



Please write clearly in block capitals.

Centre number

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Candidate number

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Surname

Forename(s)

Candidate signature

I declare this is my own work.

GCSE COMBINED SCIENCE: TRILOGY

F

Foundation Tier
Biology Paper 1F

Tuesday 12 May 2020

Afternoon

Time allowed: 1 hour 15 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.

Information

- The maximum mark for this paper is 70.
- 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	
TOTAL	



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0 1

Being overweight can affect the health and life expectancy of a person.

0 1 . 1

What is **one** lifestyle change a person could make to help them lose body mass?

[1 mark]

Tick (✓) **one** box.

Drink more alcohol

☐

Eat less fatty food

☒

Stop smoking

☐

0 1 . 2

Exercise has many health benefits.

Give **two** health benefits of regular exercise.Do **not** refer to losing body mass in your answer.

[2 marks]

1 Strengthens muscles including heart
muscles.

2 Can reduce the risk of coronary
heart disease (CHD)



During exercise, breathing rate increases to provide more oxygen for aerobic respiration.

0 1 . 3 What is the equation for aerobic respiration?

[1 mark]

Tick (✓) **one** box.

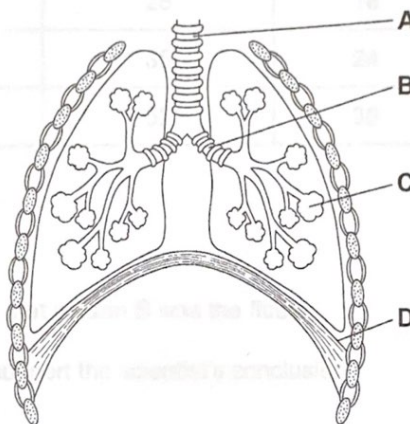
carbon dioxide + water → glucose + oxygen ☐

glucose + oxygen → carbon dioxide + water ☒

oxygen + water → glucose + carbon dioxide ☐

0 1 . 4 Figure 1 shows the human breathing system.

Figure 1



Where does gas exchange take place?

[1 mark]

Tick (✓) **one** box.

A

☐

B

☐

C

☒

D

☐

Turn over ►



A scientist investigated the effect of exercise on the breathing rate of four people.

This is the method used.

1. Measure the resting breathing rate.
2. Exercise for 10 minutes.
3. Measure the breathing rate as soon as exercise stops.
4. Record the time taken for the breathing rate to return to the resting rate.

Table 1 shows the results.

Table 1

Person	Resting breathing rate in breaths per minute	Breathing rate after exercise in breaths per minute	Increase in breathing rate in breaths per minute	Time for breathing rate to return to resting rate in minutes
A	12	45	33	5.5
B	10	28	18	4.0
C	11	35	24	6.5
D	13	52	39	10.0

Complete the sentences.

Choose answers from the box.

0 1 . 5

The scientist concluded that person **B** was the fittest.

Give **two** reasons that support the scientist's conclusion.

Use Table 1.

[2 marks]

- 1 They had the lowest resting breathing rate
- 2 They took the least amount of time for breathing rate after exercise to return to resting rate.



0 1 . 6 Suggest **two** reasons why the scientist's conclusion may **not** be valid.

[2 marks]

- 1 It is only based on one measurement
- 2 Person B may have done less intense exercise than other participants

0 1 . 7 Give **two** changes that happen in the body during aerobic exercise.

Do **not** refer to increased breathing rate in your answer.

[2 marks]

- 1 Heart rate increases
- 2 Deeper / heavier breathing

0 1 . 8 Muscles respire anaerobically during vigorous exercise.

Complete the sentences.

Choose answers from the box.

[2 marks]

amino acids	carbon dioxide	glucose
lactic acid	oxygen	

0 2 . 2 Muscles respire anaerobically if they do not have

enough Oxygen.

Anaerobic respiration of glucose produces Lactic acid.

