AQA

Please write clearly in block capitals.

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

Surname _____

Forename(s) _____

Candidate signature _____

I declare this is my own work.

GCSE BIOLOGY

F

Foundation Tier Paper 1F

Tuesday 13 May 2025 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.
- Pencil should only be used for drawing.
- Fill in the boxes at the top of this page.
- Answer **all** questions in the spaces provided.
- If you need extra space for your answer(s), use the lined pages at the end of this book. Write the question number against your answer(s).
- 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.

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

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.

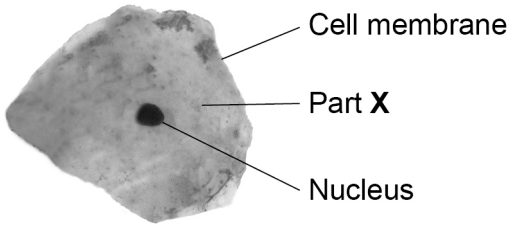
Do not write outside the box

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

0 1 This question is about cells.

0 1 . 1 **Figure 1** shows an animal cell seen through a microscope.

Figure 1



What is part **X** in **Figure 1**?

[1 mark]

Tick (✓) **one** box.

Cytoplasm ☐

Mitochondrion ☐

Vacuole ☐

0 1 . 2 Name **one** structure found in the nucleus.

[1 mark]

0 1 . 3 Name **one** cell part that is found in a plant cell but is **not** found in an animal cell.

[1 mark]

Do not write outside the box

0 1 . 4 Root hair cells are found in plants.

Which substance do root hair cells absorb from the soil?

[1 mark]

Tick (✓) **one** box.

Glucose ☐

Protein ☐

Water ☐

0 1 . 5 A sperm cell is a specialised cell.

What is the function of a sperm cell?

[1 mark]

Question 1 continues on the next page

Do not write outside the box

0 1 . 6 Draw **one** line from each specialised cell to the type of organism where the specialised cell is found.

[2 marks]

Specialised cell	Type of organism
	Animals
Nerve cell	Bacteria
Xylem cell	Fungi
	Plants

0 1 . 7 The cell membrane controls which substances move into and out of cells.

Which **two** processes move substances into and out of cells?

[2 marks]

Tick (✓) **two** boxes.

- Active transport ☐
- Diffusion ☐
- Mitosis ☐
- Mutation ☐
- Respiration ☐

Do not write outside the box

0 1 . 8 **Table 1** shows substances that are exchanged between the blood and muscle cells.

Complete **Table 1** to show the direction of movement of each substance.

[3 marks]

Tick (✓) **one** box in each row.

Table 1

Substance	Direction of movement of substance		
	ONLY from blood to muscle cells	**ONLY from muscle cells to blood**	**From blood to muscle cells AND from muscle cells to blood**
Carbon dioxide			
Oxygen			
Water			

12

Turn over for the next question

Do not write outside the box

There are no questions printed on this page

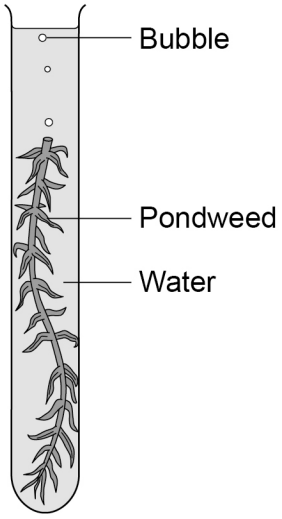
DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED

Do not write outside the box

0 2 A student investigated the effect of temperature on the rate of photosynthesis in pondweed.

Figure 2 shows how the student set up the apparatus.

Figure 2



This is the method used.

1. Prepare six tubes of pondweed as shown in **Figure 2**.
2. Place one tube into each of six water baths set at different temperatures.
3. Wait two minutes.
4. Measure the time taken for each piece of pondweed to release 10 bubbles.

0 2 . 1 What is the independent variable in the investigation?

[1 mark]

Tick (✓) **one** box.

Length of pondweed ☐

Temperature of pondweed ☐

Volume of water ☐

Question 2 continues on the next page

Do not write outside the box

Table 2 shows the results.

Table 2

Temperature in °C	Time taken for pondweed to release 10 bubbles in seconds
10	84
20	43
30	27
40	25
50	33
60	77

0 2 . 2 Complete the sentences.

Choose answers from the box.

