



Surname _____

Forename(s) _____

Centre Number _____

Candidate Number _____

Candidate Signature _____

I declare this is my own work.

GCSE
BIOLOGY

H

Higher Tier Paper 1H

8461/1H

Tuesday 16 May 2023

Morning

Time allowed: 1 hour 45 minutes

At the top of the page, write your surname and forename(s), your centre number, your candidate number and add your signature.

[Turn over]



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



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01

A root is a plant organ.

Plant roots contain many different types of tissue.

01.1

What is a tissue? [1 mark]

01.2

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 1 . 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 1 shows information about where chemical A is found.

TABLE 1

| 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 |



01.4

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]

[Turn over]



01.6

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

[Turn over]



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

0 1 . 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



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

Some of these reports are biased.

0 1 . 8

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

[Turn over]



01.9

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.

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| |
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| 13 |



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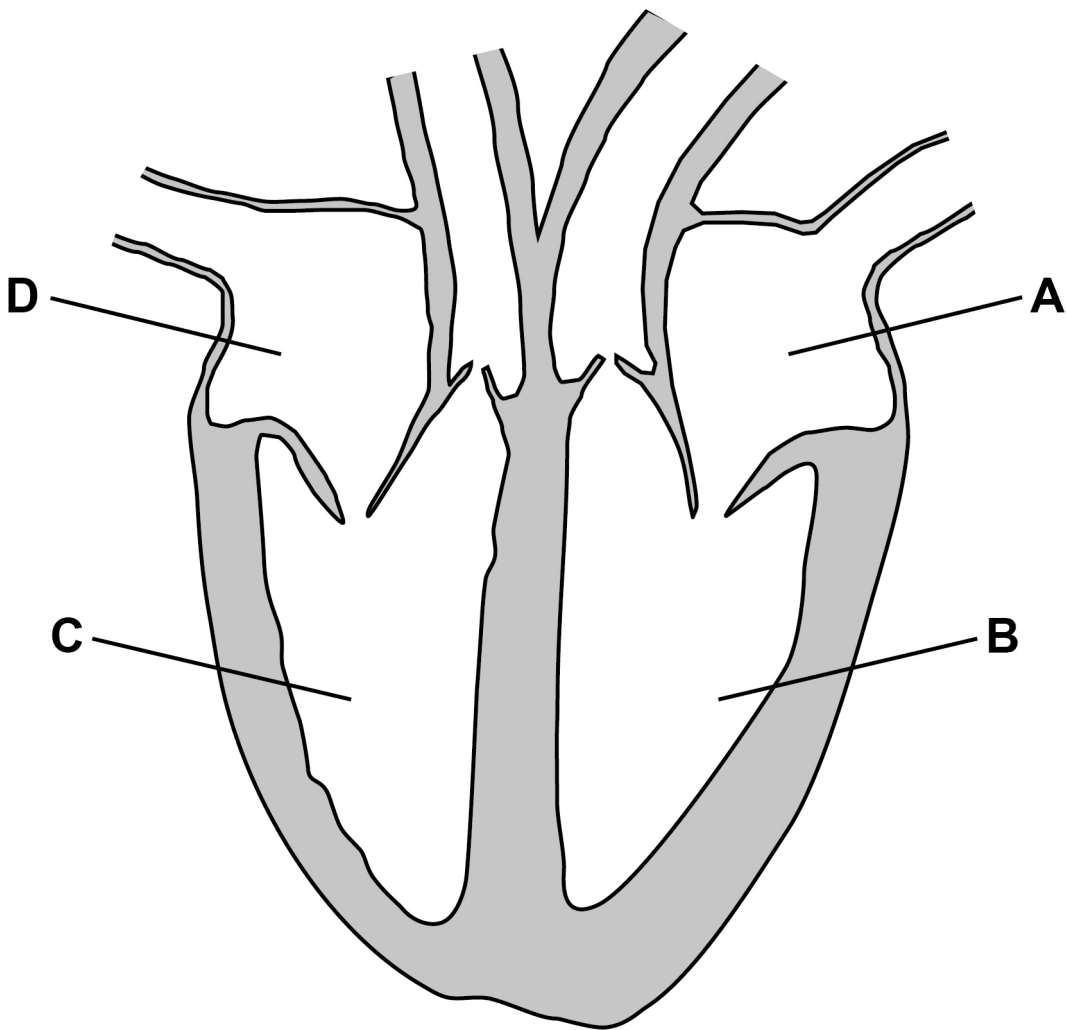


02

This question is about the circulatory system.

FIGURE 1 shows the human heart.

