

Please write clearly in block capitals.

Centre number

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Candidate number

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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	

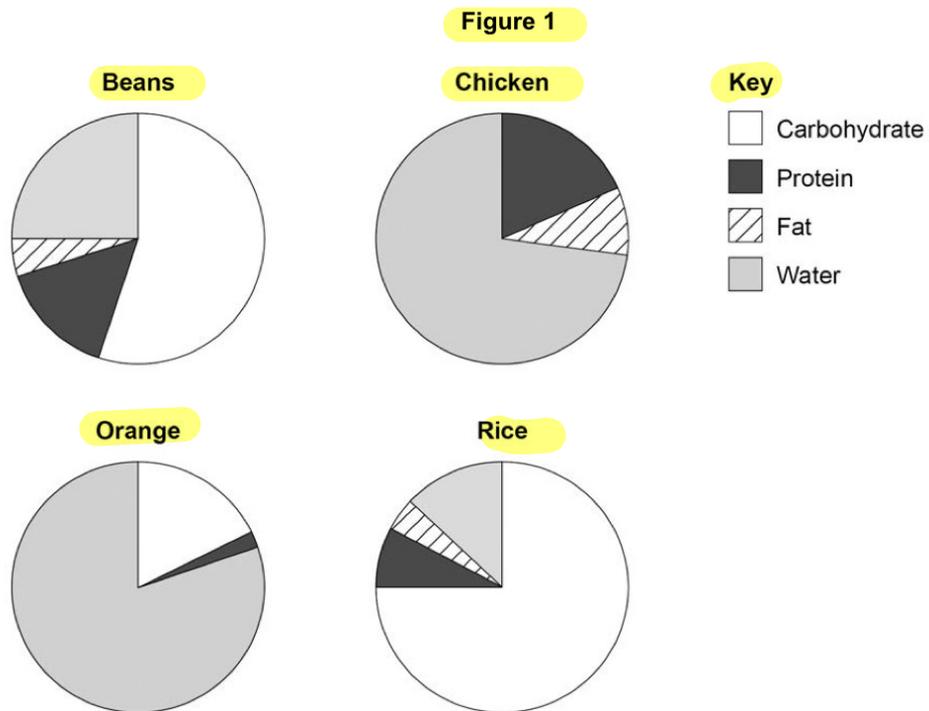


Answer **all** questions in the spaces provided.

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	<input type="checkbox"/>	Beans		Chicken	
Chicken	<input type="checkbox"/>				
Orange	<input type="checkbox"/>				
Rice	<input checked="" type="checkbox"/>				

Figure 1

Beans

Chicken

Orange

Rice

Key

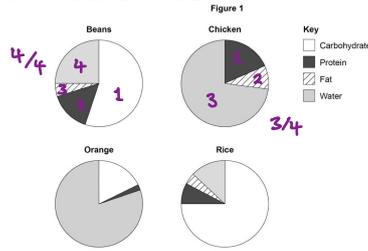
- Carbohydrate
- Protein
- Fat
- Water



0 1 . 2

Estimate the percentage of water found in **beans**.

[1 mark]



25 %

0 1 . 3

Look at **Figure 1**.

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

[1 mark]

beans contain all four food groups

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 ← breaks down fats
- Lipase ← breaks down lipids (fats)
- Protease ← breaks down proteins

Which chemical could be used to test for glucose?

[1 mark]

Tick (✓) **one** box.

- Benedict's reagent
- Biuret reagent ← tests for proteins
- Iodine solution ← tests for starch
- Sulfuric acid ← tests for fats

Turn over ►



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

[1 mark]

From blue to red /green/ yellow/ orange/ brown.

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?

7.1 > 7.0

[1 mark]

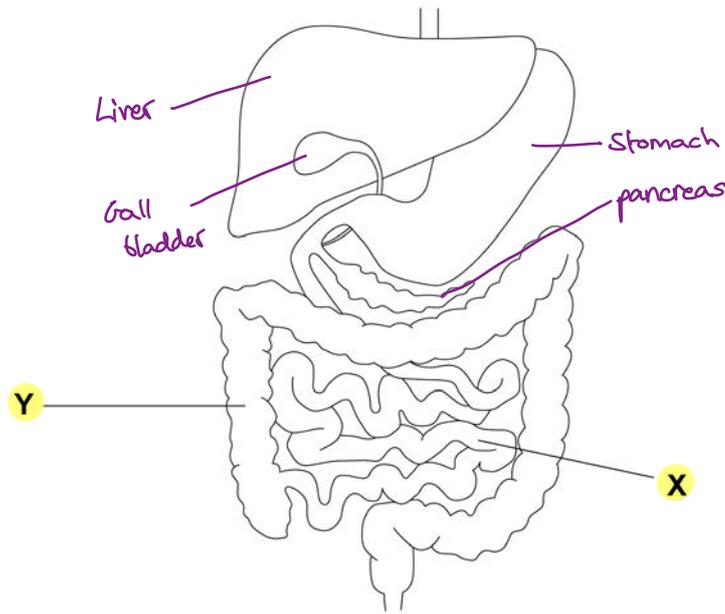
Tick (✓) one box.

A B C D



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]

small intestine

0 1 . 9 Complete the sentences.

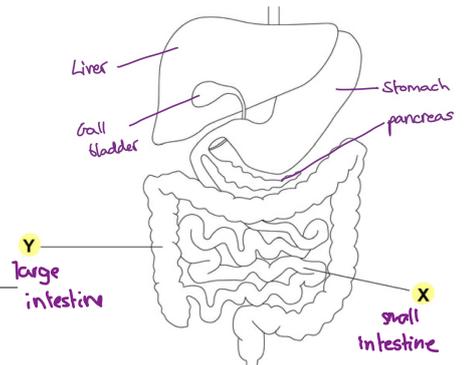
Choose answers from the box.

[2 marks]

<p>active transport</p> <ul style="list-style-type: none"> ↳ requires energy ↳ against concentration gradient 	<p>digestion</p> <ul style="list-style-type: none"> ↳ breakdown of protein/lipid/carbohydrate etc 	<p>excretion</p> <ul style="list-style-type: none"> ↳ getting rid of waste
<p>osmosis</p> <ul style="list-style-type: none"> ↳ diffusion of water 		<p>respiration</p> <ul style="list-style-type: none"> ↳ O₂ ↳ CO₂

Some glucose is absorbed into the bloodstream against the concentration gradient by the process of active transport.