[2 marks]

cellulose	**chlorophyll**	**nitrogen**	**oxygen**	**water**

Photosynthesis by the pondweed releases bubbles of _____.

The green substance needed for photosynthesis is called _____.

0 2 . 3 Describe the effect of increasing temperature on the time taken for the pondweed to release 10 bubbles.

[2 marks]

_____

_____

_____

_____

Do not write outside the box

0 2 . 4 Calculate the rate of photosynthesis at **50 °C**.

Use the equation:

$$\text{rate of photosynthesis in bubbles per second} = \frac{10}{\text{time taken to release 10 bubbles in seconds}}$$

Use **Table 2**.

Give your answer to 1 decimal place.

[3 marks]

Rate of photosynthesis (1 decimal place) = _____ bubbles per second

0 2 . 5 Which temperature had the fastest rate of photosynthesis?

[1 mark]

Tick (✓) **one** box.

- 20 °C ☐
- 30 °C ☐
- 40 °C ☐
- 50 °C ☐

Question 2 continues on the next page

Do not write outside the box

Table 2 is repeated below.

Table 2

Temperature in °C	Time taken for pondweed to release 10 bubbles in seconds
10	84
20	43
30	27
40	25
50	33
60	77

0 2 . 6 The student repeated the investigation at 80 °C.

What would be the time taken for the pondweed to release 10 bubbles at 80 °C?

[1 mark]

Tick (✓) **one** box.

Less than 77 seconds ☐

Exactly 77 seconds ☐

More than 77 seconds ☐

Do not write outside the box

0 2 . 7 Which **two** factors could affect the rate of photosynthesis in this investigation?

[2 marks]

Tick (✓) **two** boxes.

- Concentration of carbon dioxide ☐
- Light intensity ☐
- Size of boiling tube ☐
- Size of bubbles ☐
- Type of stopwatch ☐

12

Turn over for the next question

Do not write outside the box

0 3 Blood contains different types of cell.

0 3 . 1 Complete the sentences.

Choose answers from the box.

[2 marks]

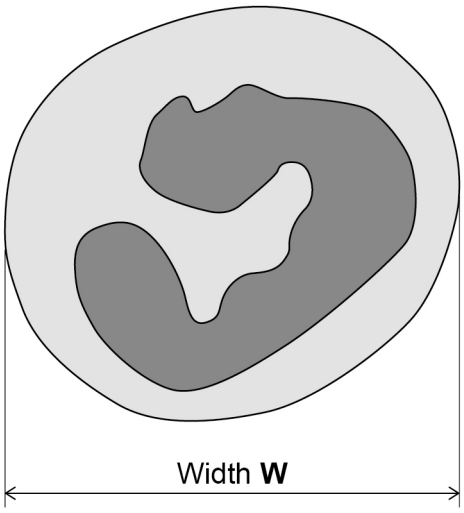
antibiotics	**antitoxins**	**painkillers**	**pathogens**

White blood cells defend the body against _____.

Some white blood cells release chemicals that neutralise toxins. These chemicals are called _____.

0 3 . 2 **Figure 3** shows a white blood cell.

Figure 3



The image of the white blood cell in **Figure 3** is magnified 4000 times.

Do not write outside the box

Calculate the real width of the white blood cell.

[4 marks]

Complete the following steps.

Measure width **W** in millimetres (mm).

Width **W** = _____ mm

Convert your measurement to micrometres (μm).

1 millimetre (mm) = 1000 micrometres (μm).

Width **W** in micrometres = _____ μm

Calculate the real width of the white blood cell.

Use the equation:

$$\text{real width} = \frac{\text{width } \mathbf{W} \text{ (μm)}}{\text{magnification}}$$

Real width = _____ μm

Do not write outside the box

Table 3 shows information about different types of blood vessel.

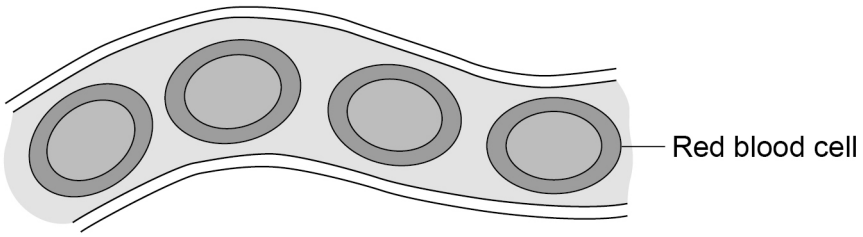
Table 3

Blood vessel	Width of blood vessel in micrometres (µm)	Pressure of blood travelling through the blood vessel
Artery	10 000	High
Capillary	10	Low
Vein	20 000	Very low

0 3 . 3 The width of a red blood cell is 8 µm.

