



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	



J U N 1 9 8 4 6 1 1 F 0 1

IB/M/Jun19/E16

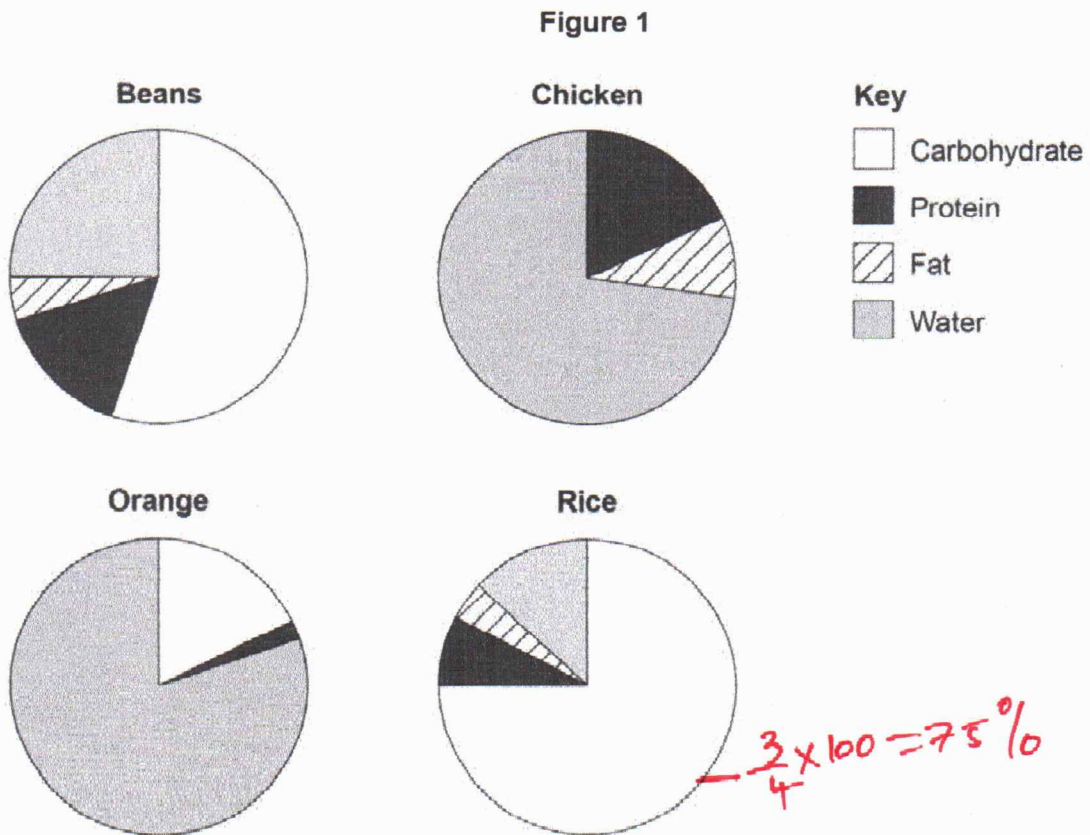
8461/1F

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
- Chicken
- Orange
- Rice



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

[1 mark]

$$\frac{1}{4} \times 100 = 25\%$$

Percentage = 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 contains all the food groups.
Chicken contains less carbohydrate.

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

- digests starch into glucose

Bile

- neutralises acidity of chyme

Lipase

- digests lipids

Protease

- digests proteins

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

[1 mark]

Tick (✓) one box.

Benedict's reagent

Biuret reagent

- tests proteins

Iodine solution

- tests starch

Sulfuric acid

- not a reagent for food test

Turn over ►



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

[1 mark]

From blue to orange

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

lowest glucose level

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?

Tick (✓) one box.

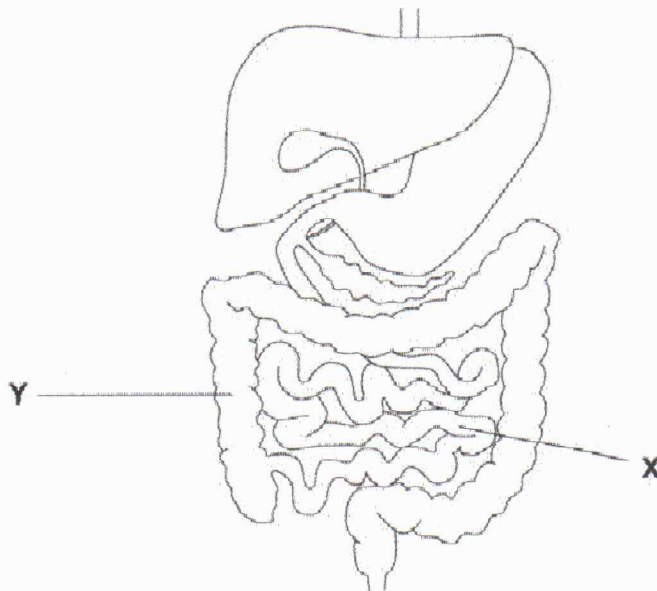
A B C D

has highest glucose level in blood [1 mark]



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 (ileum)

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 *active transport*.

