 . 1

Which part of a plant is the largest?
[1 mark]

Tick (✓) ONE box.

- ☐ **A guard cell**
- ☐ **A leaf**
- ☐ **A root hair**

Students investigated the effect of concentration of salt solution on the mass of pieces of potato.

This is the method used.

1. Cut two pieces of potato to the same size.
2. Record the mass of each piece of potato.
3. Place one piece of potato into a beaker containing a dilute salt solution.
4. Place the other piece of potato into a beaker containing a concentrated salt solution.
5. After 20 minutes, remove each piece of potato from its solution.
6. Record the change in mass of each piece of potato.
7. Repeat steps 1 to 6 two more times.

[Turn over]

TABLE 1 shows the results.

TABLE 1

SOLUTION	Change in mass of piece of potato in grams			
	TEST 1	TEST 2	TEST 3	MEAN
Dilute salt solution	1.1	1.1	1.4	X
Concentrated salt solution	−7.2	−6.8	−32.4	−7.0

0 1 . 2

Calculate mean value X in TABLE 1.
[2 marks]

_____

_____

_____

X = _____ grams

There is an anomalous result for the concentrated salt solution in TABLE 1.

0 1 . 3

Draw a ring around the anomalous result in TABLE 1, on the opposite page.

[1 mark]

[Turn over]

0 1 . 4

What did the students do with the anomalous result when calculating the mean in TABLE 1, on page 6? [1 mark]

---

0 1 . 5

What name is given to a variable that is kept the same during an investigation? [1 mark]

Tick (✓) ONE box.

☐ **Control variable**

☐ **Dependent variable**

☐ **Independent variable**

0 1 . 6

One variable the students kept the same during the investigation was the size of the pieces of potato.

Which other variable did the students keep the same? [1 mark]

Tick (✓) ONE box.

- ☐ **Change in mass of pieces of potato**
- ☐ **Concentration of salt solution**
- ☐ **Time in the salt solution**

[Turn over]

0 1 . 7

The pieces of potato in the concentrated salt solution decreased in mass.

Complete the sentence.

Choose the answer from the list.
[1 mark]

- **excretion**
- **osmosis**
- **respiration**

Water moved out of the potato by the process of _____ .

0 1 . 8

The potato cells have a partially permeable membrane.

Which particles can pass through a partially permeable membrane? [1 mark]

Tick (✓) ONE box.

- ☐ **No particles**
- ☐ **Some particles**
- ☐ **All particles**

0 1 . 9

How could the students improve their investigation? [1 mark]

Tick (✓) ONE box.

- ☐ **Boil the pieces of potato at the start.**
- ☐ **Leave the skin on some pieces of potato.**
- ☐ **Use more concentrations of salt solution.**

10

BLANK PAGE

[Turn over]

0 2

Viruses cause disease.

0 2 . 1

What name is given to microorganisms that cause disease? [1 mark]

Tick (✓) ONE box.

- ☐ **Pathogens**
- ☐ **Predators**
- ☐ **Producers**

0 2 . 2

The body has defences to stop viruses entering.

Draw ONE line from each defence to the part of the body that provides the defence. [2 marks]

Defence	Part of the body that provides the defence
A physical barrier that stops viruses entering	Brain
Mucus that traps viruses	Heart
	Nose
	Skin

[Turn over]

Some viruses can cause tumours to develop.

0 2 . 3

Complete the sentence.

Choose the answer from the list.
[1 mark]

- **digestion**
- **division**
- **metabolism**

A tumour can form when changes to cells cause uncontrolled cell

_____ .

0 2 . 4

Malignant tumours are cancers.

Which TWO sentences describe malignant tumours? [2 marks]

Tick (✓) TWO boxes.

- ☐ **Malignant tumours are only found in the reproductive system.**
- ☐ **Malignant tumours contain digestive enzymes.**
- ☐ **Malignant tumours do not change in size.**
- ☐ **Malignant tumours have cells that can spread to other parts of the body.**
- ☐ **Malignant tumours may form secondary tumours.**

[Turn over]

HPV is a virus that can cause one type of cancer in females.

In the UK since 2008, most 12 to 13-year-old females have been vaccinated against HPV.

Scientists investigated the percentage of 16 to 18-year-old females with HPV.

TABLE 2 shows the results.

TABLE 2

YEAR	Percentage (%) of 16 to 18-year-old females with HPV
2010	8.2
2012	3.2
2014	2.0
2016	1.6

0 2 . 5

What does TABLE 2, on the opposite page, show about the percentage of females with HPV from 2010 to 2016? [1 mark]

0 2 . 6

Suggest the reason for the change you described in Question 02.5. [1 mark]

The HPV vaccine contains an inactive form of the virus.

The inactive form of the virus is injected into the body.

0 2 . 7

Which part of the blood responds to the inactive virus? [1 mark]

Tick (✓) ONE box.

☐ Platelets

☐ Red blood cells

☐ White blood cells

0 2 . 8

What is produced by the body in response to the inactive virus? [1 mark]

Tick (✓) ONE box.

- ☐ **Antibiotics**
- ☐ **Antibodies**
- ☐ **Antiseptics**

0 2 . 9

Suggest ONE reason why some PARENTS refuse to allow their children to have the HPV vaccine.

Do NOT refer to the pain of the injection in your answer. [1 mark]

11

BLANK PAGE

[Turn over]

0 3

Photosynthesis produces oxygen.

0 3 . 1

Complete the word equation for photosynthesis.

Choose answers from the list. [3 marks]

- **carbon dioxide**
- **fat**
- **glucose**
- **nitrogen**
- **protein**
- **water**

_____ **+** _____ ⟶

_____ **+ Oxygen**

0 3 . 2

Explain how oxygen is used in cells.
[2 marks]

A student investigated the effect of light from different coloured light bulbs on photosynthesis.

The student:

- **used pondweed in a beaker of water**
- **used different coloured light bulbs in a lamp**
- **counted the number of bubbles of oxygen the pondweed produced in 2 minutes for each colour of light bulb.**

0 3 . 3

Give ONE hazard the student would need to consider when using the apparatus in this investigation.

