Please write clearly in block capitals.

Centre number | | | | | | Candidate number | | | | |

Surname _____

Forename(s) _____

Candidate signature _____

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	
TOTAL	

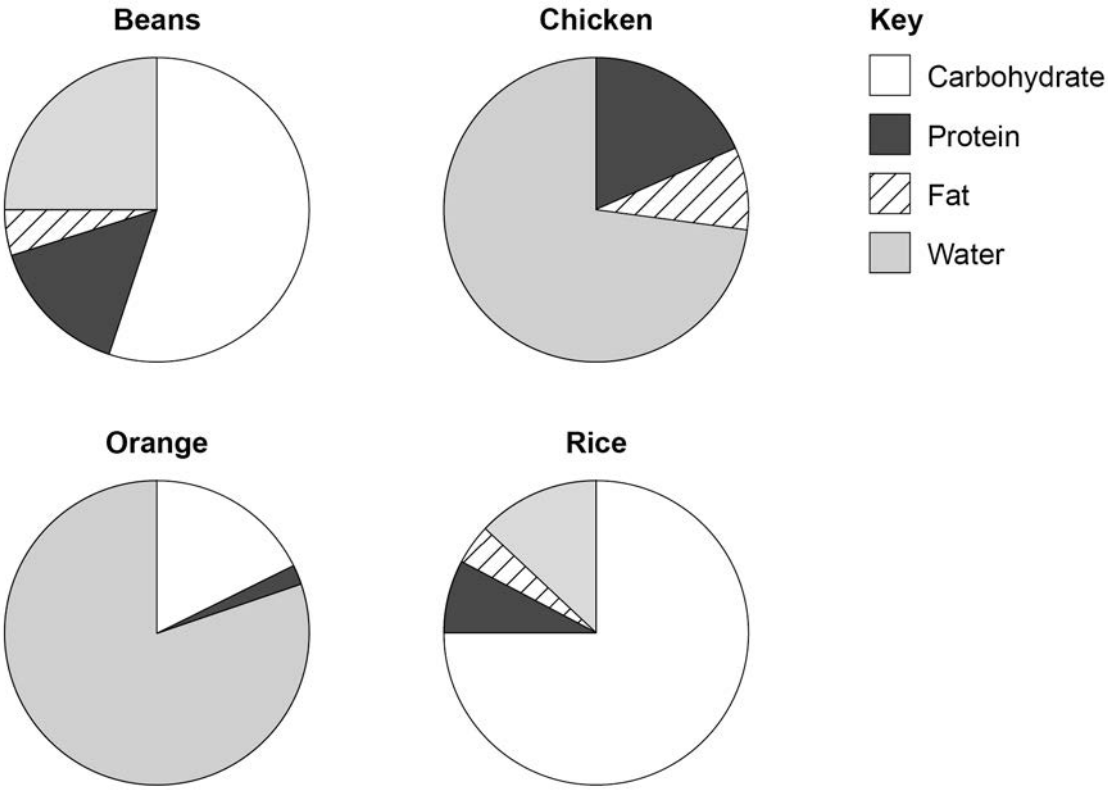
Answer **all** questions in the spaces provided.

Do not write outside the box

0 1 Many foods contain carbohydrates.

Figure 1 shows information about four different foods.

Figure 1



0 1 . 1 Which food contains the highest percentage of carbohydrate?

[1 mark]

Tick (✓) **one** box.

Beans ☐

Chicken ☐

Orange ☐

Rice ☐

Do not write outside the box

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]

_____

_____

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 ►

Do not write outside the box

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]

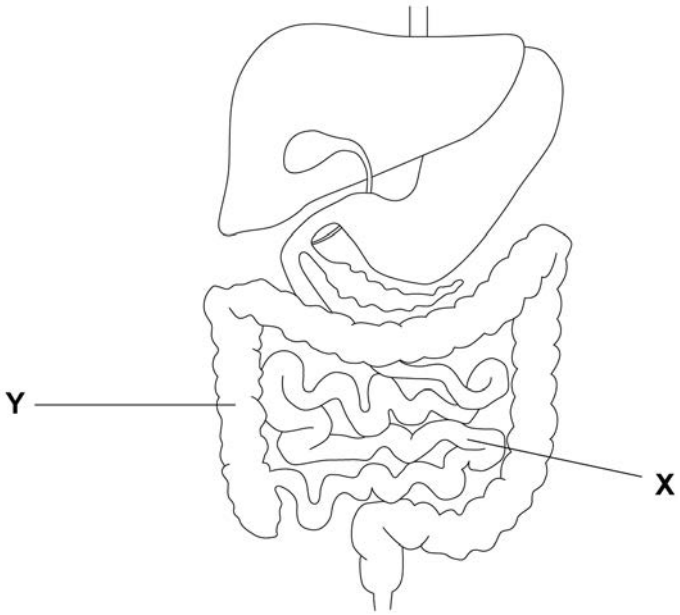
Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

