AQA GCSE Biology | 8461

SPECIFICATION POINT 4.2.2.1

The human digestive system

Past-paper questions

Tier	**Higher**
Question groups	**35**
Available paper years	**2008–2025**

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:** _____

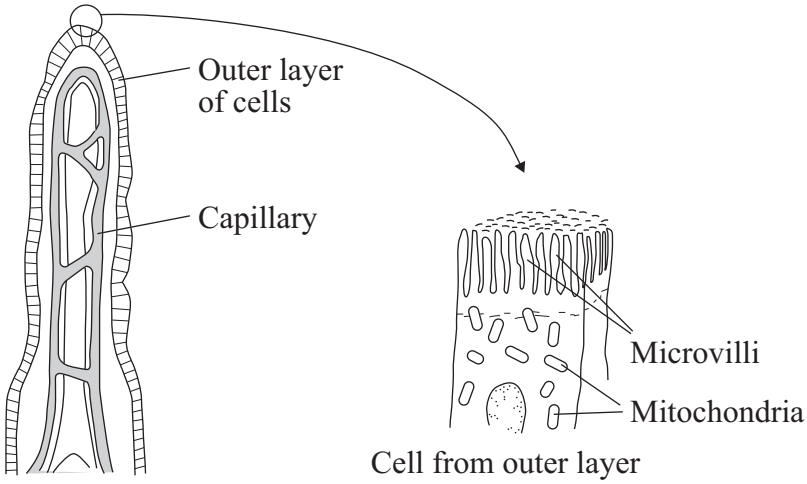
Whole questions are retained for context, so some parts assess other specification points. Current and legacy sources are labelled. Continue on extra paper if needed.

4.2.2.1 The human digestive system

Question 01

January 2008 | BLY3H | Original Q6 | Legacy

6 The small intestine is lined with millions of villi.
The diagram shows the structure of a villus.



In the small intestine, some of the products of digestion are absorbed into the blood by *active transport*.

(a) Explain what is meant by *active transport*.

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(2 marks)

(b) How do microvilli and mitochondria help in the active transport of the products of digestion from the small intestine into the blood?

Microvilli .....

.....

Mitochondria .....

.....

(2 marks)

4

4.2.2.1 The human digestive system

Question 02

June 2008 | BLY2H | Original Q1 | Legacy

1 Enzymes are used in biological detergents.

1 (a) Name the type of enzyme that digests stains containing fats.

.....

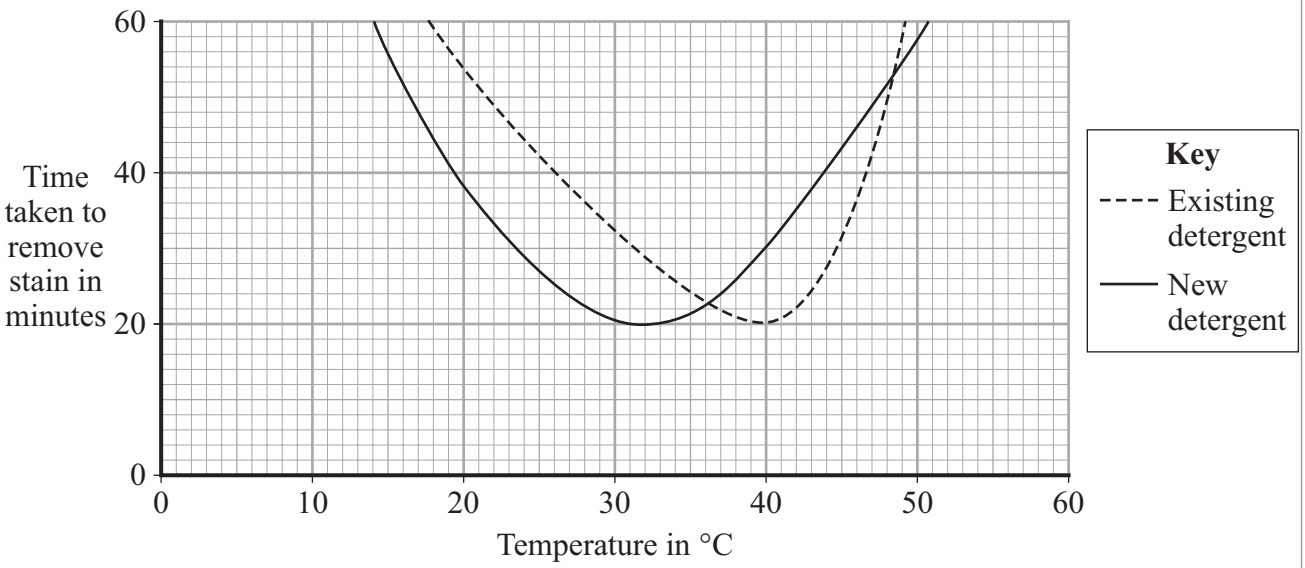
(1 mark)

1 (b) A new detergent is marketed as being 'environmentally-friendly'.

Scientists compared the performance of this new detergent with an existing detergent.

They measured the time taken by the two detergents to remove a fat stain at different temperatures.

The graph shows their results.



1 (b) (i) Describe the effect of increasing the temperature on the time taken by the existing detergent to remove the stain.

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(2 marks)

4.2.2.1 The human digestive system

Question 02 · continued

for mark

1 (b) (ii) The new detergent works at a lower temperature than the existing one.

Is the new detergent likely to be more 'environmentally-friendly' than the existing detergent?

Draw a ring around your answer. **Yes / No**

Explain the reason for your answer.

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(2 marks)

1 (c) Neither detergent works well at 60 °C.

Explain why.

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(2 marks)

7

4.2.2.1 The human digestive system

Question 03

June 2008 | BLY2H | Original Q5 | Legacy

5 The hormone insulin is a protein. Insulin is produced in the pancreas and controls blood glucose concentration.

5 (a) Which organ in the body monitors blood glucose concentration?

.....

(1 mark)

5 (b) We now know that a lack of the hormone insulin causes diabetes. In the early twentieth century there was no known cure for diabetes.

Frederick Banting and Charles Best carried out a number of experiments on dogs.

In the first experiment they removed part of the pancreas from a healthy dog (dog **A**). They ground up the pancreas tissue and injected an extract into dog **B**, whose pancreas had been removed to make it diabetic. Dog **B**'s diabetes was **not** cured.

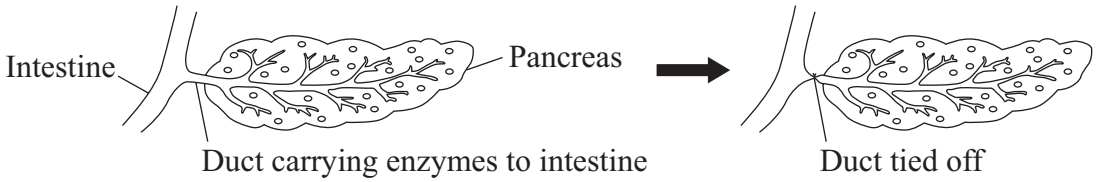
Banting thought that an enzyme produced in the pancreas of dog **A** had digested the hormone before it was injected.

Name the enzyme that might have been responsible for digesting the hormone.

.....

(1 mark)

5 (c) In the second experiment with another healthy dog, Banting and Best tied off the duct which normally carries digestive enzymes out of the pancreas. This did **not** kill the dog.



5 (c) (i) The dog survived even though enzymes from the pancreas could not digest food in the intestine.

Explain why the dog survived.

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.....

.....