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

10

Turn over ►

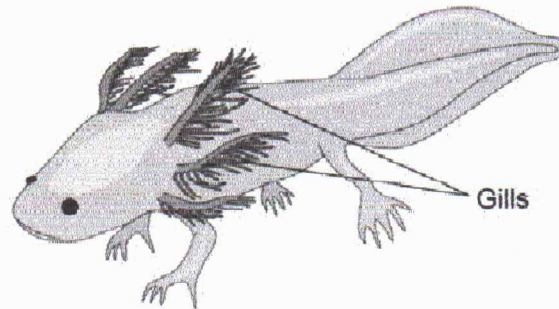


0 2

An animal called an axolotl lives in water.

Figure 3 shows an axolotl.

Figure 3



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

0 2 1

What is diffusion?

[1 mark]

Tick (✓) one box.

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

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

→ (active transport)

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 projectionsDescription To increase surface area over which gases are exchanged

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 differentiation.

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 mitosis.

0 2 . 5

Which one of the following does not contain stem cells?

[1 mark]

Tick (✓) one box.

Bone marrow

Embryos

Hair

Meristem tissue

Turn over ►



0 2 . 6

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

What are **two** advantages of using axolotls in stem cell research?**[2 marks]**Tick (✓) **two** boxes.

Axolotls are cheap to feed.

- cost is low to feed

Axolotls are easy to breed.

- highly adaptable

Axolotls are endangered.

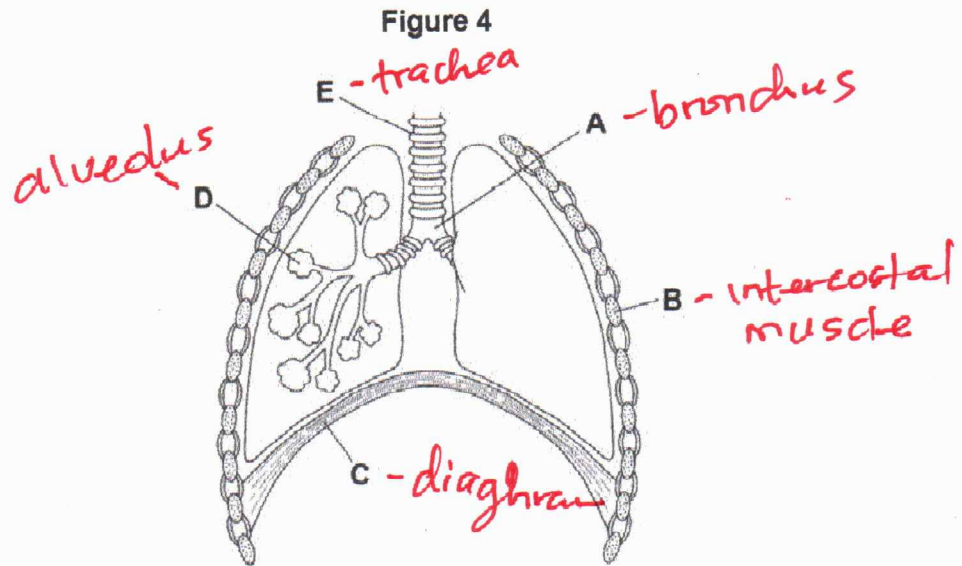
Axolotls live in water.

Axolotl research is cruel.



Oxygen uptake in humans takes place in the lungs.

Figure 4 shows the human breathing system.



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

Pulmonary artery

Vena cava



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 epidermis.

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

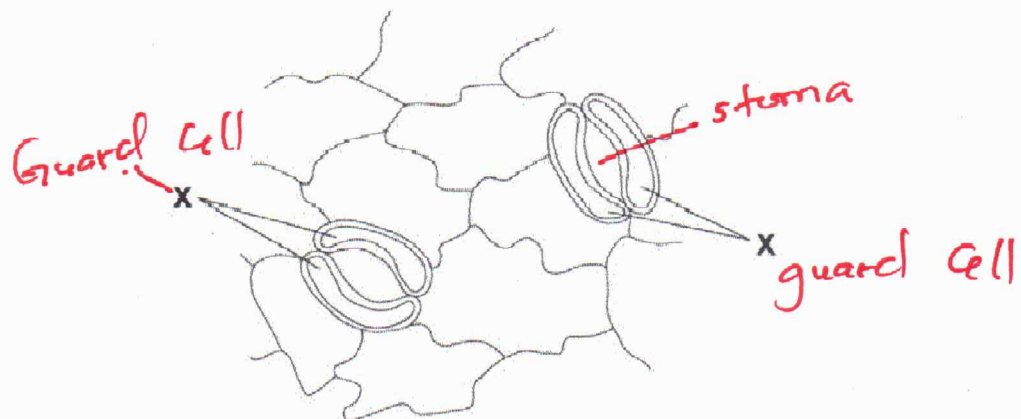
Water is transported to the leaf in the xylem.

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 *-false*

Root hair cells *-false*

Stem cells *-false*

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

[1 mark]

Tick (✓) one box.

To allow light into the leaf *-cutticle*

To let carbon dioxide into the leaf

To let sugars out of the leaf
↳ *phloem*

To protect the leaf from pathogens
(cutticle)

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

[1 mark]

Tick (✓) one box.