Give the risk the hazard would cause.

[2 marks]

Hazard _____

_____

_____

Risk _____

_____

_____

0 3 . 4

The student needed to keep the temperature of the water in the beaker the same throughout the investigation.

Describe how the student could keep the temperature of the water the same.
[1 mark]

0 3 . 5

The beaker of water contained the pondweed.

Explain why the temperature of the water in the beaker needed to be kept the same throughout the investigation. [2 marks]

TABLE 3 shows the results.

TABLE 3

Colour of light bulb	Number of bubbles of oxygen produced in 2 minutes
Blue	46
Green	8
Red	38
Yellow	29

0 3 . 6

Which colour of light caused the highest rate of photosynthesis in the pondweed? [1 mark]

Tick (✓) ONE box.

- ☐ **Blue**
- ☐ **Green**
- ☐ **Red**
- ☐ **Yellow**

[Turn over]

REPEAT OF TABLE 3

Colour of light bulb	Number of bubbles of oxygen produced in 2 minutes
Blue	46
Green	8
Red	38
Yellow	29

0 3 . 7

What is the best way to display the data in TABLE 3? [1 mark]

Tick (✓) ONE box.

☐ **Bar graph**

☐ **Line graph**

☐ **Scatter graph**

0 3 . 8

The student wanted to measure the VOLUME of oxygen the pondweed produced in 2 minutes.

Name ONE piece of apparatus the student could use to measure the volume of oxygen. [1 mark]

_____

_____

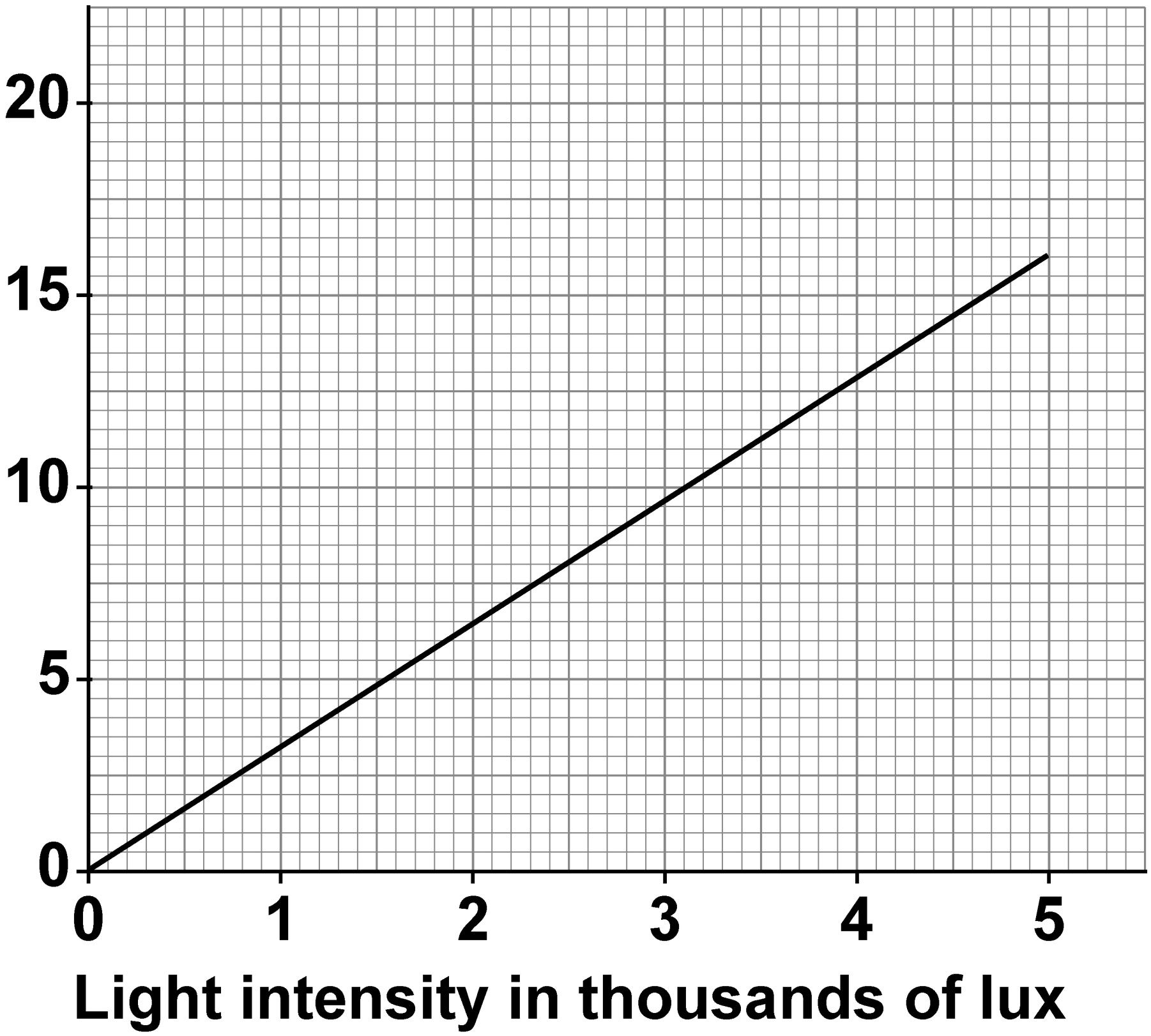
0 3 . 9

Another student investigated the effect of light intensity on the rate of photosynthesis.

FIGURE 1, on the opposite page, shows the results.

Describe what FIGURE 1, on the opposite page, shows about the relationship between light intensity and the rate of photosynthesis. [2 marks]

FIGURE 1



[Turn over]

15

0 4

Malaria is caused by a protist.

The protist is passed from one person to another person by mosquitos.

0 4 . 1

Which term describes the mosquito?
[1 mark]

Tick (✓) ONE box.