Do not write outside the box

Figure 2 shows part of the human digestive system.

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.

[2 marks]

Choose answers from the box.

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 _____.

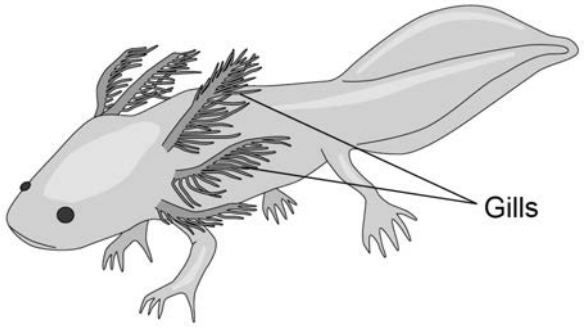
10

Do not write outside the box

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 _____

_____

_____

Do not write outside the box

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 ☐

Do not write outside the box

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. ☐

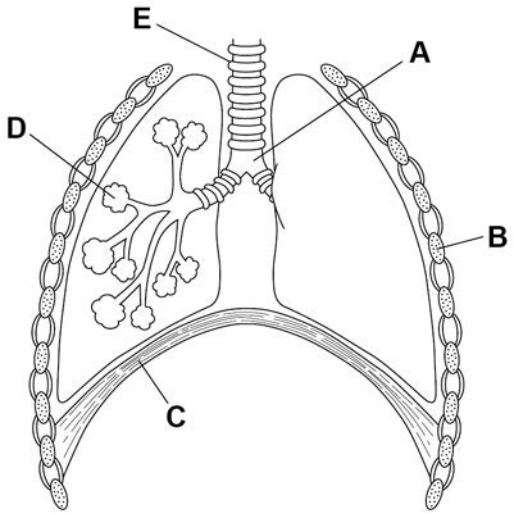
Axolotl research is cruel. ☐

Do not write outside the box

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 ☐

11

Do not write outside the box

0 3 This question is about leaves.

0 3 . 1 Complete the sentences.

Choose answers from the box.

[3 marks]

epidermis	**phloem**	**palisade mesophyll**
waxy cuticle	**xylem**	

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 _____.

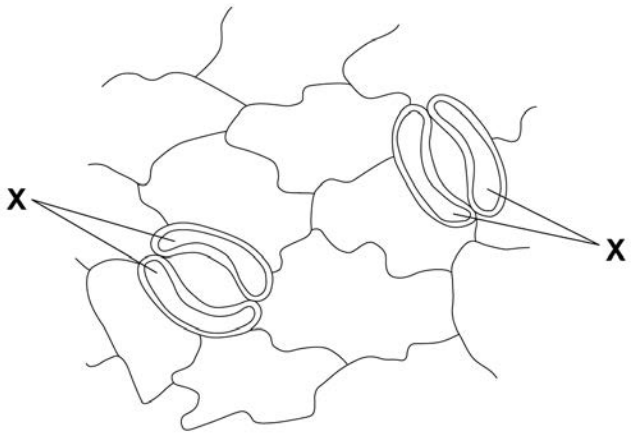
Water is transported to the leaf in the _____.

