AQA GCSE Combined Science - Trilogy | 8464

SPECIFICATION POINT 4.2.2.1

The human digestive system

Past-paper questions

Tier	**Higher**
Question groups	**7**
Available paper years	**2019–2024**

Using this booklet

1. Answer the questions in order and show your working.
2. Original question numbers and marks are retained.
3. Print at actual size (100%) for measuring questions.
4. Use the companion answer booklet to check your work.

Name: _____ **Date:** _____

Whole questions are retained for context, so some parts assess other specification points. Current and legacy sources are labelled. Continue on extra paper if needed.

4.2.2.1 The human digestive system

Question 01

June 2019 | 8464/B/1H | Original Q2

0 2 This question is about digestion.

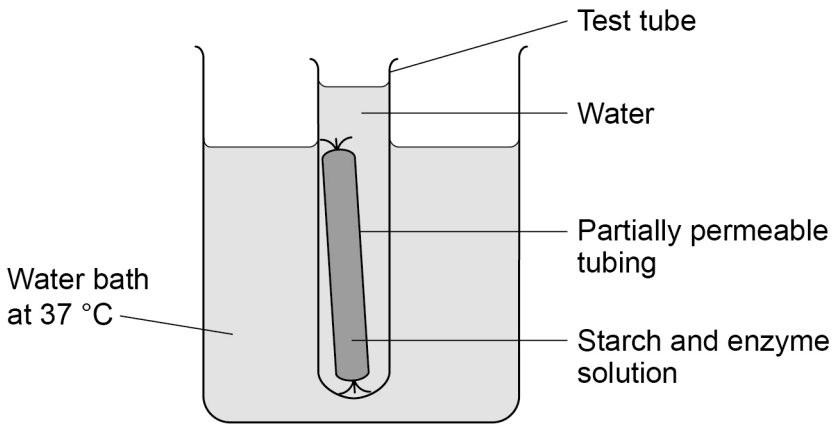
0 2 . 1 Name the enzyme that digests starch in the human digestive system.

[1 mark]

A student set up a model to represent the digestion and absorption of food molecules in the digestive system.

Figure 2 shows the student's model.

Figure 2



This is the method used.

1. Fill a test tube with water at 37 °C
2. Test the water for starch and for sugar.
3. Mix together starch and enzyme solution and immediately test it for starch and for sugar.
4. Fill some partially permeable tubing with the starch and enzyme mixture.
5. Seal the tubing and place it in the test tube of water.
6. Place the test tube in a water bath at 37 °C
7. After 30 minutes, test the mixture inside the partially permeable tubing and test the water in the test tube for starch and for sugar.

0 2 . 2 Suggest which parts of the body the partially permeable tubing and the water in the test tube represent.

[2 marks]

Partially permeable tubing _____

Water in the test tube _____

4.2.2.1 The human digestive system

Question 01 · continued

Table 2 shows the results.

Table 2

Test	Description of liquid	Result of starch test	Result of sugar test
1	Mixture inside tubing at start	✓	✗
2	Water in the test tube at start	✗	✗
3	Mixture inside tubing after 30 minutes	✓	✓
4	Water in the test tube after 30 minutes	✗	✓

Key
✓ = Present
✗ = Not present

0 2 . 3 Name the reagents used to test for starch and for sugar.

[2 marks]

Starch _____

Sugar _____

0 2 . 4 Why was there no sugar present in test **1**?

[1 mark]

_____

_____

0 2 . 5 Explain the results for test **3**.

[2 marks]

_____

_____

_____

_____

_____

4.2.2.1 The human digestive system

Question 01 · continued

0 2 . 6 Explain the results for test **4**.

[2 marks]

10

Turn over for the next question

4.2.2.1 The human digestive system

Question 02

November 2020 | 8464/B/1H | Original Q2

0 2 Starch is digested to form sugar molecules in the digestive system.

0 2 . 1 What is the name of the enzyme that digests starch?

[1 mark]

0 2 . 2 Where are most food molecules absorbed?

[1 mark]

Tick (✓) **one** box.