☐ **Bacterium**

☐ **Gene**

☐ **Vector**

BLANK PAGE

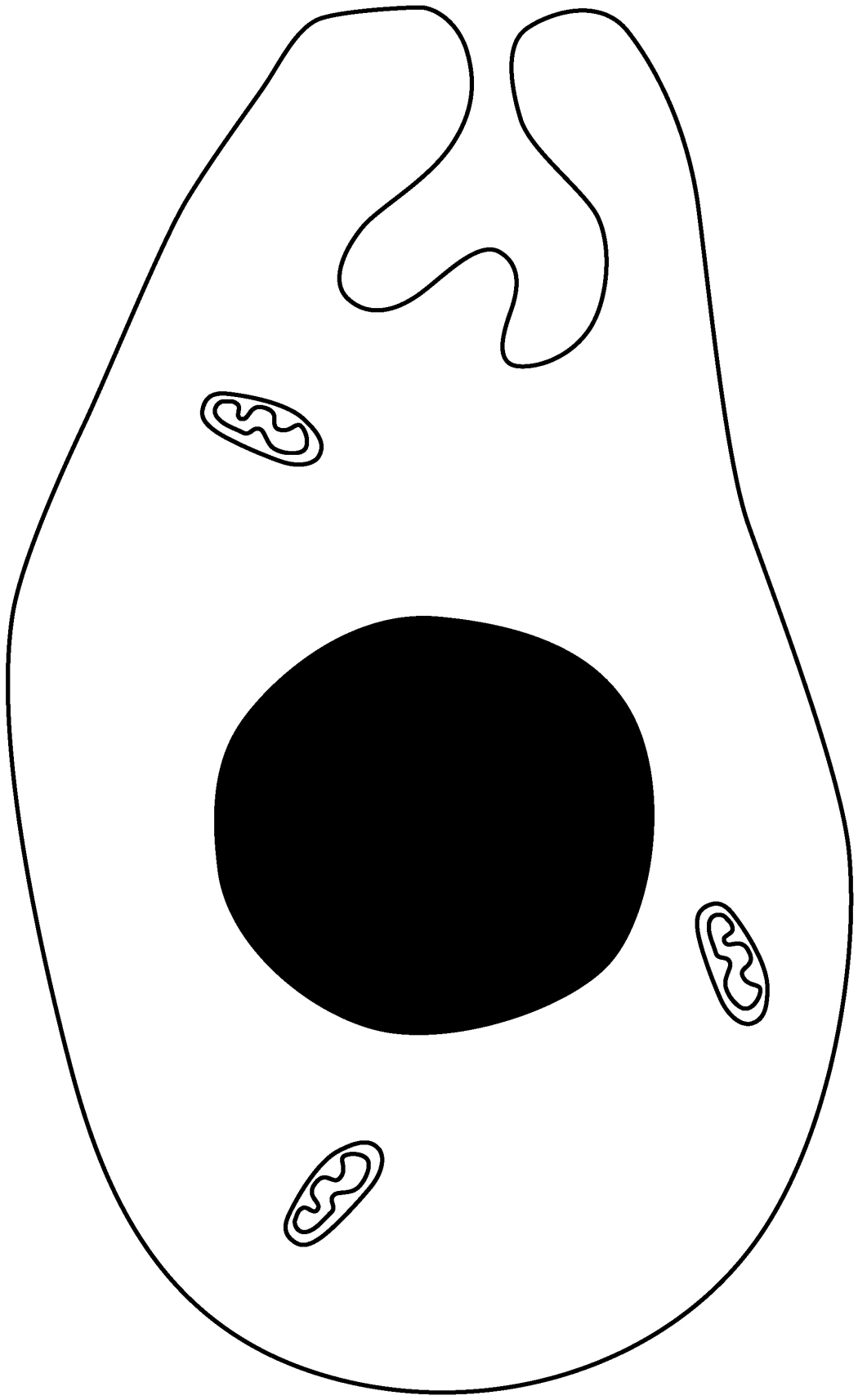
[Turn over]

0 4 . 2

The malarial protist is a eukaryotic cell.

FIGURE 2 shows a malarial protist.

FIGURE 2



Give TWO features of the malarial protist that show the cell is eukaryotic and NOT prokaryotic. [2 marks]

1 _____

_____

2 _____

_____

_____

[Turn over]

0 4 . 3

Which organism is prokaryotic? [1 mark]

Tick (✓) ONE box.

- ☐ **Cow**
- ☐ **Grass**
- ☐ **Salmonella**

0 4 . 4

The malarial protist reproduces asexually.

What is a feature of asexual reproduction? [1 mark]

Tick (✓) ONE box.

- ☐ **Only one parent is involved.**
- ☐ **The offspring show genetic variation.**
- ☐ **Two gametes fuse.**

[Turn over]

0 4 . 5

Mitosis occurs in the malarial protist during asexual reproduction.

The protist has 14 chromosomes.

How many chromosomes will each new protist cell have after mitosis? [1 mark]

Tick (✓) ONE box.

- ☐ **7**
- ☐ **14**
- ☐ **21**
- ☐ **28**

0 4 . 6

When a person has malaria, the protists destroy red blood cells.

What change would happen in the blood of a person with malaria? [1 mark]

Tick (✓) ONE box.

- ☐ **Decreased antibodies**
- ☐ **Decreased haemoglobin**
- ☐ **Increased plasma**
- ☐ **Increased platelets**

[Turn over]

0 4 . 7

It is estimated that 210 million people are infected with malaria every year.
Half of these infected people survive the disease.

Calculate how many people would survive the disease in 3 years if the estimate is correct.

Give your answer in standard form.
[4 marks]

Number of people (in standard form) =

[Turn over]

0 4 . 8

The spread of malaria can be controlled by using mosquito nets to avoid being bitten.

Describe TWO other ways that people can reduce the chance of being bitten by mosquitos.

Do NOT refer to mosquito nets in your answer. [2 marks]

1 _____

_____

_____

2 _____

_____

_____

BLANK PAGE

[Turn over]

0 4 . 9

Different types of disease may interact.

Scientists studied how having disorder S interacts with malaria.

The scientists calculated the chance of children with disorder S getting malaria.

TABLE 4 shows the results.

TABLE 4

Age in years	Percentage (%) chance of children with disorder S getting malaria
2	70
4	65
6	50
8	45

Describe the trend shown in TABLE 4, on the opposite page.

