AQA

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.
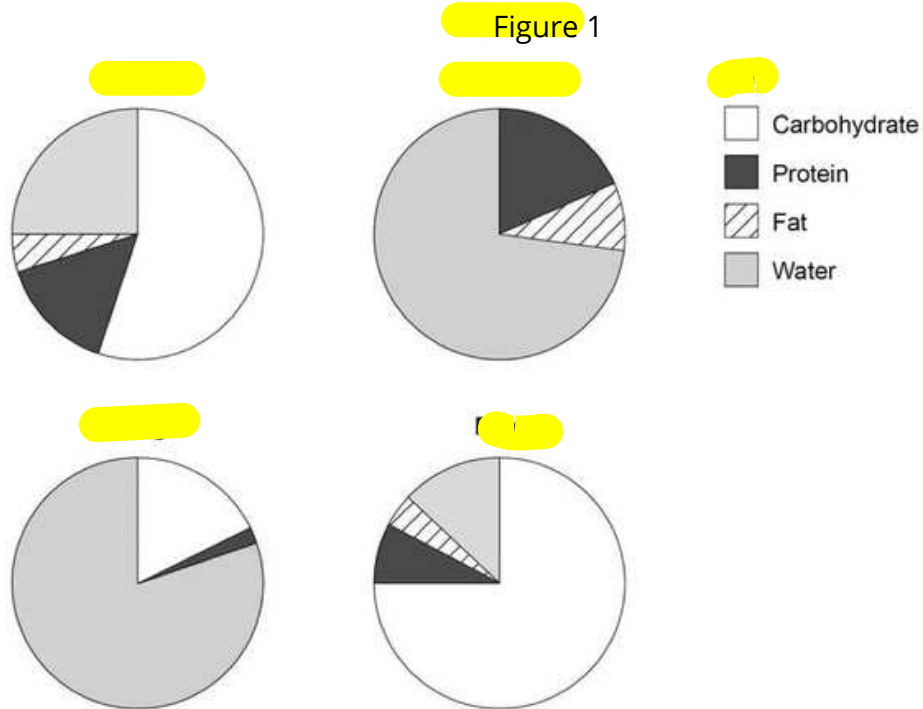- You are reminded of the need for good English and clear presentation in your answers.

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

8461/1F

Answer all questions in the spaces provided.

0 1   Many foods contain carbohydrates.

Figure 1 shows information about four different foods.

Figure 1

	Carbohydrate
■	Protein
▨	Fat
▦	Water

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

[1 mark]

Tick (✓) one box.

Beans 50K ☐

Chicken ☐

Orange ☐

Rice ☑

Figure 1

Beans 50%<   Chicken   Key

■	Protein
▨	Fat
▦	Water

Orange   Rice 75%

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

[1 mark]

4/4 14

2
3
1
2 3

Percentage 3/4
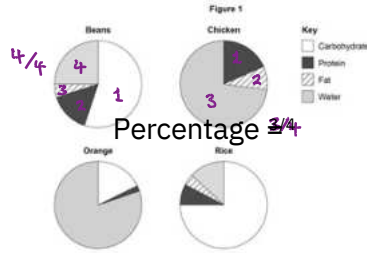
25 %. %

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 ☐ ← 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.

red/

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>07.0
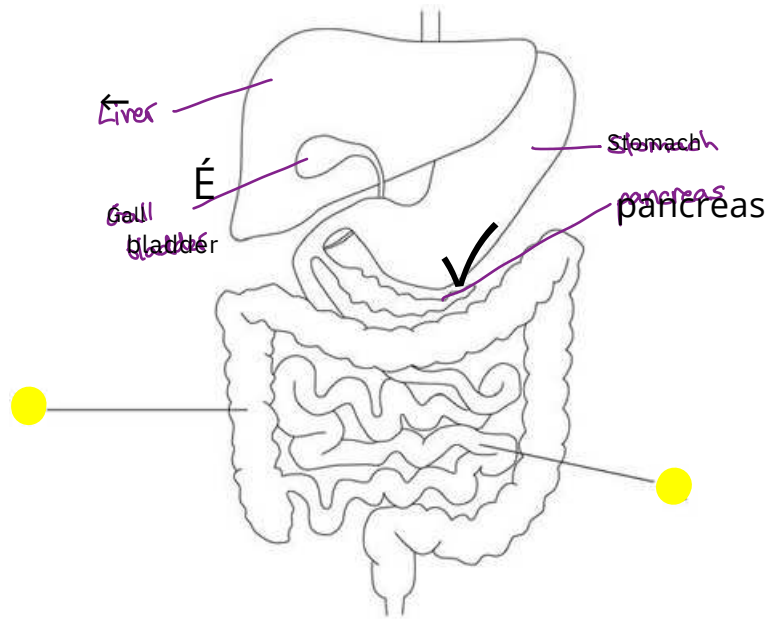
[1 mark]

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.

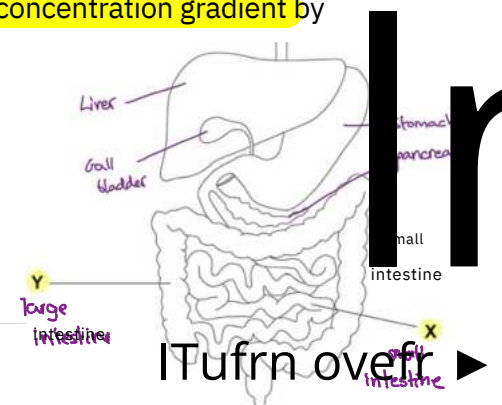[1 mark]

small intestine

0 1 9 Complete the sentences.

[2 marks]

Choose answers from the box.

active transport   digestion   excretion -
→ requires energy   → breakdown of   → getting rid
→ against concentration   protein/lipid/carbohydrate   of waste
gradient   osmosis   etc
→   → diffusion of water   respiration -
→   → O₂
→   → CO₂

Some glucose is absorbed into the bloodstream against the concentration gradient by

the process of active
transport.   active transport

Water moves out of part Y and into the bloodstream by -

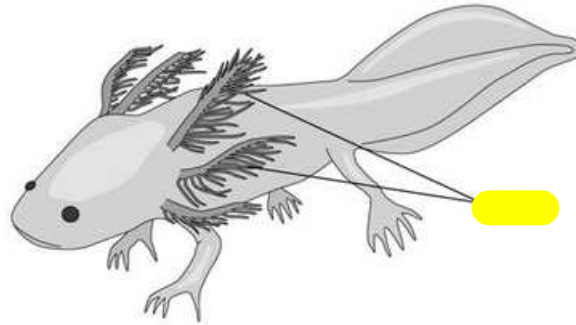the process of osmosis. osmosis
large

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.

along the concentration gradient ✓ t

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

nstÉtit, *against the concentration gradient*

The movement of particles from a low concentration to a high concentration — active transport t

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

0 2 . 2 Describe how one feature of the axolotl's gills increases the rate of diffusion of oxygen.

