

Please write clearly in block capitals.

Centre number

Candidate number

Surname

Forename(s)

Candidate signature

I declare this is my own work.

INTERNATIONAL GCSE

COMBINED SCIENCE

Paper 1 Biology Core

C

Thursday 24 October 2024

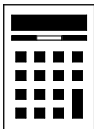
07:00 GMT

Time allowed: 1 hour 45 minutes

Materials

For this paper you must have:

- a pencil and a ruler
- a scientific calculator.



Instructions

- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- All working must be shown.
- 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.

Information

- The marks for questions are shown in brackets.
- The maximum mark for this paper is 100.
- You are expected to use a scientific calculator where appropriate.

| For Examiner's Use |      |
|--------------------|------|
| Question           | Mark |
| 1                  |      |
| 2                  |      |
| 3                  |      |
| 4                  |      |
| 5                  |      |
| 6                  |      |
| 7                  |      |
| 8                  |      |
| 9                  |      |
| 10                 |      |
| TOTAL              |      |



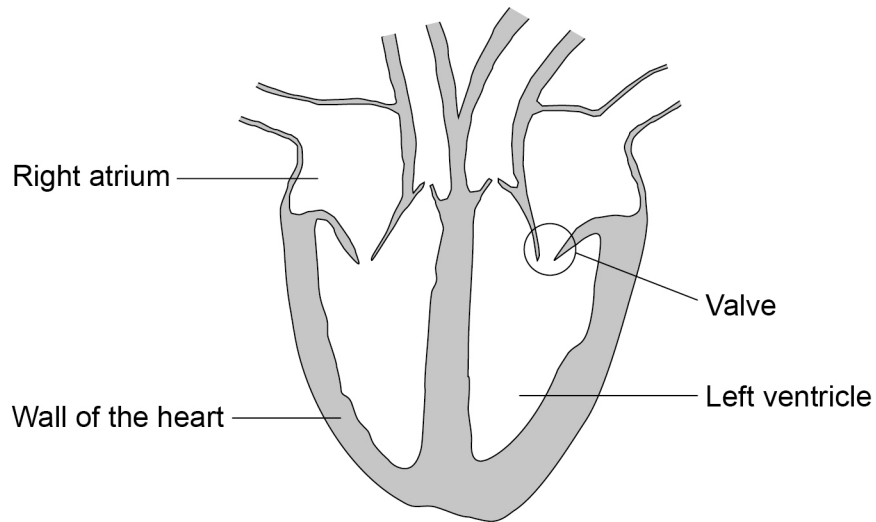
Answer **all** questions in the spaces provided.

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outside the  
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0 1

**Figure 1** shows the human heart.

**Figure 1**



0 1 . 1

What is the function of the heart?

[1 mark]

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0 1 . 2

How many chambers are there in the heart?

[1 mark]

Tick (✓) **one** box.

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|---|--------------------------|
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| 4 | <input type="checkbox"/> |
| 6 | <input type="checkbox"/> |
| 8 | <input type="checkbox"/> |



**0 1 . 3** What is the function of the valves in the heart?

**[1 mark]**

Tick (✓) **one** box.

To control the heart rate

☐

To slow down blood flow to the body

☐

To stop blood flowing in the wrong direction

☐

**0 1 . 4** Complete the sentence.

Choose the answer from the box.

**[1 mark]**

**bone**

**muscle**

**skin**

The walls of the heart are made of \_\_\_\_\_.