Use data from TABLE 4. [2 marks]

_____

_____

_____

_____

_____

15

0 5

This question is about food and digestion.

0 5 . 1

Proteins are needed to make new body cells by mitosis.

Give ONE reason why a person needs new body cells. [1 mark]

_____

_____

0 5 . 2

What are proteins made of? [1 mark]

Tick (✓) ONE box.

- ☐ **Amino acids**
- ☐ **Fatty acids**
- ☐ **Glucose**
- ☐ **Starch**

[Turn over]

0 5 . 3

Which chemical is used to test for protein in food? [1 mark]

Tick (✓) ONE box.

- ☐ **Benedict's reagent**
- ☐ **Biuret reagent**
- ☐ **Ethanol**

0 5 . 4

What colour would be seen in a positive test for protein? [1 mark]

Tick (✓) ONE box.

- ☐ **Black**
- ☐ **Purple**
- ☐ **Red**
- ☐ **White**

Enzymes break down food molecules in the human body.

0 5 . 5

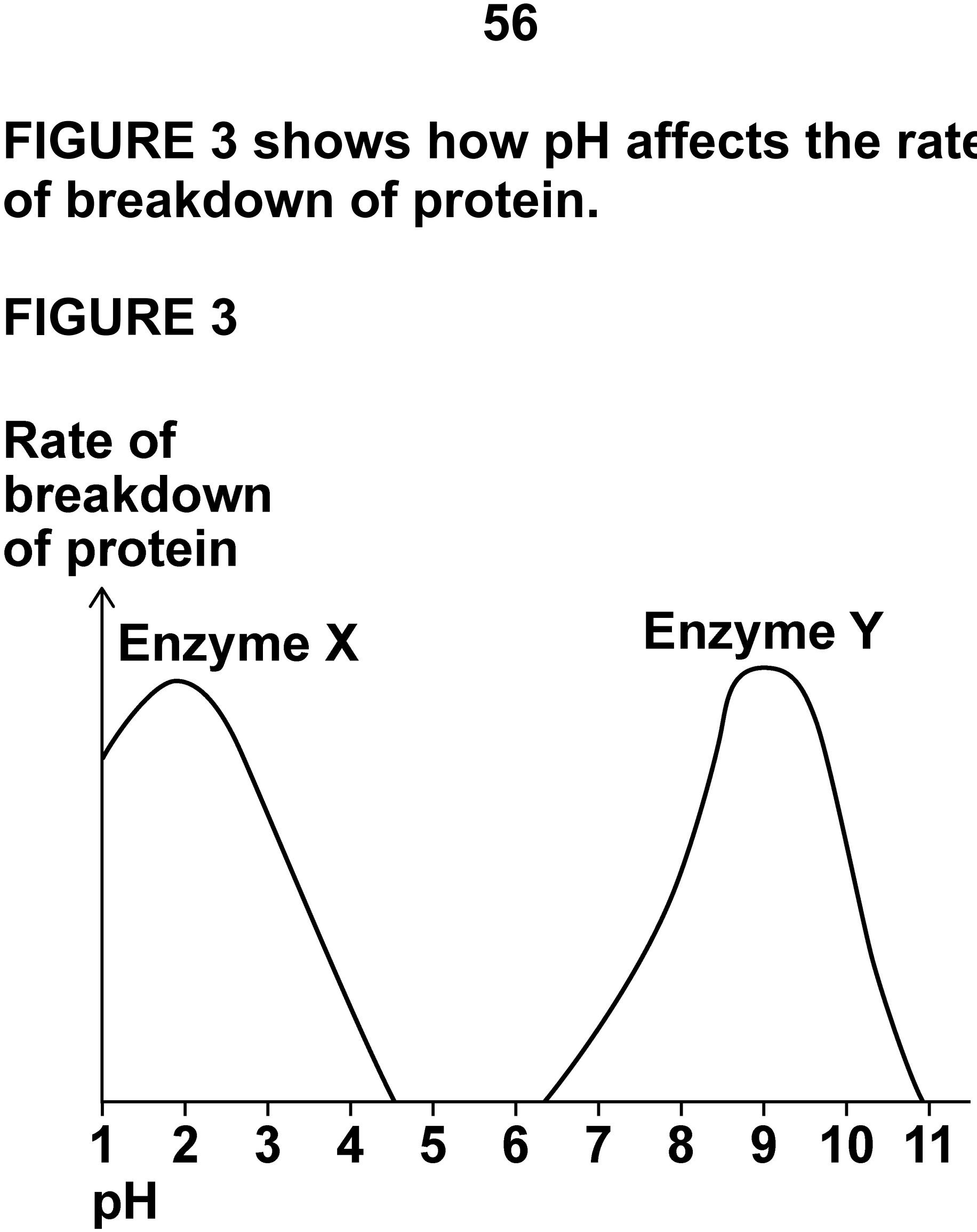
Characteristics of enzymes are linked to their function.

On the opposite page, draw ONE line from each characteristic to its effect on enzyme function. [2 marks]

CHARACTERISTIC	EFFECT ON ENZYME FUNCTION
Has a special shape	Only fits one molecule
Is a catalyst	Speeds up reactions
	Works fast at high pH

FIGURE 3 shows how pH affects the rate of breakdown of protein.

FIGURE 3



0 5 . 6

Which pH does enzyme Y work fastest at? [1 mark]

pH = _____

0 5 . 7

Explain why enzyme X works best in the stomach. [2 marks]

_____

_____

_____

_____

_____

_____

[Turn over]

0 5 . 8

Complete the sentences.

Choose answers from the list. [2 marks]

- **active site**
- **antigen**
- **glucose**
- **starch**
- **substrate**

Enzyme Y does NOT break down protein at pH 6 because the shape of the enzyme has changed.

The part of the enzyme that changes shape is the _____ .

The change in shape means the enzyme cannot bind to the _____ .

0 5 . 9

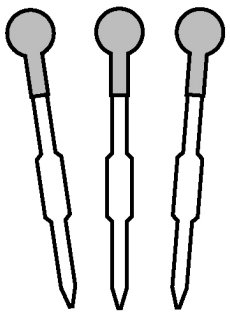
Amylase is an enzyme which breaks down starch.