Figure 4 shows red blood cells in one type of blood vessel.

Figure 4



Which type of blood vessel is shown in **Figure 4**?

Use **Table 3**.

[1 mark]

Tick (✓) **one** box.

Artery ☐

Capillary ☐

Vein ☐

Do not write outside the box

0 3 . 4 Explain why arteries need to have thick walls.

Use **Table 3**.

[2 marks]

Coronary arteries in the heart can become narrowed.

0 3 . 5 What happens inside coronary arteries to cause them to become narrowed?

[1 mark]

0 3 . 6 Explain why narrowed coronary arteries can be dangerous.

[2 marks]

Question 3 continues on the next page

Do not write outside the box

0 3 . 7 Treatments are available for some cardiovascular diseases.

Draw **one** line from each cardiovascular disease to a treatment for the disease.

[3 marks]

Cardiovascular disease	Treatment
A blocked coronary artery	Antibiotics
Heart failure	Heart transplant
High blood cholesterol	Statins
	Stent

0 3 . 8 Why is coronary heart disease described as a 'non-communicable disease'?

[1 mark]

_____

_____

16

Do not write outside the box

Turn over for the next question

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED

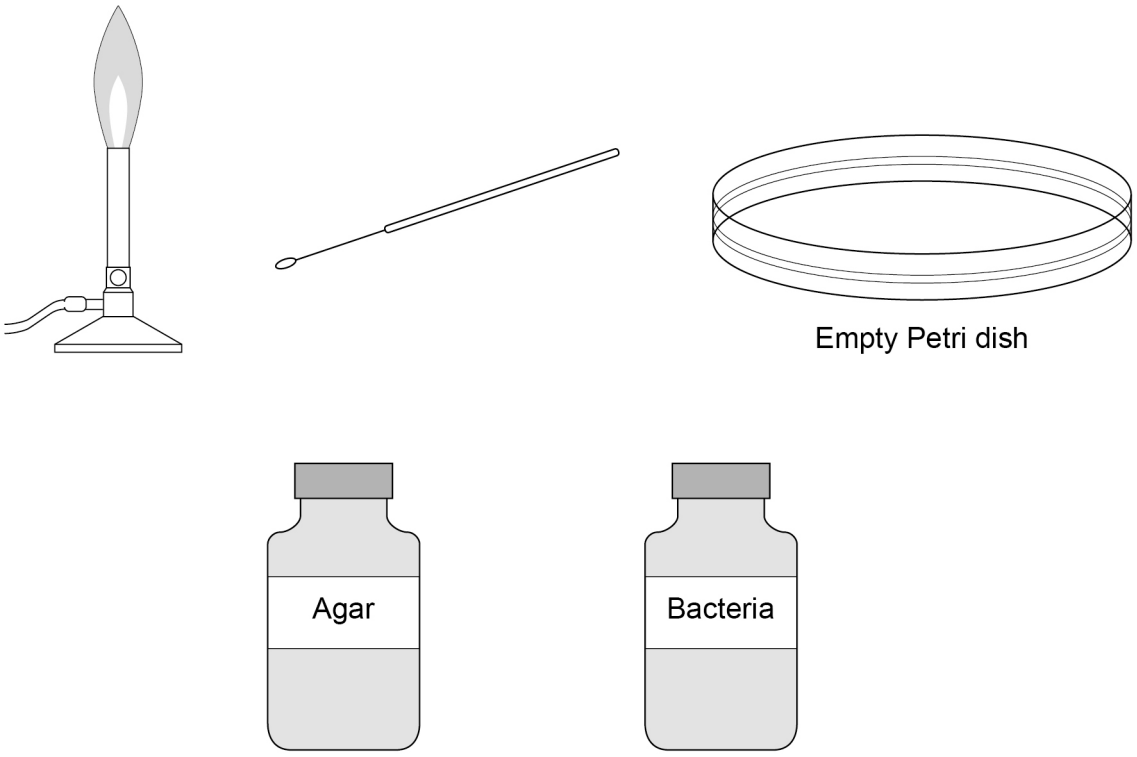
Do not write outside the box

0 4 A student investigated the effect of antibiotics on the growth of bacteria.