(1 mark)

4.2.2.1 The human digestive system

Question 03 · continued

for mark

5 (c) (ii) As a result of these experiments, a method was developed to extract insulin from the pancreas.

Insulin is used to treat humans with diabetes.

The amount of insulin injected needs to be carefully controlled.

Explain why.

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(1 mark)

5 (d) Evaluate the use of dogs in experiments of this type.

Remember to include a conclusion to your evaluation.

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(3 marks)

7

4.2.2.1 The human digestive system

Question 04

January 2009 | BLY2H | Original Q3 | Legacy

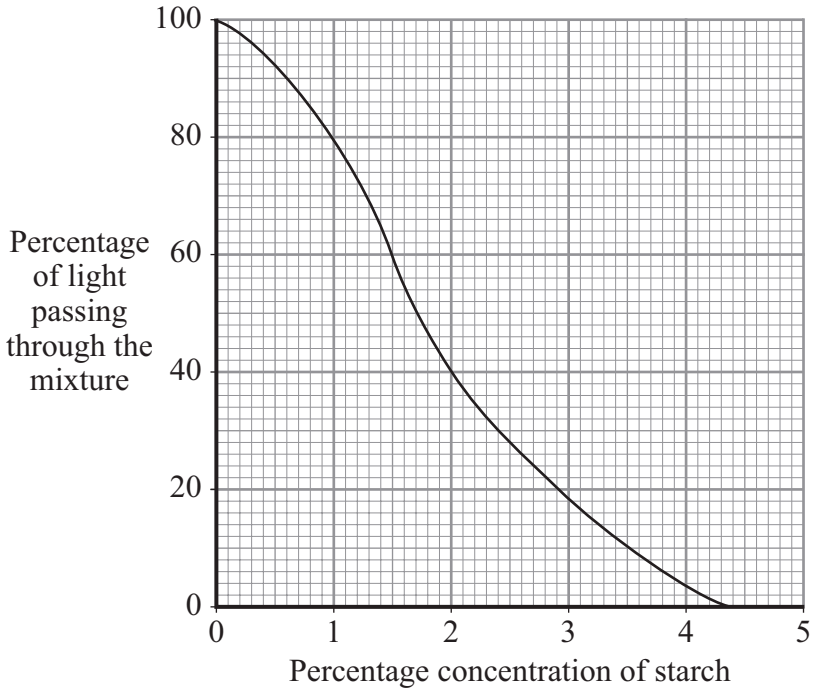
3 A manufacturer of slimming foods is investigating the effectiveness of carbohydrases from different microorganisms.

Iodine solution is a pale golden brown, transparent solution. Starch reacts with iodine to form a dark blue mixture.

Known concentrations of starch are added to iodine solution. The mixture is placed in a colorimeter which measures the percentage of light passing through the mixture.

Graph 1 shows the results.

Graph 1



3 (a) Explain why less light passes through the mixture when the starch is more concentrated.

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(1 mark)

Question 04 · continued

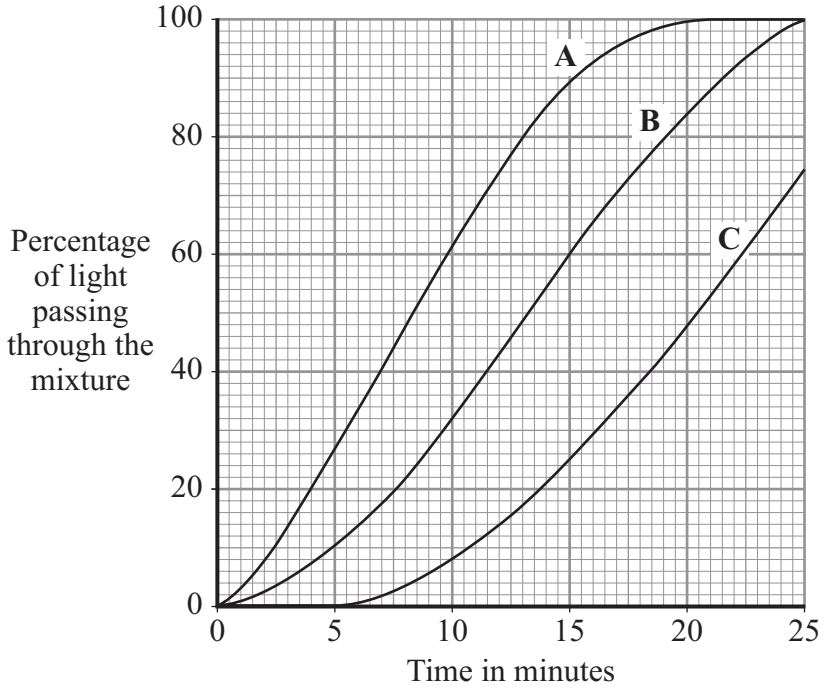
for mark

3 (b) The manufacturer adds carbohydrase from each of three different microorganisms, **A**, **B** and **C**, to starch in flasks at 40 °C.

Every minute a sample of the mixture is added to iodine solution and placed in the colorimeter.

Graph 2 shows these results.

Graph 2



3 (b) (i) When the concentration of starch reaches 2 %, digestion is considered to be sufficient for the next stage in the manufacture of the slimming food.

How long does this take for the most effective carbohydrase?

Show clearly how you work out your answer.

.....

.....

..... minutes
(2 marks)

Question 3 continues on the next page

4.2.2.1 The human digestive system

Question 04 · continued

for mark

3 (b) (ii) Explain why the manufacturer carried out the investigation at 40 °C.

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(2 marks)

3 (c) Carbohydrases convert starch into glucose. To complete the manufacture of the slimming food the glucose should be converted into fructose.

3 (c) (i) Name the enzyme which would be used to convert glucose into fructose.

.....

(1 mark)

3 (c) (ii) Explain why fructose, rather than glucose, is used in slimming foods.

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.....

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(2 marks)

8

4.2.2.1 The human digestive system

Question 05

June 2009 | BLY2H | Original Q4 | Legacy

4 A manufacturer is trying to improve the quality of the biological detergent he produces.

Scientists at his company carried out the following experiments on enzymes:

- Samples of lipase were collected from five different types of bacterium, **A**, **B**, **C**, **D** and **E**.
- The samples were diluted to give the same concentration of lipase.
- Agar jelly containing a lipid was prepared in a dish. This forms a cloudy mixture which becomes clear when the lipid is digested.
- Five small holes were cut into the agar.
- Two drops of lipase solution from bacterium **A** was added to hole **A**.
- This process was repeated for each sample of lipase.

Diagram 1 shows the appearance of the dish.

Diagram 1

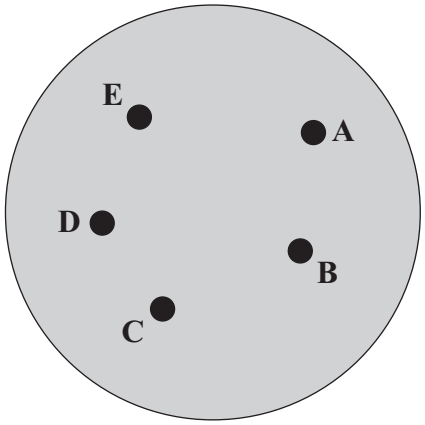
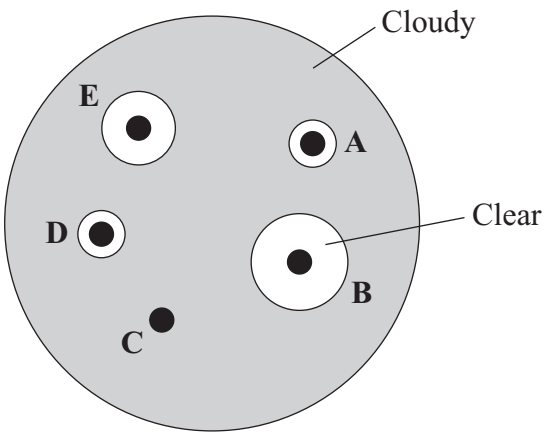


Diagram 2 shows the appearance of the dish 24 hours later.