**Question 1 continues on the next page**

**Turn over ►**

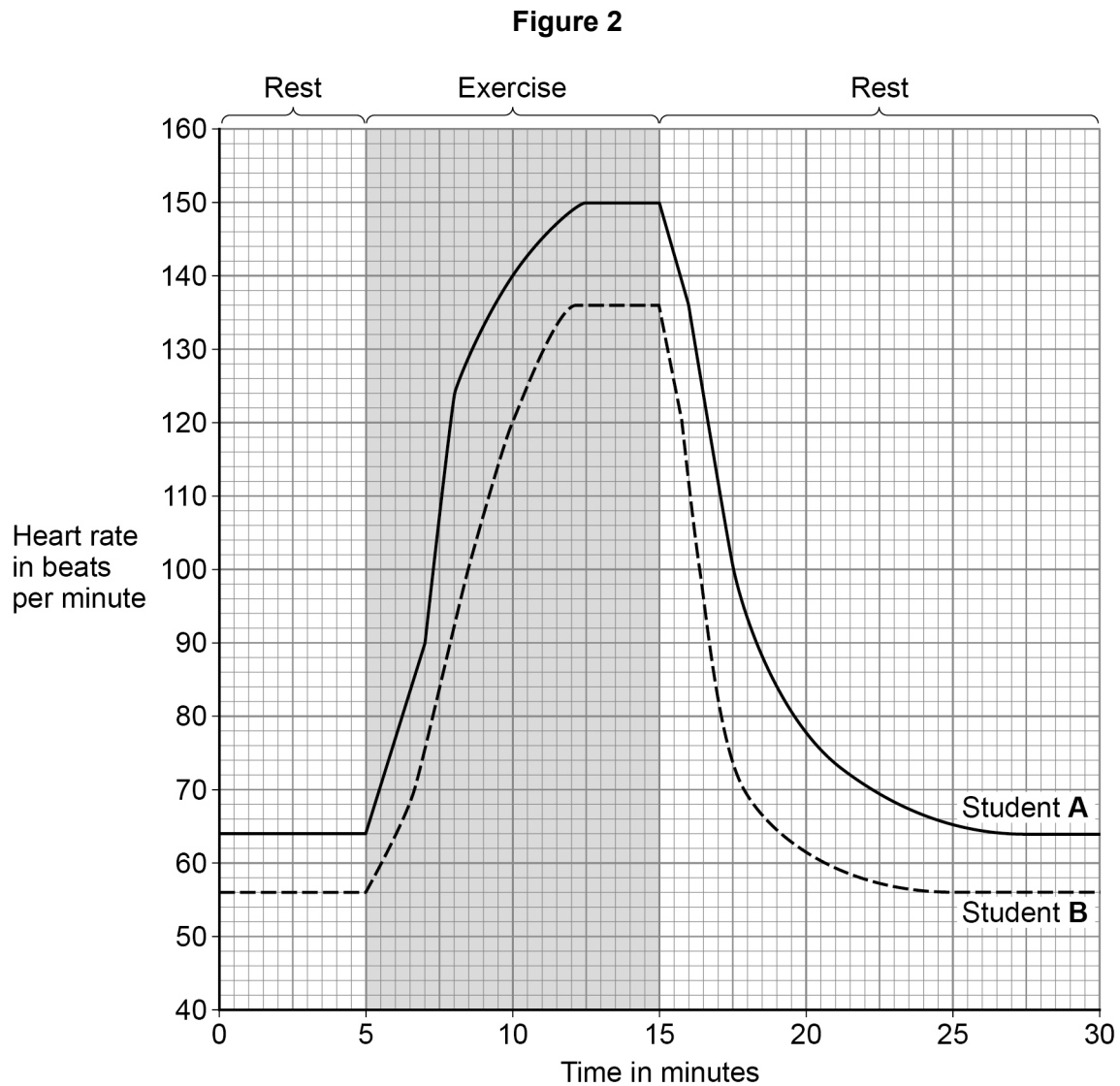


Two students investigated the effect of exercise on heart rate.

Each student recorded their heart rate:

- at rest before exercise
- during exercise
- at rest after exercise.

**Figure 2** shows the results.



**0 1 . 5** Complete **Table 1** using data from **Figure 2**.

**[2 marks]**

**Table 1**

|               | Heart rate in beats per minute |           |
|---------------|--------------------------------|-----------|
|               | Student A                      | Student B |
| At 5 minutes  | 64                             |           |
| At 15 minutes | 150                            |           |

**0 1 . 6** Describe **two** ways the heart rate of **Student B** is different to the heart rate of **Student A**.

Use **Figure 2**.

**[2 marks]**

1 \_\_\_\_\_

\_\_\_\_\_

2 \_\_\_\_\_

\_\_\_\_\_

**0 1 . 7** The heart rate of the students increases during exercise.

Complete the sentence.

**[1 mark]**

The heart rate of the students increases during exercise

to provide more glucose to the \_\_\_\_\_.

**Turn over ►**



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ANSWER IN THE SPACES PROVIDED**



0 2

Respiration releases energy in the cells of living organisms.

0 2 . 1

Complete the word equation for aerobic respiration.

Choose answers from the box.

[2 marks]

carbon dioxide

nitrogen

protein

starch

water

glucose + oxygen → \_\_\_\_\_ + \_\_\_\_\_

0 2 . 2

Complete the sentence.

Choose the answer from the box.

[1 mark]

cell membrane

mitochondria

nucleus

Aerobic respiration takes place in the \_\_\_\_\_.

0 2 . 3

When does respiration take place in animals?

[1 mark]

Tick (✓) **one** box.

All the time

☐

Only when it is dark

☐

Only when it is light

☐

Question 2 continues on the next page

Turn over ►



Mammals and birds use energy from respiration to maintain a constant body temperature.

**Table 2** shows information about six different animals.

**Table 2**

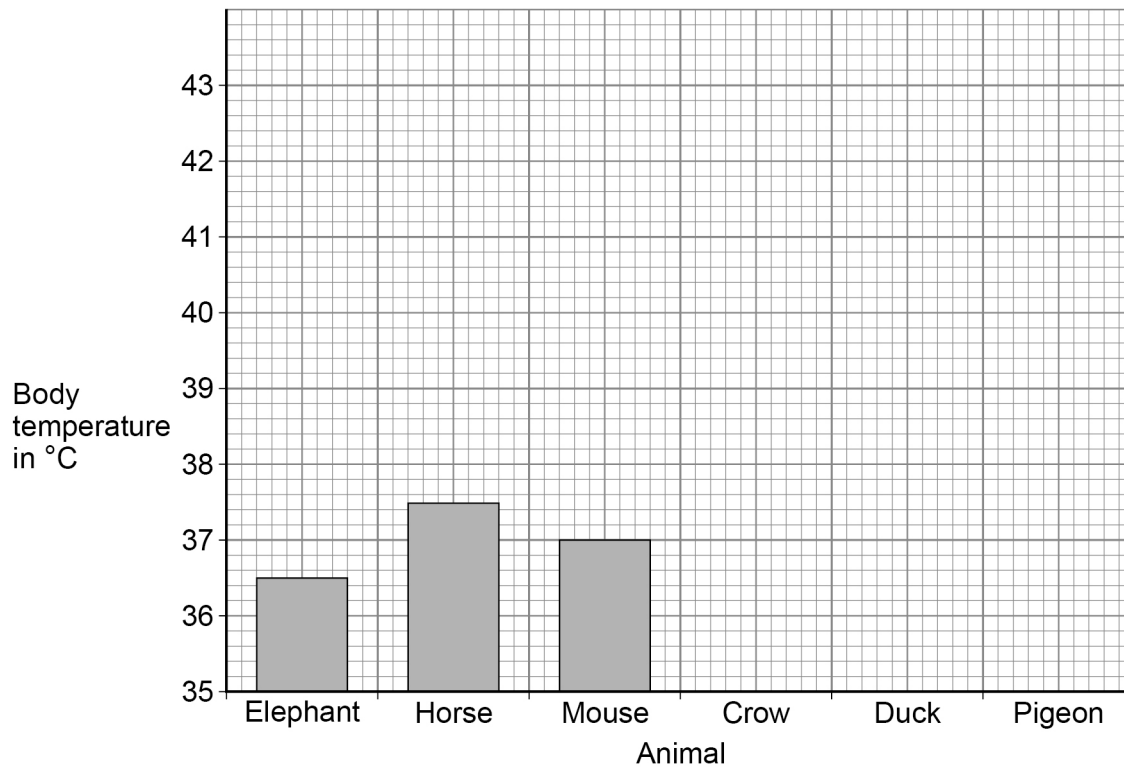
| Animal         |          | Body temperature<br>in °C | Mass<br>in kg |
|----------------|----------|---------------------------|---------------|
| <b>Mammals</b> | Elephant | 36.5                      | 4000          |
|                | Horse    | 37.5                      | 550           |
|                | Mouse    | 37.0                      | 0.0025        |
| <b>Birds</b>   | Crow     | 40.0                      | 1.5           |
|                | Duck     | 41.0                      | 3.5           |
|                | Pigeon   | 42.5                      | 0.5           |

**0 2 . 4** Complete **Figure 3**.

You should plot the remaining data for body temperature from **Table 2**.