The student prepared an agar gel plate.

Figure 5 shows some of the equipment the student used.

Figure 5



0 4 . 1 Describe a method the student could use to:

- prepare a sterile agar gel plate
- grow an uncontaminated sample of bacteria on the agar gel plate.

Use the equipment in **Figure 5** in your answer.

[6 marks]

Do not write outside the box

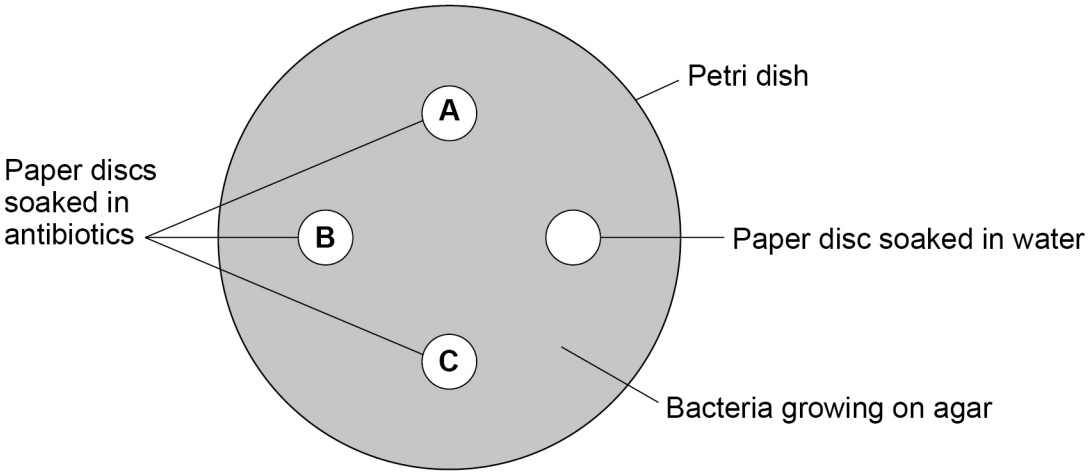
Question 4 continues on the next page

Do not write outside the box

The student used an agar gel plate to test three antibiotics, **A**, **B** and **C**.

Figure 6 shows how the agar gel plate was set up.

Figure 6



0 4 . 2 The student incubated the agar gel plate at 25 °C.

Why should the temperature **not** be higher than 25 °C?

[1 mark]

0 4 . 3 What was the purpose of the paper disc soaked in water?

[1 mark]

Tick (✓) **one** box.

To check the bacteria were uncontaminated. ☐

To make the investigation more accurate. ☐

To show the effect of no antibiotics. ☐

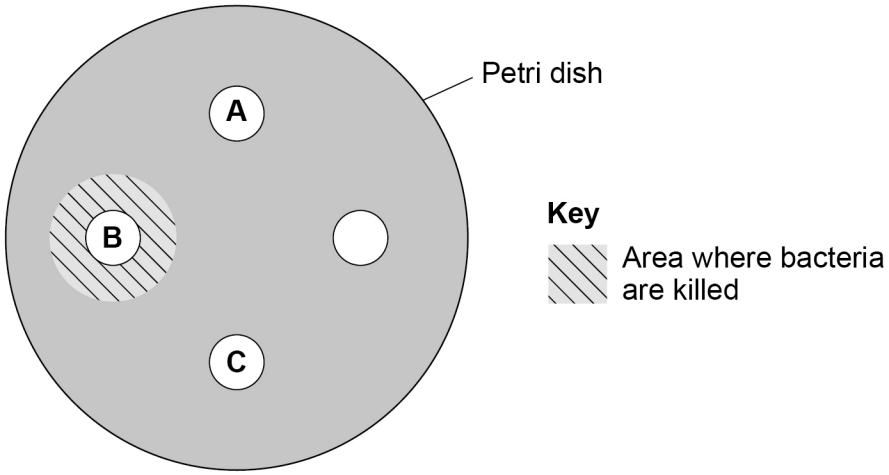
Do not write outside the box

0 4 . 4 The student removed the agar gel plate from the incubator after 48 hours.

Antibiotic **A** was the **most** effective at killing the bacteria.
Antibiotic **C** was the **least** effective at killing the bacteria.

Figure 7 shows the results for the disc soaked in antibiotic **B**.

Figure 7



Complete **Figure 7** to show the results you would expect.