By evaporation

By respiration
↳ *energy products*

By translocation
↳ *transport of food*

Turn over ►

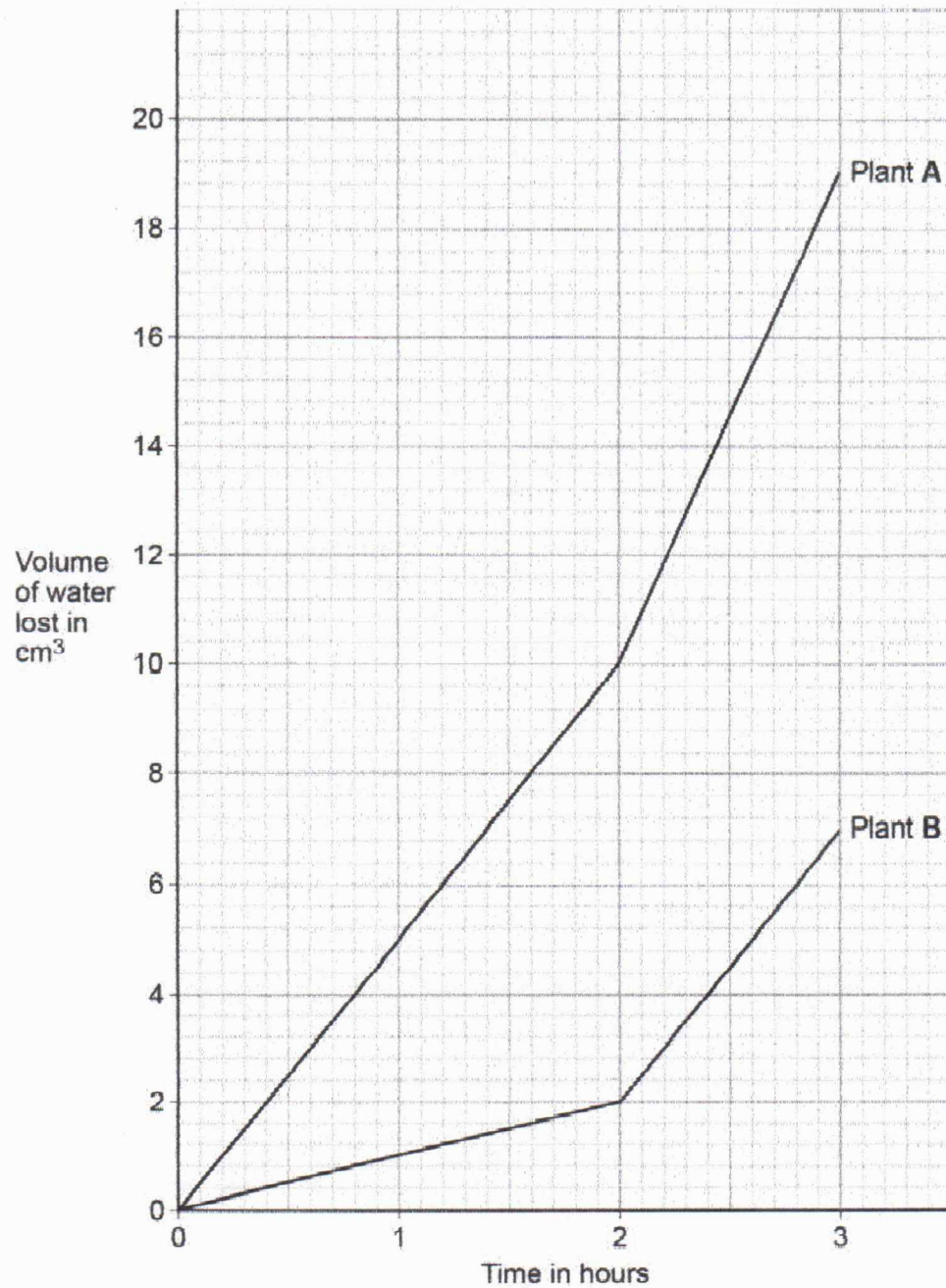


A student investigated the volume of water lost from two plants.

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]

$$(5.2 - 1.2) \text{ cm}^3 = 4 \text{ cm}^3$$

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 (✓) one box.

Plant A has fewer stomata per leaf.

↳ no evidence

Plant A is smaller.

↳ no evidence

Plant A has more leaves.

- plants lose water through stomata on the leaves.

Plant A has smaller leaves.

↳ no evidence

The many the leaves the more water is lost

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]

The new room was less humid

new room was warmer

Question 3 continues on the next page

Turn over ►

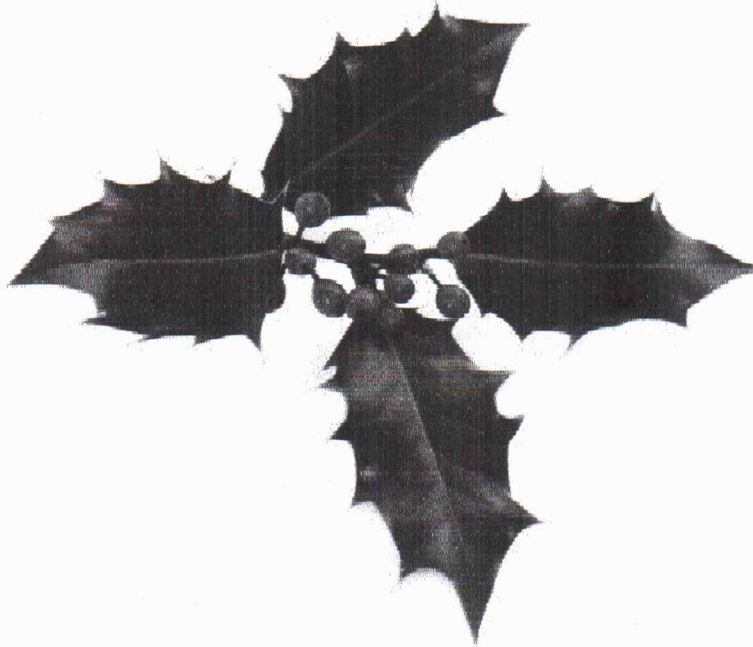


0 3 . 8

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

Figure 7 shows part of a holly plant.