13

Turn over ►

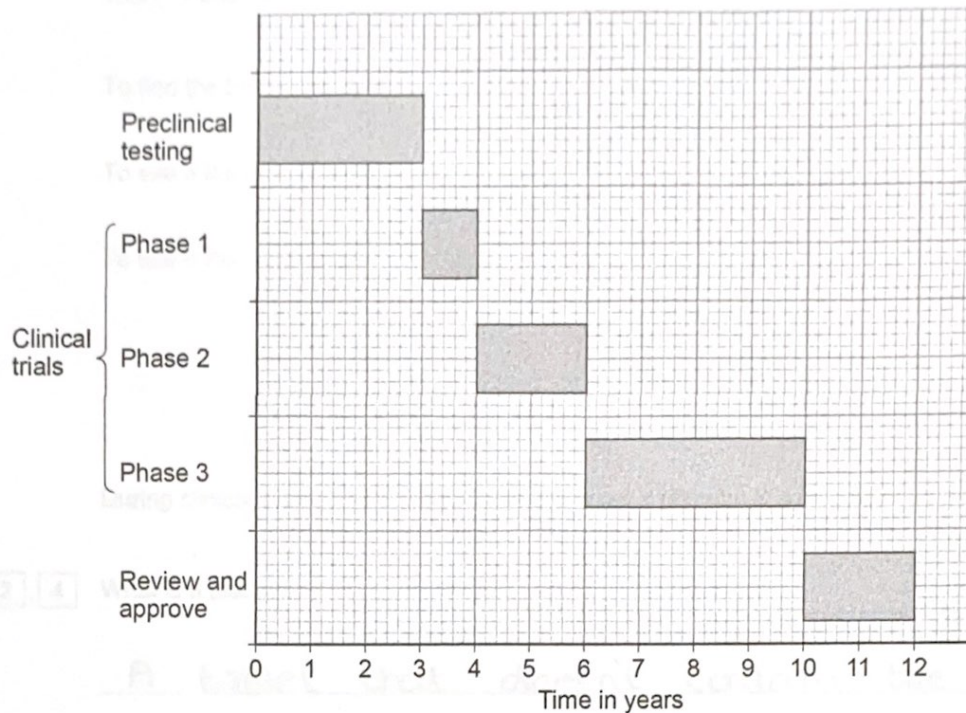


0 2

New drugs are tested before they can be licensed for use with patients.

Figure 2 shows how much time the different stages of testing took for one new drug.

Figure 2



0 2 . 1

Preclinical testing is done in a laboratory.

What is the drug tested on in a laboratory?

0 2 . 6

Who knows which patients are given the placebo and which patients are given the drug?
Give **one** example.

[1 mark]

Cells

0 2 . 2

How many years did the clinical trials take for the drug in Figure 2?

[1 mark]

From year 3 to year 10

$10 - 3 = 7$

Time for clinical trials = 7 years



0 2 3 During Phase 1 clinical trials, the drug is tested on **healthy** volunteers using **low** doses.

What is the main purpose of Phase 1 testing?

[1 mark]

Tick (✓) **one** box.

To find the best dose to use.

☐

To see if the drug is safe to use.

☒

To see if the drug works.

☐

During clinical trials, half of the patients are given a placebo in a double blind trial.

0 2 4 What is a placebo?

[1 mark]

A tablet that doesn't contain the
drug

0 2 5 Who knows which patients are given the placebo and which patients are given the drug in a double blind trial?

[1 mark]

Tick (✓) **one** box.

Not the patients or the doctors

☒

The patients and the doctors

☐

The patients but not the doctors

☐

Turn over ►



Paracetamol and ibuprofen are two medicines used to reduce a high body temperature.

Doctors investigated which medicine was more effective at reducing high body temperature in 200 children who were ill.

The children were put into two groups, which were matched for:

- age
- gender
- body mass.

Each group had 100 children.

This is the method used.

1. Measure the body temperature of each child before any medicine is given.
2. Give children in Group 1 paracetamol.
3. Give children in Group 2 ibuprofen.
4. Measure the body temperature of each child every hour after the medicine is given.

0 2 . 6 Give **two** control variables in this investigation.

[2 marks]