Water moves out of part Y and into the bloodstream by the process of osmosis.

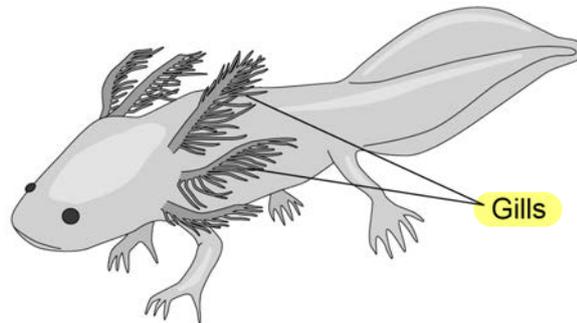


0 2

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

along the concentration gradient ✓

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

against the concentration gradient

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.

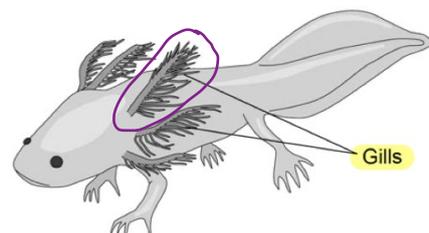
Use information from Figure 3.

[2 marks]

Feature gills have many projections

Description makes (gills have) a large surface area

Figure 3



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 → characteristic of an organism that improves its chances of survival
 differentiation → cells express specific genes that characterise it into a more specialised cell type
 evolution → Change of inherited characteristics within a population over time (through natural selection)
 variation → (genetic) differences between individuals within a species

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

known as differentiation.

0 2 . 4

Complete the sentence.

[1 mark]

Choose the answer from the box.

binary fission → bacterial replication
 mitosis → cellular replication
 mutation → change in a gene

To grow a new gill the stem cells divide by mitosis.

0 2 . 5

Which one of the following does not contain stem cells?

[1 mark]

Tick (✓) one box.

- Bone marrow Develops into:
- Red blood cell (-cartilage, bone)
- White blood cell
- Platelets
- Embryos Person!
- Hair X
- Meristem tissue - Plant organs (eg roots, leaves...)
↑ in plants

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.

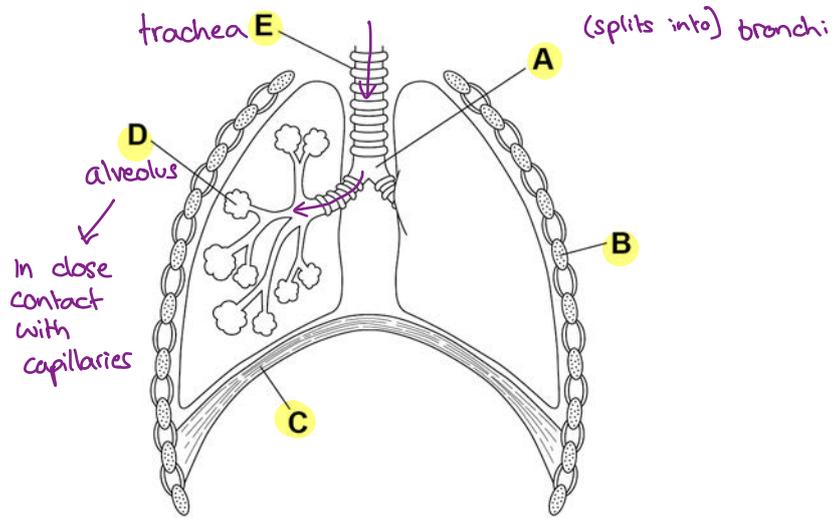
Axolotl research is cruel.



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]

trachea

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

[1 mark]

Tick (✓) one box.

Aorta → out of heart to the body
 Pulmonary artery → from heart to lungs
 Vena cava → from body to heart



0 3

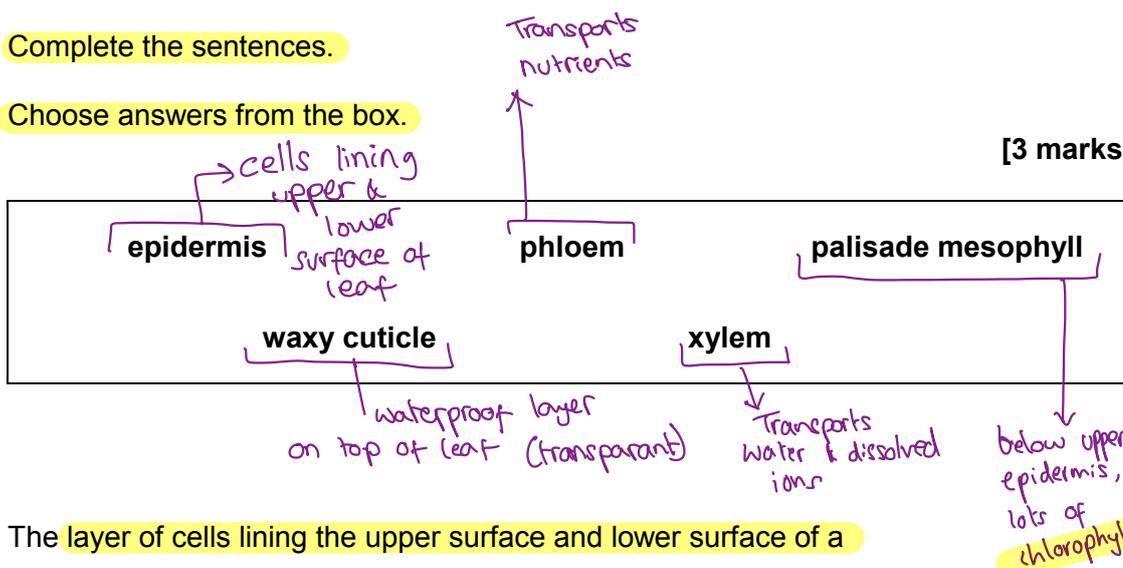
This question is about leaves.

0 3 . 1

Complete the sentences.

Choose answers from the box.

[3 marks]



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

The part of the leaf where most photosynthesis occurs is the palisade mesophyll.

