

Please write clearly in block capitals.

Centre number

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Candidate number

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Surname

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Forename(s)

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Candidate signature

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# GCSE BIOLOGY

# F

Foundation Tier      Paper 1F

Tuesday 14 May 2019

Afternoon

Time allowed: 1 hour 45 minutes

### Materials

For this paper you must have:

- 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 in the spaces provided.
- 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.

| For Examiner's Use |      |
|--------------------|------|
| Question           | Mark |
| 1                  |      |
| 2                  |      |
| 3                  |      |
| 4                  |      |
| 5                  |      |
| 6                  |      |
| 7                  |      |
| 8                  |      |
| 9                  |      |
| <b>TOTAL</b>       |      |



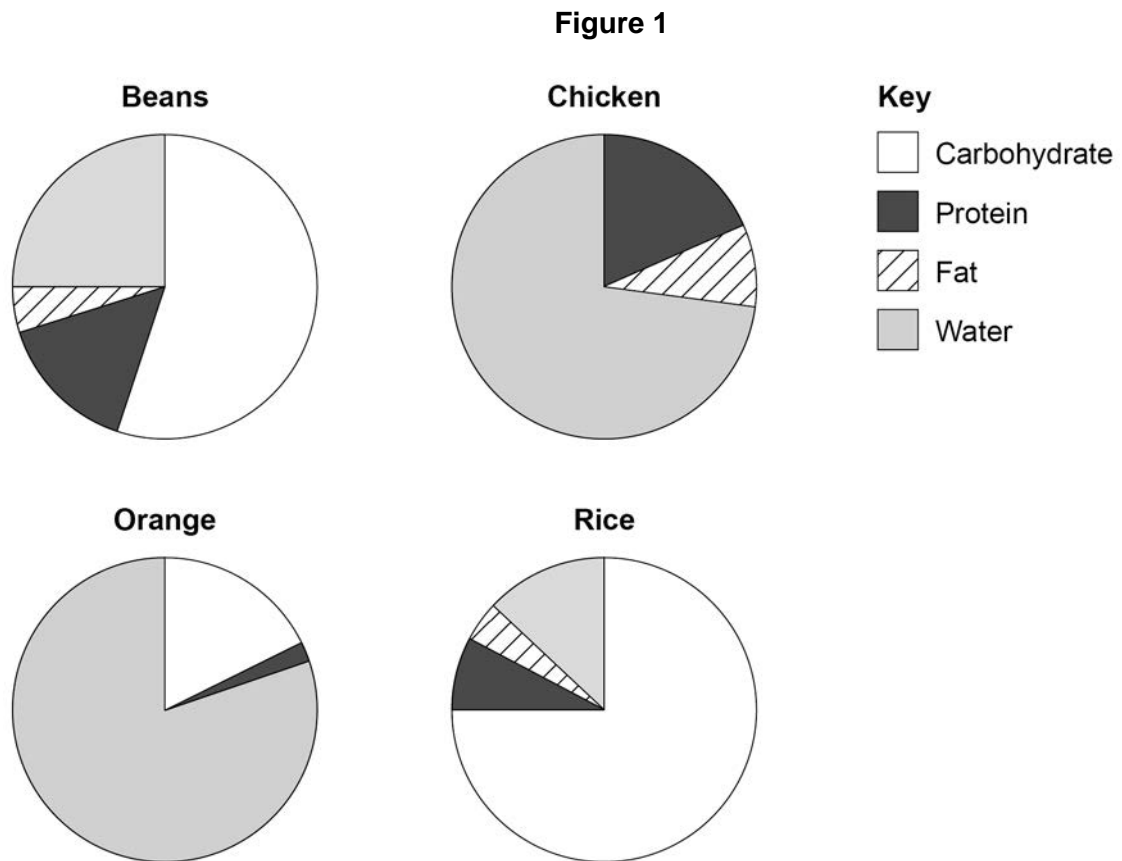
Answer **all** questions in the spaces provided.

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outside the  
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0 1

Many foods contain carbohydrates.

**Figure 1** shows information about four different foods.



0 1 . 1

Which food contains the highest percentage of carbohydrate?

[1 mark]

Tick (✓) **one** box.

|         |  |
|---------|--|
| Beans   |  |
| Chicken |  |
| Orange  |  |
| Rice    |  |



**0 1 . 2** Estimate the percentage of water found in beans.

**[1 mark]**

Percentage = \_\_\_\_\_ %

**0 1 . 3** Look at **Figure 1**.

Why would eating only beans provide a more balanced diet than eating only chicken?

**[1 mark]**

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**0 1 . 4** Sugars are produced when enzymes break down starch.

What is the name of the enzyme which breaks down starch to produce sugars?

**[1 mark]**

Tick (✓) **one** box.

Amylase

Bile

Lipase

Protease

**0 1 . 5** Which chemical could be used to test for glucose?

**[1 mark]**

Tick (✓) **one** box.

Benedict's reagent

Biuret reagent

Iodine solution

Sulfuric acid

**Turn over ►**



**0 1 . 6** What colour change would be seen in a positive test for glucose?

**[1 mark]**

From blue to \_\_\_\_\_.

**0 1 . 7** People with diabetes have difficulty controlling the concentration of glucose in their blood.

The blood of four people was tested.

**Table 1** shows the results.

**Table 1**

| Person | Concentration of glucose in blood in arbitrary units |
|--------|--|
| A      | 4.2  |
| B      | 6.9  |
| C      | 7.1  |
| D      | 5.1  |

**Table 2** shows the information used to help decide if a person has diabetes.

**Table 2**

| Concentration of glucose in blood in arbitrary units | Conclusion      |
|--|-----------------|
| <5.6   | No diabetes     |
| 5.6 to 7.0   | Mild diabetes   |
| >7.0   | Severe diabetes |

Which person has severe diabetes?