FIGURE 1



| | | | |
|---|---|---|---|
| 0 | 2 | . | 1 |
|---|---|---|---|

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

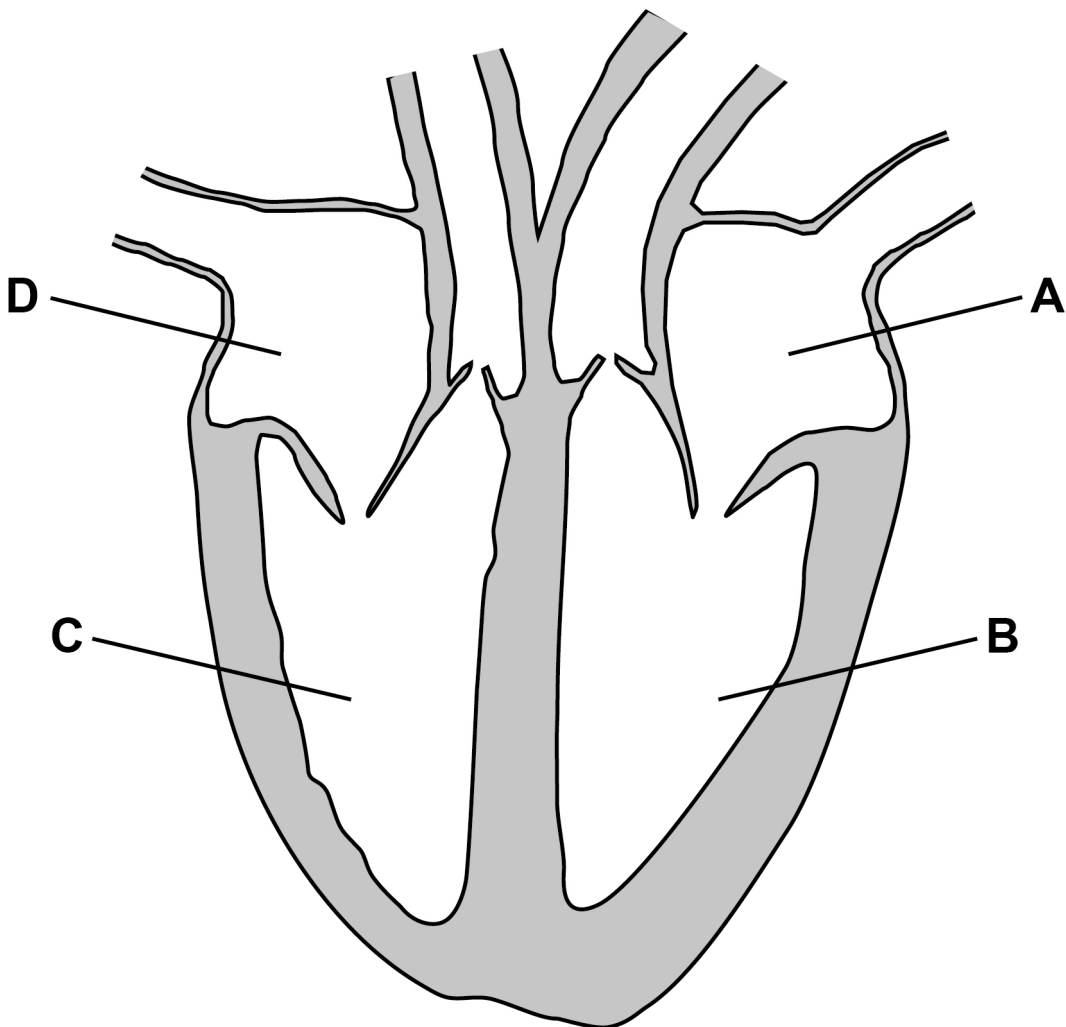
Tick (✓) ONE box.

A**B****C****D**

[Turn over]



REPEAT OF FIGURE 1



| | | | |
|---|---|---|---|
| 0 | 2 | . | 2 |
|---|---|---|---|

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

Tick (✓) ONE box, on the opposite page.



A B C D .

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

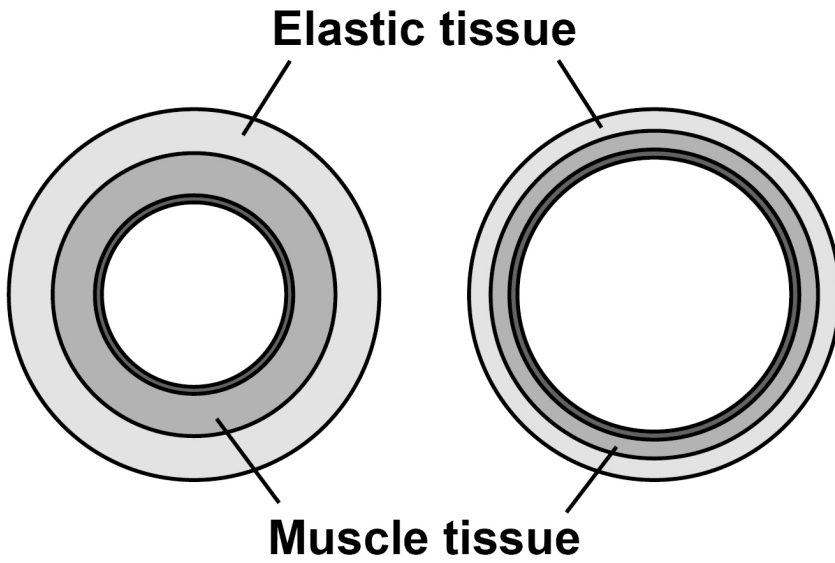
[Turn over]



02.4

FIGURE 2 shows a cross section of an artery and of a vein.

FIGURE 2



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

1

2

[Turn over]

02.5

In coronary heart disease, the coronary arteries become narrower.

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

TABLE 2 shows how a blockage in a coronary artery affects blood flow.

TABLE 2

| 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 2. [1 mark]



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[Turn over]



REPEAT OF TABLE 2

| Percentage (%) of coronary artery that is blocked | Blood flow in cm³/minute |
|--|--|
| 0 | 100 |
| 10 | 64 |
| 20 | 42 |
| 50 | 8 |
| 80 | 2 |

02.6

Complete FIGURE 3, on the opposite page.

You should:

- use a suitable scale for the y-axis
- plot the data from TABLE 2
- draw a line of best fit.