**[2 marks]**

**Figure 3**



0 2 . 5

A student made two conclusions about the body temperature of animals:

- body temperatures of all mammals are lower than body temperatures of all birds
- larger animals have a lower body temperature than smaller animals.

Evaluate the student's conclusions.

Use information from **Table 2** and **Figure 3**.

[4 marks]

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0 2 . 6

Anaerobic respiration uses glucose but does **not** use oxygen.

What is the product of **anaerobic** respiration in animals?

[1 mark]

Tick (✓) **one** box.

Lactic acid

☐

Nitrate

☐

Starch

☐

11

Turn over ►



**0 3**

All living organisms are made of cells.

**0 3 . 1**The structures in **Table 3** are found in cells.Complete **Table 3** to show where each structure is found.Tick (✓) **one** box in each row.**[3 marks]****Table 3**

| Structure     | Only found in animal cells | Only found in bacterial cells | Found in both animal cells and bacterial cells |
|---------------|----------------------------|-------------------------------|------------------------------------------------|
| Cell membrane |                            |                               |                                                |
| Nucleus       |                            |                               |                                                |
| Plasmid       |                            |                               |                                                |

**0 3 . 2**

What are plasmids made of?

**[1 mark]**Tick (✓) **one** box.

Cellulose

☐

DNA

☐

Fat

☐

Glucose

☐

Some bacteria and viruses are pathogens.

Pathogens cause disease.

Antibiotics can be used to cure some diseases.

**0 3 . 3** Complete **Table 4** to show if each disease can be cured with antibiotics.

Tick (✓) **one** box in each row.

**[1 mark]**

**Table 4**

| Disease         | Type of pathogen | Can be cured with antibiotics |    |
|-----------------|------------------|-------------------------------|----|
|                 |                  | Yes                           | No |
| Rheumatic fever | Bacteria         |                               |    |
| Flu             | Virus            |                               |    |

A scientist tested four antibiotics to find out which one is most effective against a particular pathogen.

The scientist tested antibiotics **A**, **B**, **C** and **D**.

This is the method used.

1. Grow the pathogen in a Petri dish containing agar.
2. Soak a paper disc in a solution containing antibiotic **A**.
3. Repeat step 2 for antibiotics **B**, **C** and **D**.
4. Put the four paper discs onto the agar in the Petri dish.
5. Place the Petri dish in an incubator for 48 hours.

**0 3 . 4** Give **one** variable the scientist should have kept the same in the investigation.

**[1 mark]**

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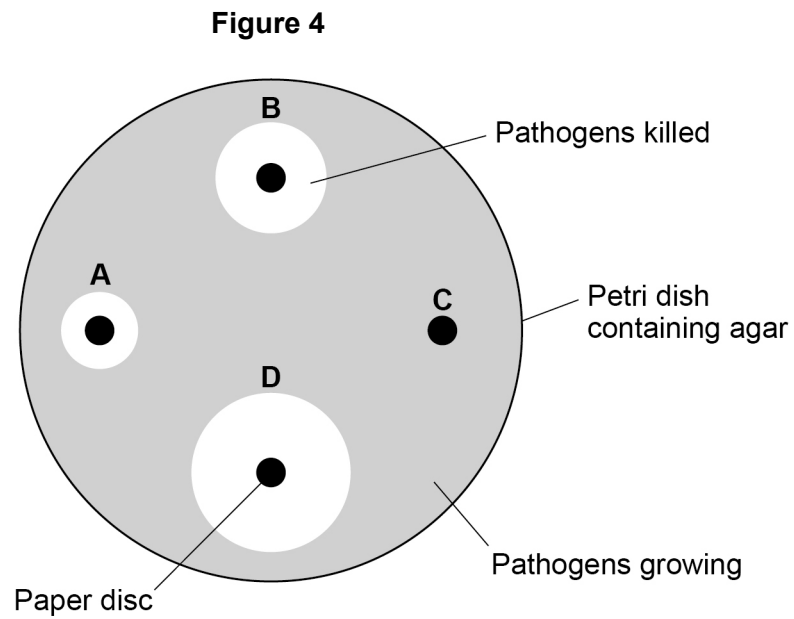


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**Turn over ►**



Figure 4 shows the scientist's results.



**0 3 . 5** Suggest **one** way the scientist could make sure all the pathogens stay in the Petri dish.

[1 mark]

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**0 3 . 6** Antibiotic particles move from the paper disc into the agar.

Complete the sentence.

Choose the answer from the box.

[1 mark]

diffusion

evaporation

osmosis

The movement of antibiotic particles from an area of high concentration to an area of low concentration is called \_\_\_\_\_.



**0 3 . 7** Which antibiotic is most effective against the pathogen used in the investigation?

Give the reason for your answer.

Use **Figure 4**.

**[2 marks]**

Antibiotic \_\_\_\_\_

Reason \_\_\_\_\_

\_\_\_\_\_

**0 3 . 8** The pathogen used in the investigation is resistant to one of the antibiotics.

What causes the development of a new resistant strain of a pathogen?

**[1 mark]**

Tick (✓) **one** box.

Adaptation

☐

Decomposition

☐

Mutation

☐

**0 3 . 9** Scientists are developing new antibiotics.

Suggest **one** reason why the development of a new antibiotic takes a long time.

**[1 mark]**

\_\_\_\_\_

\_\_\_\_\_



**0 4**

The human nervous system is a control system that contains different organs.

**0 4 . 1**

Why do humans need a nervous system?