A student investigated the effect of pH on the rate of starch breakdown by amylase.

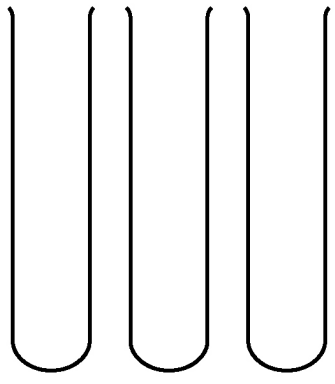
FIGURE 4, on page 60, shows some of the apparatus the student used.

[Turn over]

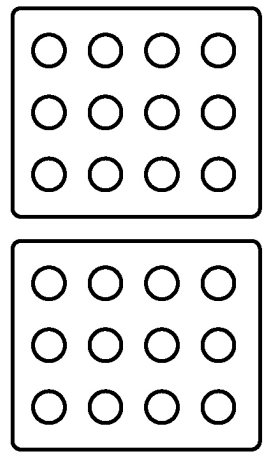
FIGURE 4



Pipettes

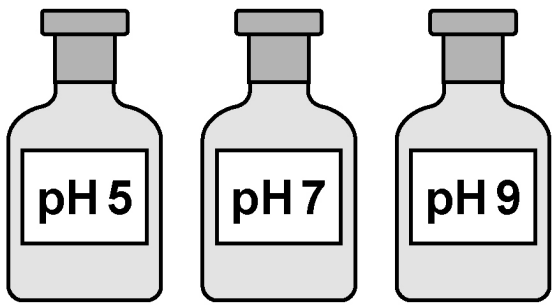


Test tubes

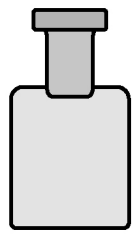


Spotting tiles

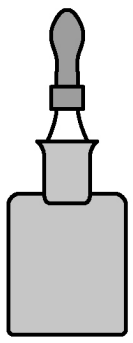
Timer



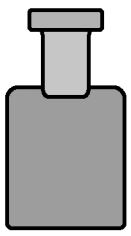
Solutions for controlling pH



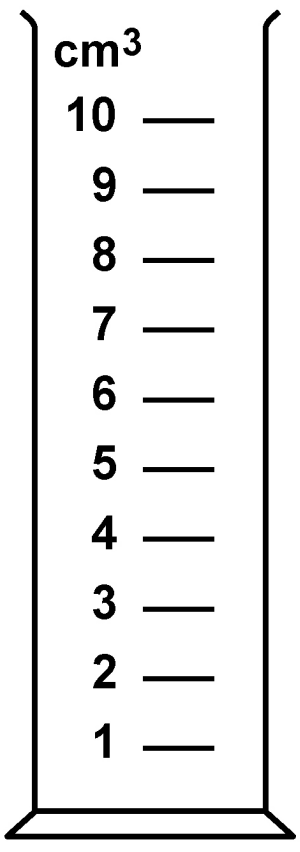
Amylase solution



Iodine solution



Starch solution



10 cm^3 measuring cylinder

Describe a method to investigate the effect of pH on the rate of starch breakdown by amylase.

You should include the apparatus shown in FIGURE 4, on the opposite page.
[6 marks]

BLANK PAGE

[Turn over]

0 6

A root is a plant organ.

Plant roots contain many different types of tissue.

0 6 . 1

What is a tissue? [1 mark]

0 6 . 2

Tissue in the tip of a plant root contains stem cells.

Stem cells can differentiate into any type of cell.

Name the type of tissue in plants that contains stem cells. [1 mark]

_____

_____

[Turn over]

In the past many drugs were extracted from plants.

0 6 . 3

Aspirin is a painkiller.

Which plant does aspirin originate from?
[1 mark]

_____

Scientists have extracted chemical A from the deadly nightshade plant.

Chemical A can be used as a painkiller.

TABLE 5, on the opposite page, shows information about where chemical A is found.

TABLE 5

Part of deadly nightshade plant	Mass of chemical A in 100 g of plant tissue in grams
Roots	1.3
Leaves	1.2
Berries	0.7

0 6 . 4

The scientists usually extract chemical A from the berries of the deadly nightshade plant.

Suggest ONE reason why berries are used instead of leaves or roots. [1 mark]

A deadly nightshade plant has chlorosis (yellow leaves).

The mass of chemical A found in the LEAVES of the plant is 60% of the mass shown in TABLE 5.

REPEAT OF TABLE 5

Part of deadly nightshade plant	Mass of chemical A in 100 g of plant tissue in grams
Roots	1.3
Leaves	1.2
Berries	0.7

0 6 . 5

Calculate the mass of chemical A in 200 g of the LEAVES with chlorosis.

Give your answer in mg. [4 marks]

Mass of chemical A = _____ mg

[Turn over]

0 6 . 6

Suggest ONE reason why the leaves of the deadly nightshade plant have chlorosis. [1 mark]

Chemical A has NOT been tested in large-scale clinical trials in the UK.

0 6 . 7

It is important for drugs to be tested in clinical trials before the drugs are approved for use by the public.

Give TWO reasons why. [2 marks]

1 _____

_____

_____

2 _____

_____

[Turn over]

There are many online reports making claims about the effects of chemical A.

Some of these reports are biased.

0 6 . 8

Suggest ONE reason why a report making claims about the effects of chemical A may be biased. [1 mark]

0 6 . 9

How can scientists be sure that claims about new drugs are valid? [1 mark]

Tick (✓) ONE box.