Figure 7



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

[1 mark]

- The spikes on its surface deter herbivores
- The leaves are harder for the herbivores to chew

11



0 4

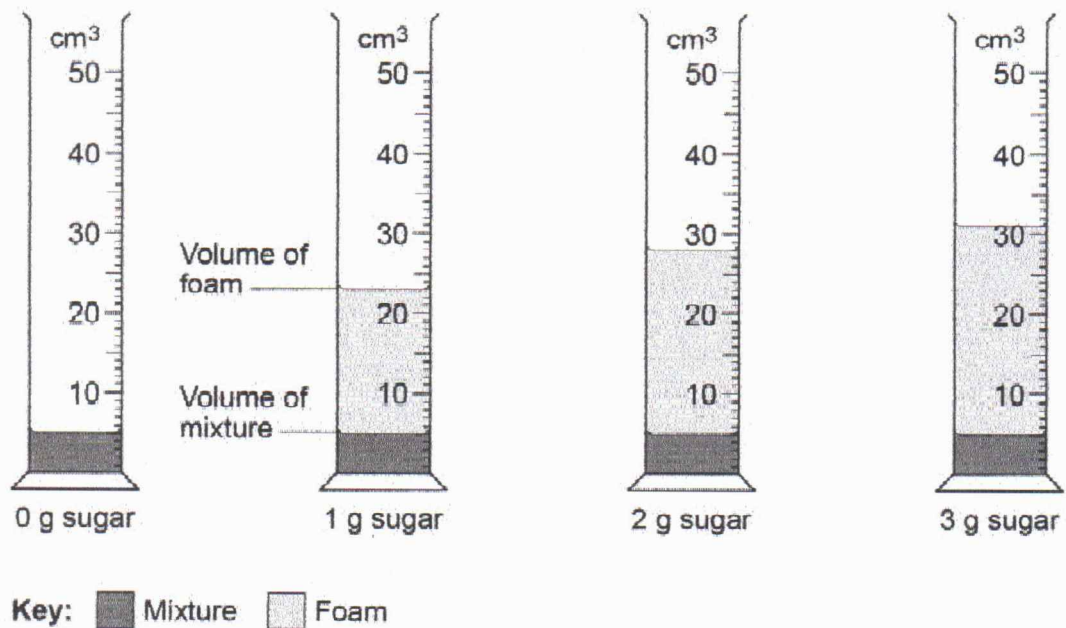
A student investigated respiration in yeast.

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

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.

$$5 + 23 = 28$$

[1 mark]X = 28 cm³

Question 4 continues on the next page

Turn over ►



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

0 4 . 3

Which gas causes the foam to rise?

[1 mark]

Tick (✓) one box.

Carbon dioxide

Hydrogen

Nitrogen

Oxygen

Glucose is respired by yeast to produce CO_2 and alcohol

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]

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 took place

0 4 . 6

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

[1 mark]

It was set up as a control



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]

oil stops the oxygen from getting into
the measuring cylinder

0 4 . 8

What other substance is produced during **anaerobic** respiration in yeast?

[1 mark]

Tick (✓) **one** box.

Ethanol

Hydrochloric acid

Lactic acid

Water

9

Turn over for the next question

Turn over ►



0 5

A man has the following symptoms:

- yellow discharge from his penis
- pain when urinating.

0 5 . 1

The man has a bacterial infection.

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

[1 mark]

Tick (✓) **one** box.

Gonorrhoea

HIV

Measles

Salmonella poisoning

0 5 . 2

The man took a full course of antibiotics.

The man's symptoms did not improve.

Why did the antibiotics not cure the symptoms?

[1 mark]

Tick (✓) **one** box.

The bacteria are immune to the antibiotics.

The bacteria are resistant to the antibiotics.

The man is immune to the antibiotics.

The man is resistant to the antibiotics.