- Large intestine ☐
- Liver ☐
- Small intestine ☐
- Stomach ☐

Question 2 continues on the next page

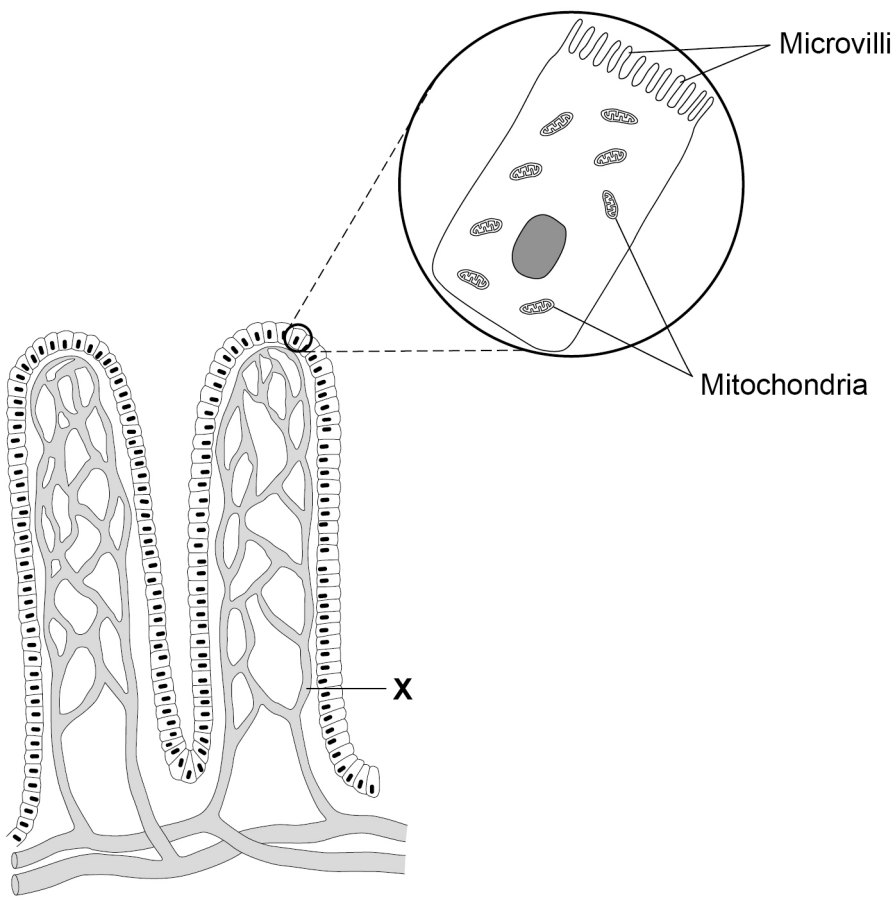
4.2.2.1 The human digestive system

Question 02 · continued

Figure 2 shows two villi.

Figure 2 also shows one cell on the surface of a villus as seen using an electron microscope.

Figure 2



0 2 . 3 Give **one** advantage of using an electron microscope compared with using a light microscope.

[1 mark]

4.2.2.1 The human digestive system

Question 02 · continued

0 2 . 4 What type of blood vessel is labelled **X**?

[1 mark]

Tick (✓) **one** box.

Artery ☐

Capillary ☐

Vein ☐

0 2 . 5 The real length of one villus is 0.8 mm

Calculate the image length if the villus is viewed at a magnification of ×20

Use the equation:

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

[3 marks]