- 1 Age
- 2 Gender



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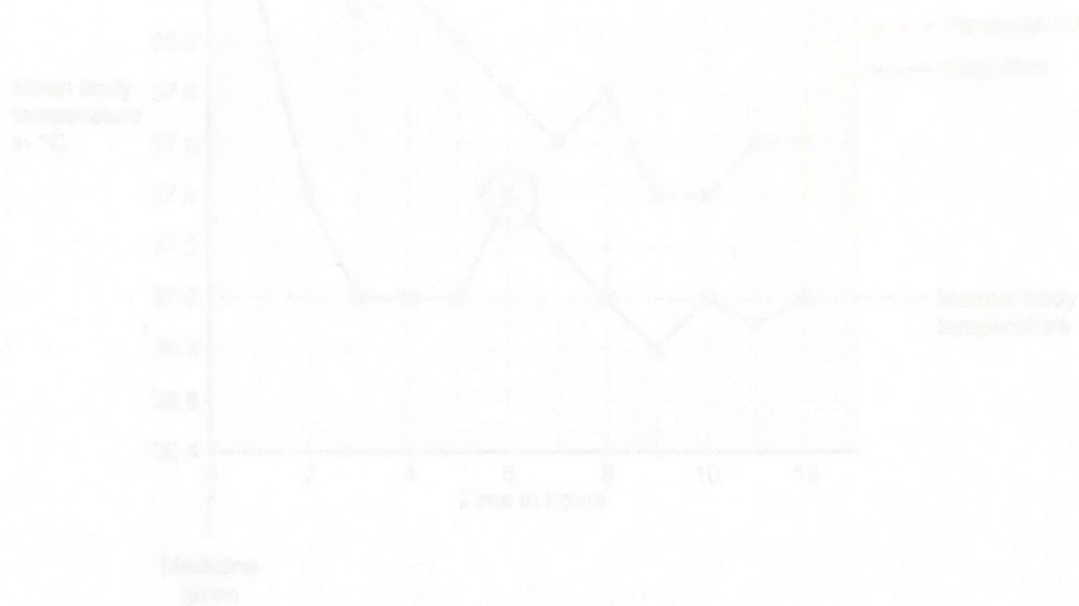
0 2 . 7 None of the children was given a placebo.

Suggest **one** reason why.

[1 mark]

The children were ill so would be unethical not to treat them as they may become more ill.

Question 2 continues on the next page



0 2 . 8 What was the mean body temperature after 6 hours for the children given aspirin?

[1 mark]