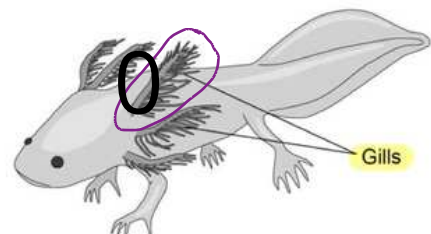Use information from Figure 3.

[2 marks]

Feature _____ gills have many projections _____

Description _____ makes (gills have) a large surface area _____

_____

_____

Figure 3

Gills

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.

Change of inherited characteristics within a population over time (through natural selection)

| adaptation | differentiation | evolution | variation |

→ cells express specific genes that characterise it into a more specialised cell type

→ Genetic differences between individuals within a species

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

differentiation _____differentiation_____.

* Mitosis =

✱ Mitosis = identical
Meiosis = non-identical

0 2 . 4 Complete the sentence.

[1 mark]

Choose the answer from the box.

→ bacterial replication *→ change in a gene*

| bacterial | binary fission | mitosis | mutation |

cellular replication

_____ _____ ___mitosis___.

0 2 . 5 Which one of the following does not contain stem cells?

[1 mark]

Tick (✓) one box.

Develops into:
- Red blood cell   (cartilage, bone)
- White blood cell
- platelets

Bone marrow ☐

Embryos ☐   *Person!!*

Hair ☑ *✗*

Meristem tissue ☐
- Plant organs (eg roots, leaves...)

in plants
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. ☑

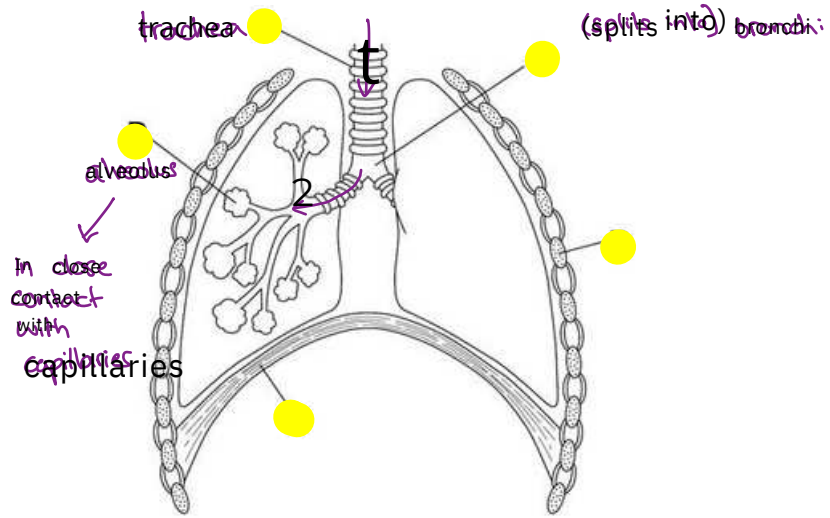Axolotls are endangered. ☐

Axolotls live in water. ☐

Axolotl research is cruel. ☐

IB/M/Jun19/8461/1F

Oxygen uptake in humans takes place in the lungs.

Figure 4 shows the human breathing system.

Figure 4

trachea

(splits into) bronchi

alveolus

in close contact with capillaries

bronchioles

0 2 . 7 Where does oxygen enter the bloodstream?

Tick (✓) one box.

-[1 m

A ☐   B ☐   C ☐   ☑

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.

out
Aorta of → ☐ → out of heart to the body

✓ → from
Pulmonary artery ☑ → from heart to lungs

Vena cava ☐ → from body to heart

11

Turn over ►

0 3   This question is about leaves.

0 3 . 1   Complete the sentences.

Choose answers from the box.

[3 marks]

---

box contents:

epidermis   phloem   palisade mesophyll

waxy cuticle   xylem

(handwritten annotations): cells lining upper & lower surface of leaf → epidermis; Transports nutrients → phloem; xylem transports water & dissolved ions; waterproof layer on top of leaf (transparent) → waxy cuticle; palisade mesophyll below upper epidermis, lots of chlorophyll
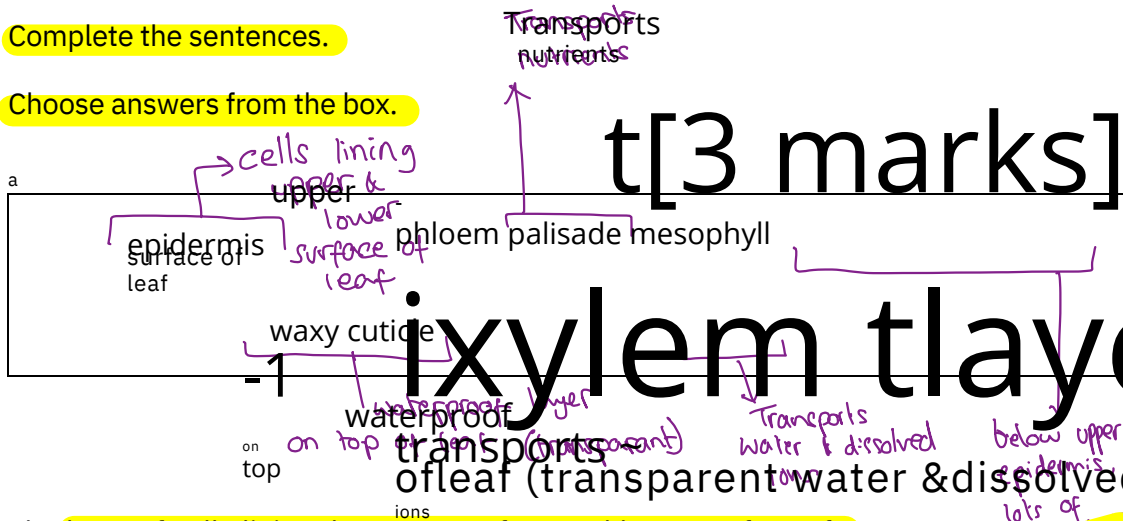
The layer of cells lining the upper surface and lower surface of a

leaf is the _____ epidermis. *(handwritten: epidermis)*

The part of the leaf where most photosynthesis occurs

is the _____ palisade mesophyll *(handwritten: palisade mesophyll)*

Water is transported to the leaf in the _____ xylem _____ . *(handwritten: 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
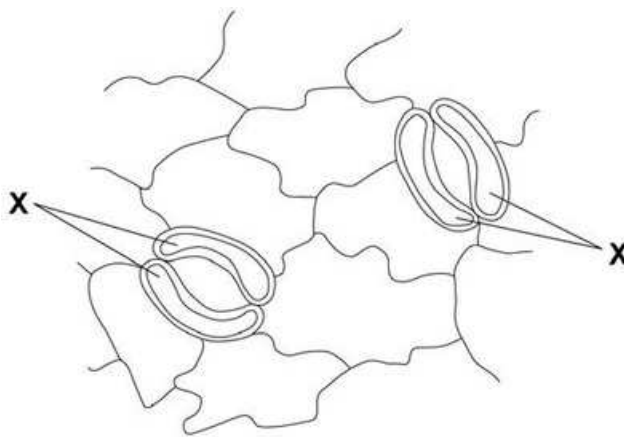
0 3 . 2 The cells labelled X control the width of the stomata.