**[1 mark]**

Tick (✓) **one** box.

To absorb nutrients from the environment

☐

To change external environmental conditions

☐

To react to changes in the environment

☐**0 4 . 2**

Which organ is part of the central nervous system?

**[1 mark]**

Tick (✓) **one** box.

Brain

☐

Nose

☐

Skin

☐

0 4 . 3

Sense organs are specialised to detect different stimuli.

Draw **one** line from each sense organ to the stimulus the sense organ detects.

[3 marks]

### Sense organ

### Stimulus

Ear

Eye

Tongue

Blood glucose concentration

Chemicals in food

Light

Sound

Water content of the body

0 4 . 4

Suggest **one** reason why there are more touch receptors in the skin on the fingertips than the skin on the back of the hand.

[1 mark]

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**Question 4 continues on the next page**

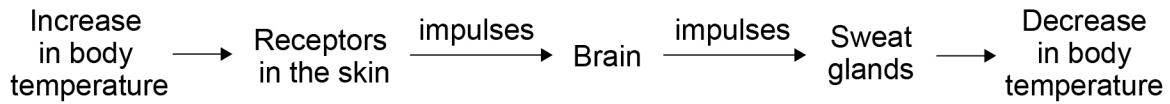
**Turn over ►**



The human body has control systems to prevent body temperature from changing too much.

**0 4 . 5** **Figure 5** shows the pathway for the response to an increase in body temperature.

**Figure 5**



Name the coordinator and the effector in **Figure 5**.

**[2 marks]**

Coordinator \_\_\_\_\_

Effector \_\_\_\_\_

**0 4 . 6** The body loses a lot of water during very hot weather.

Suggest **one** human behaviour that keeps water levels in the body constant during very hot weather.

**[1 mark]**

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**0 4 . 7** The pancreas is part of a different control system in the body.

Explain why the pancreas releases insulin.

**[2 marks]**

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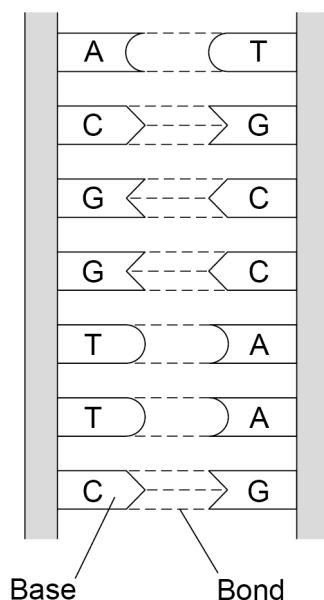
0 5

A DNA molecule has two long strands which contain bases.

Bonds between bases on opposite strands hold the two DNA strands together.

**Figure 6** shows part of a DNA molecule.

**Figure 6**



There are four different bases in DNA.

The bases are **A**, **T**, **C** and **G**.

0 5 . 1

Suggest why the number of **A** bases in DNA is always the same as the number of **T** bases in DNA.

Use information from **Figure 6**.

[1 mark]

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**Question 5 continues on the next page**

**Turn over ►**



A gene is a small section of DNA that codes for a protein.

**0 5 . 2** One gene has a total of 426 bases.

There are 64 **A** bases in the gene.

Calculate the percentage of **A** bases in the gene.

Give your answer to the nearest whole number.

**[3 marks]**

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Percentage of **A** bases (nearest whole number) = \_\_\_\_\_ %

**0 5 . 3** Three bases code for one amino acid.

One strand of DNA has 213 bases.

How many amino acids does the DNA strand code for?

**[1 mark]**

Tick (✓) **one** box.

|     |                          |
|-----|--------------------------|
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| 71  | <input type="checkbox"/> |
| 213 | <input type="checkbox"/> |
| 702 | <input type="checkbox"/> |



**0 5 . 4** Which molecule contains amino acids?

**[1 mark]**

Tick (✓) **one** box.

Amylase

☐

Glycerol

☐

Starch

☐

**0 5 . 5** Some genes code for antigens.

Where are antigens found?

**[1 mark]**

Tick (✓) **one** box.

In the cytoplasm

☐

Inside the nucleus

☐

On the surface of cells

☐

|   |
|---|
|   |
| 7 |

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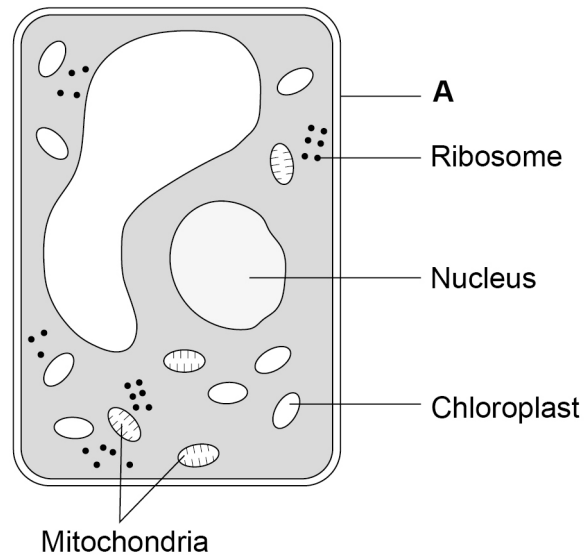


|   |   |
|---|---|
| 0 | 6 |
|---|---|

Plant cells use light energy to produce glucose.

**Figure 7** shows a plant cell.

**Figure 7**



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

|   |
|---|
| 1 |
|---|

What is part **A** in **Figure 7**?

[1 mark]

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**0 6 . 2** Which part of a plant cell contains a substance to absorb light energy?

**[1 mark]**

Tick (✓) **one** box.