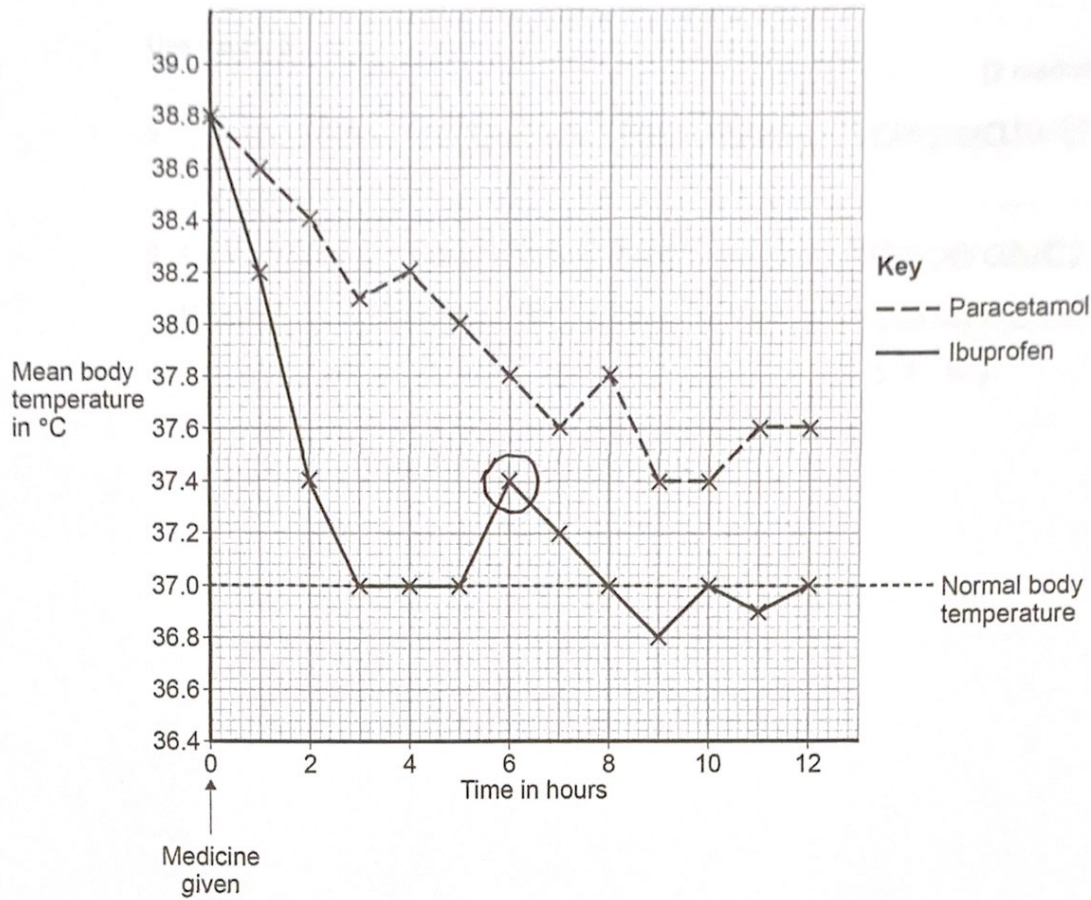
Mean body temperature = 37.2

Turn over ►



Figure 3 shows the results.

Figure 3



0 2 . 8 What was the mean body temperature after 6 hours for the children given ibuprofen? [1 mark]

Mean body temperature = 37.4 °C



0 2 . 9

The doctors concluded that children with a high body temperature should be given ibuprofen and not paracetamol.

Give **two** reasons for the doctors' conclusion.

Use Figure 3.

[2 marks]

- 1 Ibuprofen reduced the body temperatures faster
- 2 Ibuprofen reduced the body temperatures more, down to normal temperature (37°C)

11

Turn over for the next question

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED

Turn over ►



0 3

Water is lost from the leaves of plants through pores called stomata.

0 3 . 1

What is the loss of water from a leaf called?

[1 mark]

Tick (✓) **one** box.

Osmosis

☐

Respiration

☐

Transpiration

☒

0 3 . 2

Which cells control the size of stomata?

[1 mark]

Tick (✓) **one** box.

Guard cells

☒

Phloem cells

☐

Xylem cells

☐

Question 3 continues on the next page

Leaf	Surfaces covered with grease	Mass of leaf at start in grams	Mass of leaf after 24 hours in grams	Loss in mass after 24 hours in grams
A	Upper and lower	2.01	1.87	X
B	Only upper	2.00	1.87	0.13
C	Only lower	2.01	1.88	0.05
D	None	1.98	1.83	0.15

Turn over ►



A student investigated the water loss when different surfaces of leaves were covered in grease.

The grease blocks the stomata.

This is the method used.

1. Remove four similar leaves from one plant.
2. Put grease on different surfaces of the leaves as shown in **Figure 4**.
3. Record the mass of each leaf and attach the four leaves to a string.
4. After 24 hours record the mass of each leaf again.

Figure 4

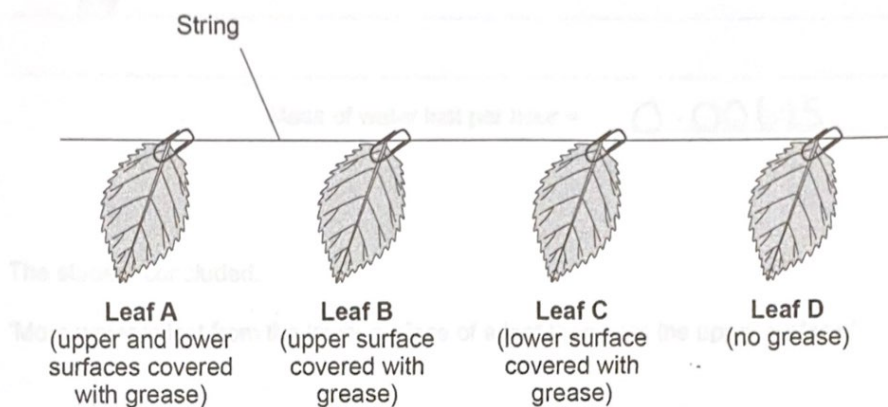


Table 2 shows the results.

Table 2

Leaf	Surfaces covered with grease	Mass of leaf at start in grams	Mass of leaf after 24 hours in grams	Loss in mass after 24 hours in grams
A	Upper and lower	2.01	1.97	X
B	Only upper	2.00	1.87	0.13
C	Only lower	2.01	1.96	0.05
D	None	1.98	1.83	0.15



03.3 Calculate value X in Table 2.

[1 mark]

$$\text{mass at start} - \text{mass after} = \text{loss of mass}$$

$$2.01 - 1.97 = 0.04$$

Value X = 0.04 g

03.4 The loss in mass of water was measured after 24 hours.

Calculate the mass of water lost in grams per hour for leaf D.