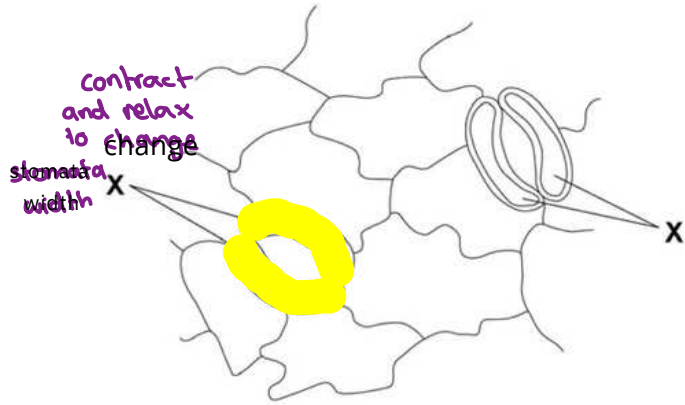What are the cells labelled X?

[1 mark]

Tick (✓) one box.

Figure 5

Guard cells ✓

contract andrelax to Mesophyll cells → beneath Surface

contract and relax to change stomata width

Mesophyll cells

Root hair cells

→ in roots

Stem cells

→ i.e. meristem in root tips

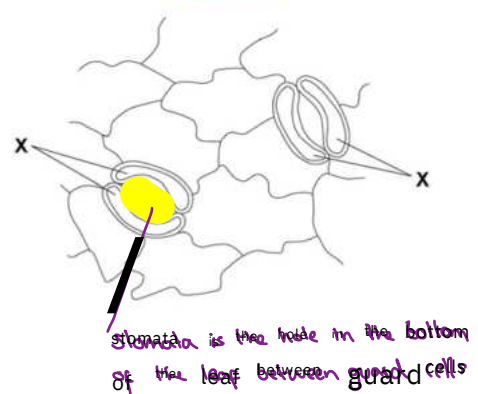**0 3 . 3** What is the function of the stomata?

[1 mark]

Tick (✓) one box.

Figure 5

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

stomata is the hole in the bottom of the leaf between guard cells

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

[1 mark]

Tick (✓) one box.

By evaporation ✓

By respiration

$C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$

By translocation

Movement of glucose to other parts after being produced via photosynthesis

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

Volume of water lost in cm³ (y-axis, 0 to 20)

Time in hours (x-axis, 0 to 3)

Plant A

Plant B

Do not write outside the box
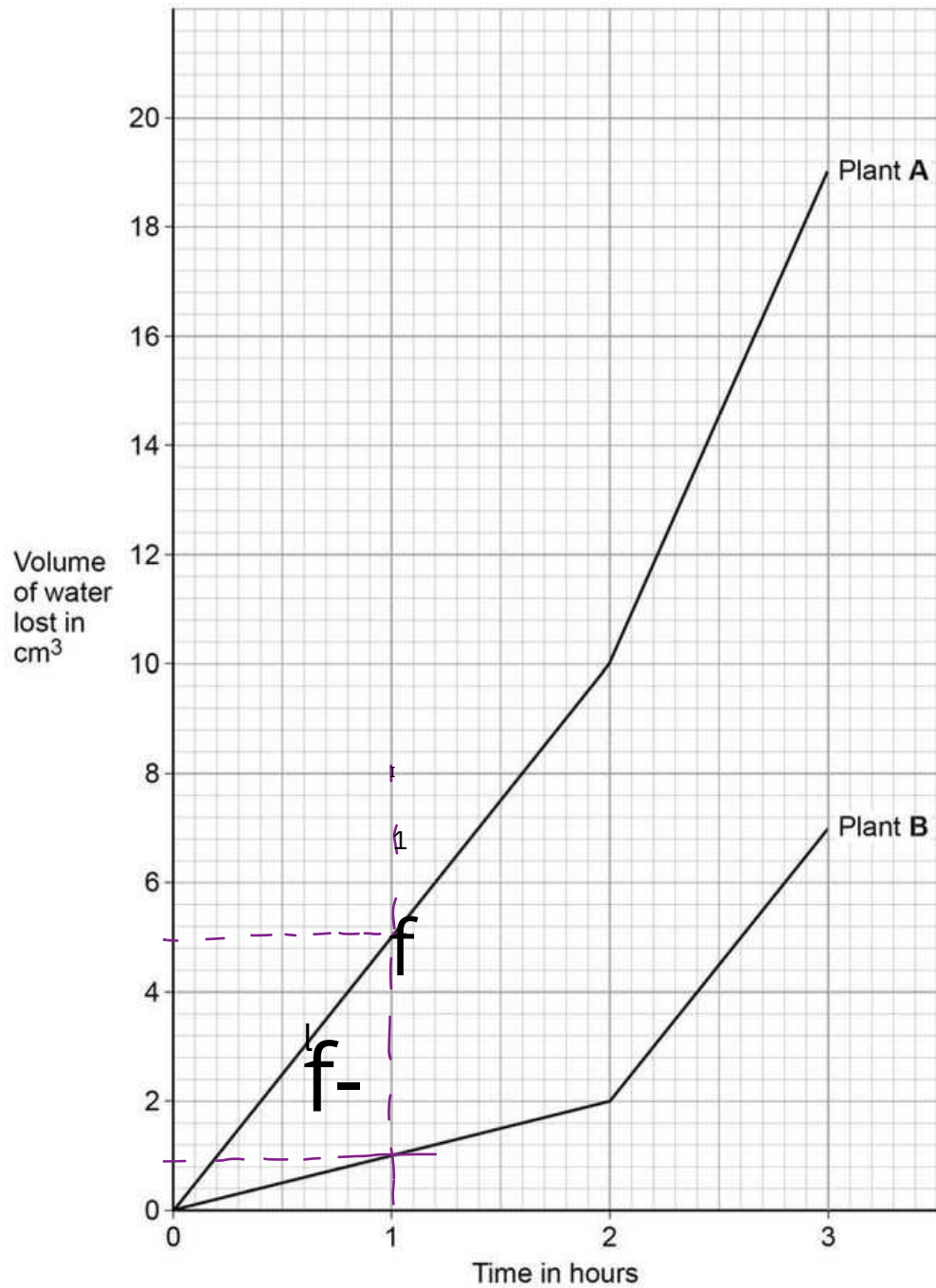
0 3 . 5 Calculate the difference in the volume of water lost by plant A compared to plant B in the first hour.