You should:

- draw a ring around the disc soaked in antibiotic **A**
- draw a ring around the disc soaked in antibiotic **C**.

[2 marks]

0 4 . 5 The student repeated the investigation with antibiotic **D**.

The bacteria were resistant to antibiotic **D**.

What effect would antibiotic **D** have had on the bacteria?

[1 mark]

Tick (✓) **one** box.

All of the bacteria would have been killed. ☐

Some of the bacteria would have been killed. ☐

None of the bacteria would have been killed. ☐

11

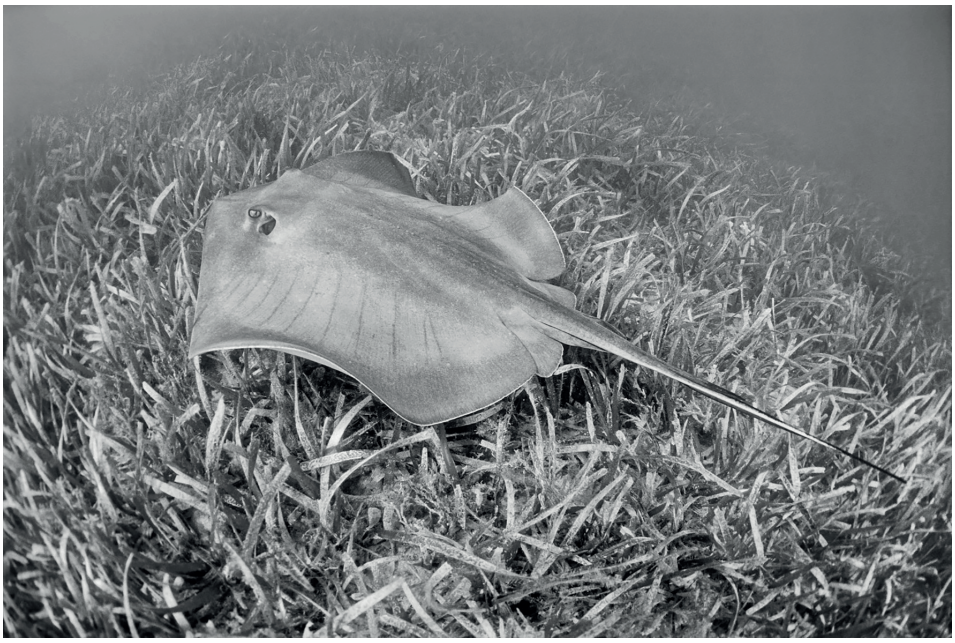
Do not write outside the box

0 5 Plants and animals have adaptations that help them survive.

A stingray is an animal that lives in the sea.
Seagrass is a plant that grows on the sea floor.

Figure 8 shows a stingray swimming above seagrass.

Figure 8



0 5 . 1 Draw **one** line from each adaptation of **seagrass** to how the adaptation helps the seagrass survive.

[2 marks]

Adaptation of seagrass	How the adaptation helps the seagrass to survive
Flexible leaves	Keep seagrass in one place on the sea floor
Long, deep roots	Poison animals that try to eat the seagrass
	Stop seagrass breaking in strong water currents

Do not write outside the box

In the stingray, gas exchange takes place in the gills.

0 5 . 2 Name the organs where gas exchange takes place in humans.

[1 mark]

---

0 5 . 3 Gills are adapted to maximise gas exchange.

Which **two** features of gills help to maximise gas exchange?

[2 marks]

Tick (✓) **two** boxes.

- Gills are not open at night. ☐
- Gills have a large surface area. ☐
- Gills have a low temperature. ☐
- Gills have thin walls. ☐
- Gills have very few capillaries. ☐

Question 5 continues on the next page

Do not write outside the box

0 5 . 4 Stingrays rest on the sea floor.

Table 4 shows information about the metabolic rate of a stingray.

Table 4

Activity of stingray	Metabolic rate in arbitrary units
Resting	484
Swimming	944

Calculate how many times greater the metabolic rate of the stingray is when swimming compared with when resting.

Give your answer to the nearest whole number.

[3 marks]

0 5 . 5 When the metabolic rate of the stingray increases, the rate of aerobic respiration in the stingray increases.

Complete the word equation for aerobic respiration.

Choose answers from the box.