Chloroplast

☐

Nucleus

☐

Ribosome

☐

Vacuole

☐

**0 6 . 3** Name the process that uses light energy to produce glucose in the leaves of plants.

**[1 mark]**

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**Question 6 continues on the next page**

**Turn over ►**



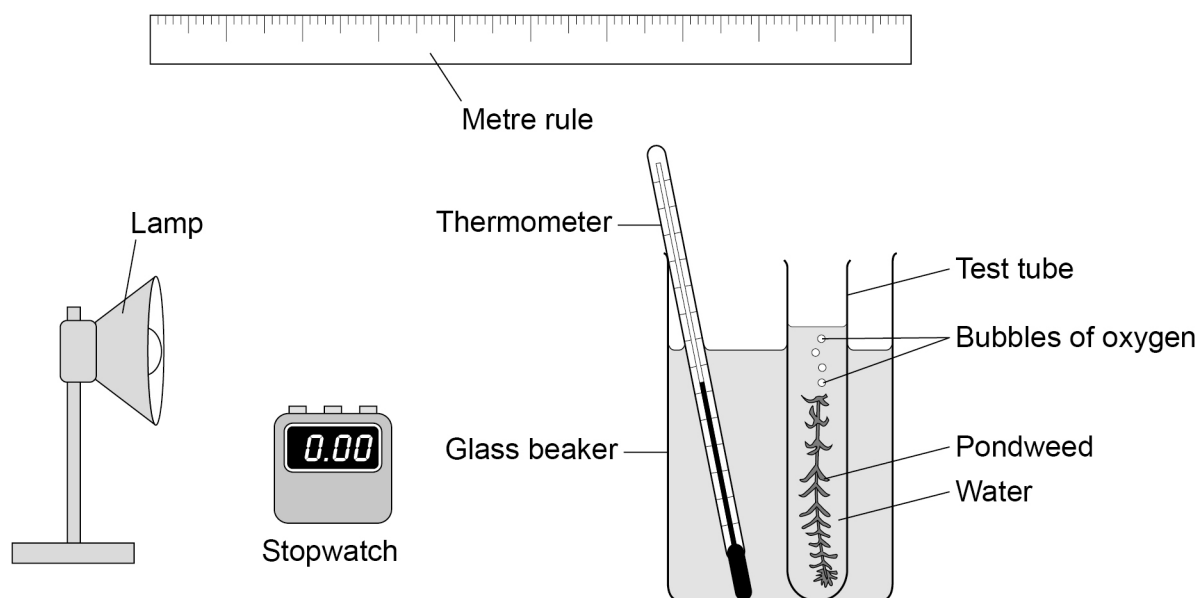
0 6 . 4

A student investigated how light intensity affects oxygen production by pondweed.

Pondweed is a plant that lives in water.

**Figure 8** shows the apparatus.

**Figure 8**



Describe a method the student could use.

**[4 marks]**

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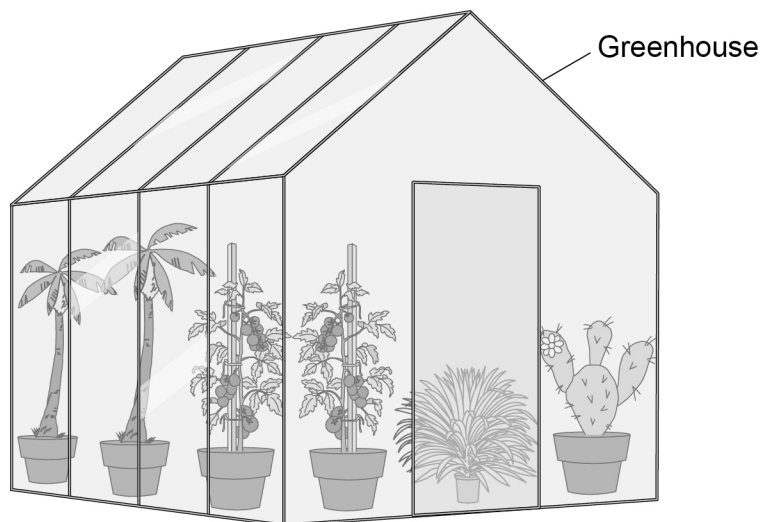
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People put plants into a greenhouse to help the plants to grow.

**Figure 9** shows a greenhouse made of glass.

**Figure 9**



0 6 . 5

Suggest why the plants in the greenhouse grow faster when the windows of the greenhouse are clean.

[1 mark]

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0 6 . 6

Suggest why the plants in the greenhouse grow faster when wood is safely burned inside the greenhouse.

[1 mark]

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07

Scientists have evidence to support the theory that organisms evolve over time.

Figure 10 shows how horses have changed over time.

Figure 10

| Date         | 35 million years ago                                                                | 26 million years ago                                                                | 3 million years ago                                                                   |
|--------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| Name         | Mesohippus                                                                          | Merychippus                                                                         | Equus                                                                                 |
| Appearance   |    |    |    |
| Height in cm | 52                                                                                  | 100                                                                                 | 135                                                                                   |
| Foot         |   |   |   |
| Skull        |  |  |  |

07.1

Give **two** ways Equus is different to Mesohippus.

[2 marks]

- 1 \_\_\_\_\_  
\_\_\_\_\_
- 2 \_\_\_\_\_  
\_\_\_\_\_

**0 7 . 2** Scientists collected evidence that showed the differences between the horses.

Suggest what type of evidence the scientists collected.

[1 mark]

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**0 7 . 3** What is the name of the process that leads to evolution?

[1 mark]

Tick (✓) **one** box.

Asexual reproduction

☐

Cell division

☐

Natural selection

☐

**0 7 . 4** Differences in the characteristics of horses can be caused by:

- genes only
- both genes **and** the environment.

Complete **Table 5**.

Tick (✓) **one** box in each row.

[2 marks]

**Table 5**

| Difference in | Caused by genes only | Caused by both genes and the environment |
|---------------|----------------------|------------------------------------------|
| Eye colour    |                      |                                          |
| Speed         |                      |                                          |
| Strength      |                      |                                          |

Turn over ►



Police horses are used by some police forces.

**0 7 . 5** What type of behaviour is shown by horses when they learn to respond to the commands of the trainer?

**[1 mark]**

Tick (✓) **one** box.

Conditioning

☐

Habituation

☐

Imprinting

☐

Migration

☐

**0 7 . 6** Police horses are exposed to a lot of sounds during their training.

What type of behaviour is shown by horses when they no longer react to loud or sudden sounds?