[2 marks]

Plant A lost 5cm³   5 - 1 = 4

Plant B lost 1cm³

Difference in volume = _____ 4 _____ cm3

0 3 . 6 What could cause plant A to lose water at a faster rate than plant B?

[1 mark]

Tick (9) one box.

– Temperature
✗ – Windspeed
– Surface area

Plant A has fewer stomata per leaf. - Surface   ☐ ✗

Plant A is smaller.   ☐ ✗

Plant A has more leaves.   ☑ ✓

Plant A has smaller leaves.   ☐ ✗

M0 A3 M.7 A

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

-Question 3 continues on the next page

Turn over ▶

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

=\ characteristic

→ characteristic giving the organism
a survival advantage

Figure 7 shows part of a holly plant. givingtheorganism
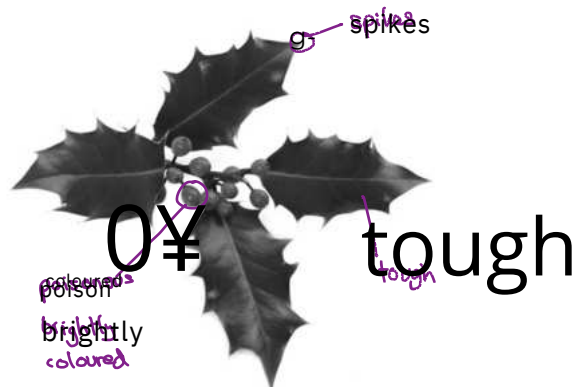
a survival
advantage

AFigure 7d

••

μ

-g-

-83g
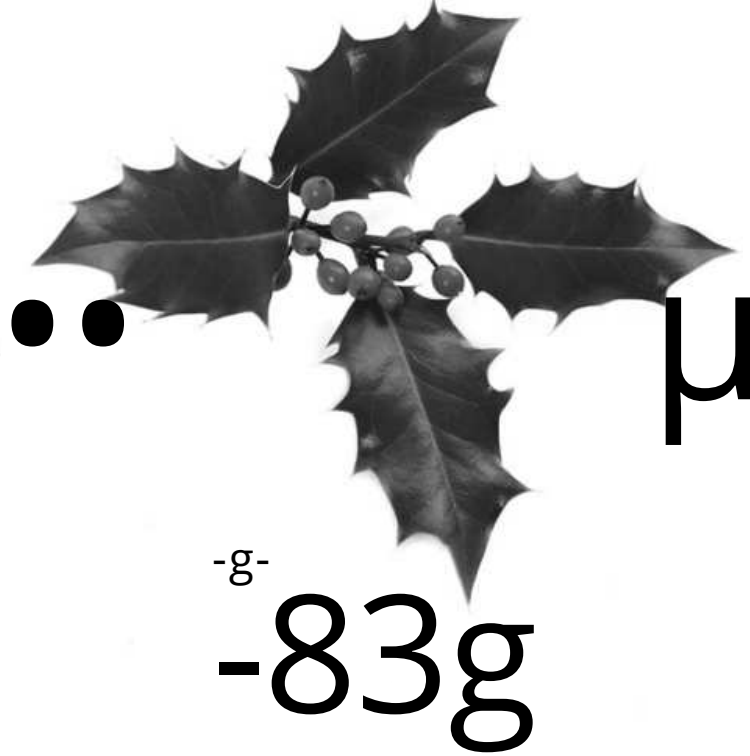
Describe one way the holly plant is adapted to stop it being eaten by animals.

[1 mark]

heaves have spikes

Figure 7

g - spikes

0¥   tough

poison   coloured
brightly
coloured

11

Turn over for the next question

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

Key: � Mixture ☐ Foam
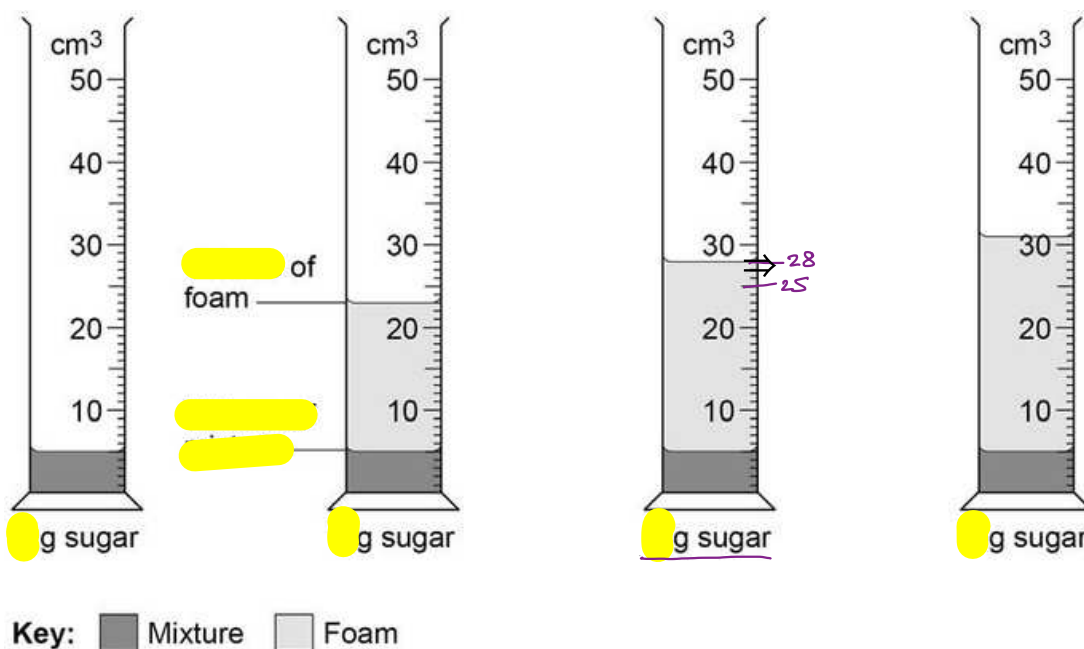
0 4 . 1 Which two variables did the student control in the method?
-4

keep the same

[2 marks]

Tick (✓) two boxes.

Mass of sugar ☐

This is the method used.

1. Add 5 cm³ of a yeast and water mixture to each measuring cylinder.

pH of the mixture ☐

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

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

Temperature ☑

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.

Volume of foam ☐

Volume of yeast and water ☑

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

-8--3Question 4

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

MAMA

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

[1 mark]

Tick (✓) one box. $6O_2 + C_6H_{12}O_6 \rightarrow 6H_2O + 6CO_2$
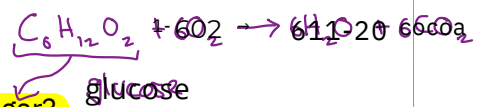
Carbon dioxide ✓ ☑

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.