Diagram 2



4.2.2.1 The human digestive system

Question 05 · continued

for mark

4 (a) (i) Which type of bacterium, **A**, **B**, **C**, **D** or **E**, produced the most effective lipase in this investigation?

Write your answer, **A**, **B**, **C, D** or **E**, in the box.

(1 mark)

4 (a) (ii) Explain your answer.

.....

.....

(1 mark)

4 (b) The manufacturer plans to add the most effective lipase to the washing powders he produces.

Suggest **two** other factors he should investigate before deciding which lipase is the most effective.

1.....

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2.....

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(2 marks)

4 (c) Many biological detergents cannot be used at high temperatures.

Explain why.

.....

.....

(1 mark)

5

4.2.2.1 The human digestive system

Question 06

June 2009 | BLY3H | Original Q6 | Legacy

6 Microorganisms are often used in the industrial production of useful substances.

The fungus, *Penicillium chrysogenum*, can be used to make an enzyme that digests the sugar sucrose. When it is growing in a medium containing sucrose, the fungus releases this enzyme into the surrounding solution.

6 (a) Explain why it is useful to the fungus to release the enzyme into the surrounding solution.

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(2 marks)

6 (b) Before setting up an industrial fermenter, laboratory-scale investigations are carried out to find the best conditions to use.

A manufacturer investigated the effect of changing several factors on the amount of enzyme produced by the fungus.

The results are shown in the table.

Condition	Concentration of enzyme produced in arbitrary units		
	24 hours	72 hours	120 hours
Amount of fungus added as %			
1	9.0	28.8	44.4
5	7.2	54.0	60.0
25	6.0	66.0	62.4
Aeration rate in arbitrary units			
0.5	9.0	36.0	45.8
1.0	7.2	54.0	60.0
2.0	10.8	43.2	52.8
Sucrose concentration at start as %			
4	7.2	54.0	60.0
8	3.0	29.7	48.3
12	0	54.0	21.6

4.2.2.1 The human digestive system

Question 06 · continued

for mark

The manufacturer decided to use the following conditions:

- amount of fungus = 5%
- aeration rate = 1.0 arbitrary units
- time = 72 hours.

Suggest an explanation for each of the following.

6 (b) (i) The manufacturer decided to add 5% fungus rather than 25%.

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(2 marks)

(Extra space) .....

6 (b) (ii) The concentration of enzyme produced at an aeration rate of 2.0 arbitrary units was less than the concentration at an aeration rate of 1.0 arbitrary units.

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(2 marks)

(Extra space) .....

6

4.2.2.1 The human digestive system

Question 07

January 2010 | BLY2H | Original Q3 | Legacy

3 (a) (i) Which organ in the body monitors the concentration of glucose (sugar) in the blood?

.....

(1 mark)

3 (a) (ii) In a healthy person, insulin prevents high levels of glucose in the blood.

How does it do this?

.....

.....

(1 mark)

3 (b) There are two forms of diabetes.

In type 1 diabetes, the body produces little or no insulin.
In type 2 diabetes, the body cells do not respond to insulin.

There are two ways in which diabetes can be treated.

Draw lines to join the type of diabetes to the way or ways in which it can be treated.

Type of diabetes	**Treatment**
	Careful attention to diet only
Type 1	
	Careful attention to diet **and** injection of insulin
Type 2	
	Injection of insulin only

(2 marks)

4.2.2.1 The human digestive system

Question 07 · continued

for mark

3 (c) To make insulin, cells in the pancreas need amino acids.
A *small section of DNA* in the pancreas cells is involved in making insulin from the amino acids.

3 (c) (i) Insulin is a hormone.

What type of substance is insulin?

Draw a ring around **one** answer.

carbohydrate **lipid** **protein**

(1 mark)

3 (c) (ii) What term is used to describe the *small section of DNA* which controls the production of insulin?

.....

(1 mark)

3 (c) (iii) Amino acids cannot be stored in the body.

Describe, as fully as you can, what happens to the excess amino acids.

You may wish to use the following words in your explanation:

liver **kidneys** **bladder**

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(3 marks)

9

4.2.2.1 The human digestive system

Question 08

January 2010 | BLY2H | Original Q6 | Legacy

6 Starch is broken down into sugar by amylase. Amylase is produced in the salivary glands.

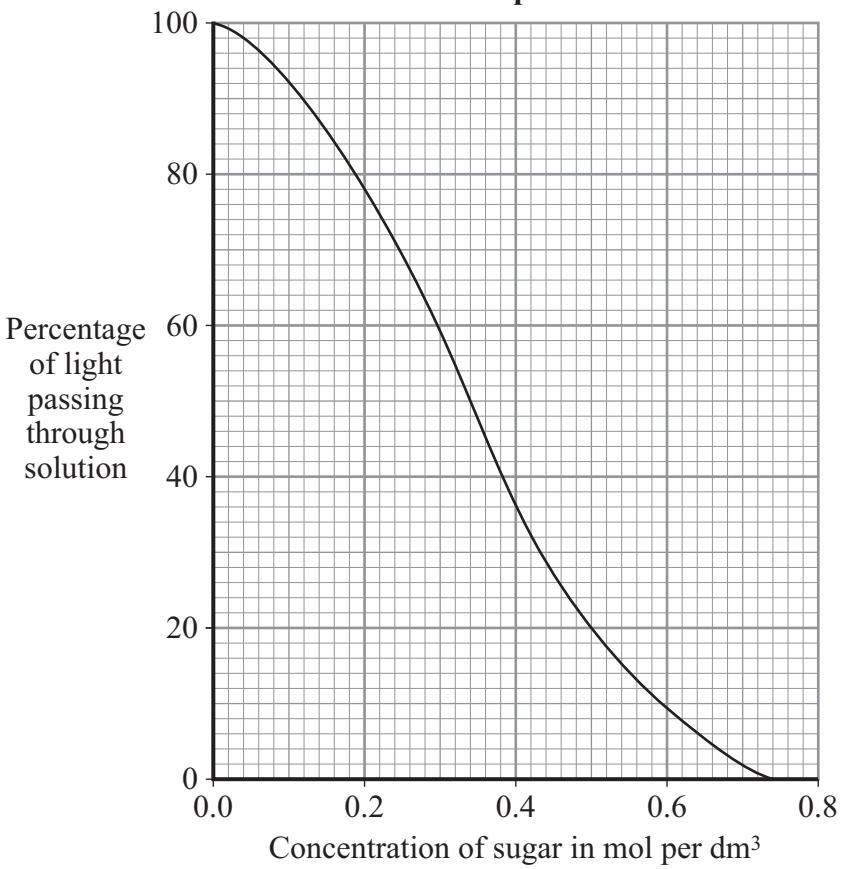
6 (a) Name **two** other organs in the digestive system which produce amylase.

.....and .....

(2 marks)

6 (b) A colorimeter measures colour intensity by measuring the percentage of light that passes through a solution.
Graph 1 shows the percentage of light passing through sugar solutions of different concentrations to which a test reagent has been added.