Wrong use of antibiotics gives the bacteria
chance to develop resistance



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

Question 5 continues on the next page

Turn over ►



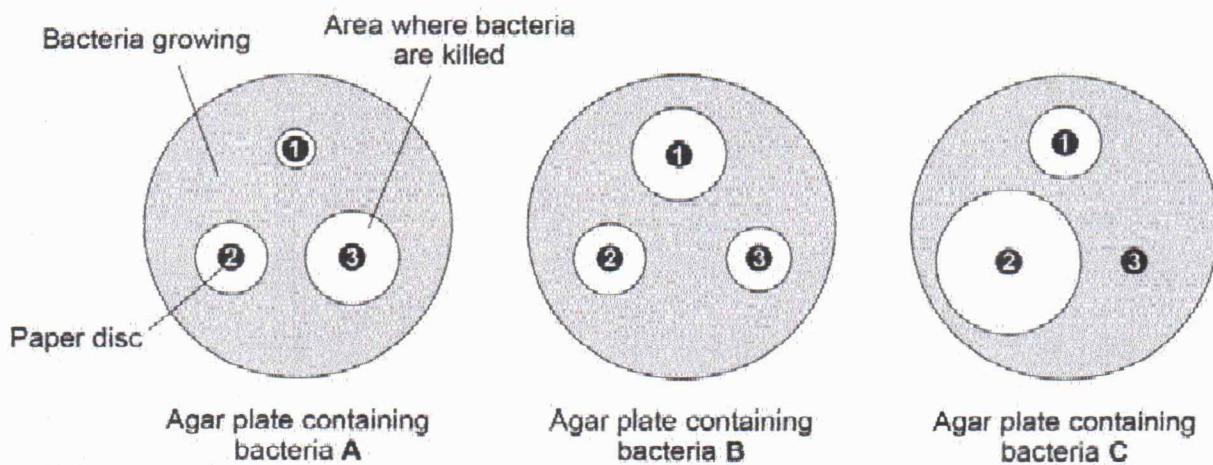
A scientist investigated the effect of three different antibiotics on three different types of bacteria, **A**, **B** and **C**.

This is the method used.

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

Figure 9 shows the scientist's results.

Figure 9



0 5 . 4

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

[6 marks]

- Antibiotic 3 works best on the bacteria A. It has the largest area where bacteria A was killed.
- Antibiotic 1 kills more of B and C compared to A. It has largest area where B and C are killed.
- Antibiotic 2 kills more of C than A. 2 works best on C.
- 2 and 3 killed similar amounts of A and B. Bacteria C is resistant to 3. None of C was killed in antibiotic 3.
- 3 works best in A, but 1 is least effective on A
- 2 works best in C but least effective on C

Question 5 continues on the next page

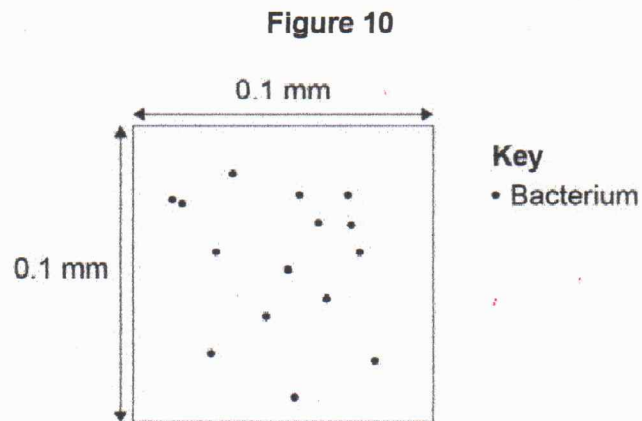
Turn over ►



Milk contains bacteria.

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

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



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

Table 4 shows the results.

Table 4

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

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

[1 mark]

Tick (✓) one box.

Sample E

Sample F

Sample G

Sample H



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

[2 marks]

$$\frac{(15+12+13+16)}{4} \Rightarrow \frac{56}{4} = 14$$

Mean number of bacteria = 14

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.

$$0.1 \times 0.1 = 0.01$$

$$\text{Volume} = 0.01 \times 0.01 = 0.0001$$

Total area of counting chamber = 0.01 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:

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

$$\text{Volume} = 0.01 \times 0.01 = 0.0001$$

Volume of counting chamber = 0.0001 mm^3

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

Use the equation:

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

$$14 \div 0.0001 = 140,000$$

Mean number of bacteria per mm^3 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

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

[1 mark]

The bacteria could make humans ill

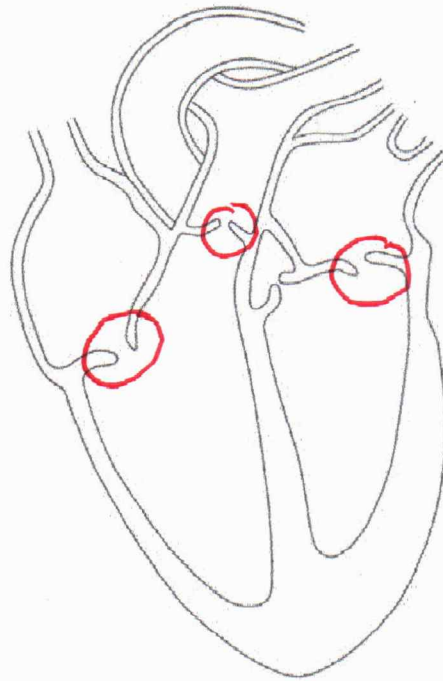
17



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 system

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]

Prevent 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]

Vein

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]

- The patient may not need to take immunosuppressive drugs*
- There is no risk of disease transmission*



0 6 . 6

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

[1 mark]

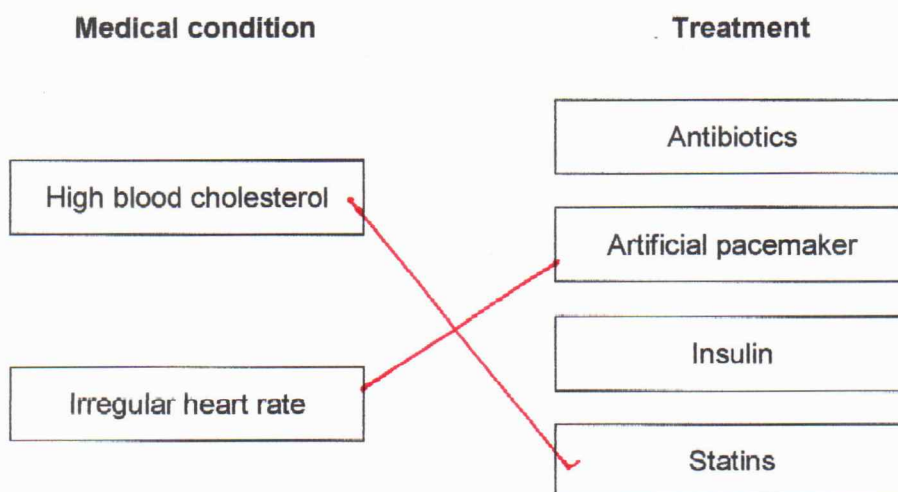
There is no need to take anti-clotting medication.