Image length = _____ mm

Question 2 continues on the next page

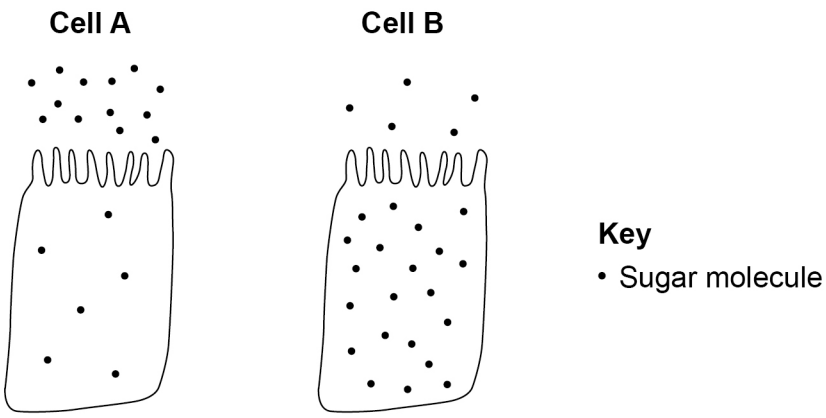
4.2.2.1 The human digestive system

Question 02 · continued

Figure 3 shows two cells from the surface of a villus.

There are sugar molecules inside and next to each cell.

Figure 3



0 2 . 6 Name the process by which sugar moves into cell **A**.

[1 mark]

0 2 . 7 Name the process by which sugar moves into cell **B**.

[1 mark]

0 2 . 8 Give **one** use of sugar in the body.

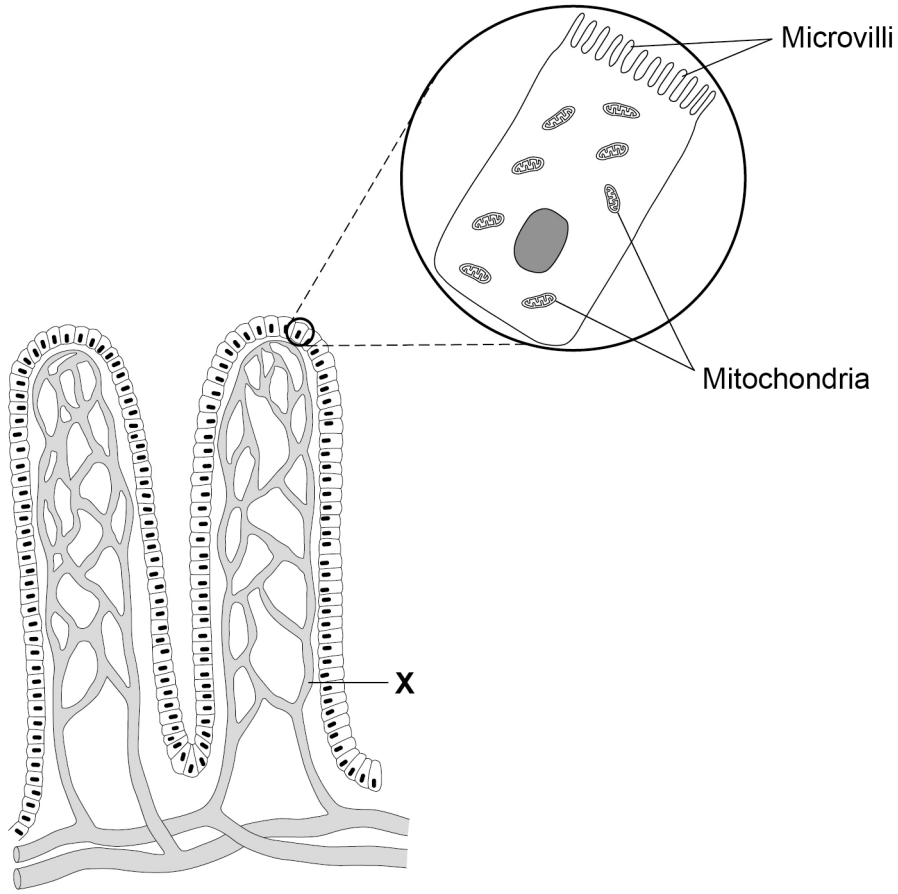
[1 mark]

4.2.2.1 The human digestive system

Question 02 · continued

0 2 . 9 **Figure 2** is repeated below.

Figure 2



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

[4 marks]

14

4.2.2.1 The human digestive system

Question 03

November 2021 | 8464/B/1H | Original Q2

0 2 Describe how to test a sample of food for protein, starch and sugar.

Give the colours that would be seen if the food sample contained protein, starch and sugar.

[6 marks]

6

4.2.2.1 The human digestive system

Question 04

June 2022 | 8464/B/1H | Original Q3

0 3 Amylase is an enzyme that digests starch.