Figure 8
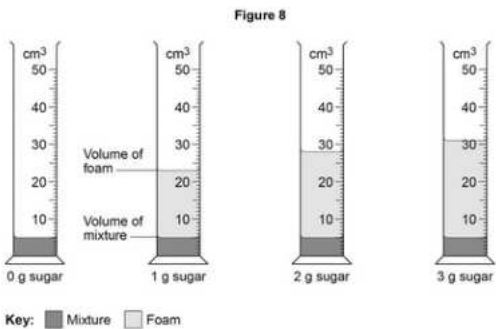
The greater the mass of sugar, the greater the volume of foam produced

$C_6H_{12}O_2 + 6O_2 \rightarrow 6H_2O + 6CO_2$
glucose

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

*

1 8 *

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]

Fth → with O_2

Stops the oxygen getting through

a0 m4.8 What other substance is produced during anaerobic respiration in yeast?

[1 mark]

Tick (✓) one box.

Ethanol ✓ ☑

Hydrochloric acid ☐

Lactic acid ☐

Water ☐

$C_6H_{12}O_2 \rightarrow 2C_2H_5OH + 2CO_2$

241¥04

ethanol
ethanol

9

②Turn over for the fnext qu-estion

Turn over ▶

19

0 5 A man has the following symptoms:

• yellow discharge from his penis

pain when url-STD•inating.
(sexually → 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 ☑ ✓

-1

HIV ☐   HIV = human immunodeficiency
virus
= not bacterial

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 b=acteria are resistant to the ☑

The man is immune to the antibiotics. ☐

The man is resistant to the antibiotics. ☐

0 5 3

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

Suggest a <mark>different way</mark> the man could <mark>avoid passing the bacteria on to</mark> someone else.

[1 mark]

Abstain from sexual intercourse

(wash hands after urinating etc)

-Question 5 -continues on th-e 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

Agar plate containing   Agar plate containing   Agar plate containing
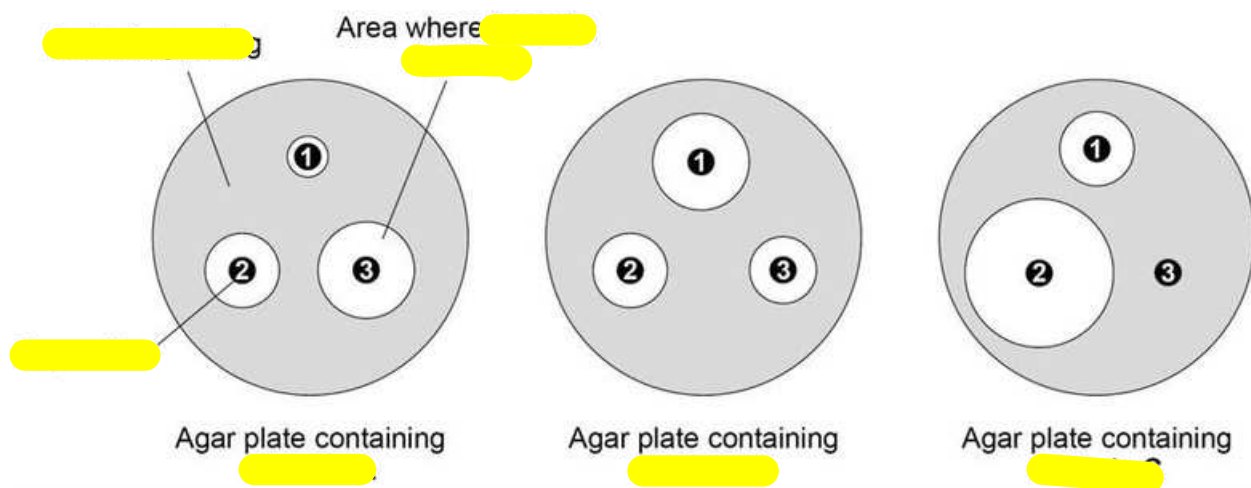
0 5 . 4 Compare the effectiveness of the three antibiotics at killing the different types *box*
of bacteria.
[6 marks]

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)

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

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

quantitat...
(less...

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

— Link relevant points in a logical sequence

_Quest-ion 5 cofntinuegs on the n_ext page

Bacteria growing | Area where bacteria are killed

Paper disc

Agar plate containing bacteria A
Agar plate containing bacteria B
Agar plate containing bacteria C

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

0.1 mm

0.1 mm

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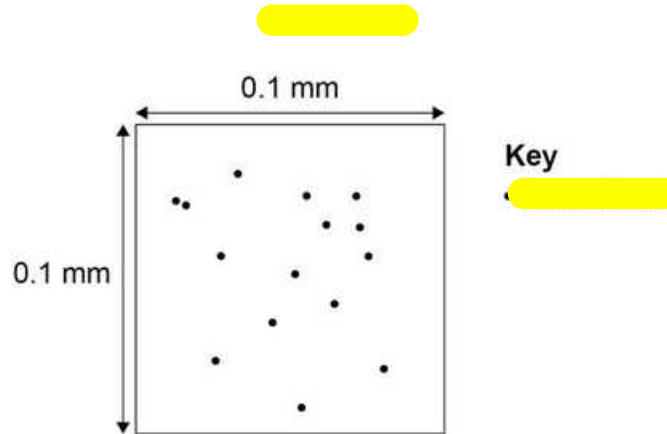
A scientist counted the number of bacteria in four samples of raw milk.

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

0.1 mm

0.1 mm

Key
• Bacterium

14
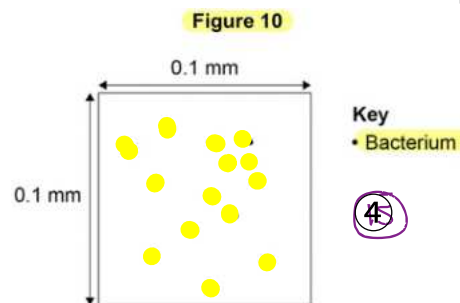
Table 4

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]

$-\dfrac{\text{sum of values}}{\text{no. of values}}$

151 + 121 + 131 + 116 = 56 56 ✓

$\dfrac{56}{4} = 14$ ✓

Mean number of bacteria = 14

0 5 . 7 Calculate the mean number of bacteria per mm3 of milk in the samples.

Complete the following steps.

[3 marks]

Figure 10

0.1 mm

0.1 mm

Key
bacteria

Calculate the total area of the counting chamber in Figure 10.
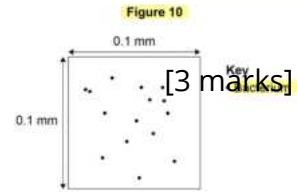
Square = 0.1 × 0.1 = 0.001

Total area of counting chamber = 0.001   mm2

The depth of the counting chamber is 0.01 mm

Calculate the volume of the counting chamber in Figure 10.

Use the equation: 0.01 × 0.01   0.01   0.01

volume = area depth

0.01 × 0.01 = 0.00001

Volume of counting chamber = 0.00001   mm3

Calculate the mean number of bacteria per mm3 of milk in the samples.