**[1 mark]**

Tick (✓) **one** box.

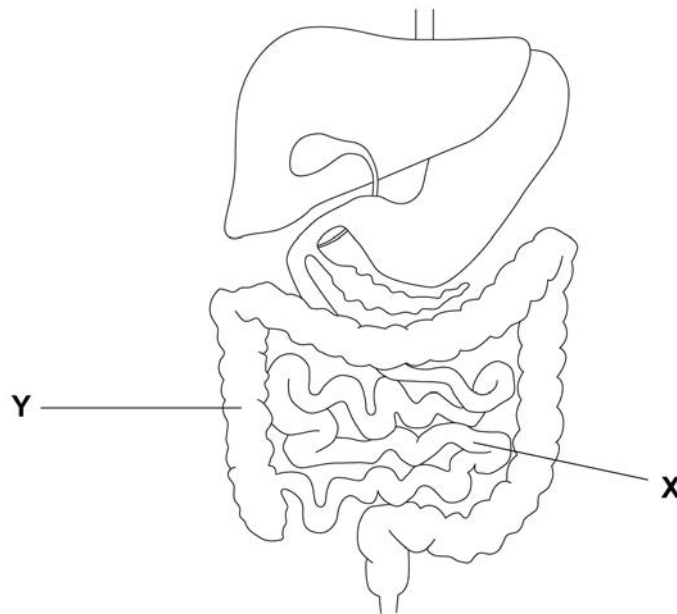
A       B       C       D



Figure 2 shows part of the human digestive system.

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Figure 2



0 1 . 8 Glucose is absorbed into the bloodstream in part X.

Name part X.

[1 mark]

---

0 1 . 9 Complete the sentences.

Choose answers from the box.

[2 marks]

|                  |             |           |
|------------------|-------------|-----------|
| active transport | digestion   | excretion |
| osmosis          | respiration |           |

Some glucose is absorbed into the bloodstream against the concentration gradient by the process of \_\_\_\_\_.

Water moves out of part Y and into the bloodstream by

the process of \_\_\_\_\_.

10

Turn over ►

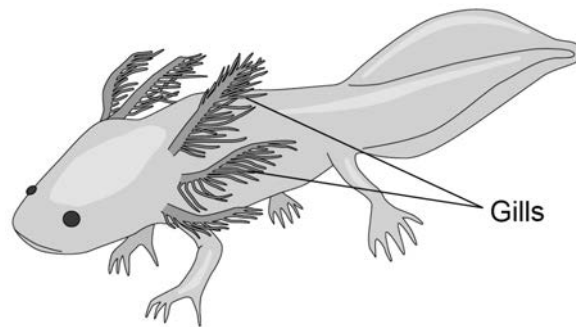


0 2

An animal called an axolotl lives in water.

**Figure 3** shows an axolotl.

**Figure 3**



Oxygen enters the axolotl's bloodstream through the gills by diffusion.

0 2 . 1

What is diffusion?

[1 mark]

Tick (✓) **one** box.

The movement of particles from a high concentration to a low concentration

The movement of particles from a low concentration to a high concentration

The movement of water from a concentrated solution to a more dilute solution

0 2 . 2

Describe how **one** feature of the axolotl's gills increases the rate of diffusion of oxygen.

Use information from **Figure 3**.

[2 marks]

Feature \_\_\_\_\_

Description \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_



If a gill of an axolotl is removed, stem cells in the damaged area will divide and a new gill will grow.

0 2 . 3

Complete the sentence.

[1 mark]

Choose the answer from the box.

adaptation

differentiation

evolution

variation

When stem cells specialise to produce gill cells, this process is

known as \_\_\_\_\_.

0 2 . 4

Complete the sentence.

[1 mark]

Choose the answer from the box.

binary fission

mitosis

mutation

To grow a new gill the stem cells divide by \_\_\_\_\_.

0 2 . 5

Which **one** of the following does **not** contain stem cells?

[1 mark]

Tick (✓) **one** box.

Bone marrow

Embryos

Hair

Meristem tissue

Turn over ►



0 2 . 6

Axolotls are small animals. Axolotls are used in stem cell research.

What are **two** advantages of using axolotls in stem cell research?

**[2 marks]**

Tick (✓) **two** boxes.

Axolotls are cheap to feed.

Axolotls are easy to breed.

Axolotls are endangered.

Axolotls live in water.

Axolotl research is cruel.

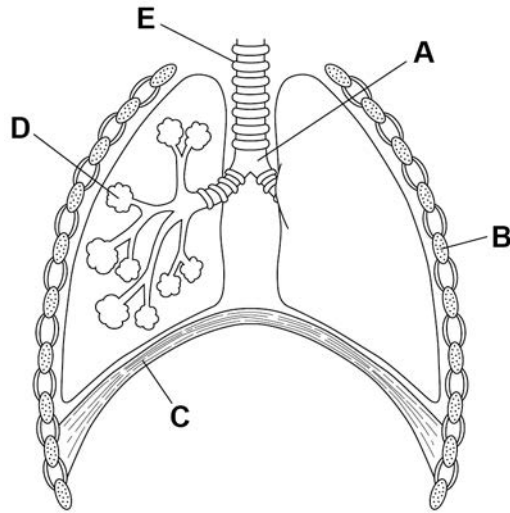




Oxygen uptake in humans takes place in the lungs.

**Figure 4** shows the human breathing system.

**Figure 4**



**0 2 . 7** Where does oxygen enter the bloodstream?

[1 mark]

Tick (✓) **one** box.

A  B  C  D

**0 2 . 8** Name part **E** on **Figure 4**.

[1 mark]

---

**0 2 . 9** Which blood vessel carries blood to the lungs?

[1 mark]

Tick (✓) **one** box.