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



Do not write outside the box

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 ☐

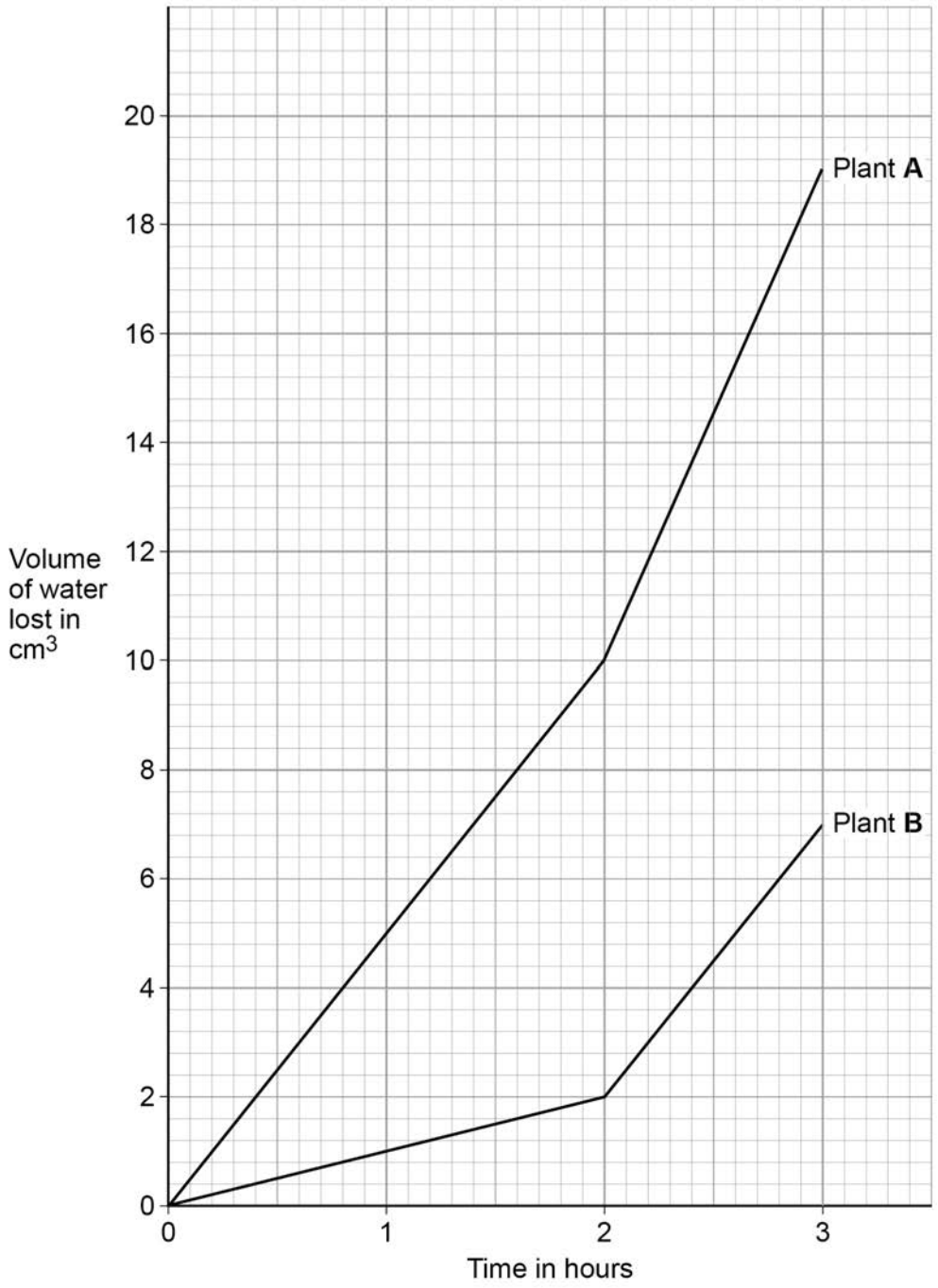
Do not write outside the box

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



Do not write outside the box

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]

Difference in volume = _____ cm^3

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]

Question 3 continues on the next page

Do not write outside the box

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]

11

Do not write outside the box

Turn over for the next question

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ANSWER IN THE SPACES PROVIDED

Do not write outside the box

0 4 A student investigated respiration in yeast.

This is the method used.