**[1 mark]**

Tick (✓) **one** box.

Conditioning

☐

Habituation

☐

Imprinting

☐

Migration

☐

0 7 . 7

**Figure 11** shows some police horses.

Police horses are used to search for people who are lost.

**Figure 11**

The characteristics of horses selected to be police horses include:

- calm
- good balance and movement
- intelligent
- powerful and strong.

Describe **two** reasons why these characteristics make the horses suitable to be police horses.**[2 marks]**

1 \_\_\_\_\_

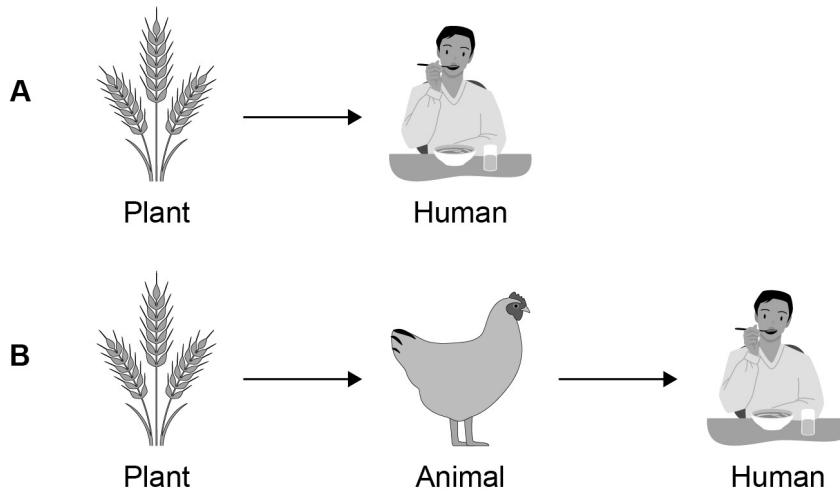
2 \_\_\_\_\_

10



0 8

Farmers produce food for humans.

**Figure 12** shows two food chains.**Figure 12**

0 8

. 1

What is the source of energy for both food chains in **Figure 12**?**[1 mark]**


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0 8

. 2

In food chain **A**, 10% of the energy transferred by the plants can be used by humans.In food chain **B**, 1% of the energy transferred by the plants can be used by humans.

Explain why there is a difference in the percentage of energy that can be used by humans between the two food chains.

**[2 marks]**


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People who grow crops use chemicals to help the crops grow bigger.

The chemicals include:

- fertiliser that contains nitrate ions
- herbicide that kills unwanted plants
- insecticide that kills insects that feed on the plants
- rooting powder that stimulates root growth.

0 8 . 3

Describe how each chemical helps the crops grow bigger.

**[4 marks]**

Fertiliser \_\_\_\_\_

\_\_\_\_\_

Herbicide \_\_\_\_\_

\_\_\_\_\_

Insecticide \_\_\_\_\_

\_\_\_\_\_

Rooting powder \_\_\_\_\_

\_\_\_\_\_

**Question 8 continues on the next page**

**Turn over ►**



Genetically modified (GM) crops have genes from a different species added to their cells.

0 8 . 4

Give **two** reasons why some crops are genetically modified.

[2 marks]

1 \_\_\_\_\_

\_\_\_\_\_

2 \_\_\_\_\_

\_\_\_\_\_

0 8 . 5

Give **one** reason why some scientists are concerned about people eating genetically modified (GM) crops.

[1 mark]

\_\_\_\_\_

\_\_\_\_\_

10

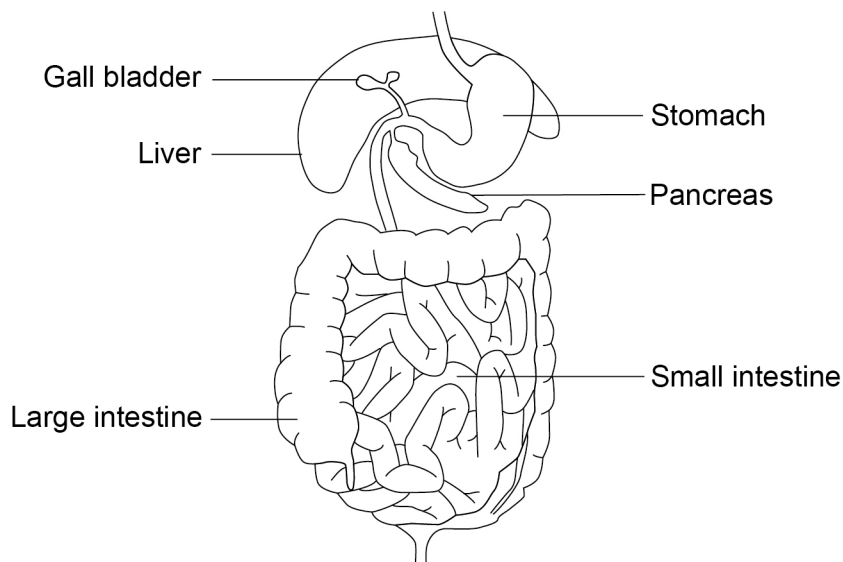


0 9

Enzymes break down food in the digestive system.

**Figure 13** shows part of the human digestive system.

**Figure 13**



0 9

1

The organs in the digestive system have different functions.

Draw **one** line from each function to the organ that carries out the function.

**[2 marks]**

**Function**

**Organ**

Produces amylase, lipase  
and protease

Produces bile

Gall bladder

Large intestine

Liver

Pancreas

Stomach



The enzyme lipase catalyses the breakdown of fat into glycerol and fatty acids.

A student investigated the effect of bile on the breakdown of fat in milk by lipase.

This is the method used.

1. Add a milk solution to a beaker.
2. Add 4.5 cm<sup>3</sup> of 5% bile solution to the beaker.
3. Place the beaker into a water bath at 37 °C.
4. When the mixture reaches 37 °C, add 5 cm<sup>3</sup> of lipase solution.
5. Use a pH probe to measure the pH of the mixture.
6. Record the pH every 2 minutes for 20 minutes.
7. Repeat steps 1 to 6 using water instead of bile solution in step 2.