Aorta

Pulmonary artery

Vena cava



0 3

This question is about leaves.

0 3 . 1

Complete the sentences.

Choose answers from the box.

**[3 marks]**

|                     |               |                           |
|---------------------|---------------|---------------------------|
| <b>epidermis</b>    | <b>phloem</b> | <b>palisade mesophyll</b> |
| <b>waxy cuticle</b> | <b>xylem</b>  |                           |

The layer of cells lining the upper surface and lower surface of a leaf is the \_\_\_\_\_.

The part of the leaf where most photosynthesis occurs is the \_\_\_\_\_.

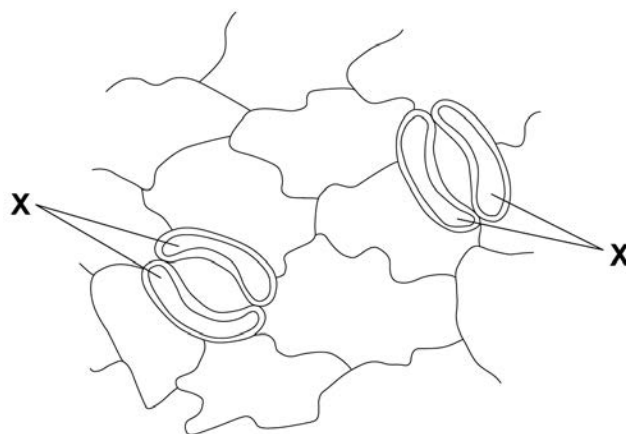
Water is transported to the leaf in the \_\_\_\_\_.

Water is lost through small openings on the lower surface of plant leaves.

These small openings are called stomata.

**Figure 5** shows two stomata on the lower surface of a leaf.

**Figure 5**



**0 3 . 2** The cells labelled **X** control the width of the stomata.

What are the cells labelled **X**?

**[1 mark]**

Tick (✓) **one** box.

Guard cells

Mesophyll cells

Root hair cells

Stem cells

**0 3 . 3** What is the function of the stomata?

**[1 mark]**

Tick (✓) **one** box.

To allow light into the leaf

To let carbon dioxide into the leaf

To let sugars out of the leaf

To protect the leaf from pathogens

**0 3 . 4** How is water lost from a leaf?

**[1 mark]**

Tick (✓) **one** box.

By evaporation

By respiration

By translocation

**Turn over ►**

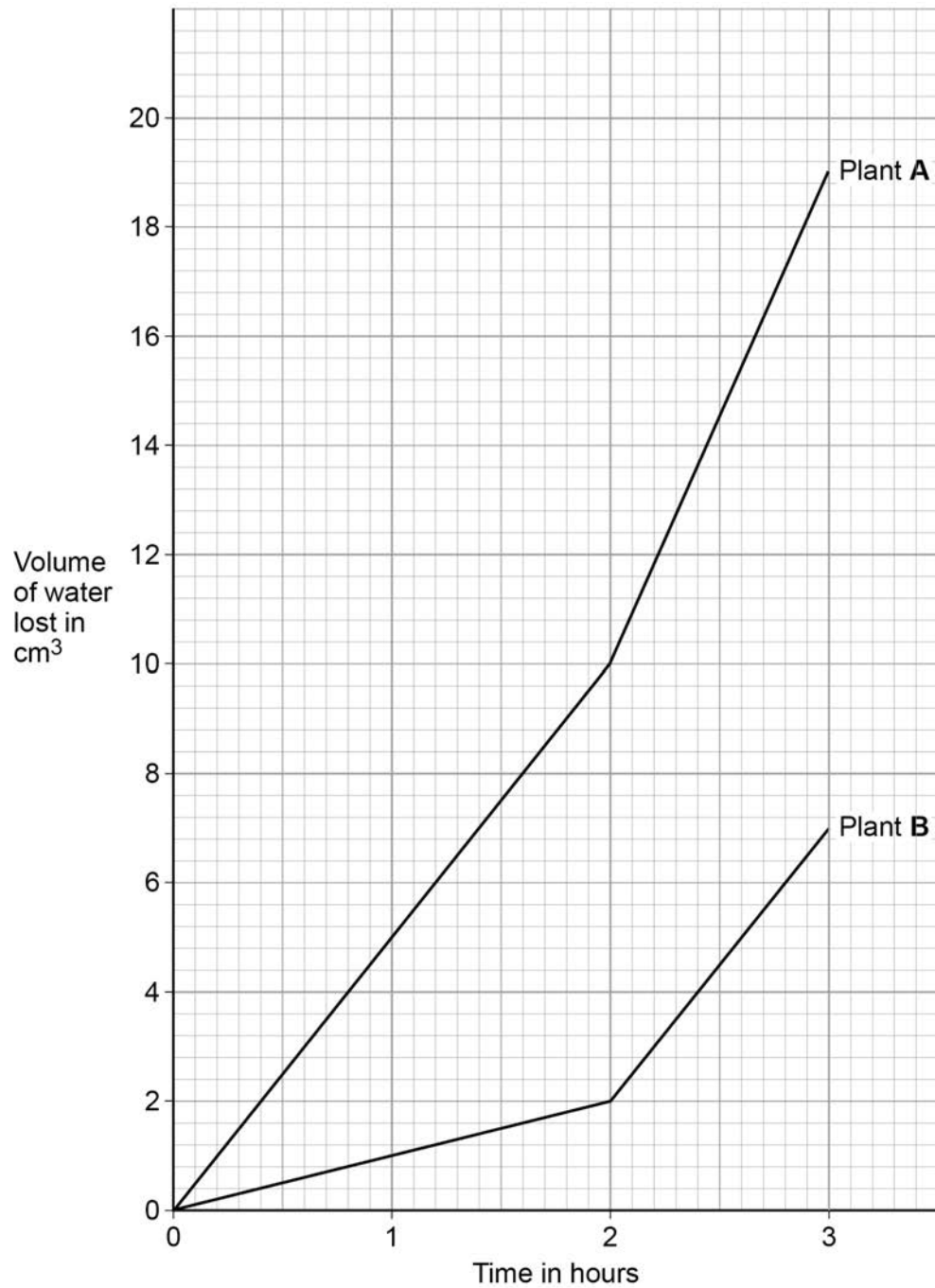


A student investigated the volume of water lost from two plants.