- ☐ **Advertise the claims on social media.**
- ☐ **Ask an international company to produce the drug.**
- ☐ **Have the claims peer reviewed.**
- ☐ **Publish the claims in a newspaper.**

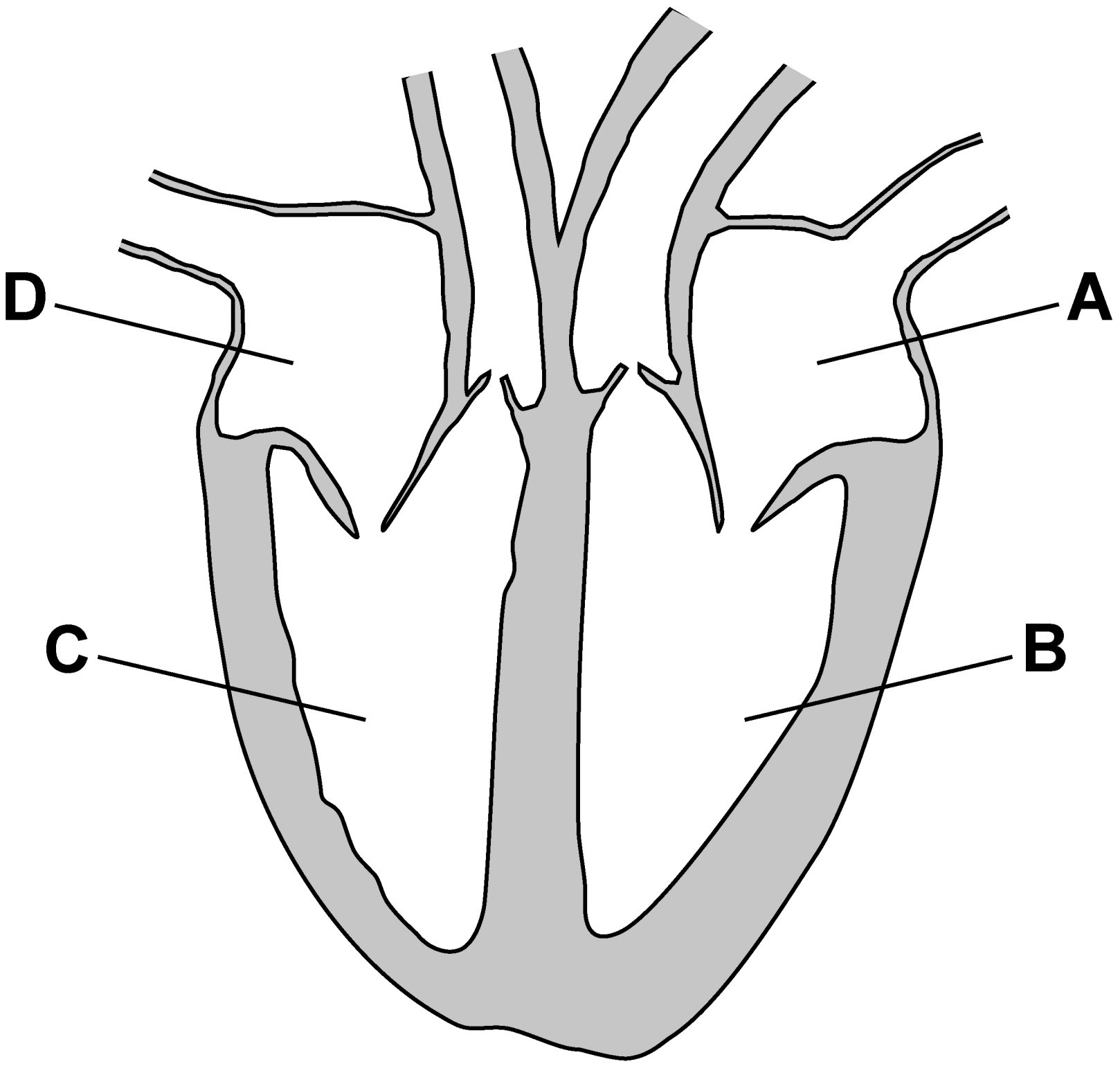
[Turn over]

0 7

This question is about the circulatory system.

FIGURE 5 shows the human heart.

FIGURE 5



0 7 . 1

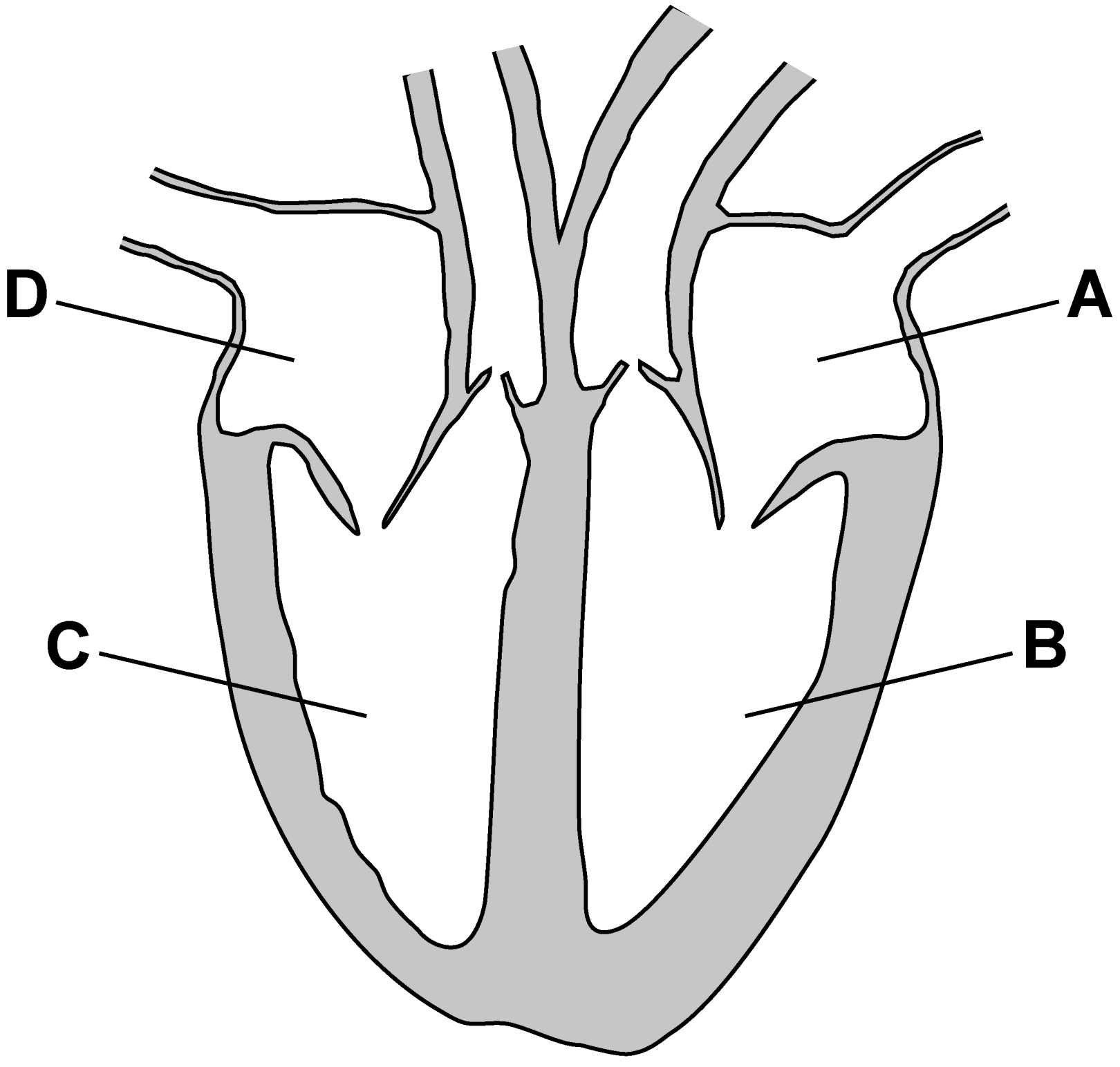
Which part of the heart receives oxygenated blood from the lungs?
[1 mark]