0 3 . 1 Which organs in the human digestive system produce amylase?

[1 mark]

Tick (✓) **one** box.

- Liver, small intestine and large intestine ☐
- Salivary glands, stomach and liver ☐
- Salivary glands, pancreas and small intestine ☐
- Stomach, pancreas and large intestine ☐

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

This is the method used.

1. Prepare amylase solution at pH 5
2. Mix the amylase solution with starch in a boiling tube.
3. Remove a drop of the amylase-starch mixture every 30 seconds and test it for the presence of starch.
4. Record the time when all the starch has been digested.
5. Repeat steps 1 to 4 using amylase solution prepared at pH 6, then at pH 7 and then at pH 8

0 3 . 2 What was the independent variable in this investigation?

[1 mark]

4.2.2.1 The human digestive system

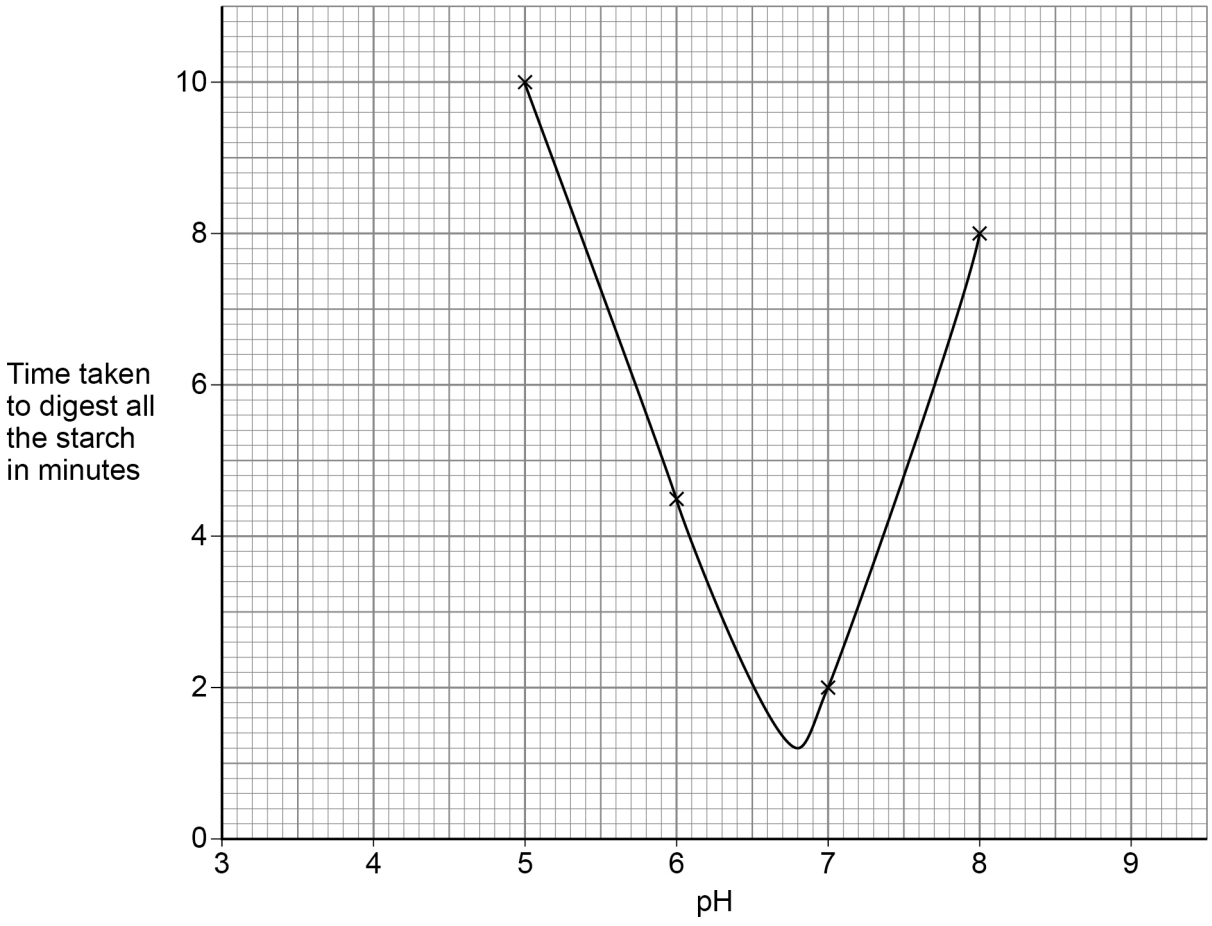
Question 04 · continued

0 3 . 3 Describe how the student would know when all the starch had been digested.

[1 mark]

0 3 . 4 **Figure 6** shows the student's results.

Figure 6



What was the optimum pH for the amylase?

Use **Figure 6**.

[1 mark]

Optimum pH = _____

Question 04 · continued

A scientist did a different investigation.

This is the method used.

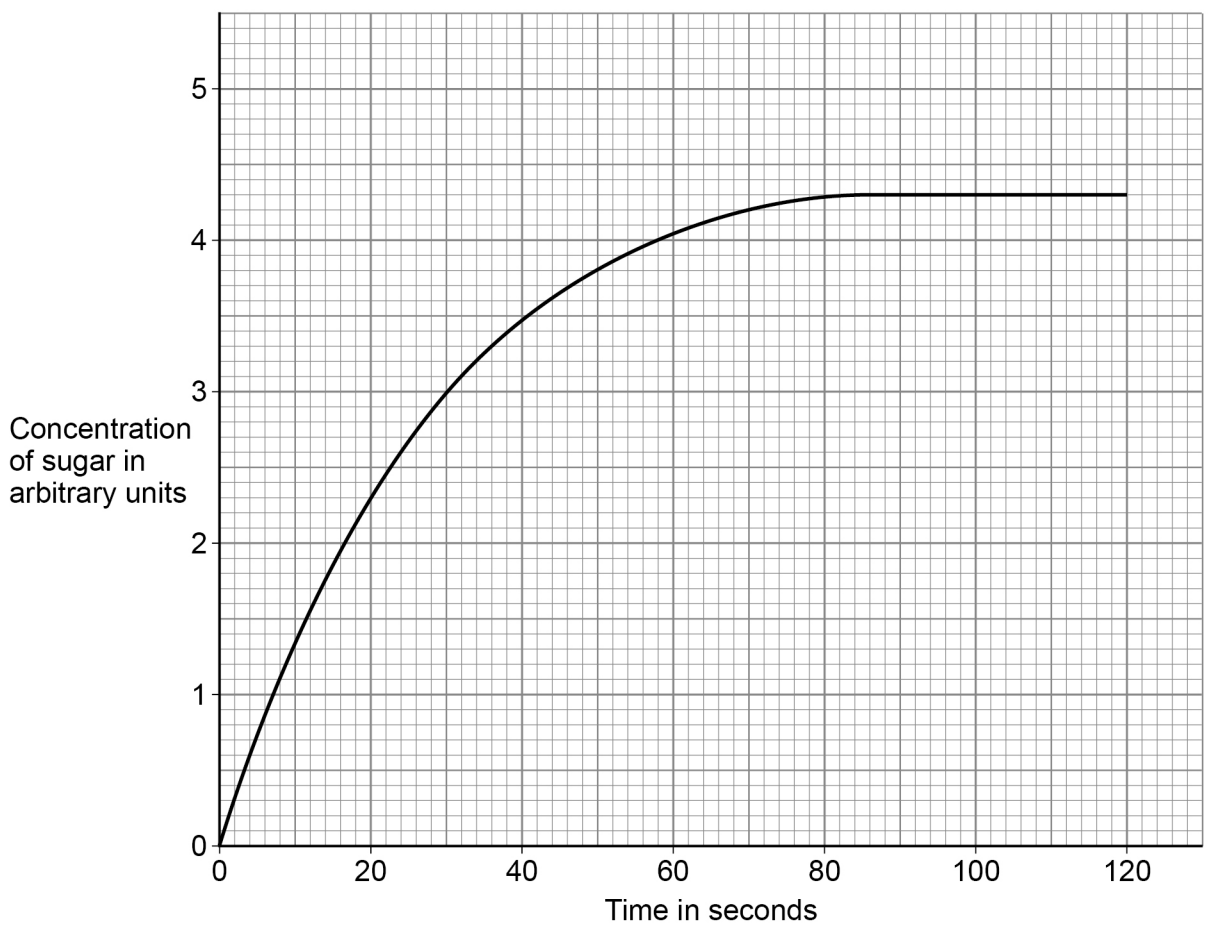
1. Prepare amylase solution at the optimum pH.