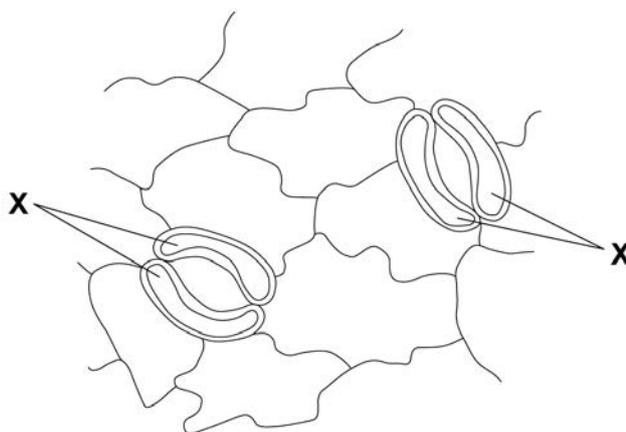
Water is transported to the leaf in the xylem.

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.

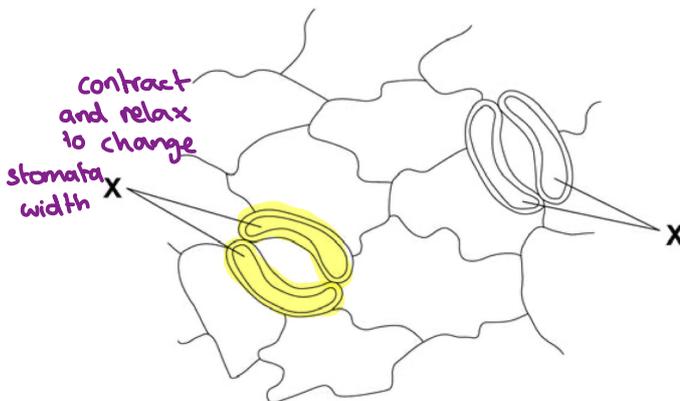
What are the cells labelled **X**?

[1 mark]

Tick (✓) **one** box.

- Guard cells
- Mesophyll cells
↳ beneath surface
- Root hair cells
↳ in roots
- Stem cells
↳ i.e. meristem in root tips

Figure 5



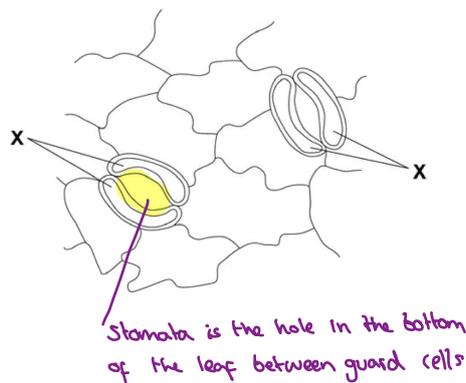
0 3 . 3 What is the function of the stomata?

[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

Figure 5



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

[1 mark]

Tick (✓) **one** box.

- By evaporation
- By respiration
- By translocation



Movement of glucose to other parts after being produced via photosynthesis

Turn over ►

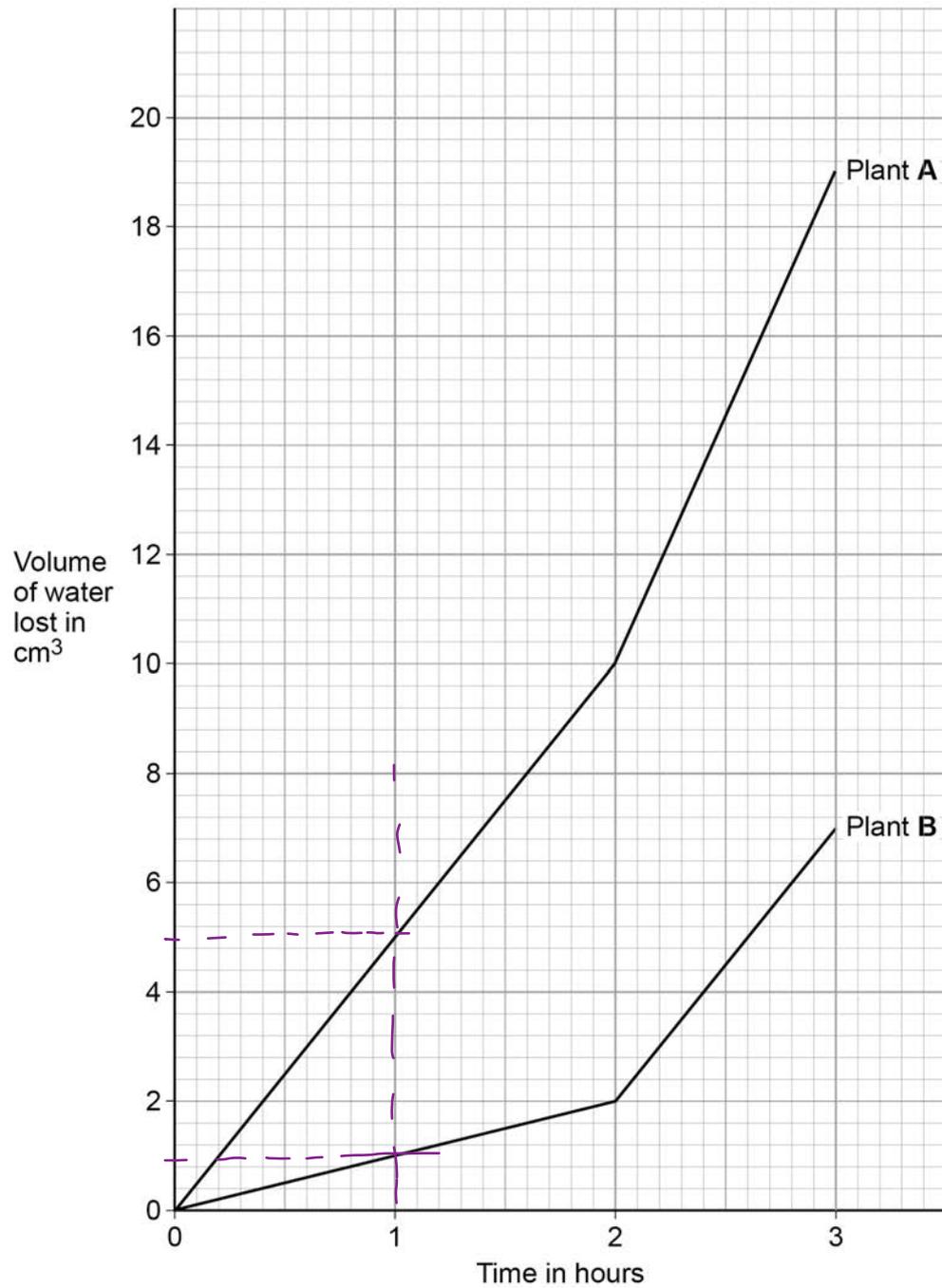


A student investigated the volume of water lost from two plants.