Tick (✓) ONE box.

- ☐ **A**
- ☐ **B**
- ☐ **C**
- ☐ **D**

[Turn over]

REPEAT OF FIGURE 5



0 7 . 2

Which part of the heart pumps deoxygenated blood to the lungs?
[1 mark]

Tick (✓) ONE box.

- ☐ **A**
- ☐ **B**
- ☐ **C**
- ☐ **D**

[Turn over]

0 7 . 3

A group of cells called the pacemaker controls the resting heart rate.

Where in the heart is the pacemaker found? [1 mark]

Tick (✓) ONE box.

- ☐ **Left atrium**
- ☐ **Left ventricle**
- ☐ **Right atrium**
- ☐ **Right ventricle**

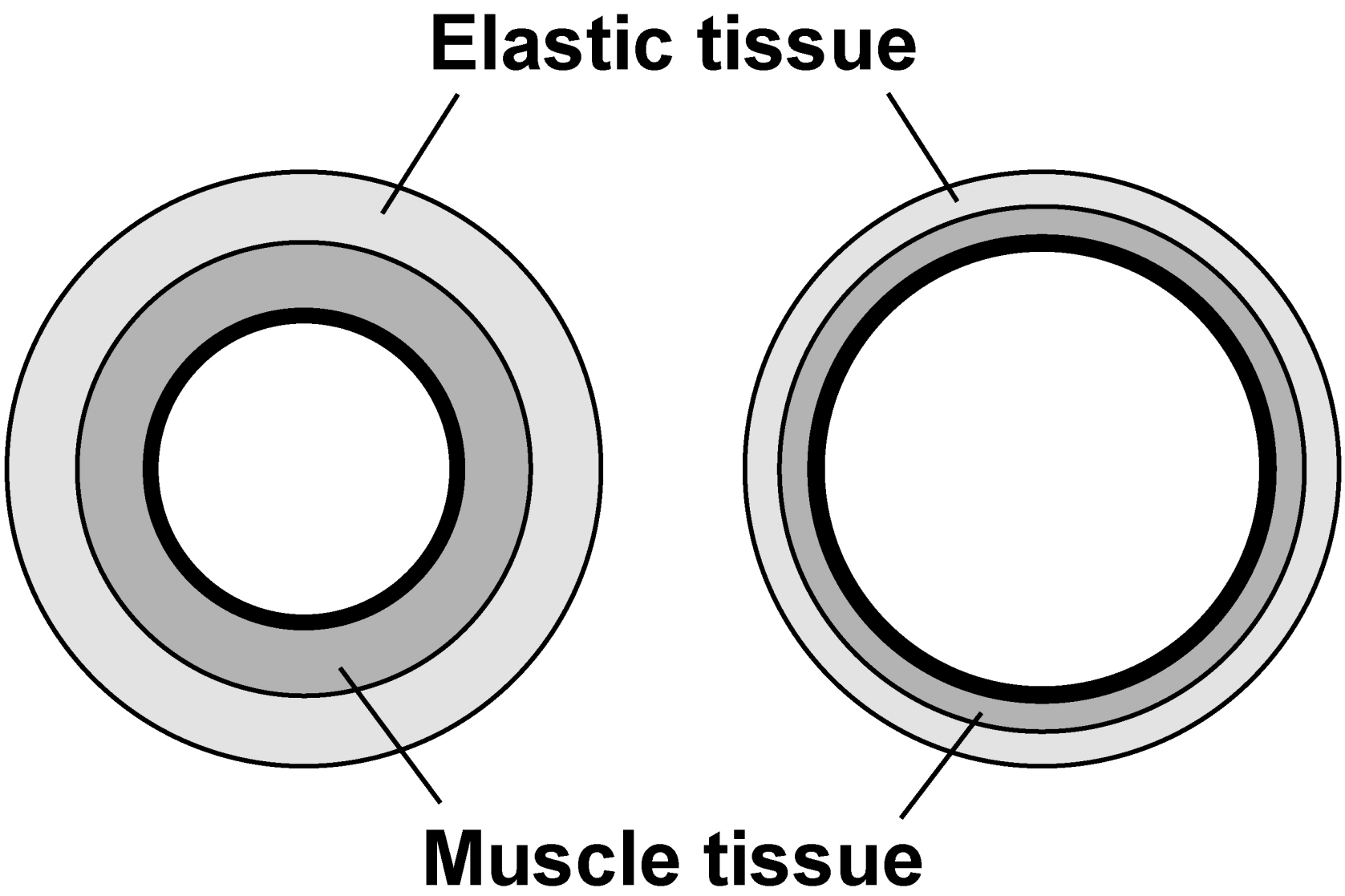
BLANK PAGE

[Turn over]

0 7 . 4

FIGURE 6 shows a cross section of an artery and of a vein.