The plants were different species.

**Figure 6** shows the student's results.

**Figure 6**



0 3 . 5

Calculate the difference in the volume of water lost by plant **A** compared to plant **B** in the first hour.

[2 marks]

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Difference in volume = \_\_\_\_\_ cm<sup>3</sup>

0 3 . 6

What could cause plant **A** to lose water at a faster rate than plant **B**?

[1 mark]

Tick (✓) **one** box.

Plant **A** has fewer stomata per leaf.

Plant **A** is smaller.

Plant **A** has more leaves.

Plant **A** has smaller leaves.

0 3 . 7

After the first 2 hours, both plants were moved to a new room.

Suggest **one** reason why both plants lost water at a faster rate in the new room.

[1 mark]

---



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**Question 3 continues on the next page**

**Turn over ►**



0 3 . 8 Some plants have adaptations to stop them from being eaten by animals.

Figure 7 shows part of a holly plant.

Figure 7



Describe **one** way the holly plant is adapted to stop it being eaten by animals.

[1 mark]

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11



**Turn over for the next question**

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0 4

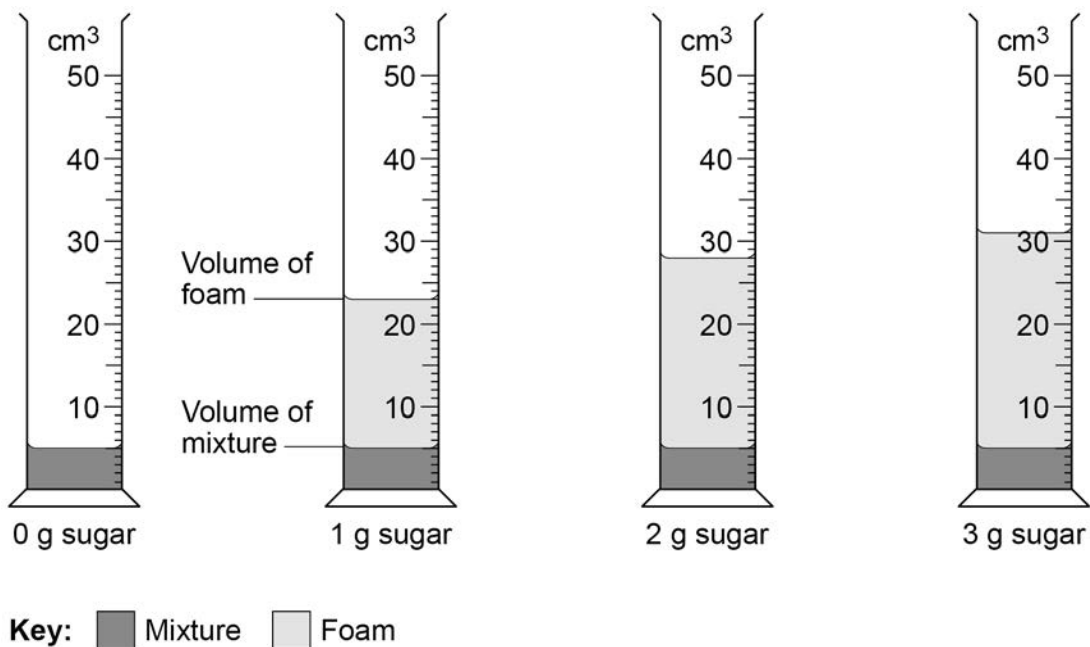
A student investigated respiration in yeast.

This is the method used.

1. Add 5 cm<sup>3</sup> of a yeast and water mixture to each measuring cylinder.
2. Add different masses of sugar to each measuring cylinder.
3. Mix the contents of each measuring cylinder gently for 5 seconds.
4. Put the measuring cylinders in a water bath at 25 °C
5. Over the next 20 minutes, record the maximum volume the foam reaches in each measuring cylinder.

**Figure 8** shows the student's results.

**Figure 8**





**0 4 . 1** Which **two** variables did the student control in the method?

**[2 marks]**

Tick (✓) **two** boxes.

Mass of sugar

pH of the mixture

Temperature

Volume of foam

Volume of yeast and water

**Table 3** shows the results.

**Table 3**

| Mass of sugar in g | Maximum volume in cm <sup>3</sup> |
|--------------------|-----------------------------------|
| 0                  | 5                                 |
| 1                  | 23                                |
| 2                  | <b>X</b>                          |
| 3                  | 31                                |

**0 4 . 2** What is value **X** in **Table 3**?

Use **Figure 8**.

**[1 mark]**

**X** = \_\_\_\_\_ cm<sup>3</sup>

**Question 4 continues on the next page**

**Turn over ►**



In the investigation, the yeast respire and releases a gas which causes the foam to rise.

**0 4 . 3** Which gas causes the foam to rise?

**[1 mark]**

Tick (✓) **one** box.

Carbon dioxide

Hydrogen

Nitrogen

Oxygen

**0 4 . 4** What conclusion can you make about the relationship between the mass of sugar used and the volume of gas produced?