[4 marks]

02.7

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

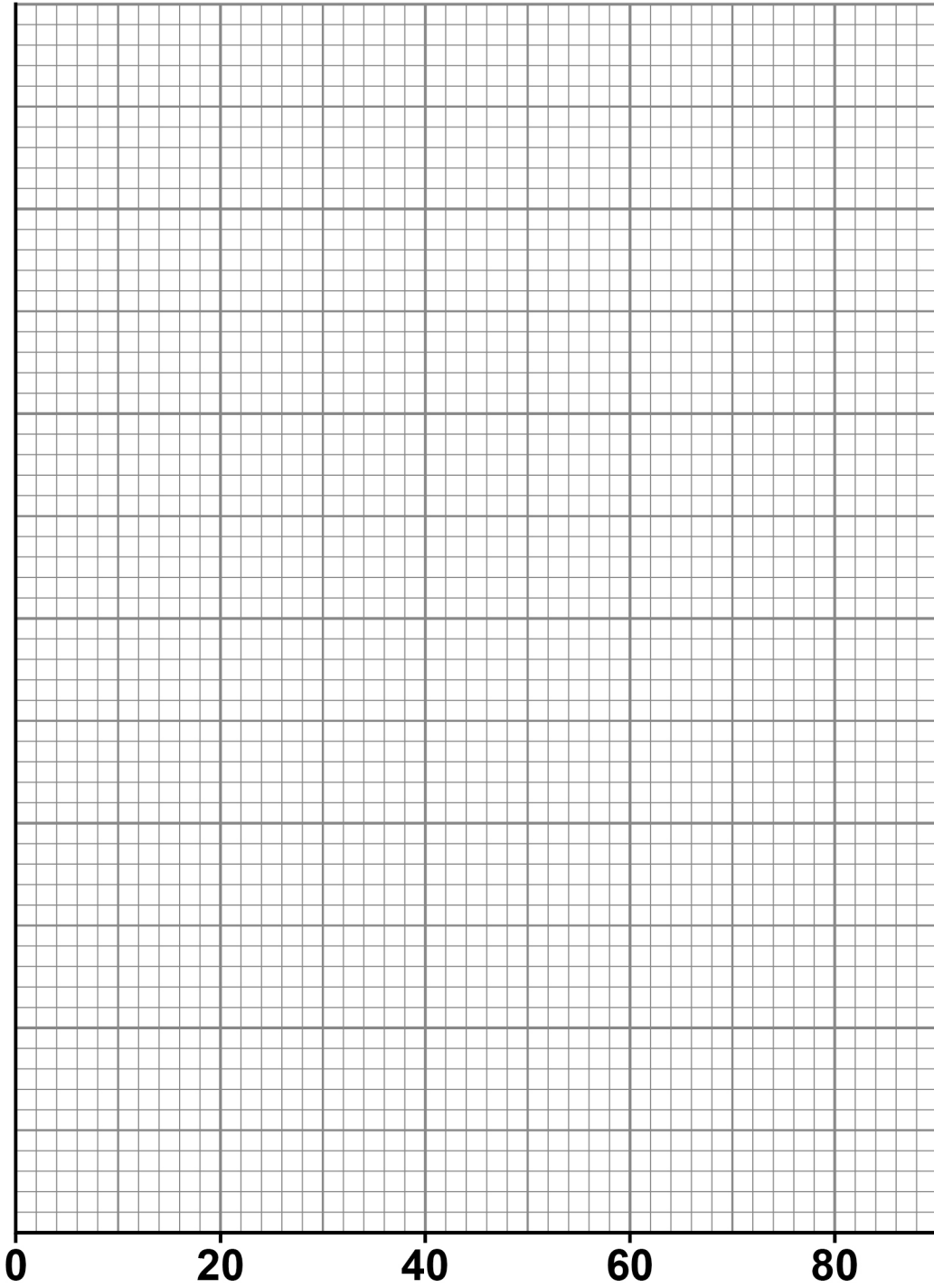
Use FIGURE 3, on the opposite page. [1 mark]

Blood flow = _____ cm³/minute



FIGURE 3

**Blood flow in
cm³/minute**



**Percentage (%) of coronary artery
that is blocked**

[Turn over]



02.9

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]

| |
|----|
| |
| 19 |



| | |
|---|---|
| 0 | 3 |
|---|---|

‘Salmonella’ bacteria cause outbreaks of food poisoning in humans.

To prevent food poisoning in humans, farmers vaccinate their animals against ‘Salmonella’ bacteria.

| | | | |
|---|---|---|---|
| 0 | 3 | . | 1 |
|---|---|---|---|

How do ‘Salmonella’ bacteria in food cause the symptoms of vomiting and diarrhoea? [1 mark]

[Turn over]



During a food poisoning outbreak, scientists identified the farm where the food came from.

The farmer had NOT vaccinated the farm animals against 'Salmonella' bacteria.

03.2

The food poisoning outbreak could have been prevented if the farm animals had been vaccinated.

Explain how:

- the immune systems of animals respond to a vaccination**
- the immune response in farm animals prevents an outbreak of food poisoning in humans.**

[4 marks]

[Turn over]



Most cases of food poisoning do NOT need to be treated with antibiotics.