Graph 1



Students used a colorimeter to compare the starch-digesting ability of amylase enzymes obtained from two organs, **P** and **Q**.

- The students collected 5 cm^3 samples of amylase from **P** and **Q** and placed them into a water-bath at 40 °C.
- Two test tubes containing 10 cm^3 samples of starch solution were also placed into the water-bath.
- All the tubes were left in the water-bath for 10 minutes.
- Each amylase sample was added to one of the tubes containing the starch solution.
- The test tubes were placed back into the water-bath.
- Every minute, a few drops were taken from each tube, the test reagent was added and the percentage of light passing through this solution was measured in the colorimeter.

The tubes containing amylase samples and starch solution were left in the water-bath for ten minutes before the amylase was added to the starch.

Explain why.

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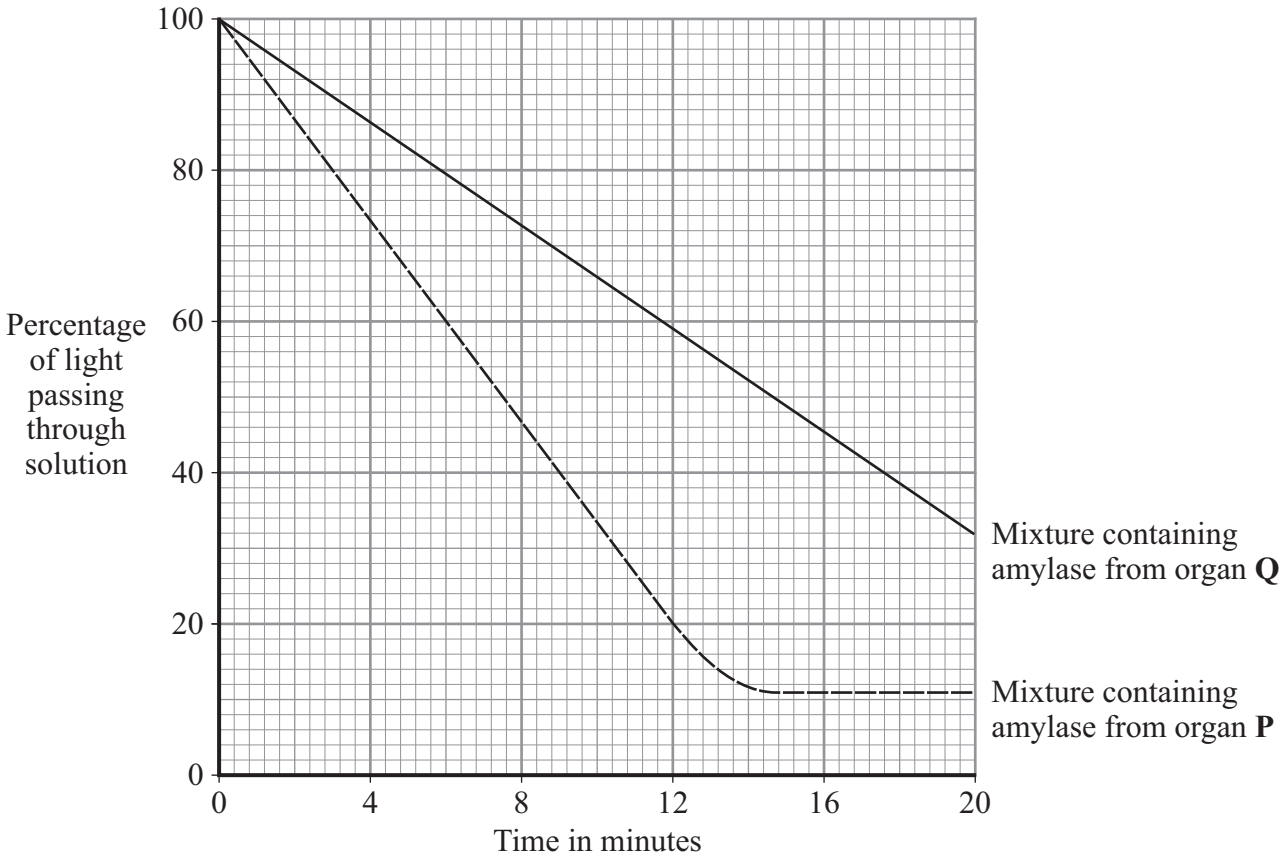
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(2 marks)

6 (c) **Graph 2** shows how the readings from the colorimeter changed over the next 20 minutes.

Graph 2



6 (c) (i) Use **Graph 1** and **Graph 2** to determine the concentration of sugar in the mixture from organ **Q** after 20 minutes.

.....

Answer ..... mol per dm^3

(1 mark)

Question 6 continues on the next page

4.2.2.1 The human digestive system

Question 08 · continued

for mark

6 (c) (ii) Use your answer to 6(c)(i) to calculate the rate at which sugar was produced in the mixture containing amylase from organ **Q**.

Show clearly how you work out your answer.

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.....

Answer.....mol per dm^3 per minute
(2 marks)

6 (c) (iii) Suggest why the amount of light passing through the mixture from organ **P** did not change after 16 minutes.

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(1 mark)

6 (c) (iv) One of the students suggested that they could have completed their experiment more quickly if the temperature of the water-bath had been set at 80 °C.

This would **not** have been the case.

Explain why.

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(2 marks)

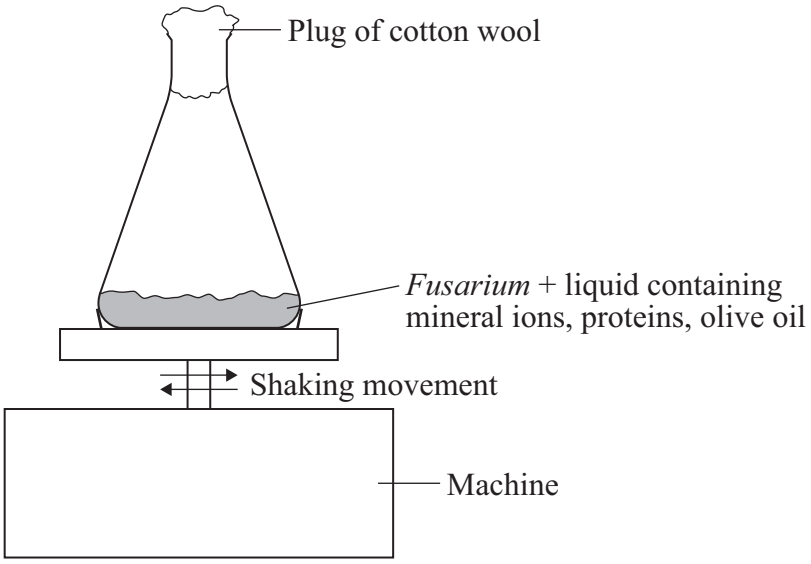
10

4.2.2.1 The human digestive system

Question 09

7 Lipase is an enzyme used in biological detergents. It catalyses the digestion of fats and oils.

Scientists investigated the production of lipase by the fungus, *Fusarium*.
The scientists made up different liquids containing mineral ions, proteins and olive oil.
They mixed 90 cm^3 of one of these liquids with a *Fusarium* culture in a flask.
The flask was then shaken on a machine throughout the investigation, as shown in the diagram.



The scientists carried out two investigations.