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

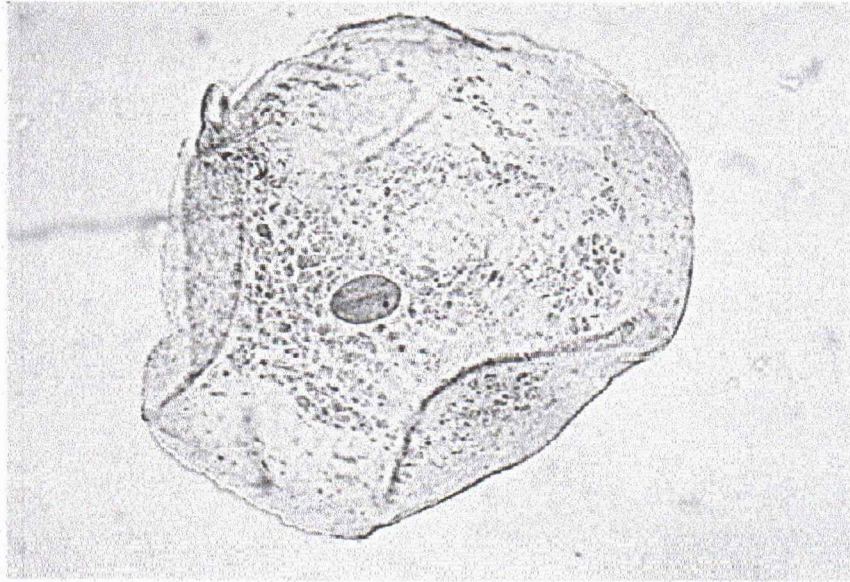
Turn over ►



07

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]

Controls activities of the cell

07.2

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

[1 mark]

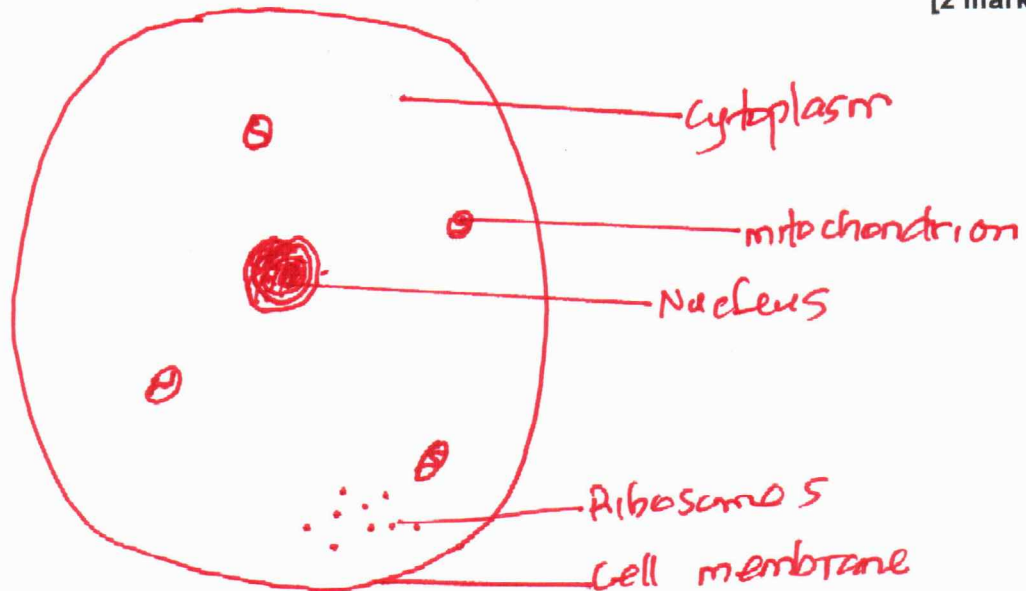
Red blood cell



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]

Cellulose cell wall

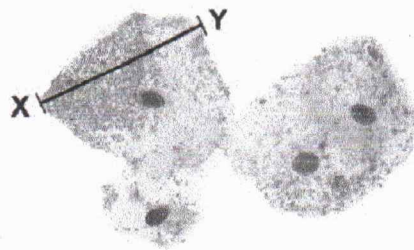
Question 7 continues on the next page

Turn over ►



Figure 13 shows some different cells.

Figure 13



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

Calculate the magnification.

Use the equation:

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

[3 marks]

$$24 \text{ mm} = 2.4 \text{ cm}$$

$$\text{length of XY} = 0.06 \text{ mm}$$

$$\text{magnification} = \frac{24}{0.06} = \times 400$$

$$\text{Magnification} = \times 400$$



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.