1. Add 5 cm^3 of a yeast and water mixture to each measuring cylinder.

2. Add different masses of sugar to each measuring cylinder.

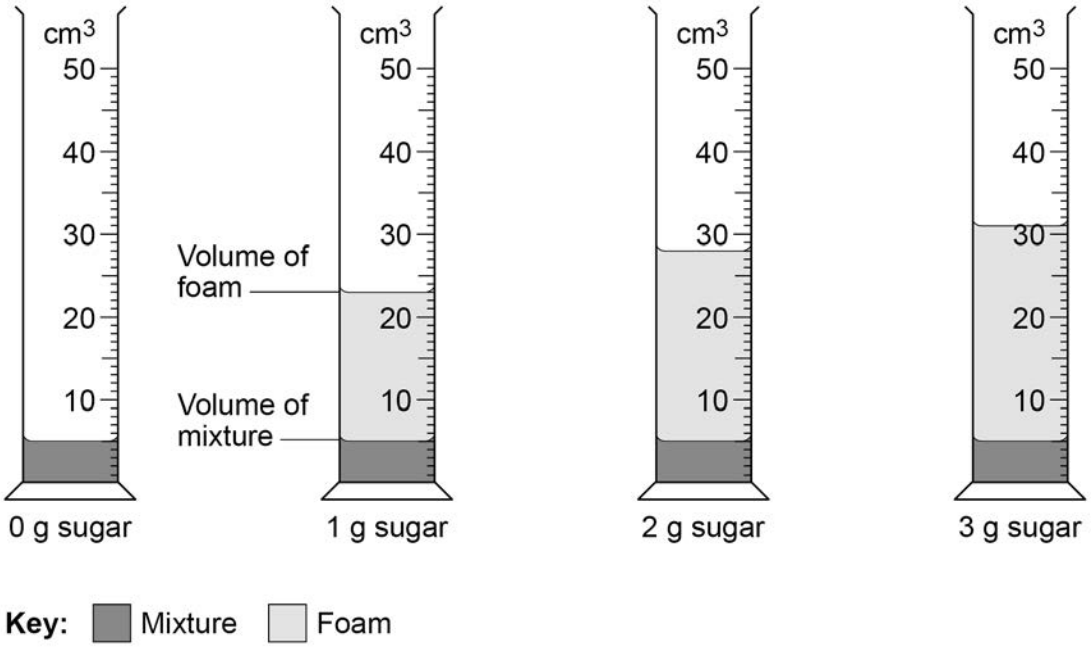
3. Mix the contents of each measuring cylinder gently for 5 seconds.

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



Do not write outside the box

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^3**
0	5
1	23
2	**X**
3	31

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

Use **Figure 8**.

[1 mark]

X = _____ cm^3

Question 4 continues on the next page

Do not write outside the box

In the investigation, the yeast respires 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]

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

[1 mark]

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

[1 mark]

Do not write outside the box

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]

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

Do not write outside the box

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. ☐

Do not write outside the box

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]

Question 5 continues on the next page

Do not write outside the box

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.

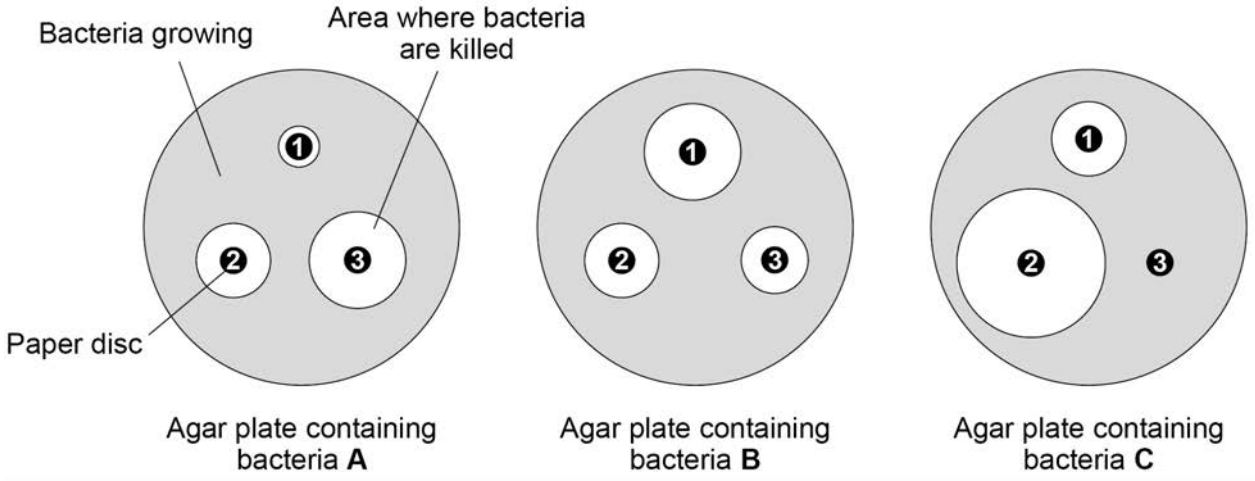
2. Put three separate paper discs each containing one of the antibiotics (**1**, **2** and **3**) onto the agar plate.