**[1 mark]**

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**0 4 . 5** Why was no foam produced in the mixture with 0 g of sugar?

**[1 mark]**

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**0 4 . 6** Why was the measuring cylinder with 0 g of sugar included in the investigation?

**[1 mark]**

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0 4 . 7 The top of the mixture can be covered with a layer of oil after step 3 in the method.

Suggest why the layer of oil stops the yeast respiring aerobically.

[1 mark]

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0 4 . 8 What other substance is produced during **anaerobic** respiration in yeast?

[1 mark]

Tick (✓) **one** box.

Ethanol

Hydrochloric acid

Lactic acid

Water

9

Turn over for the next question

Turn over ►



**0 5**

A man has the following symptoms:

- yellow discharge from his penis
- pain when urinating.

**0 5 . 1**

The man has a bacterial infection.

What is the most likely cause of the man's symptoms?

**[1 mark]**Tick (✓) **one** box.

Gonorrhoea

HIV

Measles

Salmonella poisoning

**0 5 . 2**

The man took a full course of antibiotics.

The man's symptoms did **not** improve.Why did the antibiotics **not** cure the symptoms?**[1 mark]**Tick (✓) **one** box.

The bacteria are immune to the antibiotics.

The bacteria are resistant to the antibiotics.

The man is immune to the antibiotics.

The man is resistant to the antibiotics.



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

Using a condom can stop the bacteria being passed to another person during sexual intercourse.

Suggest a different way the man could avoid passing the bacteria on to someone else.

**[1 mark]**

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**Question 5 continues on the next page**

**Turn over ►**



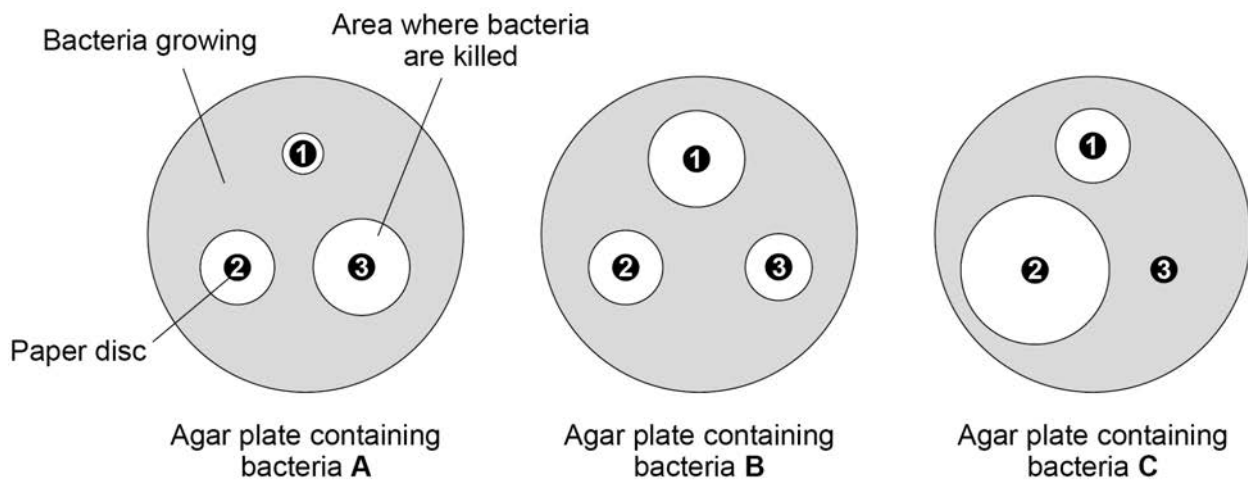
A scientist investigated the effect of three different antibiotics on three different types of bacteria, **A**, **B** and **C**.

This is the method used.

1. Grow bacteria **A** on an agar plate.
2. Put three separate paper discs each containing one of the antibiotics (**1**, **2** and **3**) onto the agar plate.
3. Put the agar plate into an incubator for 48 hours.
4. Repeat steps 1–3 for bacteria **B** and for bacteria **C**.

**Figure 9** shows the scientist's results.

**Figure 9**



**0 5 . 4**

Compare the effectiveness of the three antibiotics at killing the different types of bacteria.

**[6 marks]**


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**Question 5 continues on the next page**

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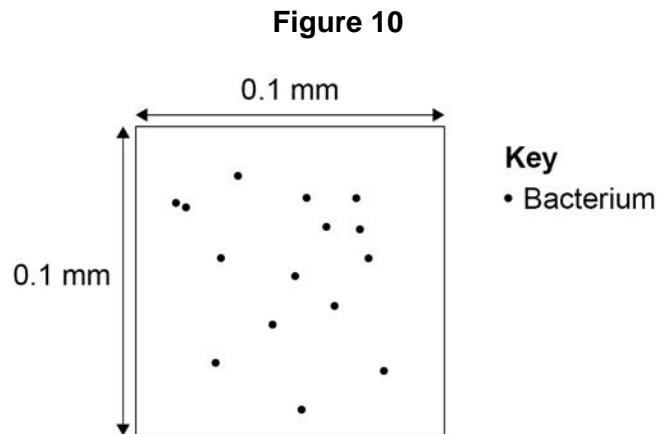
**Turn over ▶**



Milk contains bacteria.

A small volume of raw milk was placed in a counting chamber in a special type of microscope slide.

**Figure 10** shows what the counting chamber looked like when viewed using a microscope.



A scientist counted the number of bacteria in four samples of raw milk.

**Table 4** shows the results.

**Table 4**

| Milk sample | Number of bacteria in counting chamber |
|-------------|--|
| E           | 15                                     |
| F           | 12                                     |
| G           | 13                                     |
| H           | 16                                     |

**0 5 . 5** Which milk sample is shown in **Figure 10**?

[1 mark]

Tick (✓) **one** box.