[2 marks]

1 Higher magnification

2 Higher resolution

10

Turn over for the next question

Turn over ►



0 8

Mosquitoes carry a pathogen that causes malaria.

0 8 . 1

What type of pathogen causes malaria?

[1 mark]

Tick (✓) one box.

A bacterium

A fungus

A protist

A virus

Mosquito nets can help prevent the spread of malaria.

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

Table 7

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

A newspaper made the following statement:

'Study shows mosquito nets are scientifically proven to prevent malaria.'

0 8 . 2

Give one piece of evidence that supports the statement.

[1 mark]

There is 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

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]

88

Number of people per 100 000 = 88

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 health care
Mosquito nets were used to control malaria

Turn over ►



0 8 . 6

Describe how the human body:

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

[6 marks]

- The skin acts as a barrier for the entry of pathogens into the body. Sebura on skin surface repels pathogens on skin.
- The tough outer layer of skin is dry so that para. dont pass through it.
- In case of injury, platelets cause clots so that pathogens do not enter the body.
- The stomachs produce hydrochloric acid that kills pathogens in food.
- The eyes produce tears that contains lytic enzymes that kill bacteria.
- The trachea has goblet cells which secretes mucus. The mucus trap the bacteria in the inhaled air. The mucus are moved by beating of cilia.
- Immune cells have white blood cells which engulf and destroy pathogens. The lymphocytes (WBC) produce antibodies against antigens of the pathogens. After immune response, memory cells remain in blood circulation to destroy the pathogens. The secondary immune response is rapid.

11



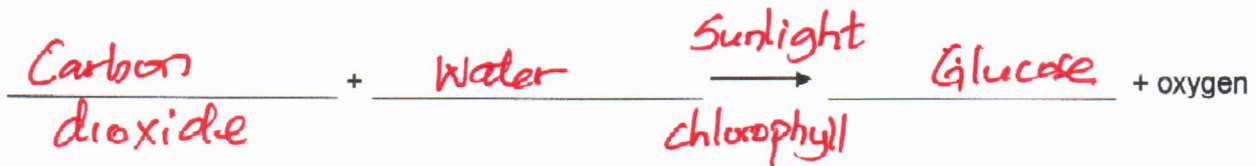
0 9

This question is about photosynthesis.

0 9 . 1

Complete the word equation for photosynthesis:

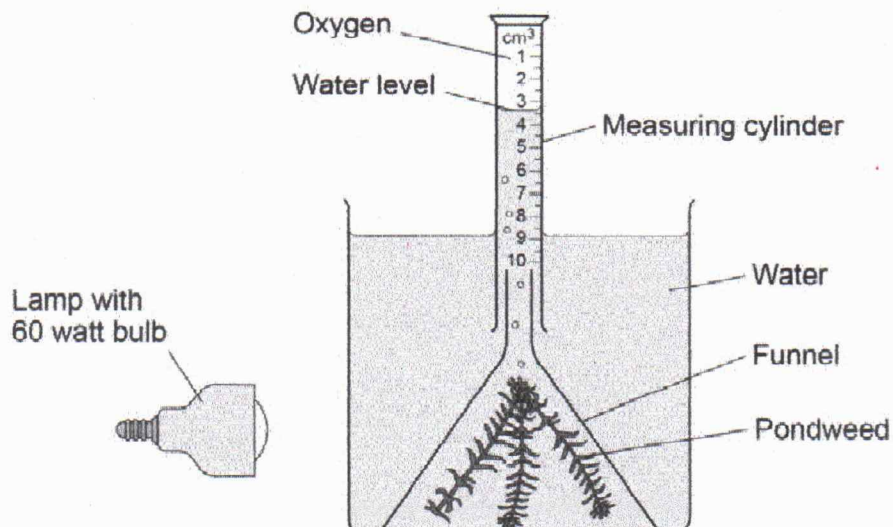
[2 marks]



A student investigated photosynthesis using pondweed.

Figure 14 shows the apparatus the student used.

Figure 14



This is the method used.

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



0 9 . 2

What was the independent variable in the investigation?

[1 mark]

Tick (✓) one box.

Power output of bulb

Rate of photosynthesis

Time to collect oxygen

Volume of oxygen collected

0 9 . 3

Suggest two ways the method could be improved so the results would be more valid.

[2 marks]

- 1 Repeat the investigation and get an average of the results
- 2 Control the concentration carbon dioxide

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
200	1.2	3.6
250	1.2	3.6

$$2.4 - 1.5 = 0.9$$

0 9 . 4

Calculate value X in Table 9.

[1 mark]