2. Mix the amylase solution with starch in a boiling tube.

3. Measure the concentration of sugar every 10 seconds for 2 minutes.

Figure 7 shows the scientist's results.

Figure 7



0 3 . 5 How much time did it take for the amylase to digest all the starch?

Use **Figure 7**.

[1 mark]

Time to digest all the starch = _____ seconds

4.2.2.1 The human digestive system

Question 04 · continued

0 3 . 6 Determine the rate of sugar production per minute at 40 seconds.

[4 marks]

Rate = _____ arbitrary units per minute

0 3 . 7 Explain how the structure of enzyme molecules is related to the effect of pH on the activity of amylase.

[6 marks]

15

4.2.2.1 The human digestive system

Question 05

0 6 Amylase is an enzyme that digests starch in the digestive system.

0 6 . 1 Explain why starch has to be digested.

[2 marks]

Question 6 continues on the next page

4.2.2.1 The human digestive system

Question 05 · continued

A student used a colorimeter to investigate the rate of starch digestion.

A colorimeter measures the percentage of light passing through a liquid.

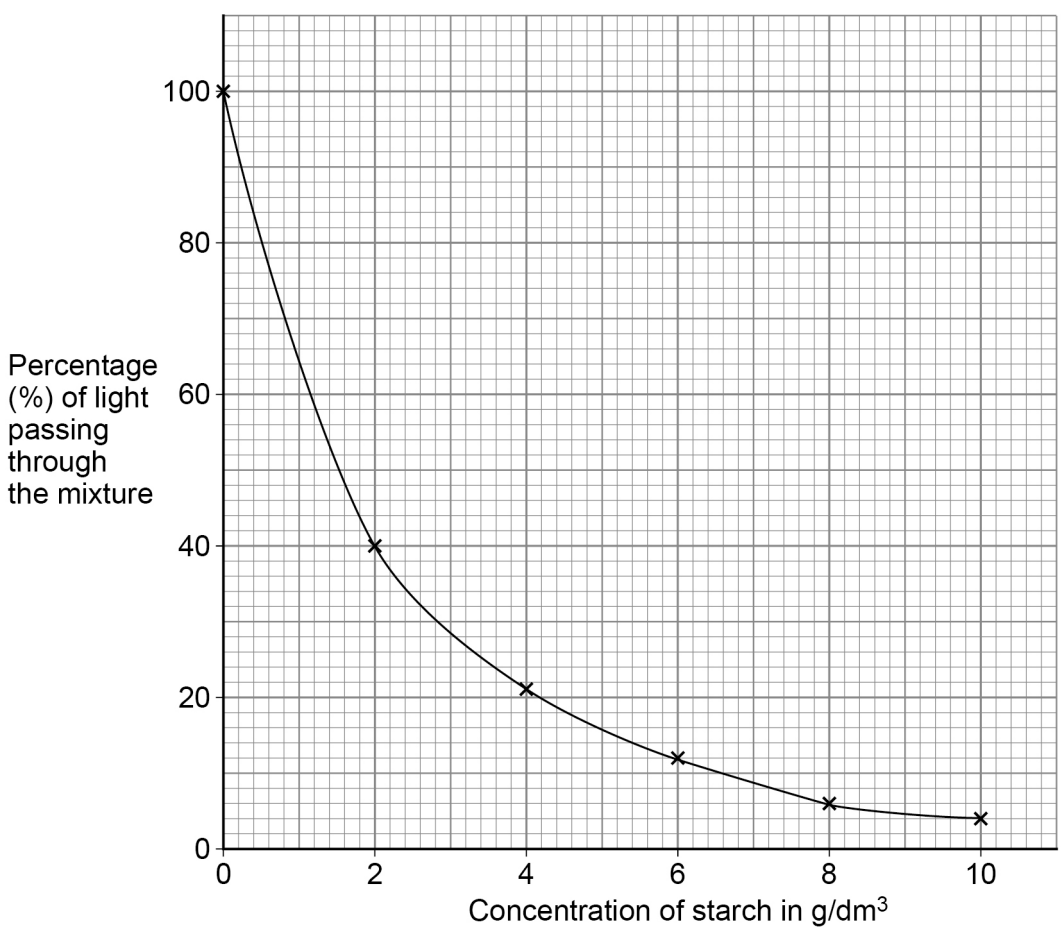
The darker the colour of the liquid, the less light passes through.