Sample **E**

Sample **F**

Sample **G**

Sample **H**





05.6

Calculate the mean number of bacteria in the four samples in **Table 4**.**[2 marks]**


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Mean number of bacteria = \_\_\_\_\_

05.7

Calculate the mean number of bacteria per  $\text{mm}^3$  of milk in the samples.

Complete the following steps.

**[3 marks]**Calculate the total area of the counting chamber in **Figure 10**.

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Total area of counting chamber = \_\_\_\_\_  $\text{mm}^2$ 

The depth of the counting chamber is 0.01 mm

Calculate the volume of the counting chamber in **Figure 10**.

Use the equation:

$$\text{volume} = \text{area} \times \text{depth}$$

---

Volume of counting chamber = \_\_\_\_\_  $\text{mm}^3$ Calculate the mean number of bacteria per  $\text{mm}^3$  of milk in the samples.

Use the equation:

$$\text{mean number of bacteria per } \text{mm}^3 \text{ of milk} = \frac{\text{mean number of bacteria from Question 05.6}}{\text{volume of counting chamber}}$$

---



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Mean number of bacteria per  $\text{mm}^3$  of milk = \_\_\_\_\_**Turn over ►**

Milk is heated to reduce the number of bacteria it contains before it is sold for humans to drink.

Milk with more than 20 000 bacteria per  $\text{cm}^3$  cannot be sold for humans to drink.

**Table 5** shows the number of bacteria per  $\text{cm}^3$  in four different samples of milk.

**Table 5**

| Milk sample | Number of bacteria per $\text{cm}^3$ of milk |
|-------------|--|
| P           | $1.8 \times 10^4$                            |
| Q           | $2.2 \times 10^4$                            |
| R           | $2.2 \times 10^{-5}$                         |
| S           | $1.8 \times 10^3$                            |

**0 5 . 8** Which of the milk samples could **not** be sold for humans to drink?

[1 mark]

Tick (✓) **one** box.

P       Q       R       S

**0 5 . 9** Why should milk sold for humans to drink **not** contain large numbers of bacteria?

[1 mark]

---



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0 6

**Figure 11** shows the internal structure of the human heart.

**Figure 11**



0 6 . 1

Which organ system is the heart a part of?

[1 mark]

---

0 6 . 2

Draw a ring around **one** valve on **Figure 11**.

[1 mark]

0 6 . 3

What is the function of the valves in the heart?

[1 mark]

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**Question 6 continues on the next page**

**Turn over ►**



**0 6 . 4** Valves are also found inside some blood vessels.

Which type of blood vessel contains valves?

**[1 mark]**

Sometimes a valve in the heart can begin to leak.

A leaking heart valve may be replaced with either:

- a mechanical valve
- a biological valve from a pig.

**Table 6** shows information about the replacement valves.

**Table 6**

| <b>Mechanical valve</b>                             | <b>Biological valve from a pig</b>                          |
|---|---|
| Made of plastic or metal                            | Made from living tissue                                     |
| Can cause the blood to clot around the valve        | No risk of blood clotting around the valve                  |
| No need for another replacement valve after 5 years | Sometimes another replacement valve is needed after 5 years |

**0 6 . 5** Suggest **two** reasons why a patient may choose a mechanical valve and **not** a biological valve from a pig.

**[2 marks]**

1 \_\_\_\_\_

2 \_\_\_\_\_



0 6 . 6

Suggest **one** reason why a patient may choose a biological valve from a pig and **not** a mechanical valve.

[1 mark]

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0 6 . 7

A person may develop other medical conditions.

Draw **one** line from each medical condition to the correct treatment.

[2 marks]

**Medical condition****Treatment**

High blood cholesterol

Antibiotics

Artificial pacemaker

Insulin

Irregular heart rate

Statins

9

**Turn over for the next question**

**Turn over ►**



07

Figure 12 shows an animal cell viewed using a microscope.

Figure 12



07.1

The cell contains a nucleus.

What is the function of the nucleus?

[1 mark]

---

07.2

Name **one** type of cell that does **not** contain a nucleus.

[1 mark]

---



**0 7 . 3** Draw a simple diagram of the cell in **Figure 12**.

Label **two** parts of the cell.

**[2 marks]**

**0 7 . 4** Name **one** structure found in a plant cell but **not** found in an animal cell.

**[1 mark]**

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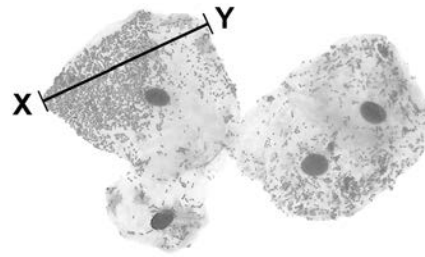
**Question 7 continues on the next page**

**Turn over ►**



Figure 13 shows some different cells.

Figure 13



0 7 . 5 The real length from point X to point Y is 0.06 mm

Calculate the magnification.

Use the equation:

$$\text{magnification} = \frac{\text{size of image}}{\text{real size of object}}$$

[3 marks]

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Magnification =  $\times$  \_\_\_\_\_





07.6

The cells shown in **Figure 13** were viewed using a light microscope.

Give **two** advantages of using an electron microscope instead of a light microscope.

**[2 marks]**

1 \_\_\_\_\_

\_\_\_\_\_

2 \_\_\_\_\_

\_\_\_\_\_

10

**Turn over for the next question**

**Turn over ►**



0 8

Mosquitoes carry a pathogen that causes malaria.

0 8 . 1

What type of pathogen causes malaria?

[1 mark]

Tick (✓) **one** box.

A bacterium

A fungus

A protist

A virus

Mosquito nets can help prevent the spread of malaria.