[3 marks]

carbon dioxide	magnesium	nitrogen	oxygen	water

glucose + _____ ⟶ _____ + _____

Do not write outside the box

0 5 . 6 Explain why the rate of respiration in the stingray increases when the stingray starts to swim.

[3 marks]

0 5 . 7 Some plants can use anaerobic respiration.

Which **two** substances are produced during anaerobic respiration in plants?

[2 marks]

Tick (✓) **two** boxes.

- Carbon dioxide ☐
- Ethanol ☐
- Hydrochloric acid ☐
- Oil ☐
- Protein ☐

16

Turn over for the next question

Do not write outside the box

0 6 Measles is an infectious disease caused by a pathogen.

0 6 . 1 What type of pathogen causes measles?

[1 mark]

0 6 . 2 Give **one** way measles is spread from one person to another person.

[1 mark]

0 6 . 3 One symptom of measles is pain.

In adults, aspirin can be used to treat the pain.

Which plant did aspirin originate from?

[1 mark]

0 6 . 4 Give **one** other symptom of measles.

Do **not** refer to pain in your answer.

[1 mark]

Do not write outside the box

The spread of measles can be reduced by vaccination.

0 6 . 5 Explain why vaccinating large numbers of children helps to reduce the spread of the measles pathogen in the population.

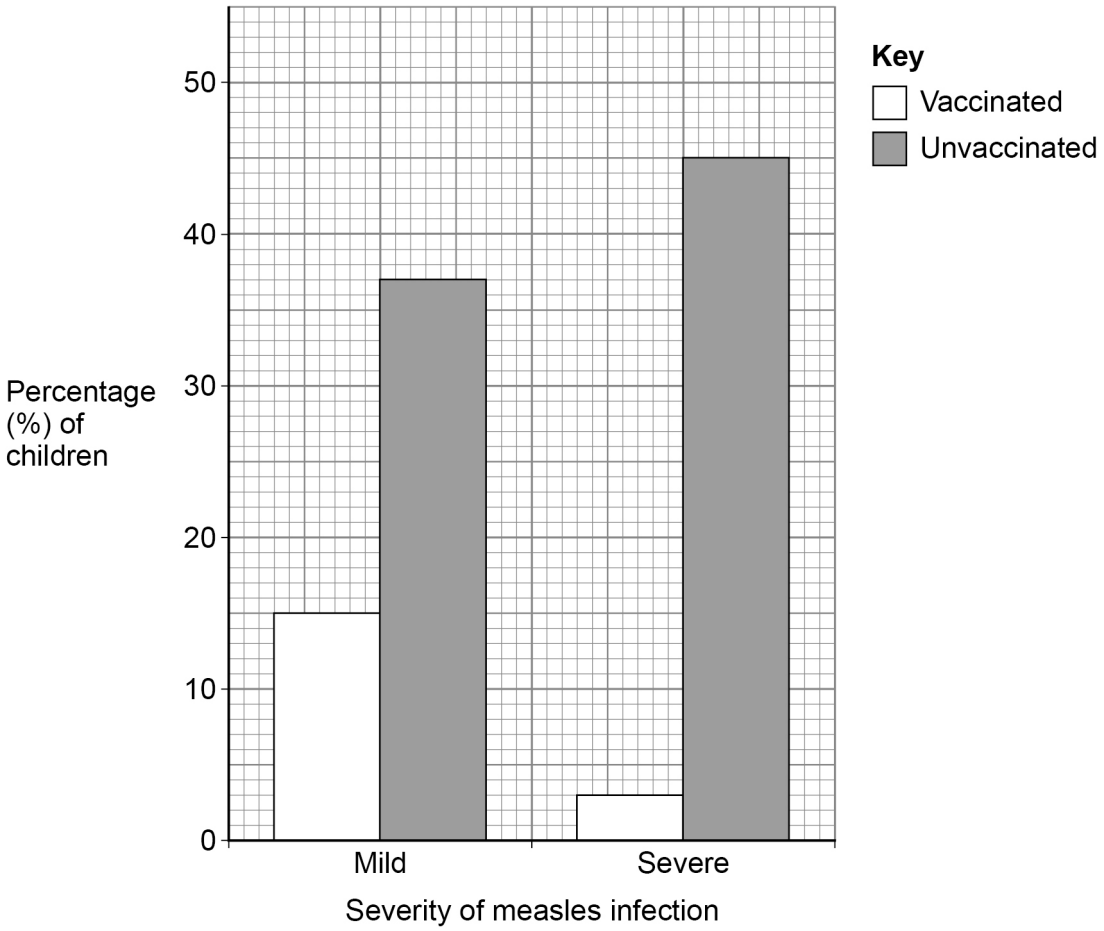
[2 marks]

Question 6 continues on the next page

Do not write outside the box

Figure 9 shows information about the severity of measles infection in vaccinated and unvaccinated children.