$$2.4 + 0.9$$

X = 3.3 cm³/hour



Do not write outside the box

09.5

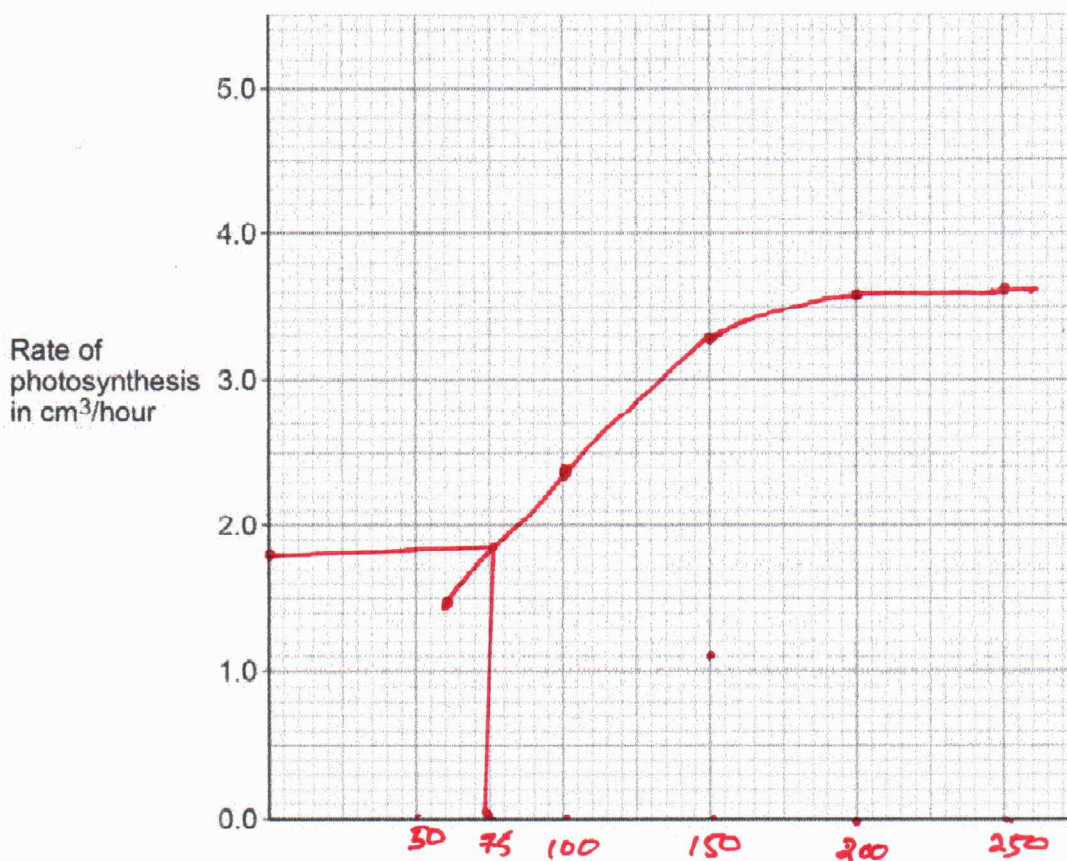
Complete Figure 15.

[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



power output of bulb / W

09.6

Determine the expected rate of photosynthesis with a bulb of power output 75 watts.

Use Figure 15.

[1 mark]

1.8

Rate of photosynthesis at 75 watts = 1.8 cm³/hour

Turn over ►



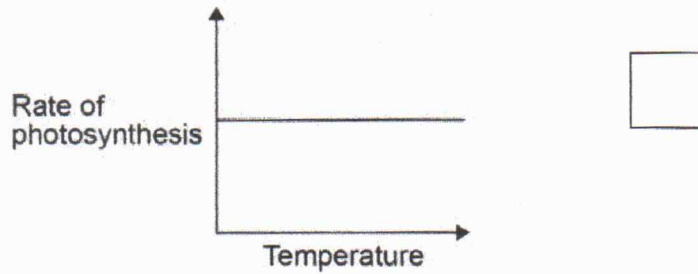
Do not write outside the box

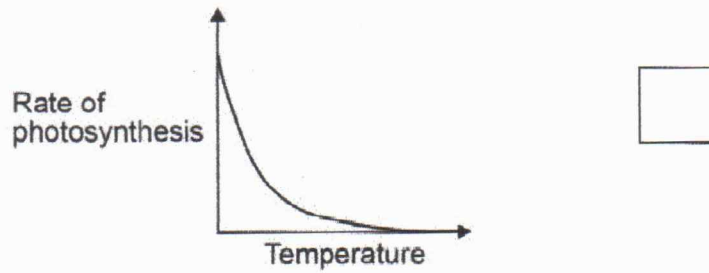
0 9 . 7

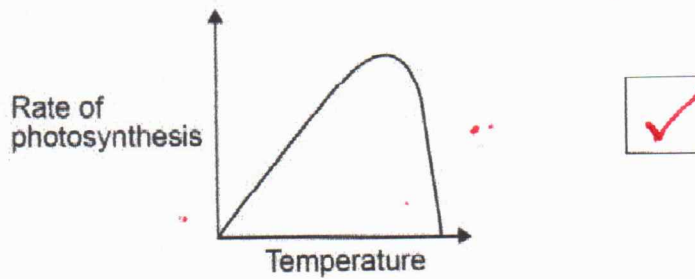
Which graph shows the effect of temperature on the rate of photosynthesis?

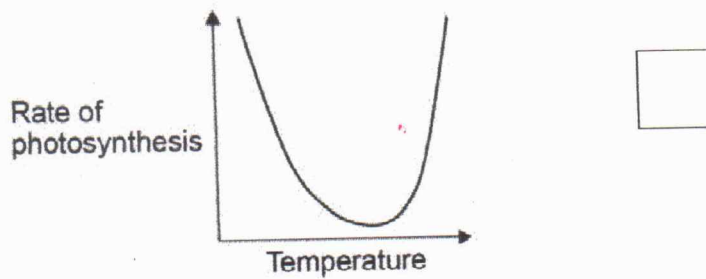
[1 mark]

Tick (✓) one box.









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END OF QUESTIONS