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



Do not write outside the box

0 5 . 4 Compare the effectiveness of the three antibiotics at killing the different types of bacteria.

[6 marks]

Question 5 continues on the next page

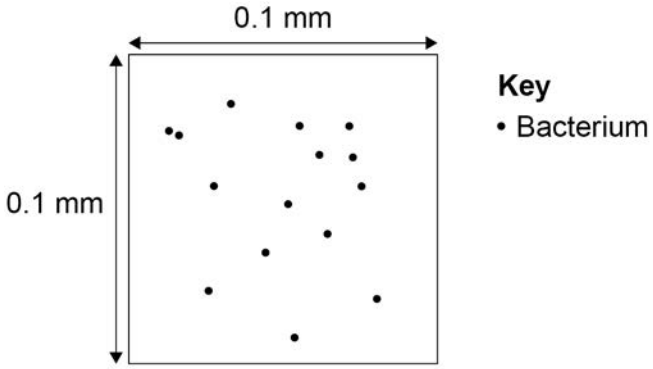
Do not write outside the box

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.

Figure 10



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** ☐

Do not write outside the box

0 5 . 6 Calculate the mean number of bacteria in the four samples in **Table 4**.

[2 marks]

Mean number of bacteria = _____

0 5 . 7 Calculate the mean number of bacteria per mm^3 of milk in the samples.

Complete the following steps.

[3 marks]

Calculate the total area of the counting chamber in **Figure 10**.

Total area of counting chamber = _____ 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 = _____ mm^3

Calculate the mean number of bacteria per mm^3 of milk in the samples.

Use the equation:

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

Mean number of bacteria per mm^3 of milk = _____

Do not write outside the box

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 cm^3 cannot be sold for humans to drink.

Table 5 shows the number of bacteria per cm^3 in four different samples of milk.

Table 5

Milk sample	Number of bacteria per cm^3 of milk
P	1.8×10^4
Q	2.2×10^4
R	2.2×10^{-5}
S	1.8×10^3

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]

_____

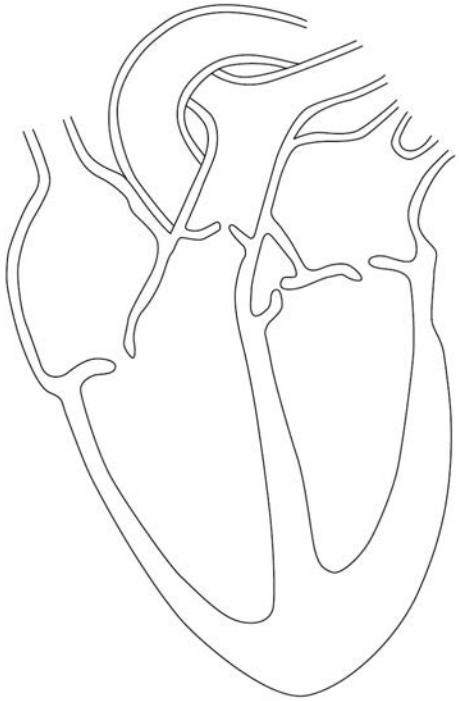
_____

17

Do not write outside the box

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]

Question 6 continues on the next page

Do not write outside the box

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

Mechanical valve	Biological valve from a pig
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

Do not write outside the box

0 6 . 6 Suggest **one** reason why a patient may choose a biological valve from a pig and **not** a mechanical valve.

[1 mark]

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
Irregular heart rate	Insulin
	Statins

9

Turn over for the next question

Do not write outside the box

0 7 **Figure 12** shows an animal cell viewed using a microscope.

Figure 12



0 7 . 1 The cell contains a nucleus.

What is the function of the nucleus?

[1 mark]

0 7 . 2 Name **one** type of cell that does **not** contain a nucleus.