The student:

- mixed 1 cm^3 of starch suspension with 10 cm^3 of iodine solution
- measured the percentage of light passing through the mixture
- repeated with different concentrations of starch suspension.

Figure 7 shows the results.

Figure 7



4.2.2.1 The human digestive system

Question 05 · continued

0 6 . 2 Suggest what liquid was used for the test with 0 g/dm^3 starch concentration.

[1 mark]

0 6 . 3 Explain the change in the percentage of light passing through the different concentrations of starch suspension in iodine solution.

Use **Figure 7**.

[3 marks]

Question 6 continues on page 21

4.2.2.1 The human digestive system

Question 05 · continued

The student then investigated the rate of starch digestion using amylase.

This is the method used.

1. Put 10 cm^3 of starch suspension into a test tube.
2. Put 5 cm^3 of amylase solution into a separate test tube.
3. Put both test tubes into a water bath at 37 °C for 10 minutes.
4. Mix the contents of both test tubes together in a beaker.
5. Put the beaker into the water bath.
6. Remove 1 cm^3 of the mixture and add it to 10 cm^3 of iodine solution.
7. Measure the percentage of light passing through the liquid.
8. Repeat steps 6 and 7 every minute for 5 minutes.

0 6 . 4 The starch suspension and the amylase solution were kept in the water bath for 10 minutes before being mixed together.

Give the reason why.

[1 mark]