Use the equation:

mean number of bacteria from question

mean number of bacteria per mm3 of milk = —————————————————
volume of counting chamber

0.00001

$\dfrac{14}{0.00001}$ = 1400000

Mean number of bacteria per mm3 of milk = 1400000.00

Turn over ▶

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 cm3 cannot be sold for humans to drink.

Table 5 shows the number of bacteria per cm3 in four different samples of milk.

Table 5

Milk sample	Number of bacteria per cm3 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 cm3 of milk	
P	1.8×10^4	$< 2 \times 10^4$
Q	2.2×10^4	$> 2 \times 10^4$
R	2.2×10^{-5}	
S	1.8×10^3	

20 000 per cm³ — standard form

$2\,0\,000 = 2.0 \times 10^4$

mama

0 5 . 8 Why should milk sold for humans to drink not contain large numbers of bacteria?

[1 mark]

17

0 5 . 9 should milk to drink

[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
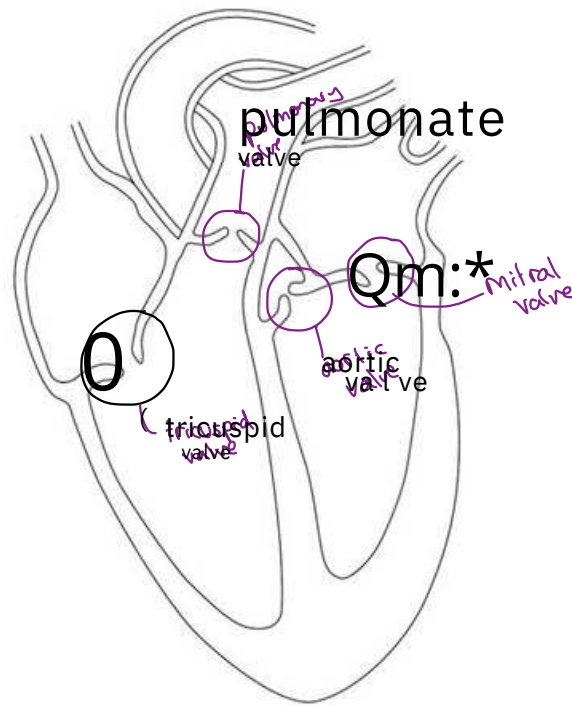
0 6 . 1   Which organ system is the heart a part of?

[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

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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 risk of rejection

less ethical concerns

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

Medical condition   Treatment

Medical condition	Treatment	
	Antibiotics	(bacterial infection)
High blood cholesterol	Artificial pacemaker	regulates heart beat
Irregular heart rate	Insulin	(Diabetes)
	Statins	lowers blood cholesterol
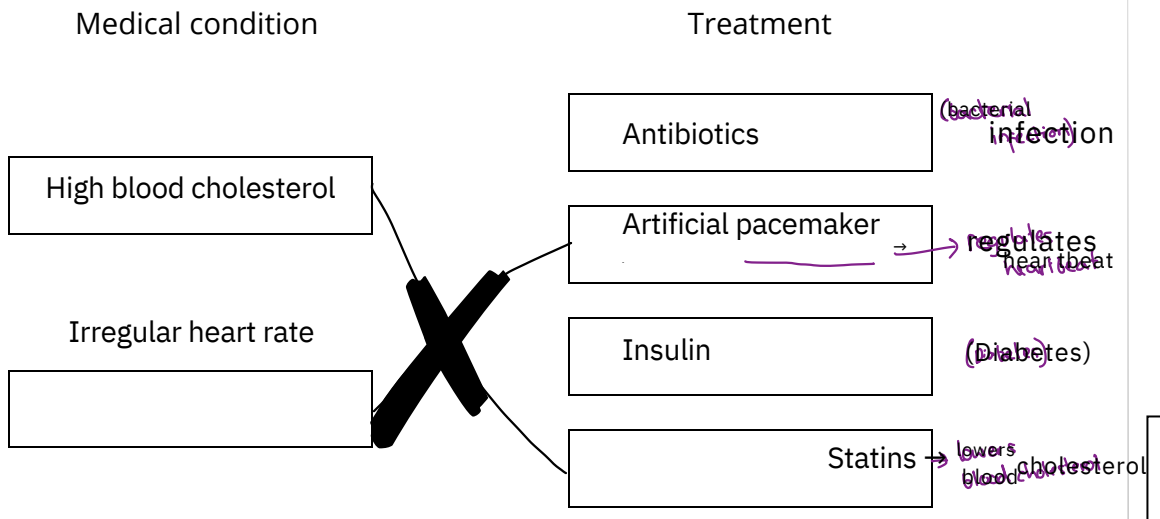
9

Turn over for the next question

Turn over ▶

29

Ifa

Answer all questions in the spaces provided.

| 0 | 7 |

a.

M0 1 M

Figure 1 shows an animal cell viewed using a microscope.

Figure 1
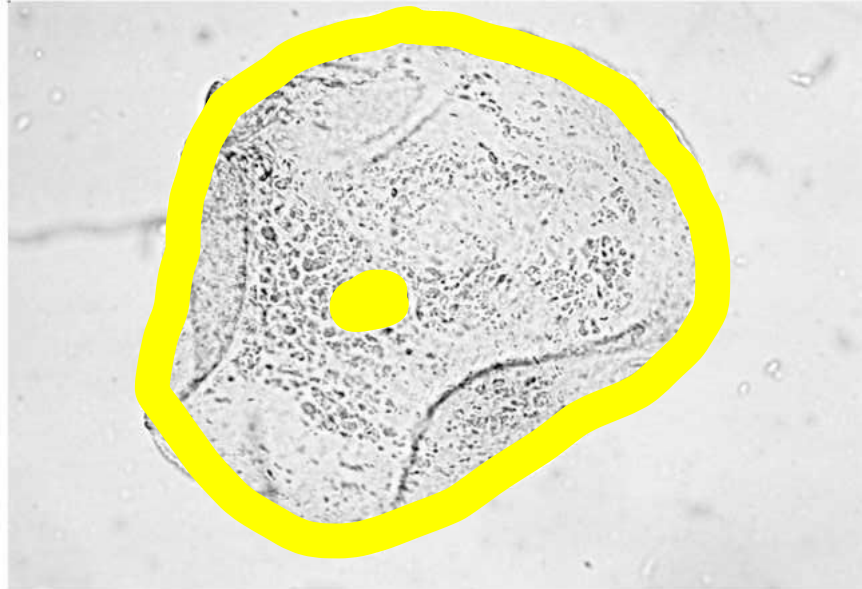
| 0 | 7 | . | 1 |

M0 1 M . 1

The cell contains a nucleus.

What is the function of the nucleus?

[1 mark]

| 0 | 7 | . | 2 |

controls the activities of the cell ✓ Contains genetic material ✓

M0 1 A . 2

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

[1 mark]

red blood cell

f ✓

because the space is needed for haemoglobin

bacteria / prokaryote

thane

have genetic material free in the cytoplasm (not membrane bound)

xylem cells

tr

dead cells that don't need a nucleus to carry out any functions

0 7 . 3 Draw a simple diagram of the cell in Figure 1.