- In each investigation, 10 cm^3 of a high concentration of *Fusarium* was used.
- In **Investigation 1**, they varied the concentration of protein.
- In **Investigation 2**, they varied the concentration of olive oil.
- In each investigation, they measured the amount of lipase produced in each flask over 72 hours.
- They repeated each investigation three times.

7 (a) (i) The shaking movement mixed the liquid and the *Fusarium*.

Suggest **one** further reason why the flasks were shaken throughout the investigations.

.....

.....

(1 mark)

4.2.2.1 The human digestive system

Question 09 · continued

for mark

7 (a) (ii) The high concentration of *Fusarium* in each flask increased the rate of lipase production.

Suggest **one** other reason why a high concentration of *Fusarium* was used.

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(1 mark)

Question 7 continues on the next page

4.2.2.1 The human digestive system

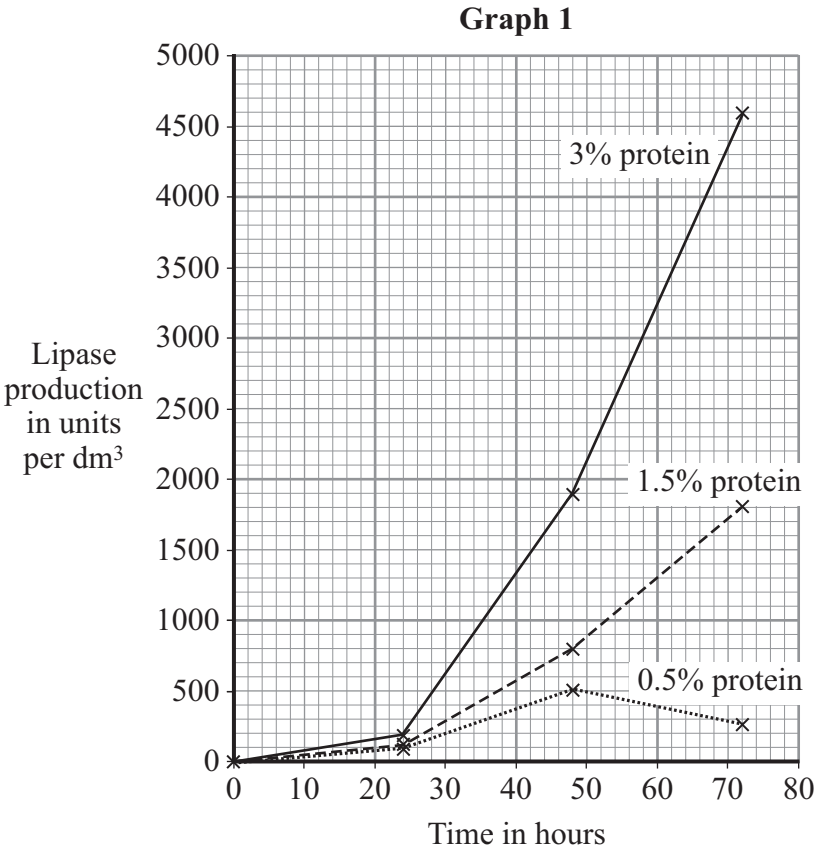
Question 09 · continued

for mark

7 (b) Graphs **1** and **2** show the results of the two investigations.

Graph 1 shows lipase production at three different concentrations of protein.

Graph 2 shows lipase production at three different concentrations of olive oil.

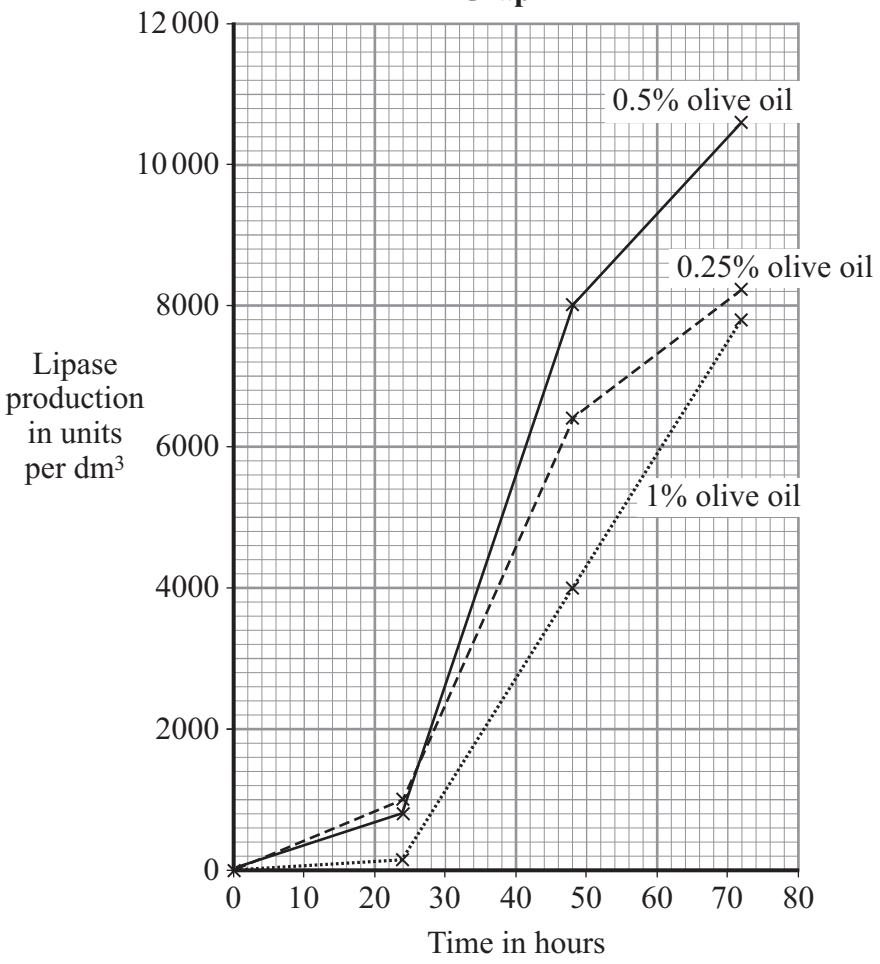


4.2.2.1 The human digestive system

Question 09 · continued

for mark

Graph 2



7 (b) (i) From **Graph 2**, calculate the maximum rate of lipase production per hour.

Show clearly how you work out your answer.

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.....

Answer =.....units of lipase per dm^3 per hour
(2 marks)

Question 7 continues on the next page

Question 09 · continued

for mark

7 (b) (ii) Each point plotted on **Graphs 1** and **2** is the mean of three values.

The scientists published only the mean results in their scientific paper. They did not include the actual measured values.

Why would it have been better to have included the actual measured values?