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]

Plant A lost 5cm^3 $5 - 1 = 4$

Plant B lost 1cm^3

Difference in volume = 4 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.

 x

Plant A is smaller.

 x

Plant A has more leaves.

Plant A has smaller leaves.

 x

- Temperature
- Windspeed
- Surface area

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]

- Warmer

- Windier

- Brighter

- Drier/ less humid

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

Characteristic giving the organism a survival advantage



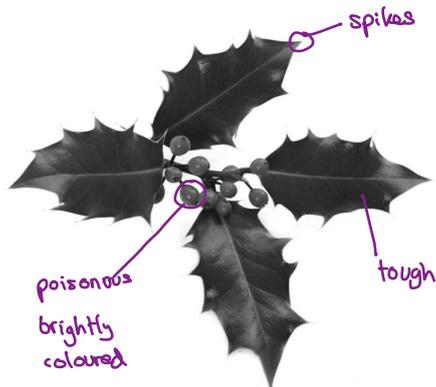
Describe one way the holly plant is adapted to stop it being eaten by animals.

[1 mark]

leaves have spikes

11

Figure 7



Turn over for the next question

*Do not write
outside the
box*

**DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED**

Turn over ►



0 4

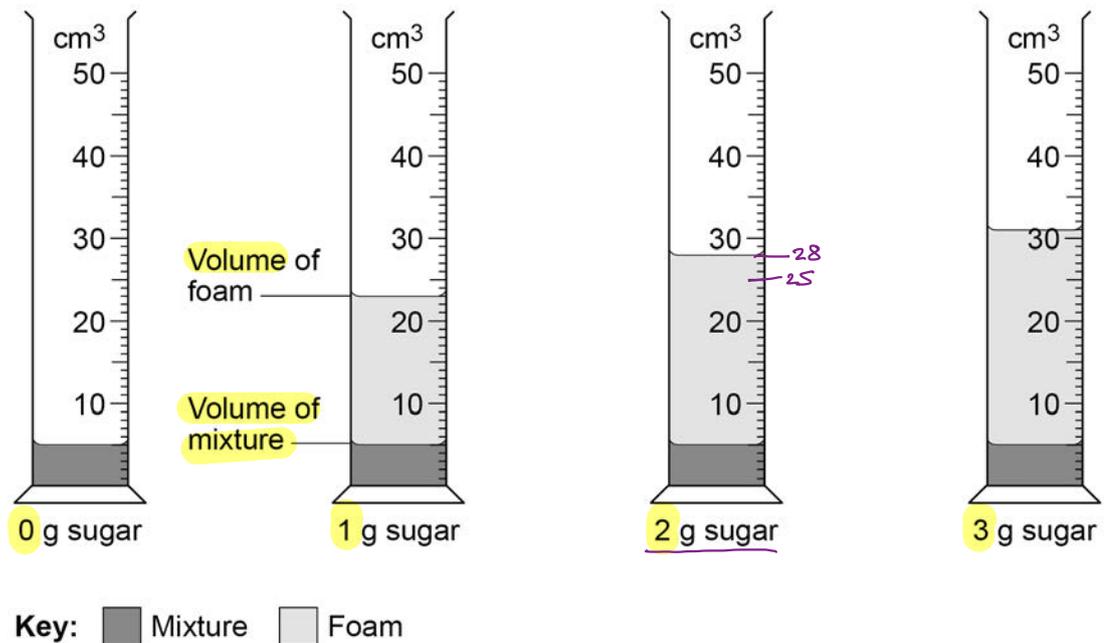
A student investigated **respiration in yeast**.

This is the method used.

1. Add **5 cm³** 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

This is the method used.

pH of the mixture

Temperature

Volume of foam

Volume of yeast and water

1. Add **5 cm³** 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.

Table 3 shows the results.

Table 3

Mass of sugar in g	Maximum volume in cm³
0	5
1	23
2	X
3	31

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

Use **Figure 8**.

[1 mark]

X = 28 cm³

Turn over ►

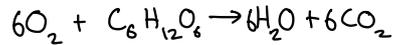


In the investigation, the yeast respires and releases a gas which causes the foam to rise.

Which gas causes the foam to rise?

[1 mark]

Tick (✓) **one** box.

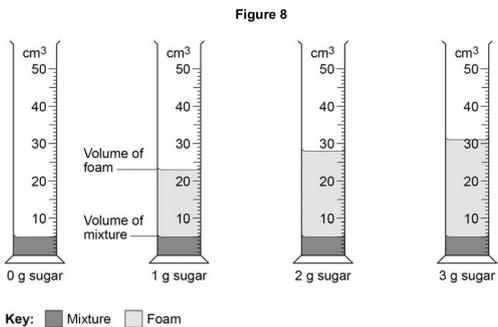


- Carbon dioxide
- Hydrogen
- Nitrogen
- Oxygen

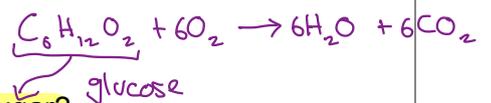
0 4 . 4 What **conclusion** can you make about the **relationship** between the **mass of sugar** used and the **volume of gas** produced?

[1 mark]

Figure 8 shows the student's results.



The greater the mass of sugar,
the greater the volume of foam
produced



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

[1 mark]

No respiration occurs (sugar is needed for respiration)

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

[1 mark]

Comparison (control)

- Checks that no other factor influences the results



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,

↳ with O₂

[1 mark]

Stops the oxygen getting through

What other substance is produced during anaerobic respiration in yeast?

[1 mark]

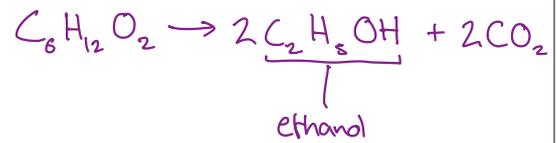
Tick (✓) one box.