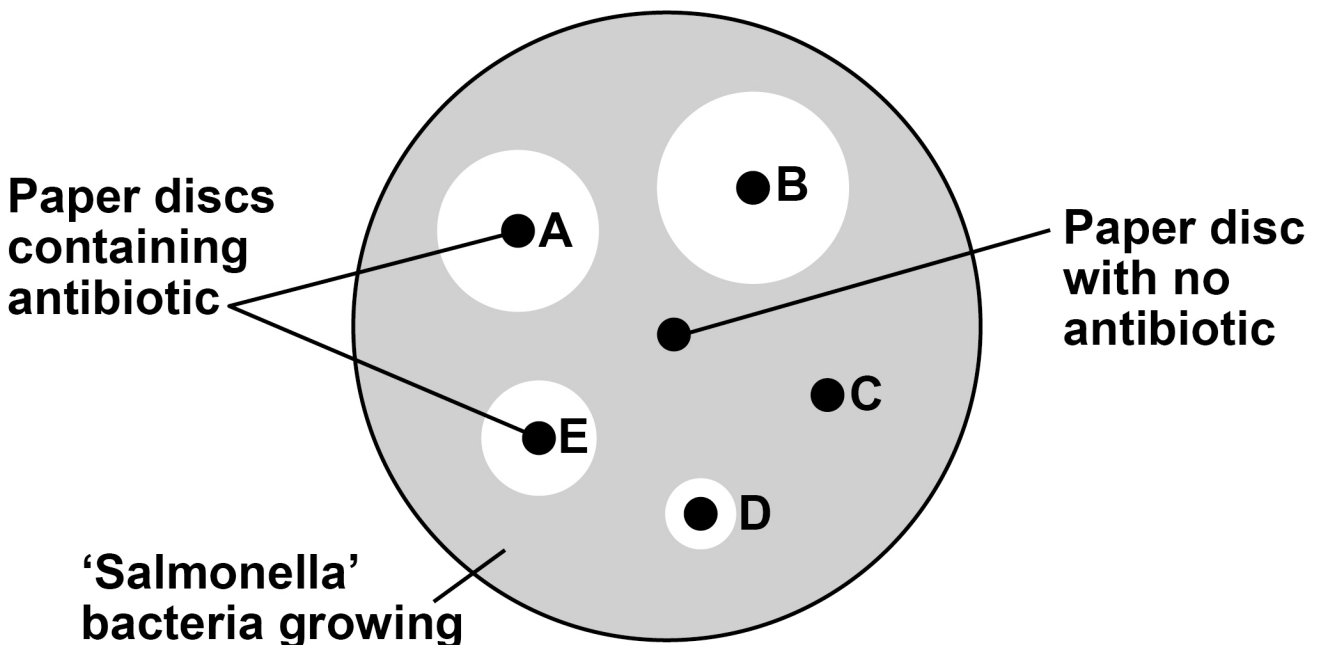
However, some patients may need to take antibiotics to recover.

Scientists investigated the effectiveness of five different antibiotics on the 'Salmonella' bacteria in the outbreak.

Antibiotics A, B, C, D and E were used in the investigation.

FIGURE 4 shows the results.

FIGURE 4



03.3

Describe TWO aseptic techniques the scientists should have used in the investigation. [2 marks]

1 _____

2 _____

[Turn over]



03.5

What is the purpose of the paper disc with no antibiotic in FIGURE 4, on page 30? [1 mark]

03.6

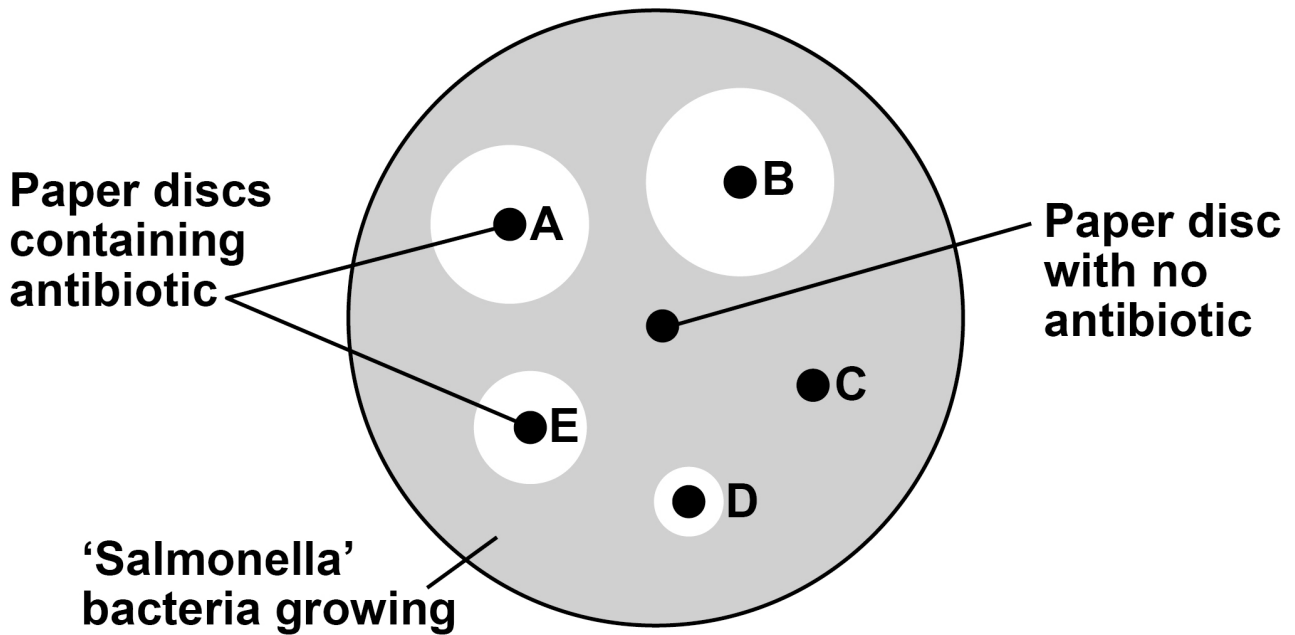
The scientists concluded that either antibiotic A or antibiotic B should be prescribed to patients with food poisoning.