**0 9 . 2** The milk solution contains milk and sodium carbonate.

Sodium carbonate is an alkali.

Why is sodium carbonate added to the mixture?

**[1 mark]**

Tick (✓) **one** box.

To control the volume of the mixture

☐

To kill the bacteria in the milk

☐

To raise the pH for lipase to work

☐

**0 9 . 3** The pH of the milk solution changes when fat is broken down into fatty acids.

Complete **Table 6** for the variables in the investigation.

Tick (✓) **one** box in each row.

**[3 marks]**

**Table 6**

| <b>Variable</b>         | <b>Control variable</b> | <b>Dependent variable</b> | <b>Independent variable</b> |
|-------------------------|-------------------------|---------------------------|-----------------------------|
| Change in pH            |                         |                           |                             |
| Temperature             |                         |                           |                             |
| Use of bile solution    |                         |                           |                             |
| Volume of milk solution |                         |                           |                             |

**Question 9 continues on the next page**

**Turn over ►**



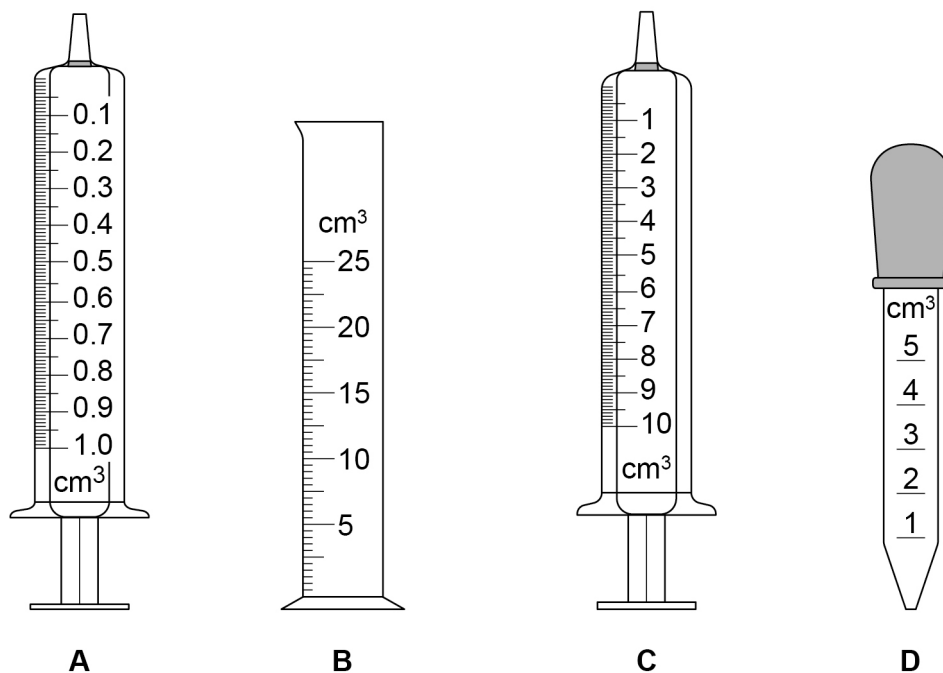
0 9 . 4

The student used different apparatus to measure the volumes of solutions during the investigation.

**Figure 14** shows apparatus used to measure volumes of solution.

The apparatus are **not** drawn to scale.

**Figure 14**



Which apparatus would measure 4.5 cm<sup>3</sup> of solution most accurately?

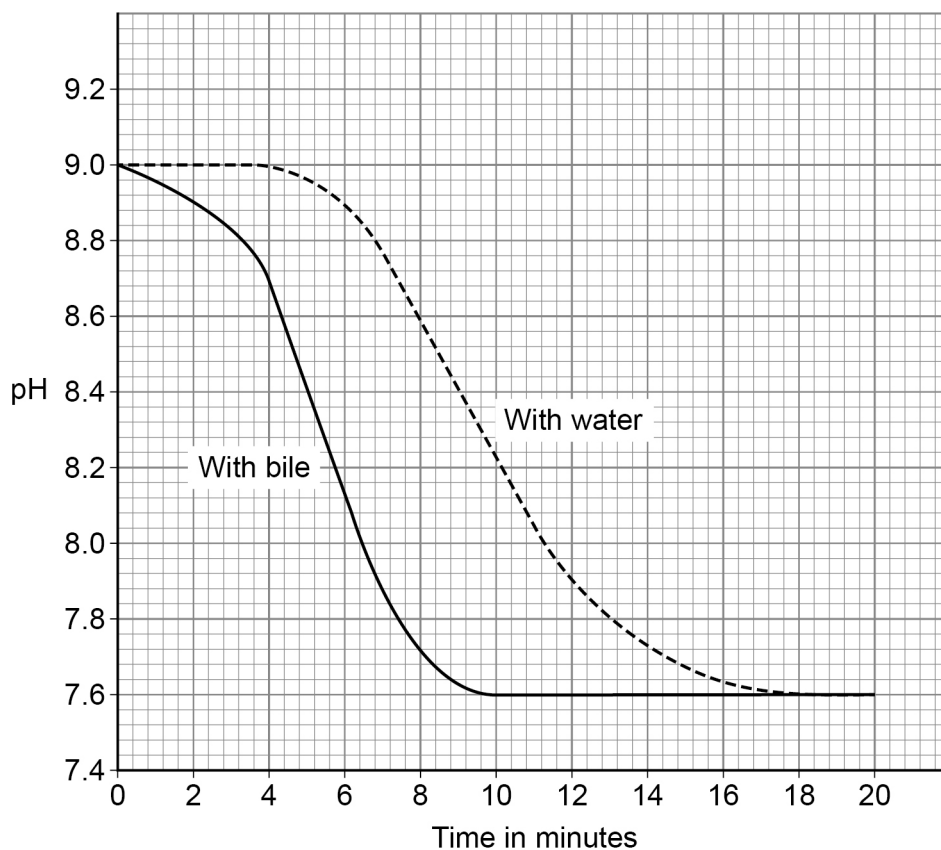
**[1 mark]**

Tick (✓) **one** box.

|          |                          |
|----------|--------------------------|
| <b>A</b> | <input type="checkbox"/> |
| <b>B</b> | <input type="checkbox"/> |
| <b>C</b> | <input type="checkbox"/> |
| <b>D</b> | <input type="checkbox"/> |

Figure 15 shows the results.