Ethanol

Hydrochloric acid

Lactic acid

Water



Turn over ►



0 5

A man has the following symptoms:

- yellow discharge from his penis
 - pain when urinating.
- } STD (sexually transmitted disease)

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

HIV = human immunodeficiency virus
↑ not bacterial

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]

Abstain from sexual intercourse

(Wash hands after urinating etc.)

Turn over ►

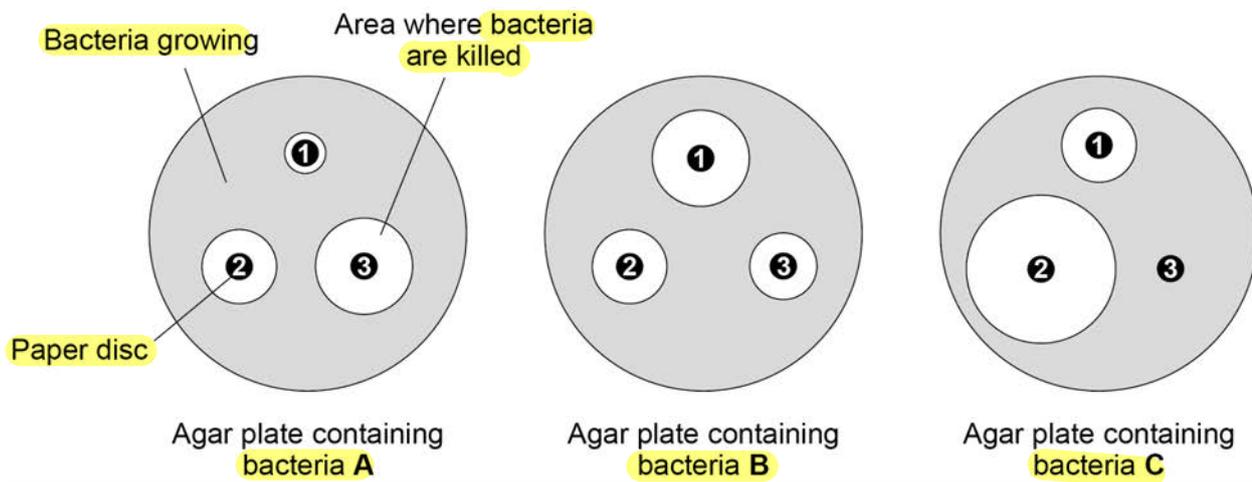
A scientist investigated the effect of **three different antibiotics** on three different types of **bacteria A, B and C**.

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]

On bacteria A, 3 is most effective. on B, 1 is most effective. On C, 2 is most effective. Number 3 has no effect on bacteria C. } qualitative (effect)

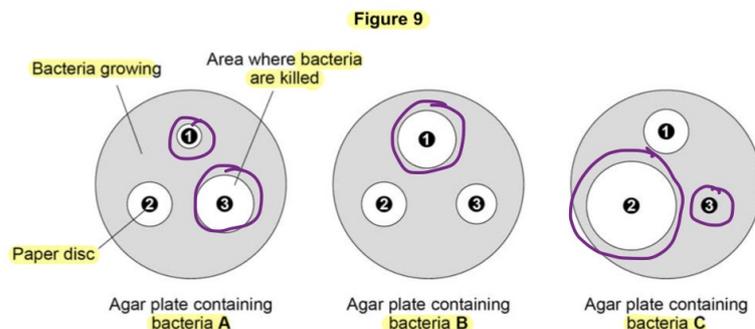
2 kills more on C compared to A or B, but about the same amount for A and B each.

3 kills more on A than on B or C, and kills more of B than of C. C is resistant to 3.

quantitative
(more or less)

1 kills more on B than on A or C, and more on C than on A.

- Link relevant points in a logical sequence



Turn over ►

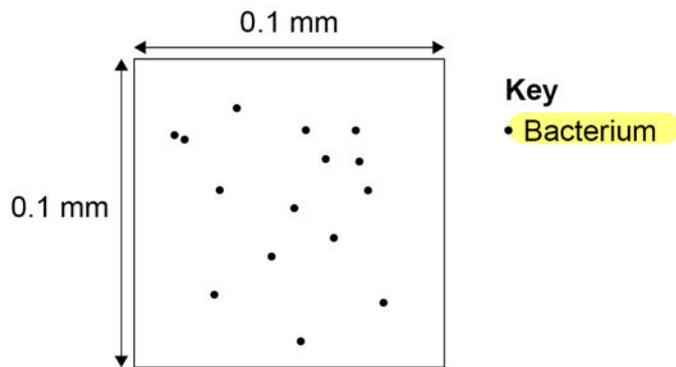


Milk contains bacteria.

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.

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

Figure 10

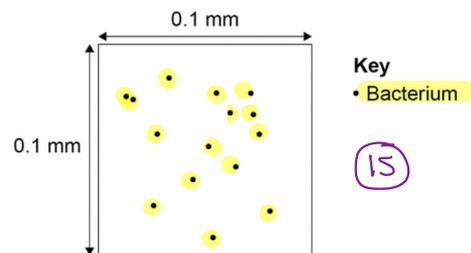


Table 4

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



0 5 . 6

Calculate the mean number of bacteria in the four samples in Table 4.

[2 marks]

$$\rightarrow \frac{\text{Sum of values}}{\text{no. of values}}$$

$$15 + 12 + 13 + 16 = 56$$

$$\frac{56}{4} = 14$$

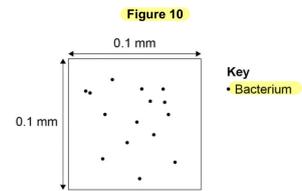
$$\text{Mean number of bacteria} = 14$$

0 5 .

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

Complete the following steps.

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



$$\text{Square} = 0.1 \times 0.1 = 0.01$$

$$\text{Total area of counting chamber} = 0.01 \text{ mm}^2$$

The depth of the counting chamber is 0.01 mm

Calculate the volume of the counting chamber in Figure 10.