Why should antibiotic A or antibiotic B be prescribed? [1 mark]

[Turn over]



REPEAT OF FIGURE 4



03.7

The scientists wanted to be more certain about which antibiotic should be prescribed.

Describe how the results in FIGURE 4 could be used to obtain a QUANTITATIVE comparison of antibiotics A and B. [1 mark]



03.8

One year later, there was another outbreak at the farm involving 'Salmonella' bacteria.

Antibiotic B did NOT have an effect.

Suggest why antibiotic B no longer had an effect.
[1 mark]

[Turn over]

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[Turn over]



| | |
|---|---|
| 0 | 4 |
|---|---|

This question is about exercise.

| | | | |
|---|---|---|---|
| 0 | 4 | . | 1 |
|---|---|---|---|

During vigorous exercise, anaerobic respiration occurs in a person's body.

Explain TWO effects of anaerobic respiration on the person's body. [4 marks]

1

2



[Turn over]



Anabolic steroids are drugs.

Anabolic steroids:

- **increase muscle mass in humans**
- **are banned in most competitive sports.**

Some athletes take anabolic steroids to improve their performance in sport.

0 4 . 3

Explain how taking anabolic steroids could improve an athlete's performance. [2 marks]

Scientists use monoclonal antibodies to test for the presence of anabolic steroids in an athlete's urine.

To produce monoclonal antibodies, a mouse lymphocyte is combined with a tumour cell.

04.4

What type of cell is created when a mouse lymphocyte and a tumour cell combine? [1 mark]

Tick (✓) ONE box.

Embryo

Hybridoma

Phagocyte

Stem cell

[Turn over]



04.6

What property makes a monoclonal antibody useful in detecting the presence of an anabolic steroid in urine? [1 mark]

Tick (✓) ONE box.

A monoclonal antibody is quick and easy to produce.

A monoclonal antibody is specific to only one person's urine.

A monoclonal antibody only binds to the anabolic steroid.

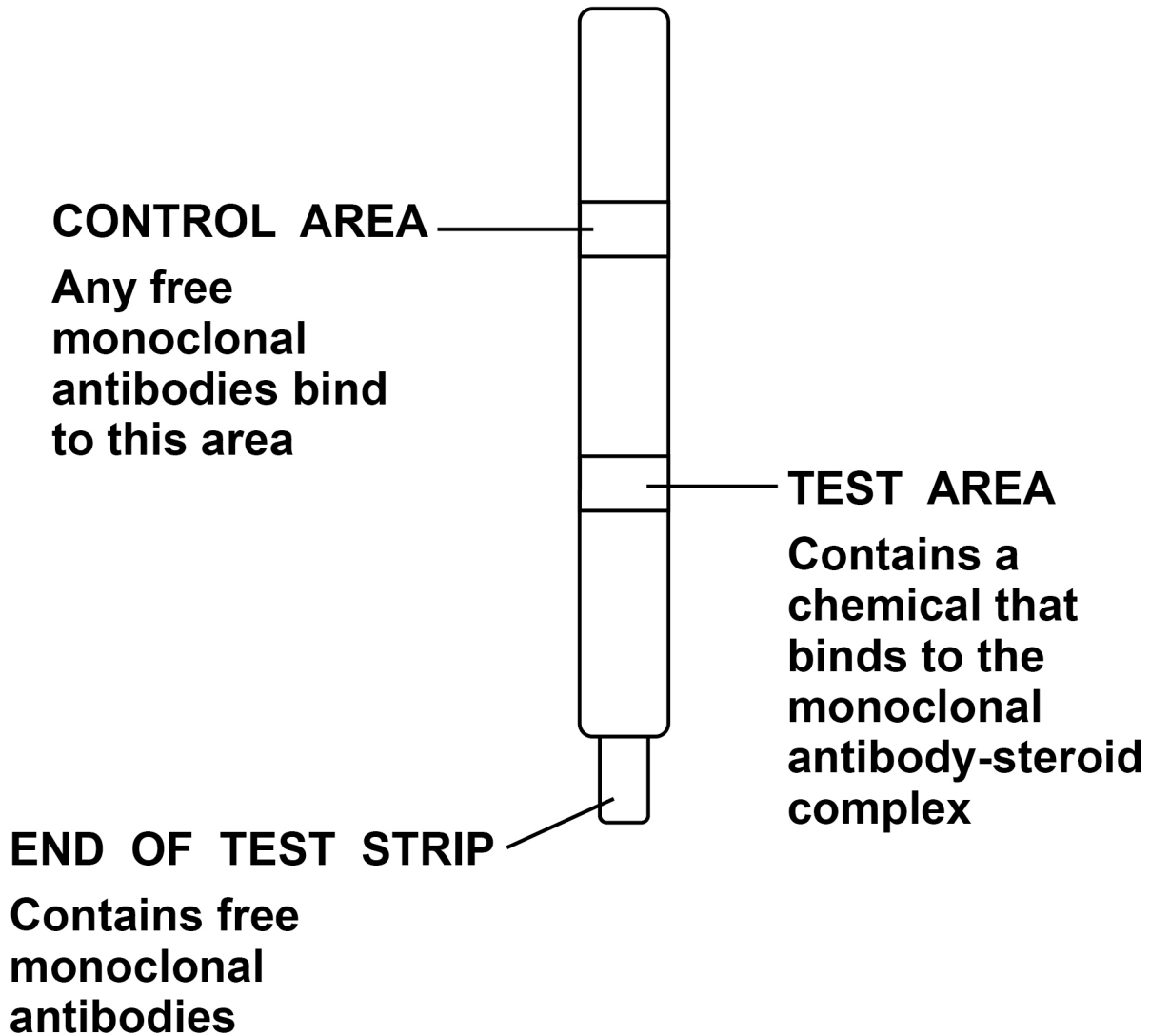
A monoclonal antibody can identify many different drugs at the same time.