**Table 7** shows the results of a study in one area of Africa.**Table 7**

| Total number of people in the study | Number of people who use mosquito nets when sleeping | Percentage of people with malaria   |  |
|-------------------------------------|--|-------------------------------------|--|
|                                     |  | Who use mosquito nets when sleeping | Who do NOT use mosquito nets when sleeping |
| 476                                 | 426  | 1.2                                 | 40   |

A newspaper made the following statement:

‘Study shows mosquito nets are scientifically proven to prevent malaria.’

0 8 . 2

Give **one** piece of evidence that supports the statement.

[1 mark]

---



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0 8 . 3

Suggest **one** reason why the statement may **not** be valid.

[1 mark]

---



---

**Table 8** shows information about the number of deaths from malaria in the same area of Africa.

Table 8

| Year | Number of deaths from malaria per 100 000 people |
|------|--|
| 2005 | 161  |
| 2007 | 136  |
| 2009 | 114  |
| 2011 | 97   |
| 2013 | 94   |
| 2015 | 92   |

0 8 . 4

Predict the number of people per 100 000 who died from malaria in 2017 if the trend stayed the same.

[1 mark]

---



---

Number of people per 100 000 = \_\_\_\_\_

0 8 . 5

Use of mosquito nets has helped to reduce the number of deaths from malaria each year.

Suggest **one** other reason for the reduced number of deaths from malaria each year.

[1 mark]

---



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Turn over ►





**Turn over for the next question**

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ANSWER IN THE SPACES PROVIDED**

**Turn over ►**



0 9

This question is about photosynthesis.

0 9 . 1

Complete the word equation for photosynthesis:

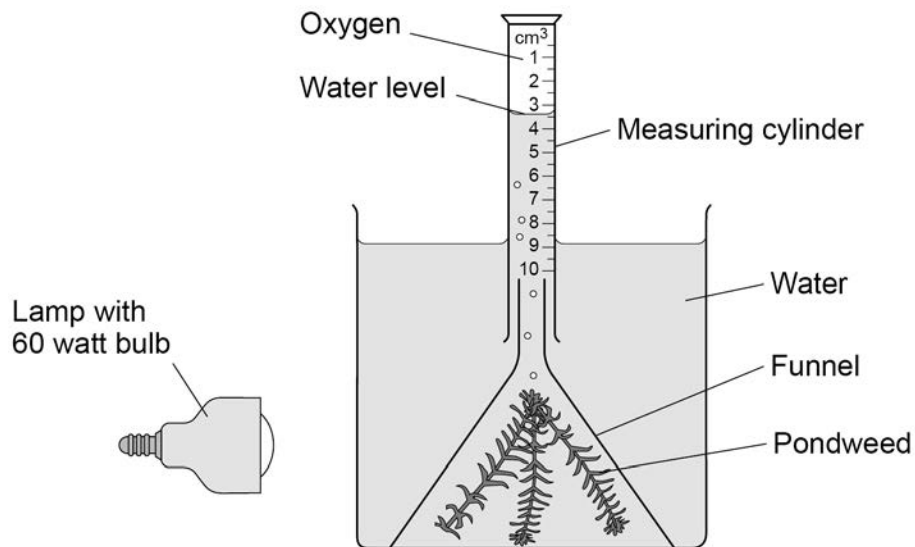
**[2 marks]**

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

A student investigated photosynthesis using pondweed.

**Figure 14** shows the apparatus the student used.

**Figure 14**



This is the method used.

1. Set up the apparatus as shown in **Figure 14**.
2. Switch on the lamp.
3. After 20 minutes, record the volume of oxygen collected in the measuring cylinder.
4. Repeat steps 1–3 using bulbs of different power output.



**0 9 . 2** What was the independent variable in the investigation?

**[1 mark]**

Tick (✓) **one** box.

Power output of bulb

Rate of photosynthesis

Time to collect oxygen

Volume of oxygen collected

**0 9 . 3** Suggest **two** ways the method could be improved so the results would be more valid.

**[2 marks]**

1

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2

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**Question 9 continues on the next page**

**Turn over ►**



**Table 9** shows the student's results.

**Table 9**

| Power output of bulb in watts | Volume of oxygen collected in 20 minutes in cm <sup>3</sup> | Rate of photosynthesis in cm <sup>3</sup> /hour |
|-------------------------------|---|---|
| 60                            | 0.5   | 1.5   |
| 100                           | 0.8   | 2.4   |
| 150                           | 1.1   | <b>X</b>  |
| 200                           | 1.2   | 3.6   |
| 250                           | 1.2   | 3.6   |

**0 9 . 4** Calculate value **X** in **Table 9**.

**[1 mark]**

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**X** = \_\_\_\_\_ cm<sup>3</sup>/hour