Use the equation:

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

$$0.01 \times 0.01 = 0.0001$$

$$\text{Volume of counting chamber} = 0.0001 \text{ mm}^3$$

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

Use the equation:

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

$$\frac{14}{0.0001} = 140,000$$

$$\text{Mean number of bacteria per } \text{mm}^3 \text{ of milk} = 140,000$$

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 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

Table 5

Milk sample	Number of bacteria per cm^3 of milk
P	$1.8 \times 10^4 < 2 \times 10^4$
Q	$2.2 \times 10^4 > 2 \times 10^4$
R	2.2×10^{-5}
S	1.8×10^3

~~20 000 per cm^3~~
standard form
 $\overset{1}{2} \overset{2}{0} \overset{3}{0} \overset{4}{0} = 2.0 \times 10^4$

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

[1 mark]

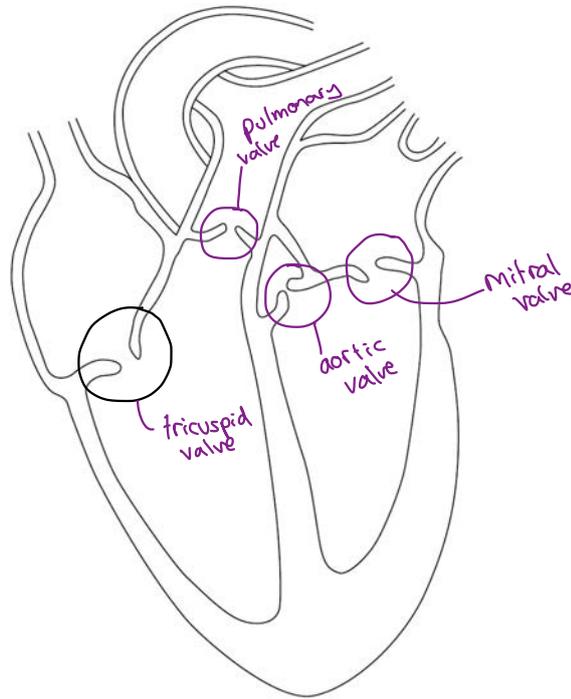
Bacteria can make humans ill / release toxins / kill
humans



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]

Circulatory

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]

Prevents the backflow of blood

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]

veins

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 longer lasting (less likely to need replacement after five years)

2 no need for anti-rejection (immunosuppressant) drugs

- less ethical concerns

less risk of rejection



0 6 . 6

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

[1 mark]

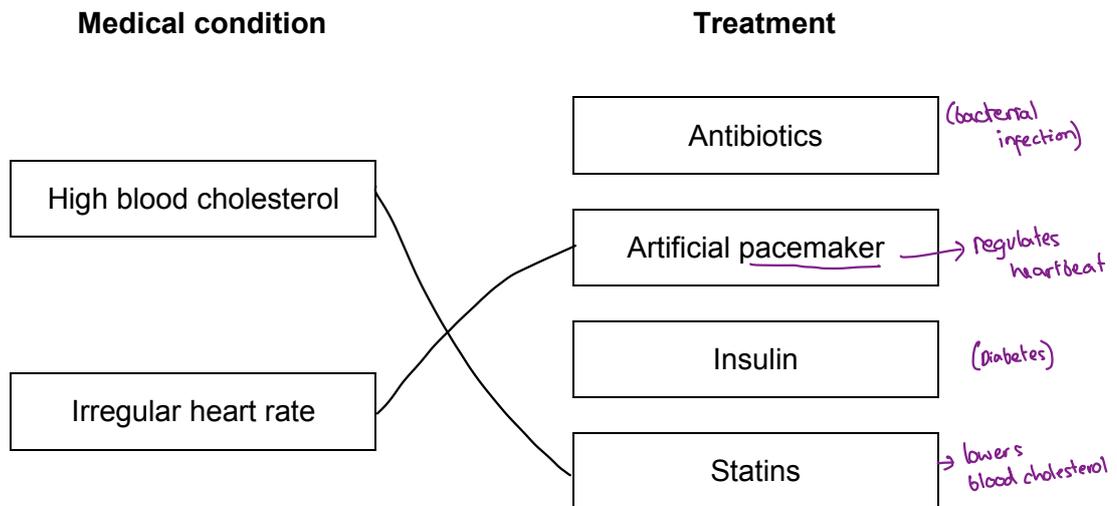
No anti-clotting medication needed

0 6 . 7

A person may **develop** other **medical conditions**.

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

[2 marks]