[1 mark]

Do not write outside the box

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]

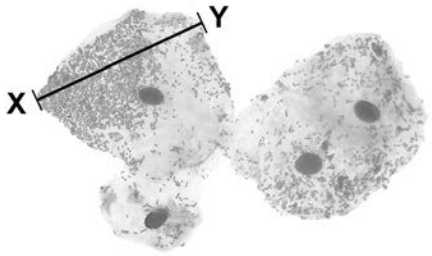
_____

Question 7 continues on the next page

Do not write outside the box

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]

Magnification = × _____

Do not write outside the box

0 7 . 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

Do not write outside the box

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]

Do not write outside the box

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]

Do not write outside the box

0 8 . 6 Describe how the human body:

- prevents pathogens from entering
- defends itself against pathogens inside the body.

[6 marks]

11

Do not write outside the box

Turn over for the next question

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ANSWER IN THE SPACES PROVIDED

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0 9 This question is about photosynthesis.

0 9 . 1 Complete the word equation for photosynthesis:

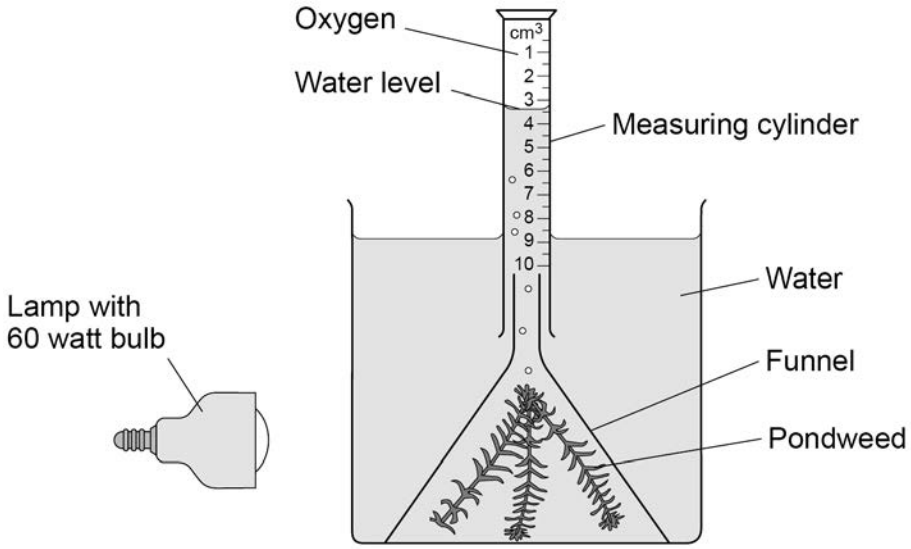
[2 marks]

_____ + _____ ⟶ _____ + 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.

Do not write outside the box

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 _____

_____

2 _____

_____

Question 9 continues on the next page

Do not write outside the box

Table 9 shows the student's results.

Table 9

Power output of bulb in watts	Volume of oxygen collected in 20 minutes in cm^3	Rate of photosynthesis in cm^3/hour
60	0.5	1.5
100	0.8	2.4
150	1.1	**X**
200	1.2	3.6
250	1.2	3.6

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

[1 mark]