[2 marks]

$$\frac{0.15}{24} = 0.00625 \text{ g or } 6.25 \times 10^{-3} \text{ g}$$

Mass of water lost per hour = 0.00625 g

The student concluded:

'More water is lost from the lower surface of a leaf than from the upper surface.'

03.5 What evidence is there in Table 2 to support the student's conclusion?

[1 mark]

Leaf B lost more mass / water than
Leaf C

03.6 What do the results in Table 2 show about the number of stomata on the surfaces of a leaf?

[1 mark]

Tick (✓) one box.

There are more stomata on the lower surface.

☒

There are more stomata on the upper surface.

☐

There are the same number of stomata on both surfaces.

☐

Turn over ►



0 3 . 7 The investigation was done at 20 °C

How would the mass of water lost be different if the investigation was done at 25 °C?

Give a reason for your answer.

[2 marks]

Difference more water will be lost

Reason because evaporation would be
faster

9

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ANSWER IN THE SPACES PROVIDED



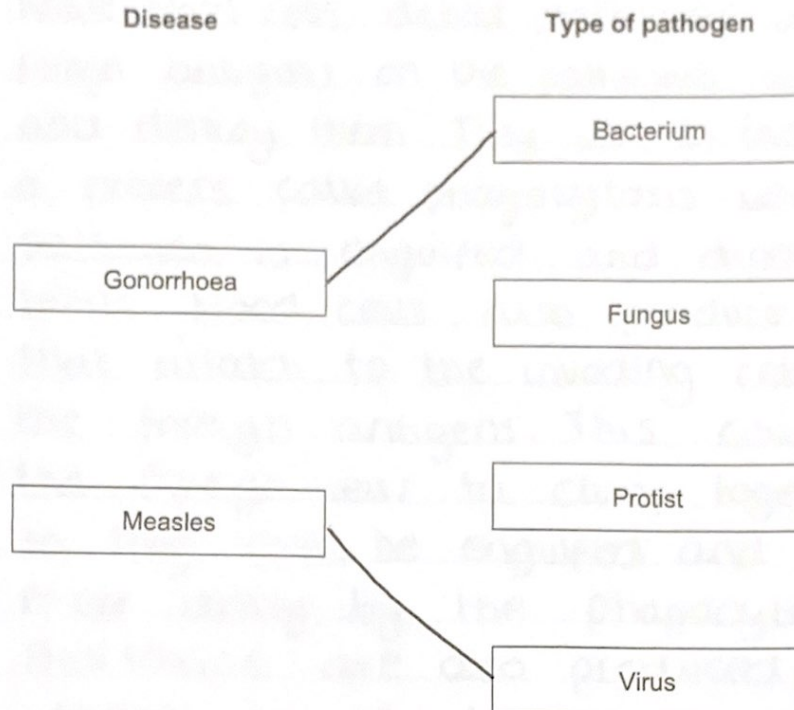
0 4

Pathogens cause infectious diseases.

0 4 . 1

Draw **one** line from each disease to the type of pathogen that causes the disease.

[2 marks]



The body defends itself against pathogens in different ways.

0 4 . 2

Give **two** ways that the body prevents pathogens entering the body.

[2 marks]

1 Skin acts as a physical barrier2 Mucus in trachea and bronchi

0 4 3

If pathogens do enter the body the immune system tries to destroy the pathogens.

Describe how the immune system defends the body against disease.

[6 marks]

White blood cells detect pathogens using the foreign antigens on the pathogens surface and destroy them. They can do this by a process called phagocytosis where the pathogen is engulfed and digested. White blood cells also produce antibodies that attach to the invading cells by the foreign antigens. This causes the foreign cells to clump together so they can be engulfed and destroyed more easily by the phagocytes. Antitoxins are also produced which destroy harmful toxins produced by the invading pathogen, so the person feels less ill. Memory cells are also produced which produce antibodies more rapidly if the person was to become infected with the same pathogen in the future.

Question 4 continues on the next page

Turn over ►



0 4 . 4

Give **one** reason why antibiotics cannot be used to treat HIV infections.

[1 mark]

antibiotics kill bacteria and HIV
is a virus

0 4 . 5

Give **two** ways to prevent the spread of HIV.

[2 marks]

1 Use a condom

2 Do not share needles

0 4 . 6

Some people with a HIV infection develop AIDS.