Figure 9



0 6 . 6 There were 240 children in the survey.

Calculate how many **unvaccinated** children had a severe measles infection.

Use **Figure 9**.

[3 marks]

Number of unvaccinated children = _____

Do not write outside the box

0 6 . 7 It is recommended that all children are given a measles vaccination.

Give evidence from **Figure 9** to support the recommendation.

Include data from **Figure 9** in your answer.

[2 marks]

11

Turn over for the next question

Do not write outside the box

0 7 Eating too much carbohydrate can cause obesity.

0 7 . 1 Name **one** disease that obesity is a risk factor for.

[1 mark]

Table 5 shows information about sugar intake and obesity in different countries.

Table 5

Country	Mean sugar intake per person per day in grams	Mean obesity rate in arbitrary units
A	122	18
B	80	9
C	172	25
D	150	23
E	110	15
F	144	19
G	192	32

Do not write outside the box

0 7 . 2 Complete **Figure 10**.

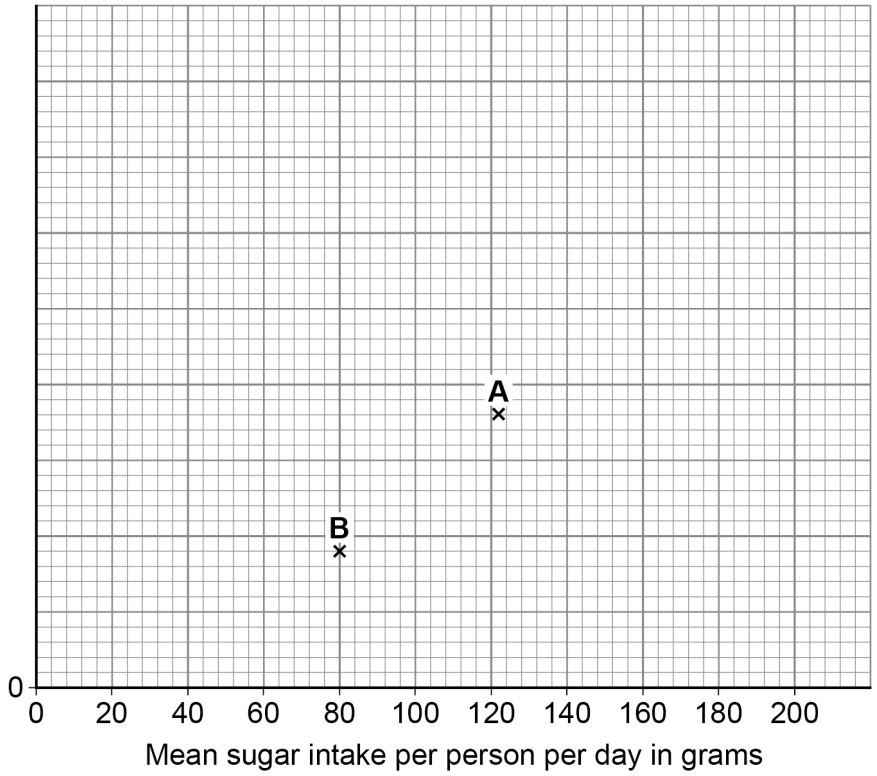
You should:

- label the *y*-axis
- add the scale for the *y*-axis
- plot the data for countries **C**, **D**, **E**, **F** and **G** from **Table 5**
- draw a line of best fit.

Countries **A** and **B** have been completed for you.