FIGURE 6



Describe TWO ways that the structure of an artery is different from the structure of a vein. [2 marks]

1 _____

_____

2 _____

_____

_____

[Turn over]

0 7 . 5

In coronary heart disease, the coronary arteries become narrower.

A build-up of fatty material can cause a blockage in a coronary artery.

TABLE 6 shows how a blockage in a coronary artery affects blood flow.

TABLE 6

Percentage (%) of coronary artery that is blocked	Blood flow in cm^3/minute
0	100
10	64
20	42
50	8
80	2

Describe the trend shown in TABLE 6, on the opposite page. [1 mark]

_____

_____

_____

[Turn over]

REPEAT OF TABLE 6

Percentage (%) of coronary artery that is blocked	Blood flow in cm^3/minute
0	100
10	64
20	42
50	8
80	2

0 7 . 6

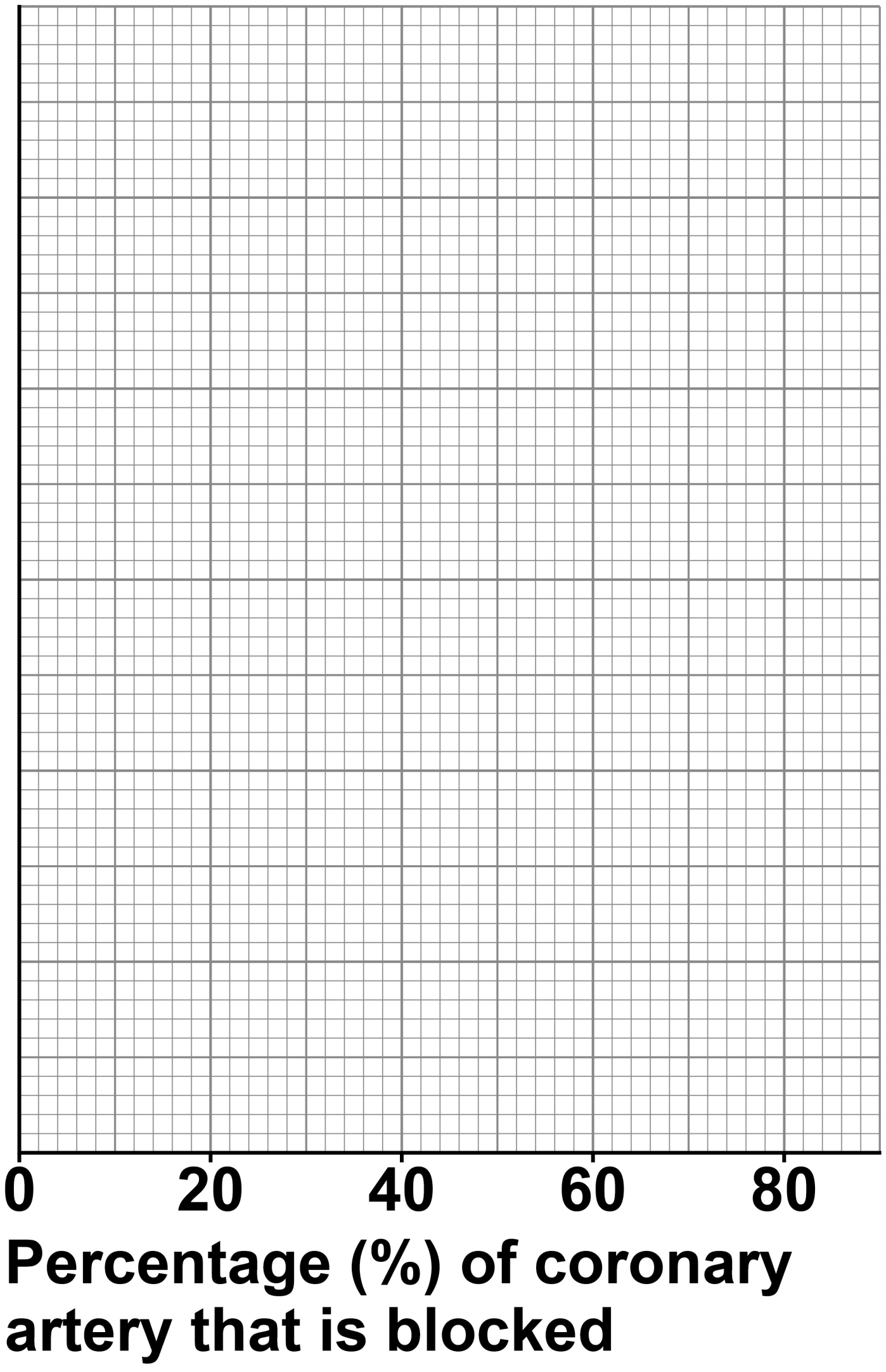
Complete FIGURE 7, on the opposite page.

You should:

- **use a suitable scale for the y-axis**
- **plot the data from TABLE 6**
- **draw a line of best fit.**

[4 marks]

FIGURE 7



[Turn over]

BLANK PAGE

0 7 . 7

Predict the blood flow in a coronary artery with a 35% blockage.

Use FIGURE 7, on page 85. [1 mark]

Blood flow = _____ cm^3/minute

[Turn over]

0 7 . 8

Explain the effect of a partly blocked coronary artery on the human body.
[6 marks]

[Turn over]

0 7 . 9

There are different treatments for a blockage in a coronary artery.

Explain how ONE treatment for a blockage in a coronary artery works.

[2 marks]

END OF QUESTIONS

19

Additional page, if required.

Write the question numbers in the left-hand margin.

Additional page, if required.

Write the question numbers in the left-hand margin.

Additional page, if required.

Write the question numbers in the left-hand margin.

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For Examiner's Use	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
TOTAL	