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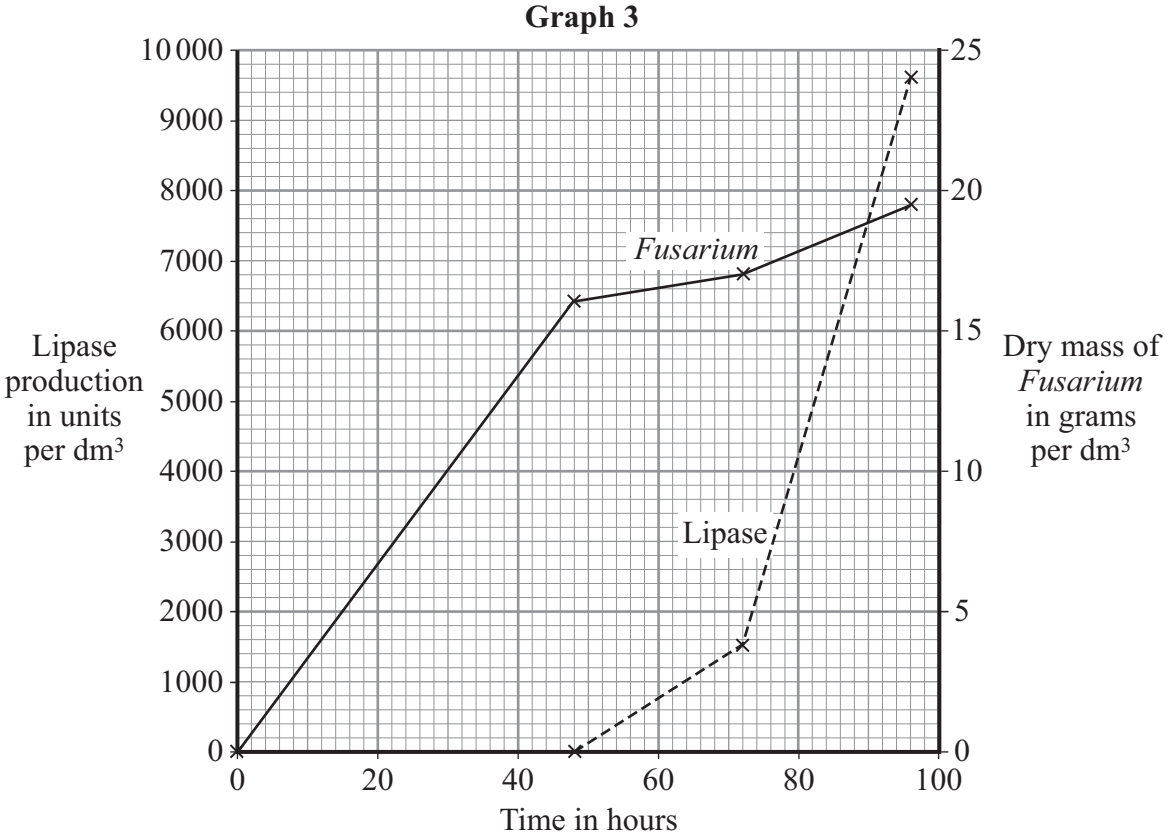
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(2 marks)

7 (c) The scientists then carried out **Investigation 3**.
They used the results of **Investigations 1** and **2** to provide optimum concentrations of protein and olive oil. They measured the dry mass of the *Fusarium* and the amount of lipase produced over 96 hours.

The results of **Investigation 3** are shown in **Graph 3**.

Graph 3



4.2.2.1 The human digestive system

Question 09 · continued

for mark

7 (c) (i) Use information from **Graph 3** to describe the relationship between the growth of *Fusarium* and the production of lipase.

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(2 marks)

7 (c) (ii) Suggest an explanation for this relationship.

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(2 marks)

10

4.2.2.1 The human digestive system

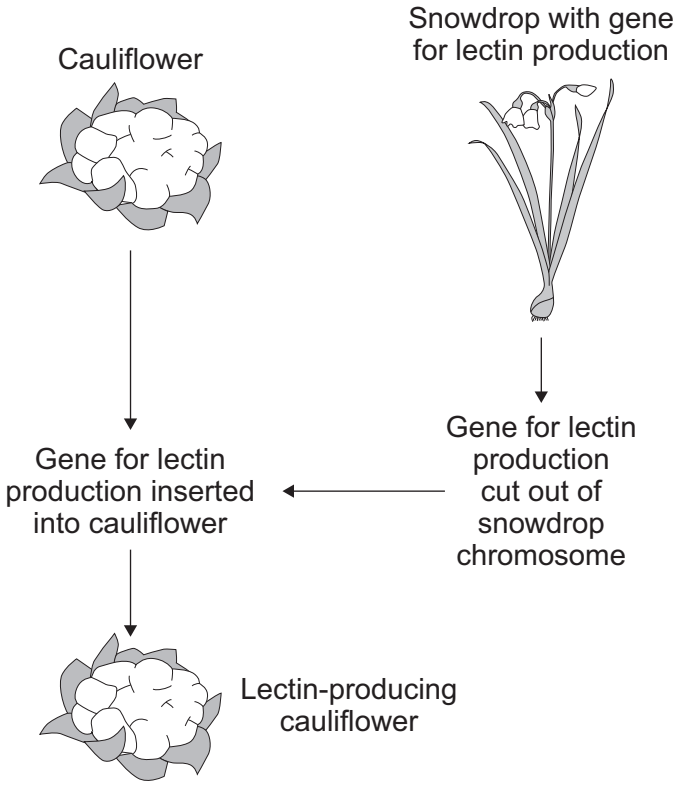
Question 10

June 2010 | BLY1BP | Original Q4 | Legacy

QUESTION FOUR

Up to 40 % of cauliflower crops may be eaten by insects.
Snowdrops can survive attacks by insects because they produce a substance called lectin.
Lectin interferes with the insect's digestive system.

The diagram shows one method of introducing the gene for lectin production into cauliflowers.



4A The gene for lectin production is cut from the snowdrop chromosome using . . .

1 lectin.

2 a herbicide.

3 an enzyme.

4 an electric shock.

4B The technique used to transfer the gene from the snowdrop to the cauliflower is called . . .

1 biodiversity.

2 embryo transplant.

3 cloning.

4 genetic engineering.

4.2.2.1 The human digestive system

Question 10 · continued

4C What is the main benefit to the environment of farmers growing lectin-producing cauliflowers?

1 More snowdrops will survive.

2 Less pesticide will be used.

3 Insects will eat something else.

4 Less fertiliser will be needed.

4D An ethical concern about this technique is that . . .

1 it will make farmers richer.

2 it will increase biodiversity.

3 it is interfering with nature.

4 it is sustainable.

Turn over for the next question

4.2.2.1 The human digestive system

Question 11

June 2010 | BLY2H | Original Q6 | Legacy

6 Fresh milk is a mixture of compounds including fat, protein and about 5% lactose sugar. Lactose must be digested by the enzyme lactase, before the products can be absorbed.

Lactase can be added to fresh milk to pre-digest the lactose. This makes 'lactose-free' milk, which is suitable for people who do not produce enough lactase of their own.

A student investigated the effect of changing pH and temperature on the digestion of lactose in milk.

The results are shown in **Tables 1** and **2**.

Table 1
Effect of pH

pH	Time taken to digest lactose in minutes
4.0	20
5.0	18
6.0	13
7.0	7
8.0	5
9.0	6

Table 2
Effect of temperature

Temperature in °C	Time taken to digest lactose in minutes
30	20
35	14
40	11
45	6
50	12
55	23

6 (a) The label on a carton of lactose-free milk states:

'Lactase is normally produced in the stomach of mammals.'

The results in **Table 1** show that this statement is unlikely to be true.

Explain how.

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(2 marks)

4.2.2.1 The human digestive system

Question 11 · continued

6 (b) Explain as fully as you can the results shown in **Table 2**.

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(3 marks)

6 (c) Bile is produced in the liver and is released into the small intestine.

Explain how bile helps the digestion of milk.