[4 marks]

Figure 10



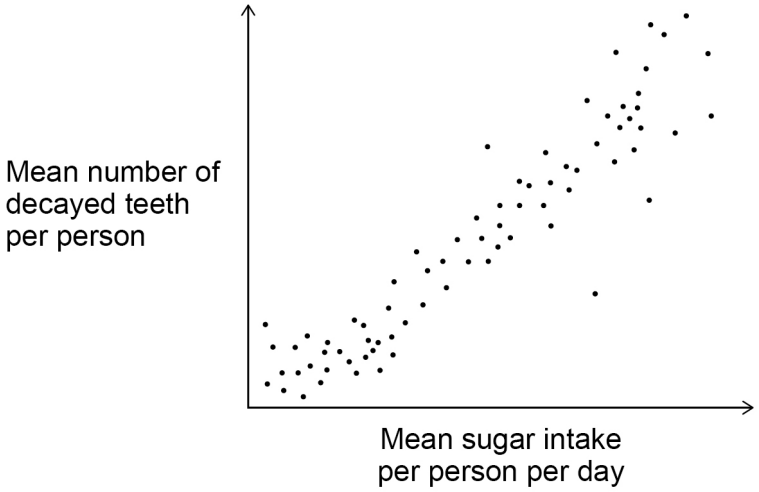
Question 7 continues on the next page

Turn over ►

Do not write outside the box

Figure 11 shows information about the relationship between sugar intake and tooth decay.

Figure 11



0 7 . 3 Name the type of graph shown in **Figure 11**.

[1 mark]

0 7 . 4 What relationship is shown between the two variables in **Figure 11**?

[1 mark]

Tick (✓) **one** box.

Inversely proportional ☐

No correlation ☐

Positive correlation ☐

Do not write outside the box

Question 7 continues on the next page

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED

Do not write outside the box

Sugars and starch are carbohydrates.

A student investigated the effect of temperature on the activity of amylase.

For each temperature, the student:

- mixed starch and amylase together
- added iodine solution after 5 minutes.

The iodine solution was yellow-brown before it was added to the mixture.

Table 6 shows the results.

Table 6

Temperature in °C	Colour of iodine solution
10	blue-black
30	yellow-brown
60	blue-black
90	blue-black

0 7 . 5 Explain the results at 30 °C and at 90 °C.

[4 marks]

30 °C _____

_____

_____

_____

90 °C _____

_____

_____

_____

Do not write outside the box

0 7 . 6 How could the student change the investigation to find a more precise temperature that amylase works best at?

[1 mark]

Tick (✓) **one** box.

Test more temperatures between 10 °C and 30 °C. ☐

Test more temperatures between 10 °C and 60 °C. ☐

Test more temperatures between 30 °C and 60 °C. ☐

Test more temperatures between 30 °C and 90 °C. ☐

0 7 . 7 Protease enzymes are involved in protein digestion.

Different types of protease enzyme are active in different organs of the digestive system.

Complete **Table 7** to identify the organ where each protease enzyme is active.

[2 marks]

Table 7

Protease enzyme	Optimum pH	Organ where enzyme is active
Pepsin	2	
Trypsin	8	

14

Do not write outside the box

0 8 A student investigated osmosis in pieces of potato.

This is the method used.

1. Cut a piece of potato into a cube.
2. Record the mass of the cube.
3. Place the cube into a beaker containing 0.4 mol/dm^3 salt solution.
4. After some time, remove the cube and record the mass.
5. Calculate the change in the mass of the cube.
6. Repeat steps 1 to 5 using two more different concentrations of salt solution.

0 8 . 1 Evaluate the student's method.

You should include how the student could improve the validity of their results.

[6 marks]

Do not write outside the box

0 8 . 2 Why would a potato cube placed into distilled water increase in mass?

[1 mark]

Tick (✓) **one** box.

The solution in the potato cells was less concentrated than the distilled water. ☐

The solution in the potato cells was more concentrated than the distilled water. ☐

The volume of water in the potato cells was greater than the volume of distilled water. ☐

The volume of water in the potato cells was less than the volume of distilled water. ☐

0 8 . 3 Active transport is another process used by potato cells.

Give **one** way active transport is different from osmosis.

[1 mark]

_____

_____

8

END OF QUESTIONS

Do not write outside the box

There are no questions printed on this page

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED

Do not write outside the box

Question number	**Additional page, if required.** **Write the question numbers in the left-hand margin.**

Do not write outside the box

Question number	**Additional page, if required.** **Write the question numbers in the left-hand margin.**

Copyright information

For confidentiality purposes, all acknowledgements of third-party copyright material are published in a separate booklet. This booklet is published after each live examination series and is available for free download from www.aqa.org.uk.

Permission to reproduce all copyright material has been applied for. In some cases, efforts to contact copyright-holders may have been unsuccessful and AQA will be happy to rectify any omissions of acknowledgements. If you have any queries please contact the Copyright Team.

Copyright © 2025 AQA and its licensors. All rights reserved.