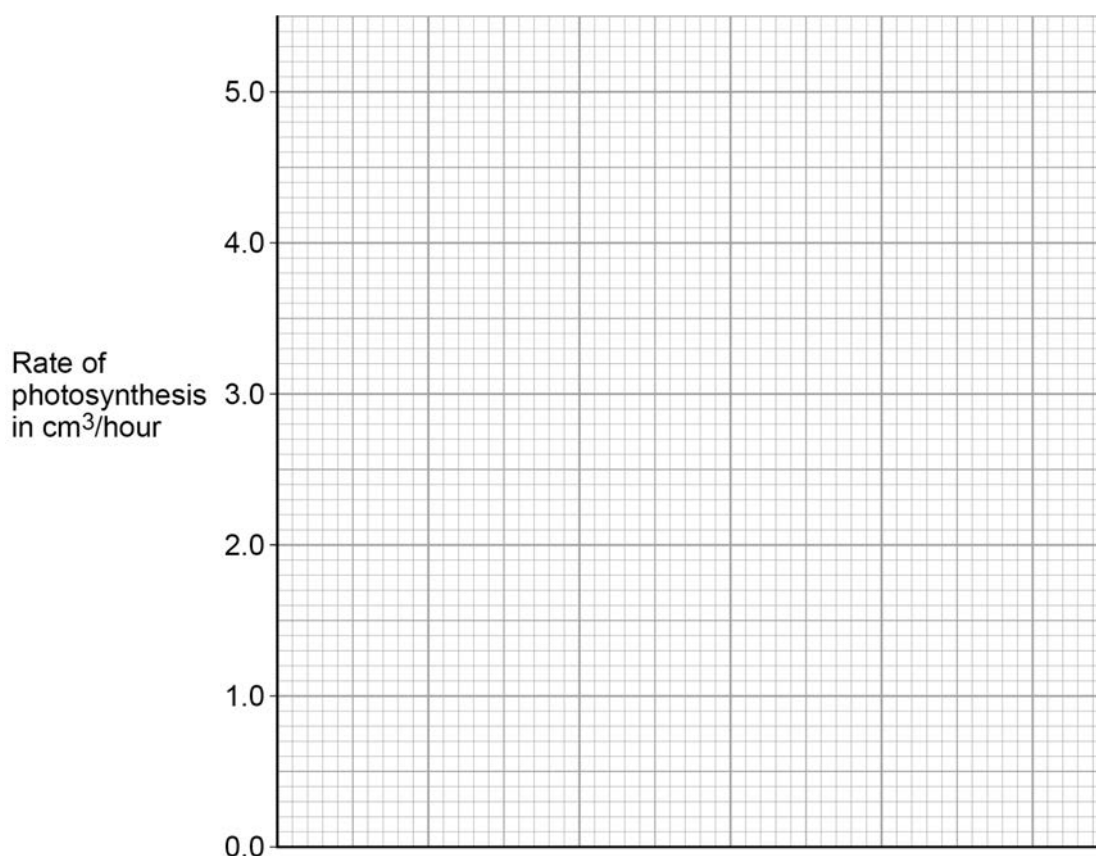
**0 9 . 5** Complete **Figure 15**.

**[4 marks]**

You should:

- label the x-axis
- use a suitable scale
- plot the data from **Table 9** and your answer to Question **09.4**
- draw a line of best fit.

**Figure 15**



**0 9 . 6** Determine the expected rate of photosynthesis with a bulb of power output 75 watts.

Use **Figure 15**.

**[1 mark]**

Rate of photosynthesis at 75 watts = \_\_\_\_\_ cm<sup>3</sup>/hour

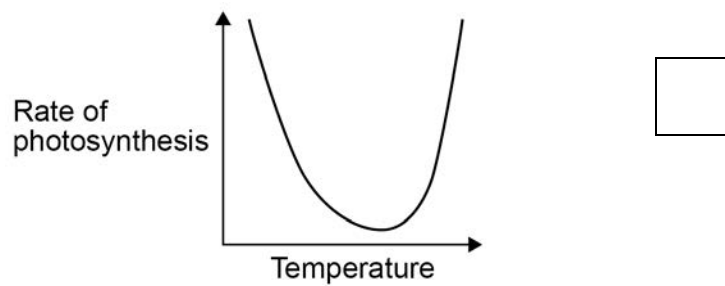
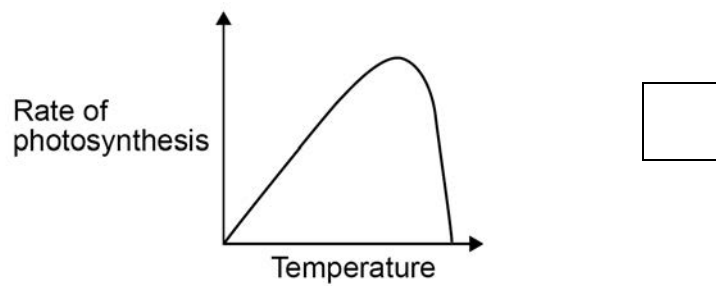
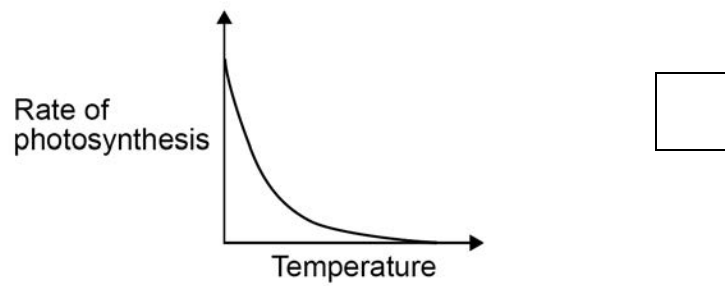
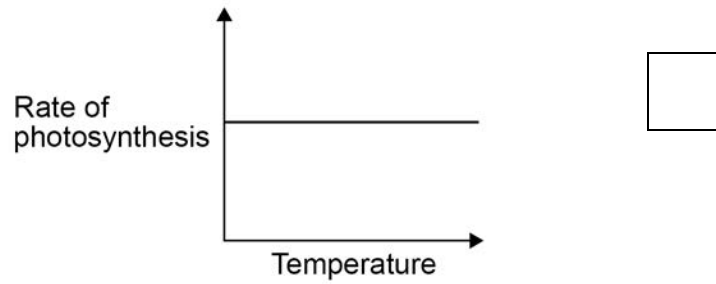
**Turn over ►**



**0 9 . 7** Which graph shows the effect of temperature on the rate of photosynthesis?

**[1 mark]**

Tick (✓) **one** box.



12

**END OF QUESTIONS**



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