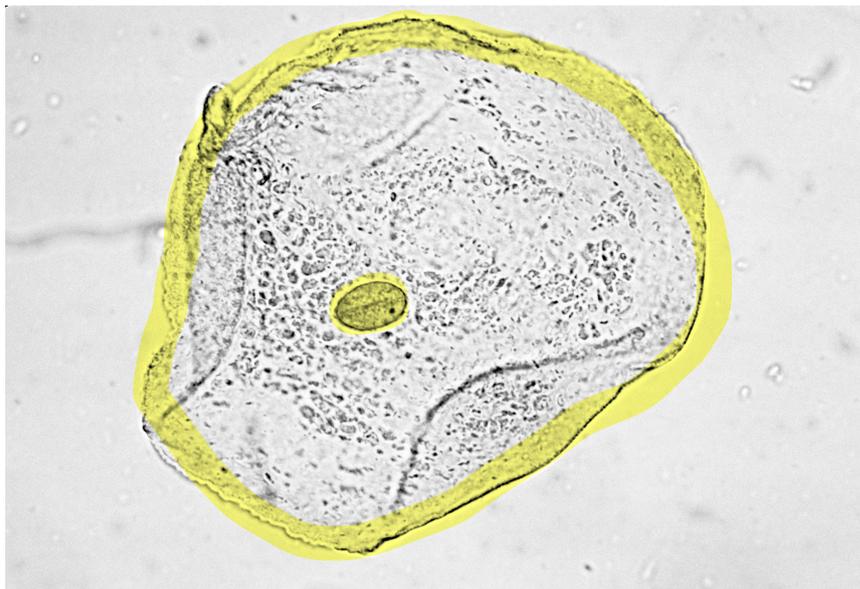
9

Turn over for the next question

Turn over ►



07

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

controls the activities of the cell ✓ contains genetic material ✓

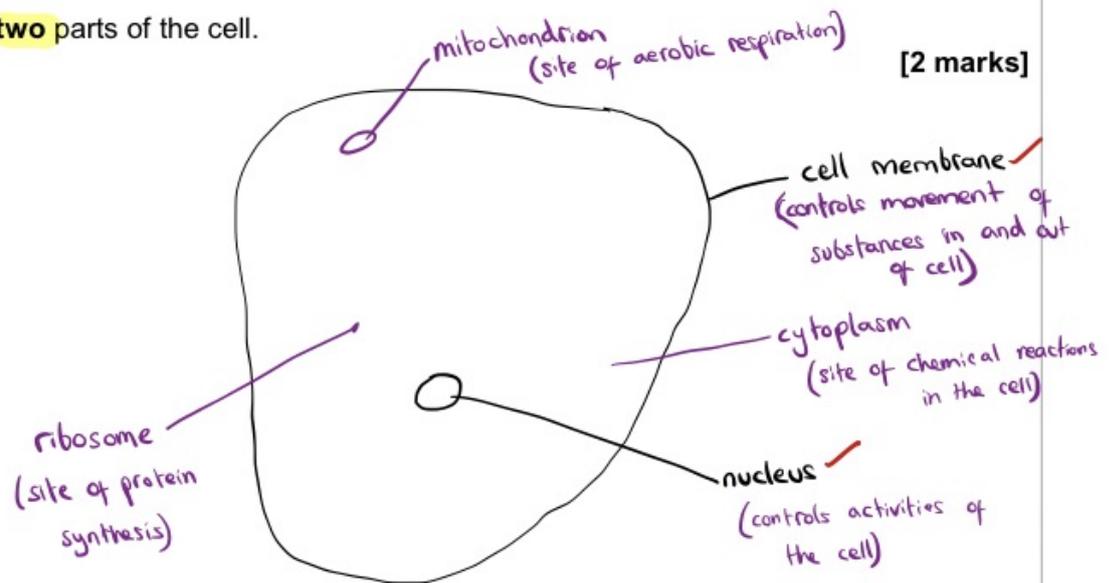
Name **one** type of cell that does **not** contain a nucleus.

[1 mark]

<p>red blood cell</p> <p>↓</p> <p>because the space is needed for haemoglobin</p>	<p>bacteria / prokaryote</p> <p>↓</p> <p>have genetic material free in the cytoplasm (not membrane bound)</p>	<p>xylem cells</p> <p>↓</p> <p>dead cells that don't need a nucleus to carry out any functions</p>
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0 7 . 3

Draw a simple diagram of the cell in **Figure 12**.Label **two** parts of the cell.

0 7 . 4

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

[1 mark]

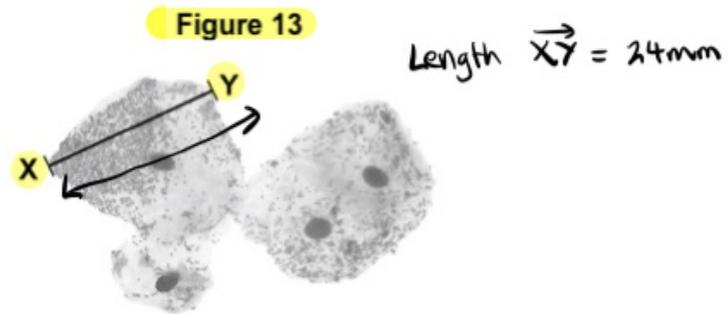
cellulose cell wall chloroplast (permanent) vacuole

Question 7 continues on the next page

Turn over ►



Figure 13 shows some different cells.



The real length from point X to point Y is 0.06 mm

0 7 . 5

Calculate the magnification.

Use the equation:

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

[3 marks]

Size of image = 24 mm ✓

Real size = 0.06 mm

$\frac{24}{0.06} = \text{magnification}$ ✓

$\frac{24}{0.06} = 400$

Magnification = \times 400 ✓



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**.

↳ uses a beam of accelerated electrons [2 marks]
 ↳ electrons have a shorter wavelength than light
 ↳ has a higher resolving power and higher magnification

1 higher magnification

2 higher resolution / resolving power

(allows '3D image')
 ↳ microscope detects
 the electrons that
 reflect back off of
 the specimen

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

(The Plasmodium protist)

A virus

Mosquito nets can help prevent the spread of malaria.

Table 1 shows the results of a study in one area of Africa.

Table 1

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	<u>1.2</u>	<u>40</u>

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]

lower percentage of people with malaria when using mosquito nets

0 8 . 3 Suggest **one** reason why the statement may **not** be valid.

[1 mark]

Some people who use mosquito nets have malaria

Data is from only one area

No other information about the people is considered

Group sizes is too small

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

-3
-2

Eg. ↓
Predict another
-2
 $92 - 2 = 90$

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]

MS allows any from 88-91

Number of people per 100 000 = 90

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]

Improved healthcare

Use of mosquito control methods

changing behaviour to avoid being bitten

Turn over ►



0 8 . 6

Describe how the human body:

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

Logical order
Well explained points
Include both bullet points given
[6 marks]

(Prevention of entering)

- Skin acts as a barrier, ^{oil} on the surface that repels pathogens ✓
scabs form over cuts / scabs form a barrier ✓
- Eyes produce tears ✓, tears are antiseptic ✓, contain enzymes to kill bacteria ✓
- (Breathing system) Trachea/nose/bronchi contain mucus ✓ which is sticky and traps bacteria ✓. Mucus is carried away by ^{small hairs lining air passages} cilia ✓
- White blood cells / immune system ✓
- Antitoxins are produced ✓ and neutralise toxins produced by pathogen
- Antibodies produced ✓ and help destroy pathogens ✓
- Memory cells form ✓ and trigger more rapid response if pathogen re-enters ✓

(Defends against pathogens inside body)



0 9 This question is about photosynthesis.