Some people with AIDS may die from a different type of infection, such as a chest infection.

Why do people with AIDS die from a different type of infection?

[1 mark]

Tick (✓) **one** box.

HIV damages the immune system.

☒

Pathogens enter the body more easily.

☐

People with AIDS are immune to HIV.

☐


0 5

A student investigated the effect of different concentrations of sugar solution on pieces of potato.

This is the method used.

1. Cut five pieces of potato.
2. Record the starting mass of each piece of potato.
3. Place each piece of potato in a different concentration of sugar solution.
4. After 24 hours remove the pieces of potato from the solutions.
5. Record the final mass of each piece of potato.
6. Calculate the change in mass for each piece of potato.

0 5 . 1

What is the independent variable?

[1 mark]

Tick (✓) **one** box.

Change in mass of the pieces of potato

☐

Concentration of the sugar solution

☒

Length of time the pieces of potato are in the solution

☐

Starting mass of the pieces of potato

☐

Question 5 continues on the next page

Turn over ►



Table 3 shows the results.

Table 3

Concentration of sugar solution in mol/dm ³	Mass of potato at start in grams	Mass of potato after 24 hours in grams	Change in mass in grams
0.0	7.94	10.14	2.20
0.1	7.95	9.10	1.15
0.2	7.96	8.21	0.25
0.3	7.93	7.53	-0.40
0.4	7.93	7.18	-0.75
0.5	7.95	7.00	-0.95

0 5 . 2

Explain why the potato in 0.0 mol/dm³ sugar solution increased in mass.

[2 marks]

The potato gained water by osmosis as the concentration of water outside of the potato was greater than inside the potato cells

0 5 . 4

The mass of a piece of potato does not change when:

concentration of solution inside cells = concentration of solution outside cells

Determine the concentration of sugar solution inside the potato cells.

Use Figure 5.

[3 marks]

Concentration = 0.23 mol/dm³



0 5 . 3 Complete Figure 5.

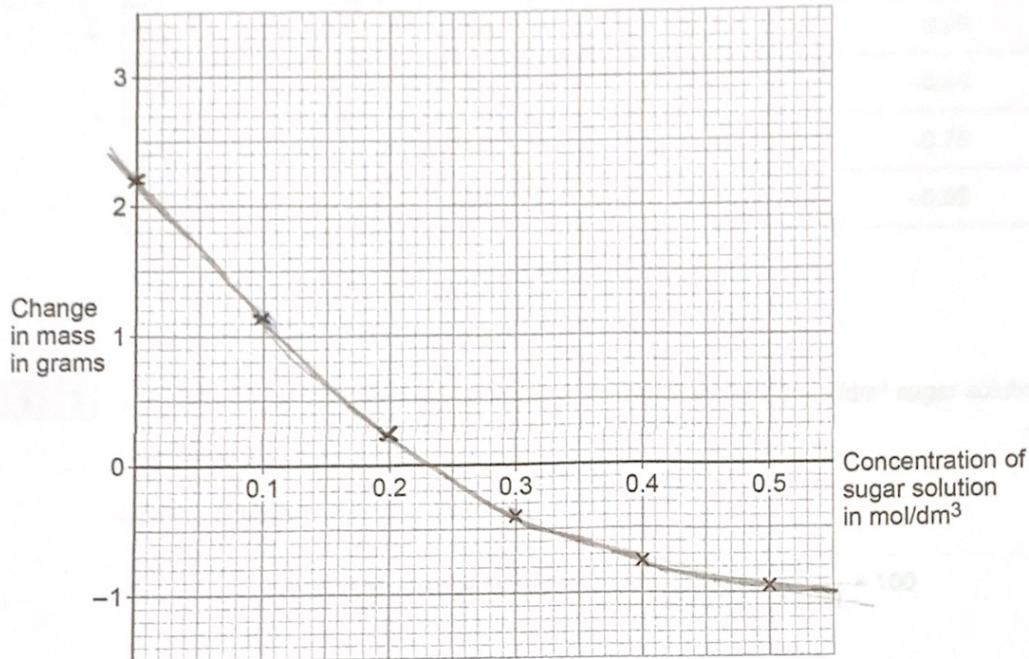
Some of the results have been plotted for you.

You should:

- plot the data from Table 3
- draw a line of best fit through all the points.