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(2 marks)

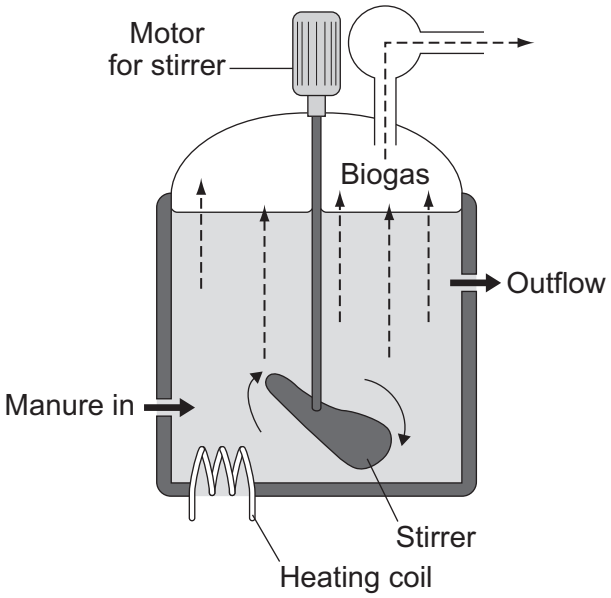
7

4.2.2.1 The human digestive system

Question 12

June 2010 | BLY3H | Original Q3 | Legacy

3 The diagram shows one type of *anaerobic* digester. This is used to produce biogas.



3 (a) (i) What does *anaerobic* mean?

.....

.....

(1 mark)

3 (a) (ii) The concentration of solids fed into this digester must be kept very low.

Suggest **one** reason why.

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(1 mark)

3 (a) (iii) This digester is more expensive to run than some other simpler designs of biogas generator.

Suggest **one** reason why.

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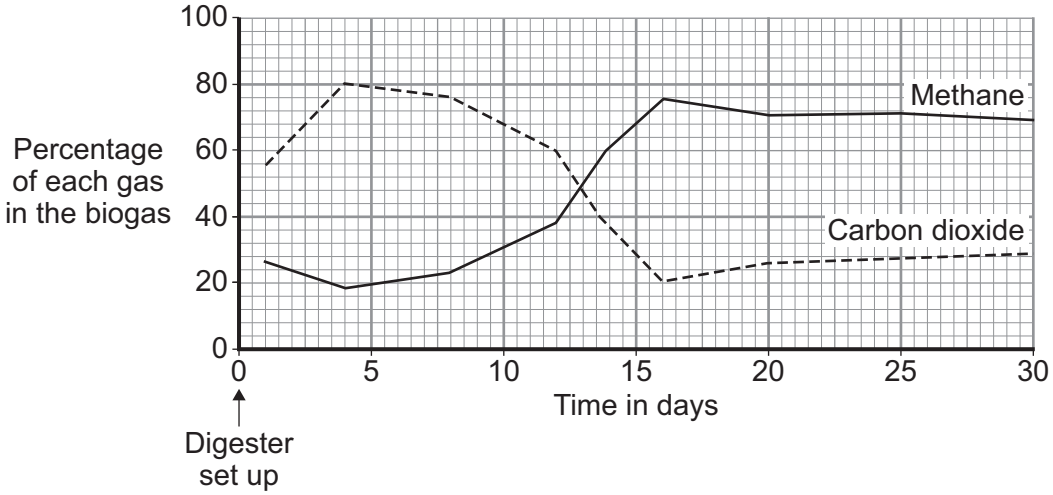
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(1 mark)

4.2.2.1 The human digestive system

Question 12 · continued

3 (b) The graph shows how the composition of the biogas produced by the digester changed over the first 30 days after the digester was set up.



Use information from the graph to answer the following questions.

3 (b) (i) Describe how the percentage of carbon dioxide changed over the 30 days.

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(3 marks)

3 (b) (ii) On which day was the best quality biogas produced? .....

(1 mark)

3 (c) Four days after the digester was first set up, the biogas contained a high percentage of carbon dioxide.

Suggest an explanation for this.

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(2 marks)

9

4.2.2.1 The human digestive system

Question 13

January 2011 | BLY3H | Original Q4 | Legacy

4 (a) Ethanol can be produced from glucose.
The glucose is often made by the digestion of maize starch.

The equation shows the digestion of starch.

$$\text{starch} + \text{water} \xrightarrow{\text{enzymes}} \text{glucose}$$

4 (a) (i) Name the type of enzyme that can be used to digest starch.

.....

(1 mark)

4 (a) (ii) The glucose can then be used by yeast in the following process.

$$\text{glucose} \xrightarrow{\text{enzymes}} \text{ethanol} + \text{carbon dioxide} (+ \text{energy})$$

Name this process.

.....

(1 mark)

4 (b) Ethanol, produced as described in part (a)(ii), can be used in car engines.

This is more environmentally friendly than using petrol.

Explain why.

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(3 marks)

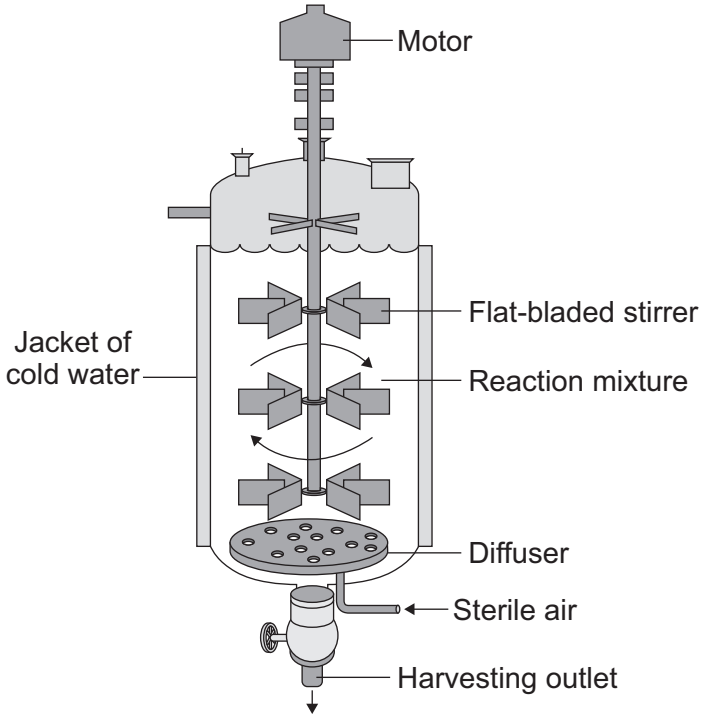
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4.2.2.1 The human digestive system

Question 14

January 2011 | BLY3H | Original Q6 | Legacy

6 The diagram shows a fermenter.
This fermenter can be used to grow a fungus which makes a protease enzyme.



6 (a) Explain, in detail, why the fermenter needs to be surrounded by a jacket of cold water.