0 9 . 1 Complete the word equation for photosynthesis:

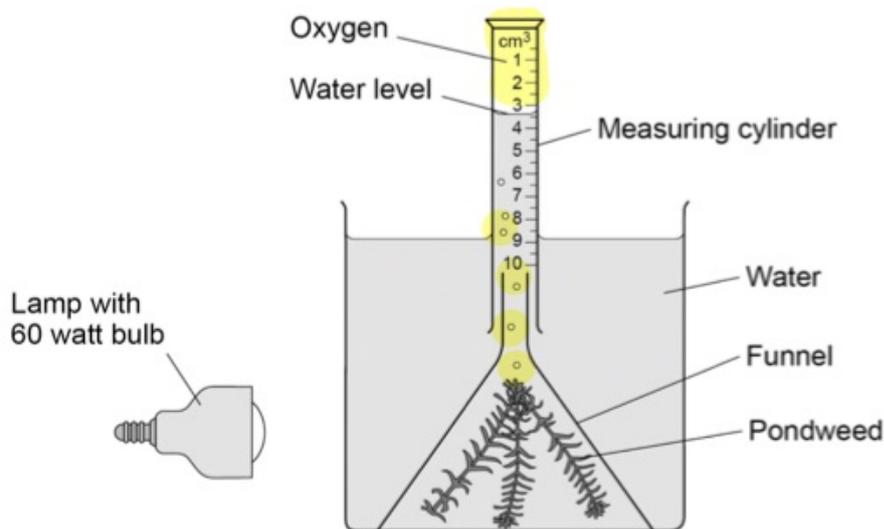
[2 marks]

carbon dioxide + water → glucose + 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.*→ the variable you change*

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 Do repeats and calculate the mean

2 Control the water temperature

- Control the distance between the bulb and pondweed
- Control the mass/length/species/age of the pondweed
- Give pondweed time to equilibrate → get used to the conditions

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^3	Rate of photosynthesis in cm^3/hour
60	0.5	1.5
100	0.8	2.4
150	1.1	X = 3.3
200	1.2	3.6
250	1.2	3.6

Calculate value X in **Table 9**

[1 mark]

0 9 . 4

$$1.1 \text{ cm}^3 = 20 \text{ mins of photosynthesis} \quad 60 \div 20 = 3$$

$$1.1 \times 3 = 3.3 \quad 3.3 \text{ cm}^3 = 60 \text{ mins of photosynthesis}$$

$$x = 3.3 \text{ cm}^3/\text{hour}$$



0 9 . 5 Complete **Figure 15.****[4 marks]**

You should:

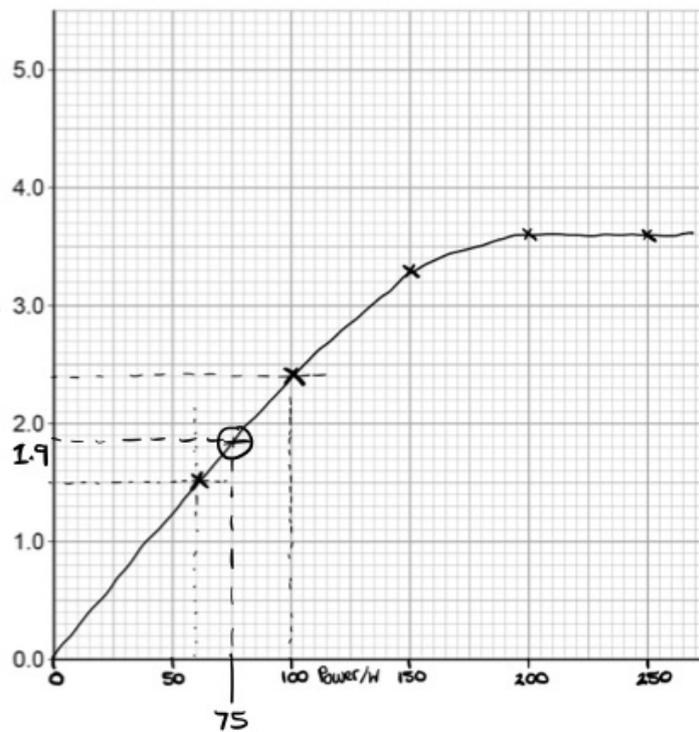
- label the x-axis
- use a suitable scale
- plot the data from **Table 9** and your answer to Question 0 9 . 4
- draw a line of best fit.

Figure 15.**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 = 3.3
200	1.2	3.6
250	1.2	3.6

Rate of photosynthesis in cm³/hour

- Independent variable on x-axis
- Dependent variable on y-axis

Determine the expected rate of photosynthesis with a bulb of power output 75 watts.Use **Figure 15.****[1 mark]**

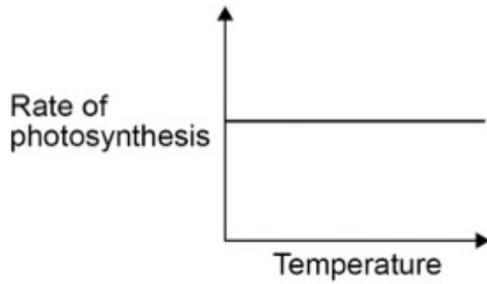
(MS allows 1.8 / 1.9)

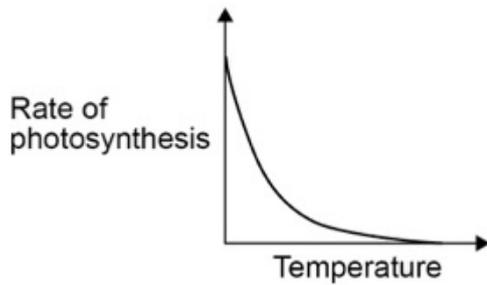
Rate of photosynthesis at 75 watts = 1.9 cm³/hour**Turn over ►**

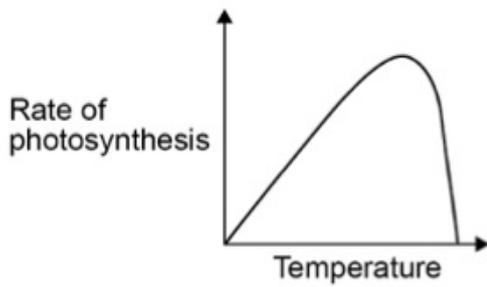
0 9 . 7 Which graph shows the effect of temperature on the rate of photosynthesis?

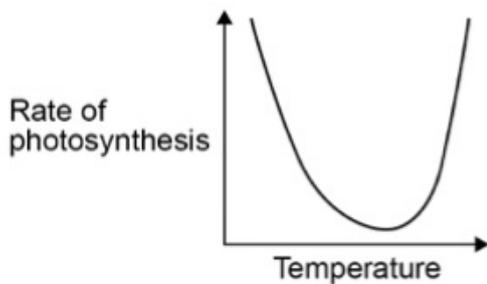
[1 mark]

Tick (✓) one box.









As temperature increases the rate of photosynthesis increases until the temperature is so high that it is damaging to the plant

12

END OF QUESTIONS



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