[2 marks]

Figure 5

0 5 . 4 The mass of a piece of potato does **not** change when:

concentration of solution inside cells = concentration of solution outside cells

Determine the concentration of sugar solution inside the potato cells.

Use Figure 5.

[1 mark]

Concentration = 0.23 mol/dm³

Turn over ►



Table 3 is repeated below.

Table 3

Concentration of sugar solution in mol/dm ³	Mass of potato at start in grams	Mass of potato after 24 hours in grams	Change in mass in grams
0.0	7.94	10.14	2.20
0.1	7.95	9.10	1.15
0.2	7.96	8.21	0.25
0.3	7.93	7.53	-0.40
0.4	7.93	7.18	-0.75
0.5	7.95	7.00	-0.95

0 5 . 5

Calculate the percentage change in mass for the potato in 0.2 mol/dm³ sugar solution.

Use Table 3.

Use the equation:

$$\text{percentage change in mass} = \frac{\text{change in mass}}{\text{mass of potato at start}} \times 100$$

Give your answer to 3 significant figures.

[3 marks]

$$\text{change in mass} = 8.21 - 7.96 = 0.25$$

$$\frac{0.25 \times 100}{7.96} = 3.14070$$

$$\text{Percentage change in mass (3 significant figures)} = 3.14 \%$$

9



0 6

Starch is digested to form sugar molecules in the digestive system.

0 6 . 1

What is the name of the enzyme that digests starch?

[1 mark]

amylase

0 6 . 2

Where are most food molecules absorbed?

[1 mark]

Tick (✓) **one** box.

Large intestine

☐

Liver

☐

Small intestine

☒

Stomach

☐

Question 6 continues on the next page

0 6 . 3

Give one advantage of using an electron microscope compared with using a light microscope.

[1 mark]

Electron microscopes have greater magnification

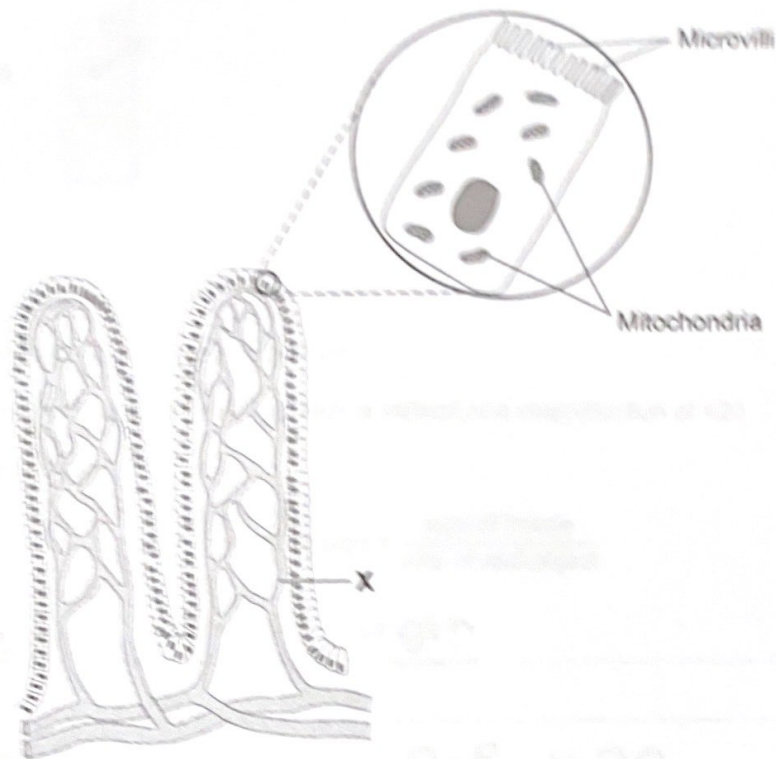
Turn over ►



Figure 6 shows two villi.

Figure 6 also shows one cell on the surface of a villus as seen using an electron microscope.

Figure 6



0 6 3

Give one advantage of using an electron microscope compared with using a light microscope.

[1 mark]

Electron microscopes have greater
magnification



0 6 . 4

What type of blood vessel is labelled X?

[1 mark]

Tick (✓) **one** box.