X = _____ cm^3/hour

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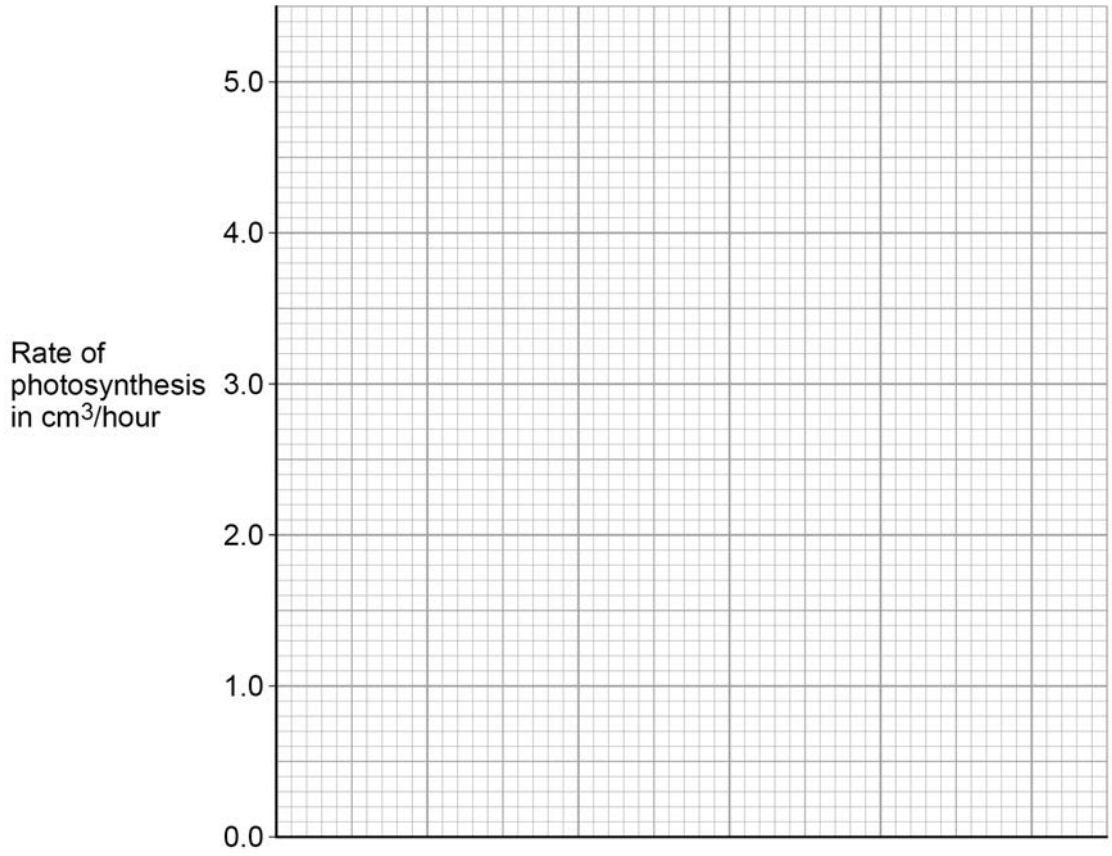
0 9 . 5 Complete **Figure 15**.

[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^3/hour

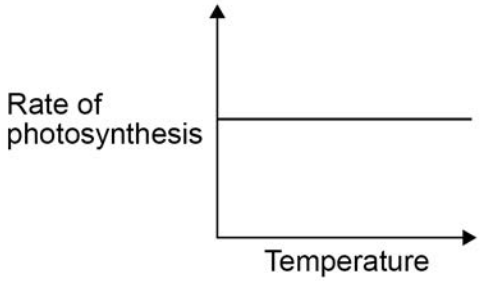
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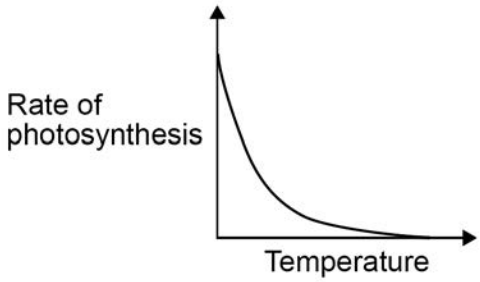
0 9 . 7 Which graph shows the effect of temperature on the rate of photosynthesis?

[1 mark]

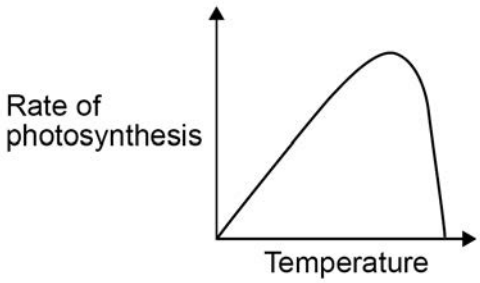
Tick (✓) **one** box.



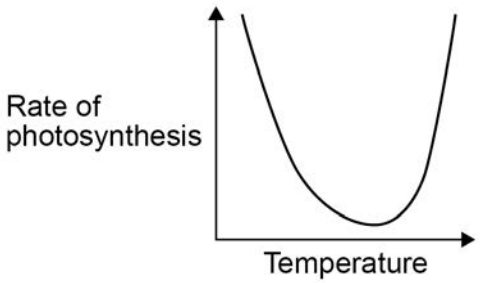
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12

END OF QUESTIONS

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