[Turn over]



FIGURE 5 shows a test strip that can detect the presence of an anabolic steroid in an athlete's urine.

FIGURE 5



The end of the test strip is dipped in urine.

The urine moves up through the test strip.

The test area and the control area contain a dye.
The dye turns blue when monoclonal antibodies bind to it.

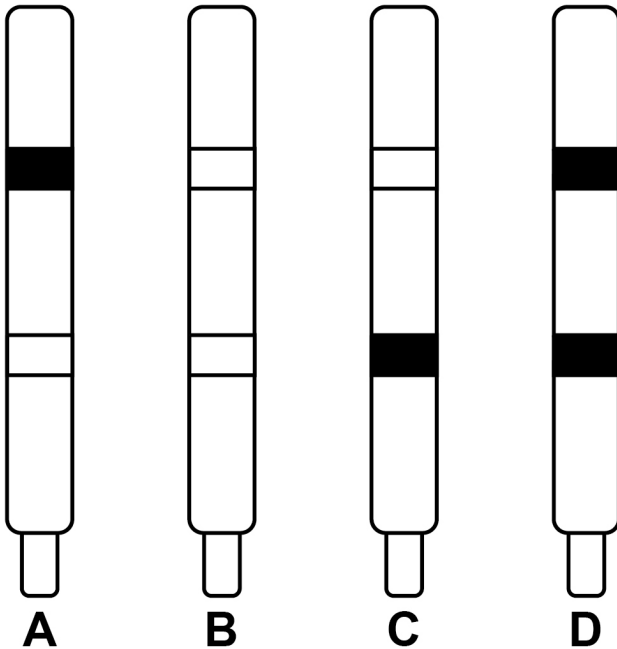
04.7

Suggest the purpose of the control area in the test strip.
[1 mark]

[Turn over]

FIGURE 6 shows the urine test results of four athletes.

FIGURE 6



KEY

■ Blue dye

0 4 . 8

Describe the evidence in **FIGURE 6** that shows the test for athlete **B** has **NOT** worked.

Suggest **ONE** reason why the test did **NOT** work.
[2 marks]

Evidence _____



Reason _____

0 4 . 9

Which athlete has tested positive for anabolic steroids in their urine? [1 mark]

Tick (✓) ONE box.

A

B

C

D

[Turn over]

21



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| | |
|---|---|
| 0 | 5 |
|---|---|

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

| | | | |
|---|---|---|---|
| 0 | 5 | . | 1 |
|---|---|---|---|

What term describes an organism that passes a pathogen from one person to another person? [1 mark]

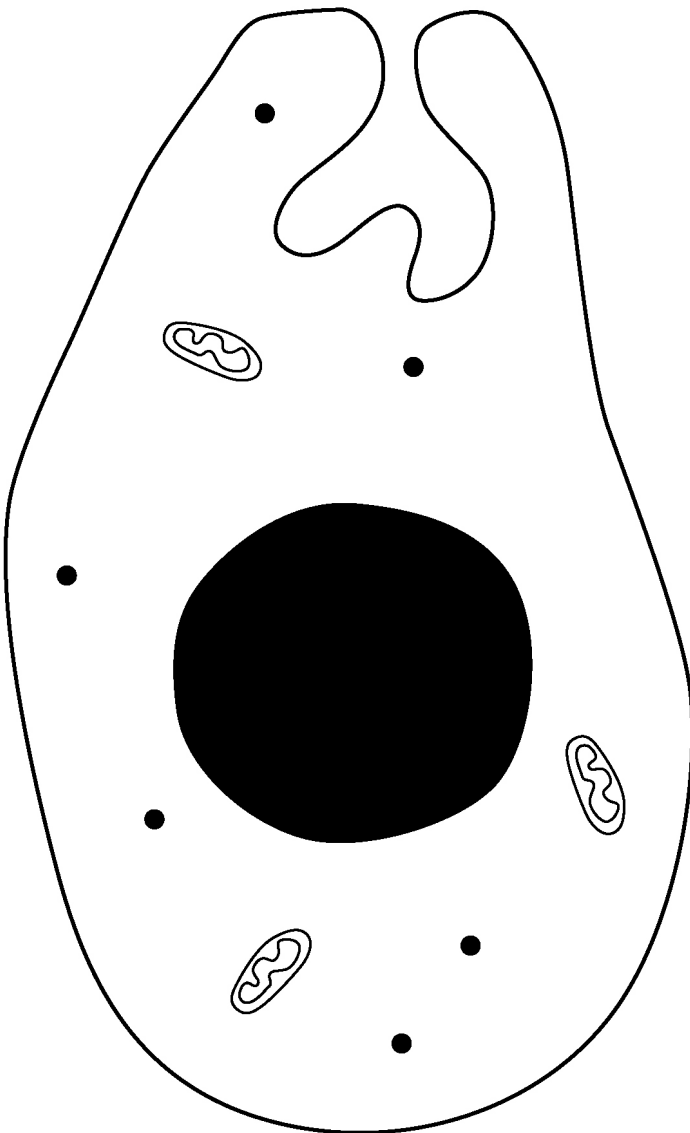
[Turn over]



05.2

FIGURE 7 shows the malarial protist.

FIGURE 7



The malarial protist is a eukaryotic cell.

Describe **THREE** ways the structure of the malarial protist is different from the structure of a prokaryotic cell.