Label **two** parts of the cell.

[2 marks]

mitochondrion
(site of aerobic respiration)

cell membrane
(controls movement of substances in and out of cell)

cytoplasm
(site of chemical reactions in the cell)

ribosome
(site of protein synthesis)

nucleus
(controls activities of the cell)
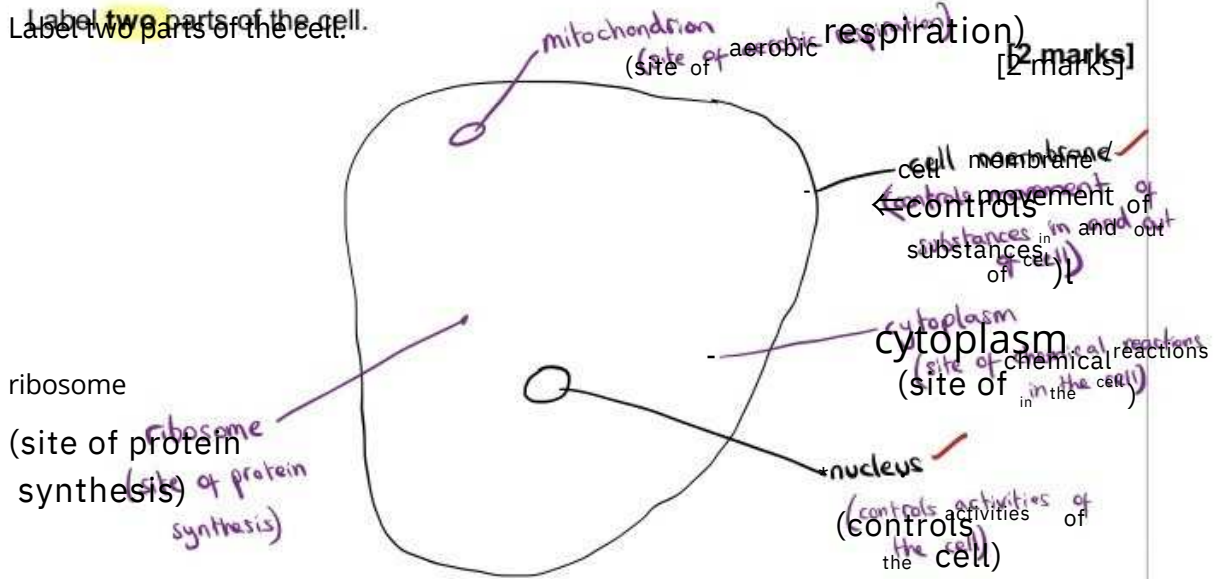
0 7 . 4 Name **one** structure found in a plant cell but **not** found in an animal cell.

[1 mark]

cellulose cell wall   chloroplast   (permanent) vacuole

Question 7 continues on the next page

BA*0G3*G

Figure 2 shows some different cells.
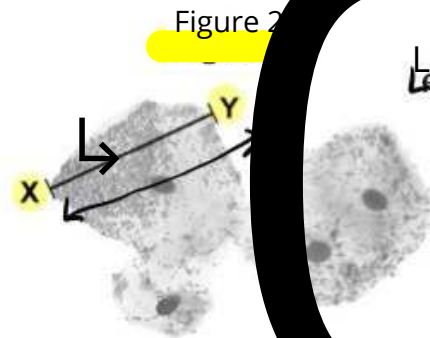
Figure 2

Length $\overrightarrow{XY}$ = 24mm

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 = 24mm

Real size = 0.06 mm

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

Magnification = × 400

A0 A1 . A6

6. The cells shown in Figure 2 were viewed using a light microscope.

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

[2 marks]

¥Emf
↳ electrons have a beam of shorter wavelength than light
↳ has a higher resolving power and higher magnification (allows 3D image)
↳ microscope detects the electrons that reflect back off of the specimen

1 higher magnification

2 higher resolution / resolving power

10
10

Turn over for the next question

0 8

Mosquitoes carry a pathogen that causes malaria.

0 8 . 1 What type of pathogen causes malaria?

Tick (✓) **one** box.

[1 mark]

A bacterium	☐
A fungus	☐
A protist	✓
A virus	☐

(The *Plasmodium* protist)

Mosquito nets can help prevent the spread of malaria.

Table 11 shows the **results** of a study in one area of Africa.

Table 11

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

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 3 . 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 2 shows information about the number of deaths from malaria in the same area of Africa.

Table 2

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

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

0 3 . 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 3 . 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 ▶

M0 M2 . M6

Describe how the human body:

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

→ Logical order

Well explained points

÷ [w ÷ e]

repels [6 marks]

Do not write outside the box

(Prevention of entering)

- Skin acts as a barrier ? Follow the surface that repels pathogens

f) sebum

surface

- Scabs form over cuts / scabs form a barrier ✓

form

- Eyes produce tears, tears are antiseptic?, contain enzymes to kill bacteria ✓

- (Breathing system) Trachea / nose / bronchi contain mucus ✓ which is sticky

T ie# air lining

and traps bacteria ✓, Mucus is carried away by cilia

small hairs passages

(Defends against pathogens inside body)

- White blood cells / immune system ✓

- Antitoxins are produced and neutralise toxins produced by pathogen

produced

- Antibodies produced and help destroy pathogens ✓

produced

- Memory cells form ✓ and trigger more rapid response if pathogen re-enters ✓

11

0 3 . 9

Hm 03.1 m

This question is about photosynthesis.

Complete the word equation for photosynthesis:

[2 marks]

carbon dioxide + water → glucose + oxygen

A student investigated photosynthesis using pondweed.

Figure 3 shows the apparatus the student used.