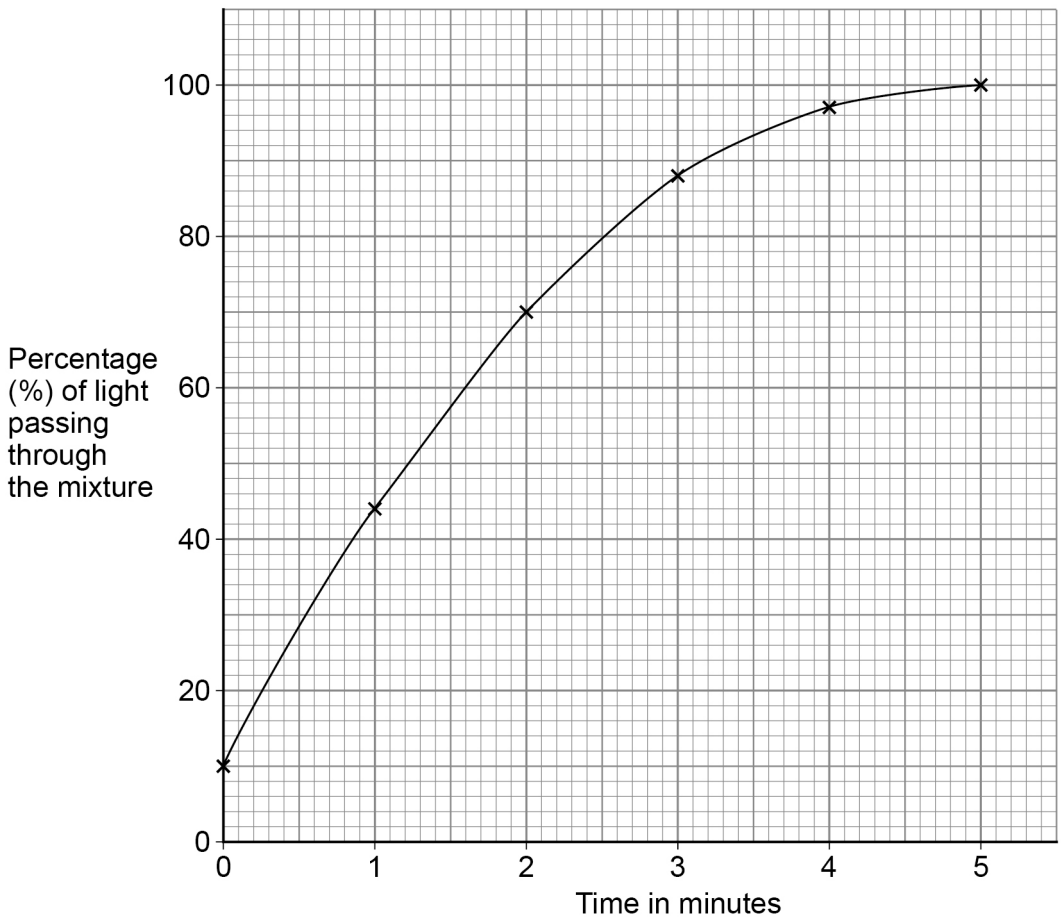
Question 6 continues on the next page

4.2.2.1 The human digestive system

Question 05 · continued

Figure 8 shows the results.

Figure 8



4.2.2.1 The human digestive system

Question 05 · continued

0 6 . 5 The concentration of starch at 3 minutes was 0.3 g/dm^3.

Calculate the mean rate of starch digestion for the first 3 minutes.

Use **Figure 7** on page 18 and **Figure 8** on page 22.

[4 marks]

Mean rate = _____ g/dm^3 per minute

0 6 . 6 The investigation was carried out at pH 7

Explain how the results would be different if the investigation was carried out at pH 1

Use **Figure 8**.

[3 marks]

14

4.2.2.1 The human digestive system

Question 06

0 2 It is estimated that 99.9% of all species that have ever existed are now extinct.

0 2 . 1 Why is the percentage of species that are extinct only an estimate?

[1 mark]

Tick (✓) **one** box.

All individuals of one species have the same genes. ☐

Extinction is always caused by humans. ☐

Humans have not found evidence of every species. ☐

0 2 . 2 What evidence is used to study species that have become extinct?

[1 mark]

_____

_____

4.2.2.1 The human digestive system

Question 06 · continued

0 2 . 3 A bacterium called *Clostridioides difficile* (*C. difficile*) can infect the human digestive system.

C. difficile can multiply and produce toxins. The toxins cause diarrhoea.

Doctors are concerned that new strains of *C. difficile* may evolve. Antibiotics may **not** be able to kill these new strains.

Explain how the evolution of antibiotic resistant *C. difficile* can be slowed down.

[6 marks]

8

4.2.2.1 The human digestive system

Question 07

June 2024 | 8464/B/1H | Original Q1

0 1 Drinks contain different substances.

A drinks company claims that a drink contains sugar, protein and fat.

0 1 . 1 Glucose and fructose are different sugars.

Fructose has a much sweeter taste than glucose.

Suggest **two** reasons why the drinks company uses fructose in the drink rather than using glucose.

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

[2 marks]

1 _____

_____

2 _____

_____

0 1 . 2 Describe how a student could test the drink for **sugar**.

Give the colour of a positive result.

[3 marks]

Test _____

_____

_____

_____

Colour of positive result _____

4.2.2.1 The human digestive system

Question 07 · continued

0 1 . 3 Describe how a student could test the drink for **protein**.

Give the colour of a positive result.

[2 marks]

Test _____

_____

_____

Colour of positive result _____

Question 1 continues on the next page

4.2.2.1 The human digestive system

Question 07 · continued

0 1 . 4 The human digestive system breaks down protein and fat in the drink.

Describe how **protein** and **fat** are digested.

You should include:

- the enzymes involved
- where the enzymes are produced.

[6 marks]

13