Do **NOT** refer to size in your answer. [3 marks]

1

2

3

[Turn over]



| | | | |
|---|---|---|---|
| 0 | 5 | . | 3 |
|---|---|---|---|

During one stage of malaria infection, the malarial protists enter red blood cells and cause them to burst.

Explain why the bursting of red blood cells causes tiredness. [2 marks]



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[Turn over]



05.4

The malarial protist reproduces sexually and asexually during a life cycle.

Complete TABLE 3, on the opposite page, to give THREE differences between sexual reproduction and asexual reproduction.

One difference has been completed for you. [3 marks]



TABLE 3

| | SEXUAL REPRODUCTION | ASEXUAL REPRODUCTION |
|----------|--------------------------------|---------------------------------|
| | Involves two parents | Involves one parent |
| 1 | | |
| 2 | | |
| 3 | | |

[Turn over]



| | | | |
|---|---|---|---|
| 0 | 5 | . | 5 |
|---|---|---|---|

One drug for treating malaria prevents mitosis occurring in the malarial protist.

The drug stops the synthesis of new DNA bases in the cell.

Suggest how the drug prevents mitosis occurring.
[1 mark]

05.7

Different types of disease may interact.

Scientists studied the incidence of malaria infections in children:

- with disorder S
- without disorder S.

The incidence of malaria in children with disorder S was calculated as a percentage of the incidence in children without disorder S.

TABLE 4 shows the results.

TABLE 4

| Age in years | Calculated percentage (%) incidence of malaria in children with disorder S |
|--------------|--|
| 2 to < 4 | 69 |
| 4 to < 6 | 63 |
| 6 to < 8 | 50 |
| 8 to 10 | 45 |
| > 10 | 73 |



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| | |
|---|---|
| 0 | 6 |
|---|---|

This question is about photosynthesis.

| | | | |
|---|---|---|---|
| 0 | 6 | . | 1 |
|---|---|---|---|

Complete the symbol equation for photosynthesis.

[1 mark]



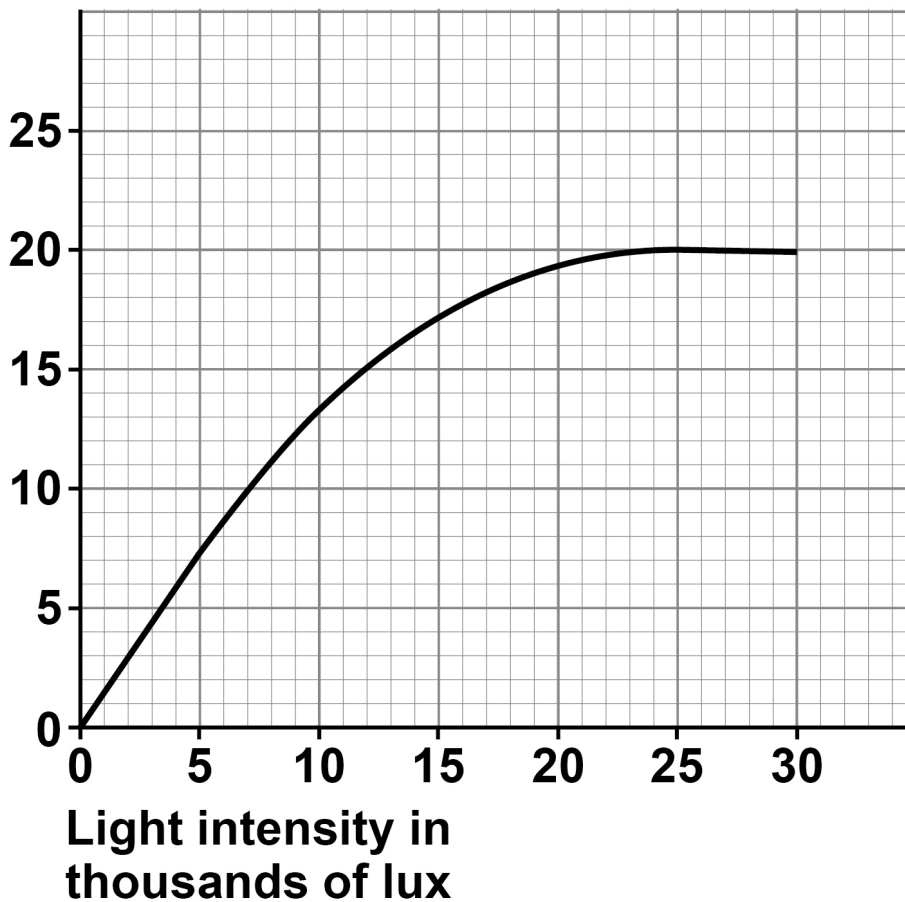
[Turn over]



FIGURE 8 shows how the rate of photosynthesis changes with light intensity.

FIGURE 8

**Rate of
photosynthesis
in arbitrary units**



06.2

Which part of the graph could be represented by the equation $y = mx + c$? [1 mark]

Tick (✓) ONE box.

From 0 to 5 000 lux

From 10 000 to 15 000 lux

From 15 000 to 20 000 lux

From 20 000 to 25 000 lux

[Turn over]



A student investigated the effect of colour of light on the rate of photosynthesis in leaves.

FIGURE 9 shows how the investigation was set up.