Figure 3
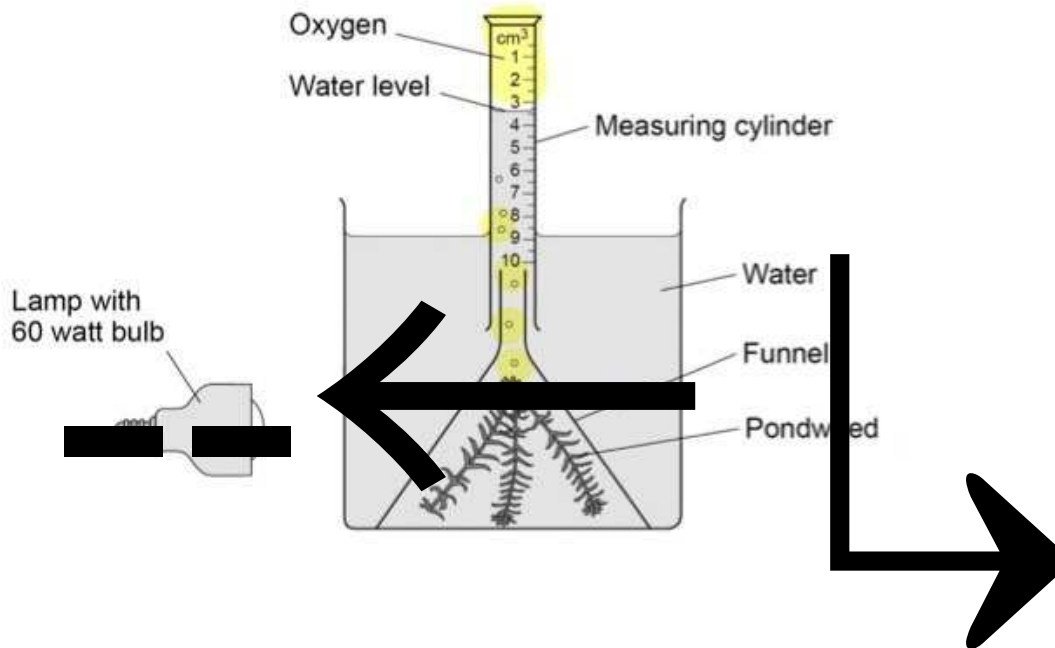
This is the method used.

1. Set up the apparatus as shown in Figure 3.

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 8 . 2 What was the independent variable in the investigation?

Tick (✓) one box.

[1 mark]

Power output of bulb ☑

Rate of photosynthesis ☐

Time to collect oxygen ☐

Volume of oxygen collected ☐

0 8 . 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 — repeats

2 Control the water temperature

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

Question 8 continues on the next page ►

Table shows the student's results.

Table 3

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 X 0.3
200	1.2	3.6
250	1.2	3.6

Calculate value X in Table 3.

[1 mark]

$1.1 cm^3 = 20$ mins of photosynthesis $60 \div 20 = 3$

$1.1 \times 3 = 3.3$ $3.3 cm^3 = 60$ mins of photosynthesis

$X = \underline{\quad 3.3 \quad}$ cm3/hour

| 0 | 3 | . | 5 |

Complete Figure 4.

TIBIAE

You should:

- label the x-axis
- use a suitable scale
- plot the data from Table 3 and your answer to Question 03.4
- draw a line of best fit.

Figure 4

= Rate of photosynthesis cm/hour

Table 3

Power output of bulb in watts	Volume of oxygen collected in 20 minutes in cm³	Rate of photosynthesis in cm³/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 .am.mx.

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

Figure 15.

- [4 marks]
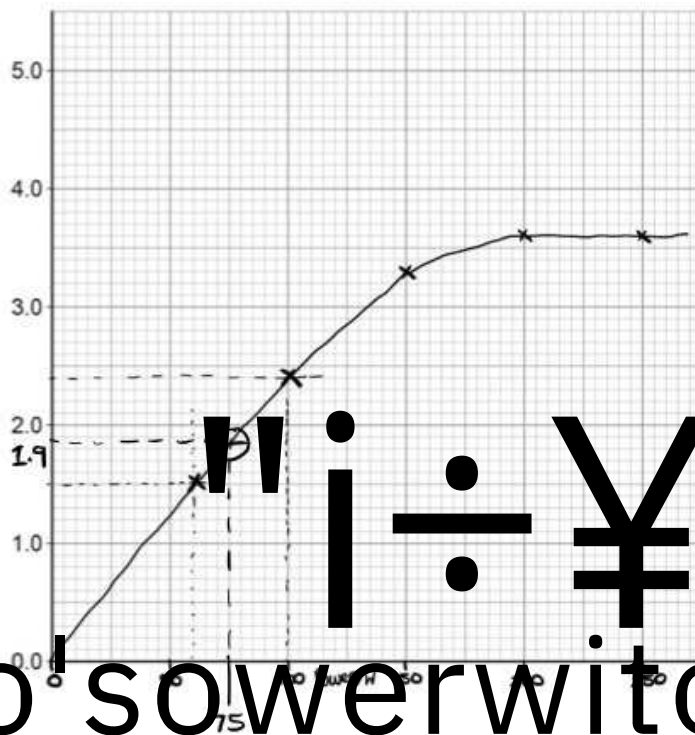
Determine the expected rate of photosynthesis with a bulb of power output 75 watts.
Use Figure 4.

[1 mark]

(MS allows 1.8/1.9)

Rate of photosynthesis at 75 watts = 1.9 cm³/hour

Hanna

0 3 . 7 Which graph shows the effect of temperature on the rate of photosynthesis?

Tick (✓) **one box.**

[1 mark]

As Rate of photosynthesis increases of

Rate of photosynthesis — Temperature ☐

Rate of photosynthesis — Temperature ✓
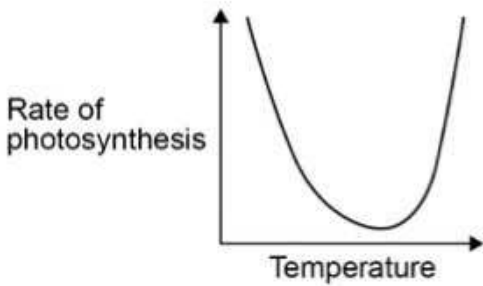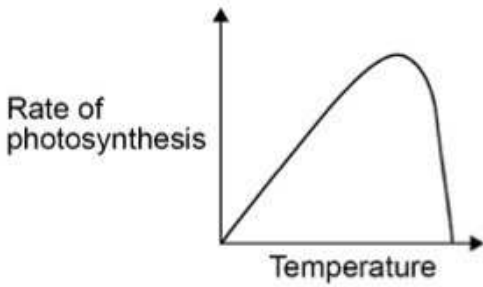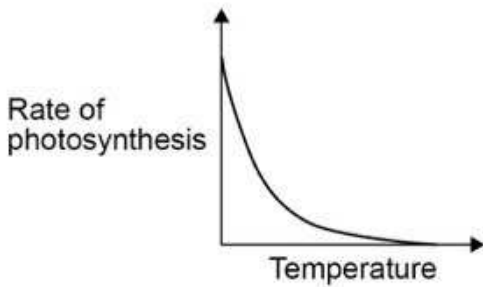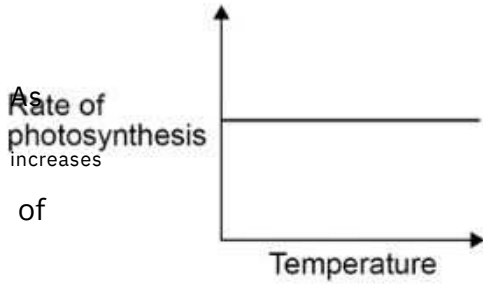
As temperature increases the rate of photosynthesis increases untill the temperature is so high that it it is damaging to the plant

Rate of photosynthesis — Temperature ☐

Rate of photosynthesis — Temperature ☐

12/12

1

END OF QUESTIONS

A*g14*o

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43

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