Artery

☐

Capillary

☒

Vein

☐

0 6 . 5

The real length of one villus is 0.8 mm

Calculate the image length if the villus is viewed at a magnification of $\times 20$

Use the equation:

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

[3 marks]

$$20 = \frac{\text{image length}}{0.8}$$

$$\text{image length} = 0.8 \times 20$$

$$\text{image length} = 16$$

$$\text{Image length} = 16 \text{ mm}$$

0 6 . 6

Question 6 continues on the next page

[1 mark]

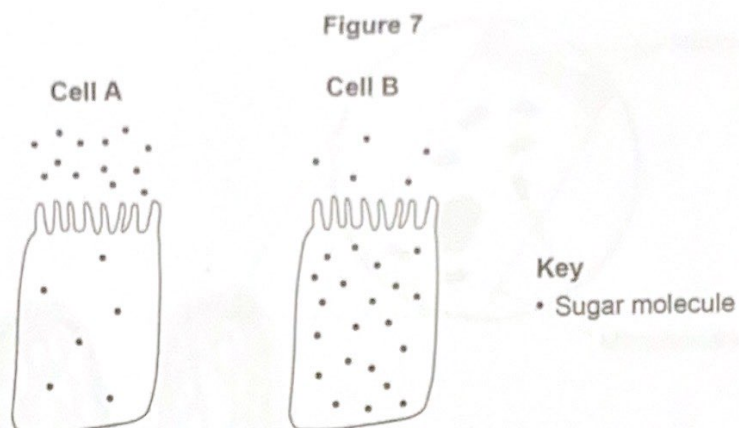
Respiration

Turn over ►



Figure 7 shows two cells from the surface of a villus.

There are sugar molecules inside and next to each cell.



0 6 . 6 Name the process by which sugar moves into cell A.

[1 mark]

Diffusion

0 6 . 7 Name the process by which sugar moves into cell B.

[1 mark]

Active transport

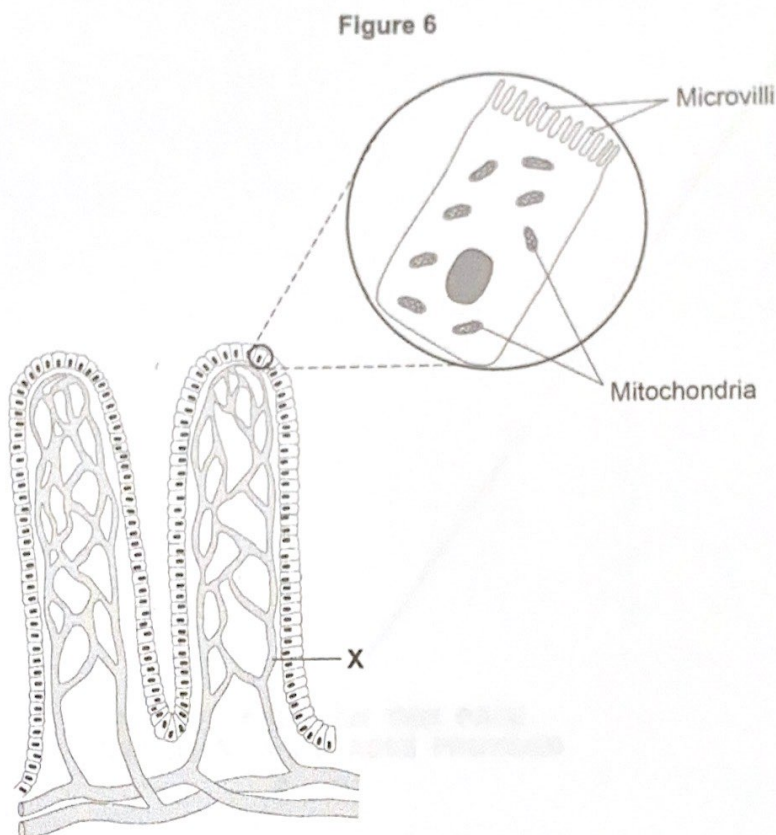
0 6 . 8 Give one use of sugar in the body.

[1 mark]

Respiration



0 6 . 9 Figure 6 is repeated below.



Explain how villi are adapted for efficient absorption of sugar molecules.

[4 marks]

Villi have many microvilli which increase the surface area for absorption. The walls of the villus are only one cell thick and capillaries are close to the surface so there is only a short pathway. Villi have good blood supply to transport food to the body and maintain a diffusion gradient. There is also lots of mitochondria to create lots of energy during respiration for active transport required to absorb food.

14

END OF QUESTIONS