FIGURE 9

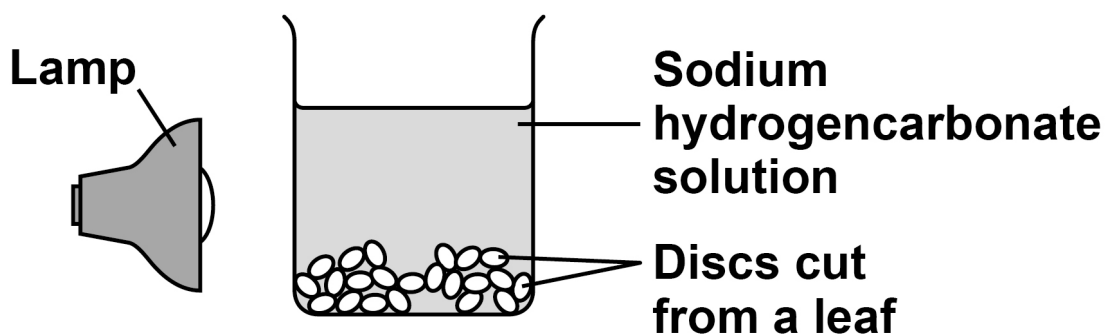


TABLE 5 shows the results.

TABLE 5

| COLOUR OF LIGHT | Time taken for 10 leaf discs to reach the surface of the solution in seconds |
|-----------------|--|
| Blue | 115 |
| Green | 831 |
| Red | 397 |

06.3

Give ONE way the student could change the colour of the light shining on the leaf discs. [1 mark]

06.4

Give the independent variable and the dependent variable in this investigation. [2 marks]

Independent variable _____

Dependent variable _____

[Turn over]



06.5

All of the air had to be removed from the leaf discs before placing them in the beaker.

Suggest ONE reason why. [1 mark]

06.6

The leaf discs were placed in a beaker of sodium hydrogencarbonate (NaHCO_3) solution.

Explain why sodium hydrogencarbonate solution was used instead of water. [2 marks]



| | | | |
|---|---|---|---|
| 0 | 6 | . | 7 |
|---|---|---|---|

Explain why the leaf discs moved to the surface of the solution during the investigation. [2 marks]

[Turn over]

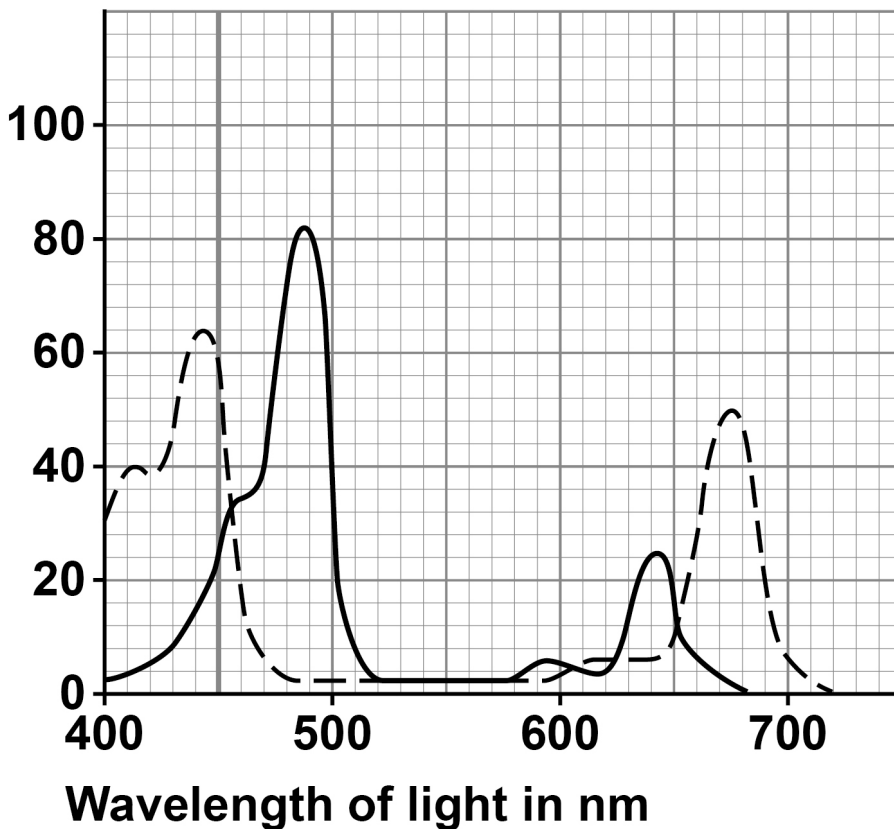


There are two types of chlorophyll in leaves.

FIGURE 10 shows the percentage of different wavelengths of light that the two types of chlorophyll absorb.

FIGURE 10

Percentage
(%) of light
absorbed



KEY

- Chlorophyll a
- Chlorophyll b



TABLE 6 shows the colour of different wavelengths of light.

TABLE 6

| | | | | | |
|---|------------------|------------------|------------------|------------------|------------------|
| Range of wavelength of light in nm | 380 – 435 | 450 – 499 | 500 – 570 | 571 – 590 | 620 – 720 |
| Colour of light | violet | blue | green | yellow | red |

0 6 . 8

Suggest the advantage to a plant of having two types of chlorophyll. [1 mark]

[Turn over]



06.9

TABLE 5 is repeated below.

TABLE 5

| COLOUR OF LIGHT | Time taken for 10 leaf discs to reach the surface of the solution in seconds |
|------------------------|---|
| Blue | 115 |
| Green | 831 |
| Red | 397 |

The leaf discs in the investigation are green.

Explain the results in TABLE 5 for blue light and for green light.

Use data from FIGURE 10 and TABLE 6. FIGURE 10 is provided on page 70 and TABLE 6 is provided on page 71. [4 marks]



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| Question | Mark |
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| 2 | |
| 3 | |
| 4 | |
| 5 | |
| 6 | |
| TOTAL | |

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