Figure 15



0 9 . 5

The student concluded:

'The results show that bile is essential for the breakdown of fat.'

Evaluate the student's conclusion.

Use Figure 15.

[2 marks]

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Question 9 continues on the next page

Turn over ►



**Figure 16** shows the effect of bile on a large fat droplet.

**Figure 16**

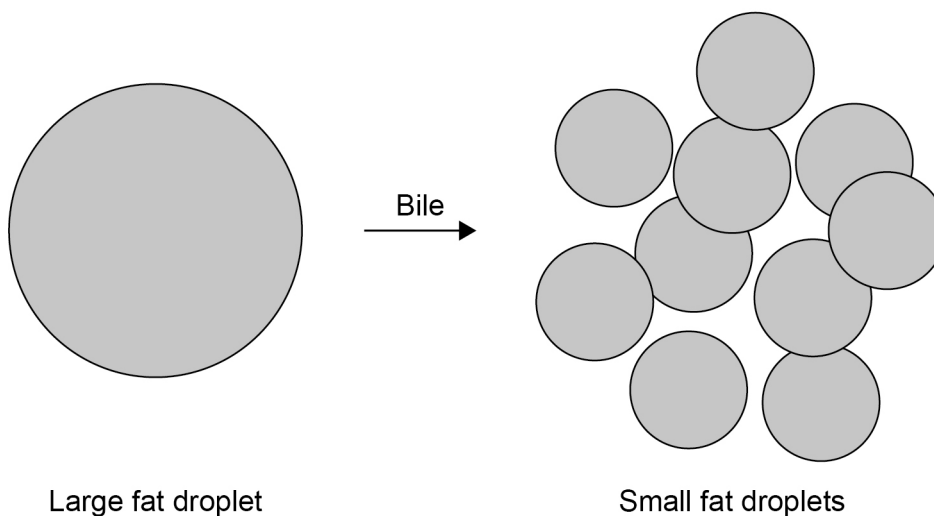


**Table 7** shows the volume and surface area of fat droplets.

**Table 7**

| Fat                | Radius<br>of one droplet<br>in arbitrary units | Total volume<br>of fat<br>in arbitrary units | Total surface area<br>of fat<br>in arbitrary units |
|--------------------|------------------------------------------------|----------------------------------------------|----------------------------------------------------|
| One large droplet  | 10.00                                          | 4190                                         | <b>X</b>                                           |
| Ten small droplets | 4.64                                           | 4190                                         | 2710                                               |

**0 9 . 6** Calculate value **X** in **Table 7**.

Use the formula:

$$\text{Surface area} = 4\pi r^2$$

Use  $\pi = 3.14$

**[2 marks]**

**X** = \_\_\_\_\_ arbitrary units



09.7

Adding bile affects the breakdown of fats by enzymes.

Explain the effect of bile on the breakdown of fats.

Use **Figure 16** and **Table 7**.

[3 marks]

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14

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ANSWER IN THE SPACES PROVIDED**



**1 0**

Some disorders are inherited.

The gene for one inherited disorder has two alleles, **T** and **t**.

**1 0 . 1**

A person will **not** develop the disorder if they inherit at least one **T** allele.

What word describes the **T** allele?

**[1 mark]**

Tick (✓) **one** box.

Dominant

☐

Genotype

☐

Mutated

☐

Recessive

☐**1 0 . 2**

How are genes passed from parents to their offspring?

**[1 mark]**

Tick (✓) **one** box.

By antibodies

☐

By blood cells

☐

By gametes

☐

By stem cells

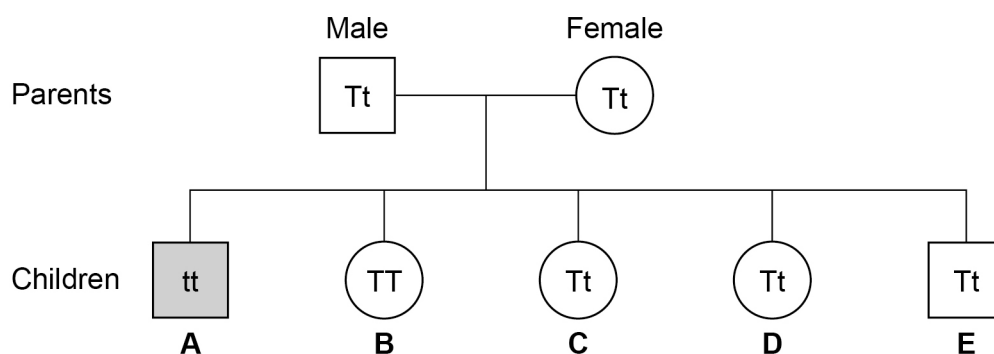
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**Question 10 continues on the next page**

**Turn over ►**

**Figure 17** shows the inheritance of the disorder in one family.

**Figure 17**



**Key**

-  male with the disorder
-  female with the disorder
-  male **without** the disorder
-  female **without** the disorder

**1 0 . 3** Which children in **Figure 17** are homozygous?

**[1 mark]**

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**1 0 . 4** Twins that develop from a single fertilised egg are genetically identical.

Which children in **Figure 17** could be identical twins?

**[1 mark]**

Child \_\_\_\_\_

Child \_\_\_\_\_



1 0 . 5

Child **B** in **Figure 17** becomes an adult and has offspring.

Explain why **none** of the offspring of child **B** will develop the disorder.

[2 marks]

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1 0 . 6

A blood test can determine if a person is a carrier of the disorder.

Suggest why some people have the blood test before deciding to have children.

[1 mark]

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7

**END OF QUESTIONS**



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