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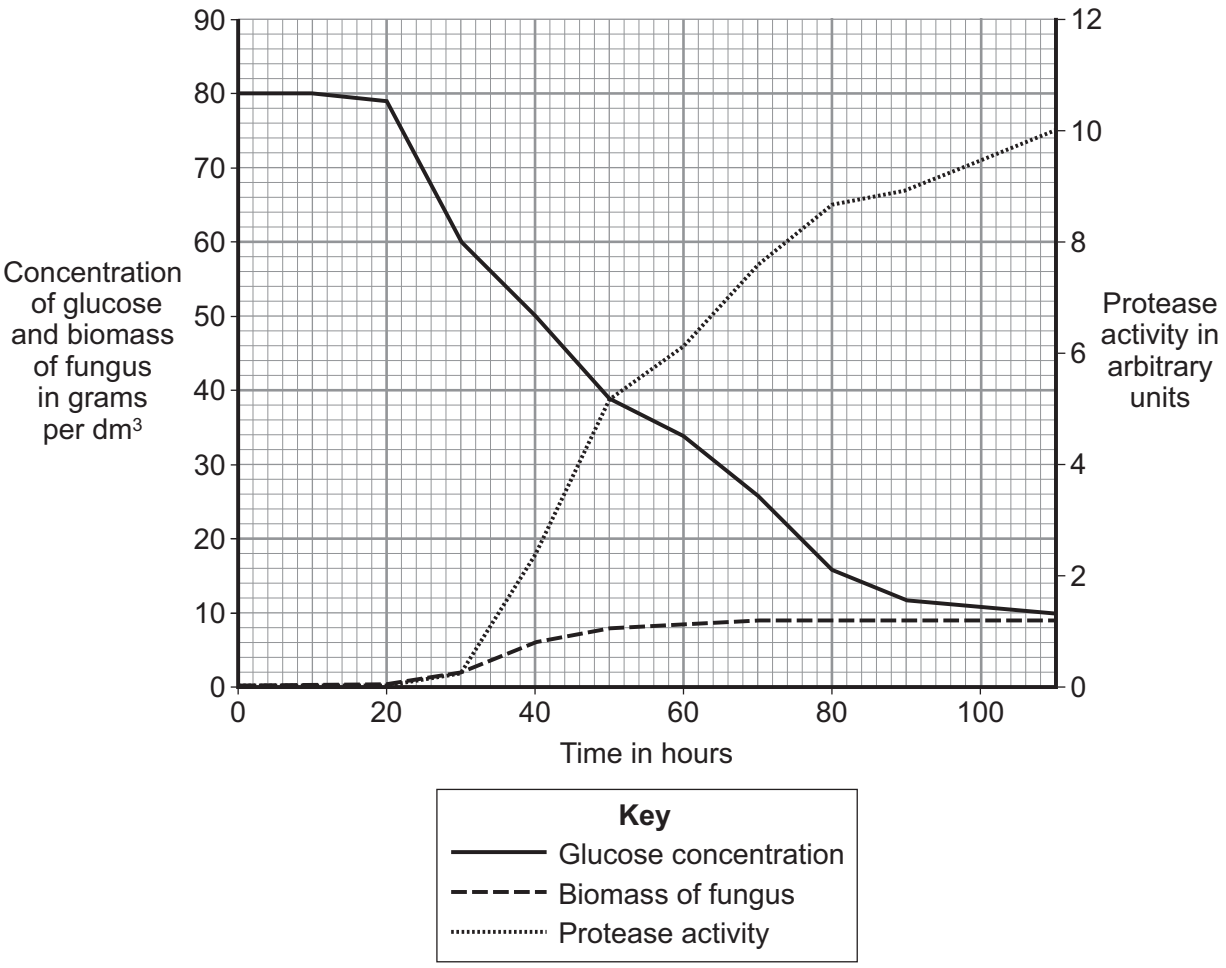
(3 marks)

Question 6 continues on the next page

4.2.2.1 The human digestive system

Question 14 · continued

6 (b) Scientists investigated the effect of glucose concentration on the growth of the fungus and on the production of the protease enzyme.
The graph shows the results when the glucose concentration in the fermenter at the start was 80 grams per dm^3.



There was no measurable amount of protease activity in the reaction mixture until after 20 hours.

Suggest an explanation for this.

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4.2.2.1 The human digestive system

Question 14 · continued

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(4 marks)

6 (c) The scientists repeated the investigation using 40 grams of glucose per dm^3 and using 60 grams of glucose per dm^3.

The table shows all of their results.

Concentration of glucose in grams per dm^3	Yield of fungus biomass in grams per gram of glucose consumed	Protease activity in arbitrary units per gram of glucose consumed	Protease activity in arbitrary units per gram of fungus biomass produced
40	0.09	0.83	8.93
60	0.11	0.22	1.92
80	0.13	0.14	1.11

The scientists plan to set up the fermenter for commercial production of the protease enzyme.

Which concentration of glucose should they use in the fermenter?

..... grams per dm^3

Explain, in detail, why you chose this concentration.

.....

.....

.....

.....

(2 marks)

9

4.2.2.1 The human digestive system

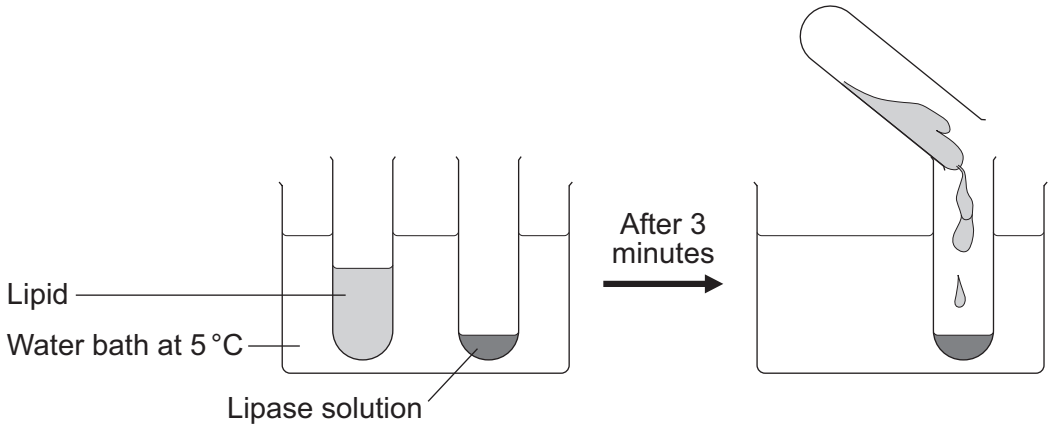
Question 15

June 2011 | BLY2H | Original Q3 | Legacy

3 A group of students investigated the effect of temperature on the action of the enzyme lipase.

The students:

- put 1 cm^3 of lipase solution into a test tube
- put 5 cm^3 of lipid into a different test tube
- put both tubes in a water bath at 5°C for 3 minutes
- mixed the lipid with the lipase solution.



Every five minutes the students tested a sample of the mixture for lipid, until no lipid remained.
The students repeated the experiment at different temperatures.

3 (a) To make their investigation fair the students needed to control some variables.

Give **one** variable the students controlled in their investigation.

.....

(1 mark)

3 (b) The tubes of lipase solution and lipid were kept separately in the water bath for 3 minutes before mixing. Why?

Tick (✓) **one** box.

So that the lipase broke down the lipid quickly ☐

So that the lipase and the lipid reached the right temperature ☐

To give enough time for the lipase to break down the lipid ☐

To give enough time for the water bath to heat up ☐

(1 mark)

4.2.2.1 The human digestive system

Question 15 · continued

The table shows the students' results.

Temperature in °C	Time taken until no lipid remained in minutes
5	40
20	15
35	5
50	30
95	lipid still there after 120 minutes

3 (c) Describe the effect on the breakdown of the lipid of increasing the temperature from 5 °C to 50 °C.

.....

.....

.....

.....

(2 marks)

3 (d) Suggest **two** ways in which the students could have improved their investigation.

Use information from the students' method and the results table to help you.

1 .....

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2 .....

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.....

(2 marks)

Question 3 continues on the next page

4.2.2.1 The human digestive system

Question 15 · continued

3 (e) (i) The lipase did **not** break down the lipid at 95°C.

Why?

.....

.....

(1 mark)

3 (e) (ii) At 35°C the lipase broke down the lipid after 5 minutes.

What new substances will be in the tube?

Draw a ring around **one** answer.

amino acids **fatty acids and glycerol** **sugars**

(1 mark)

8

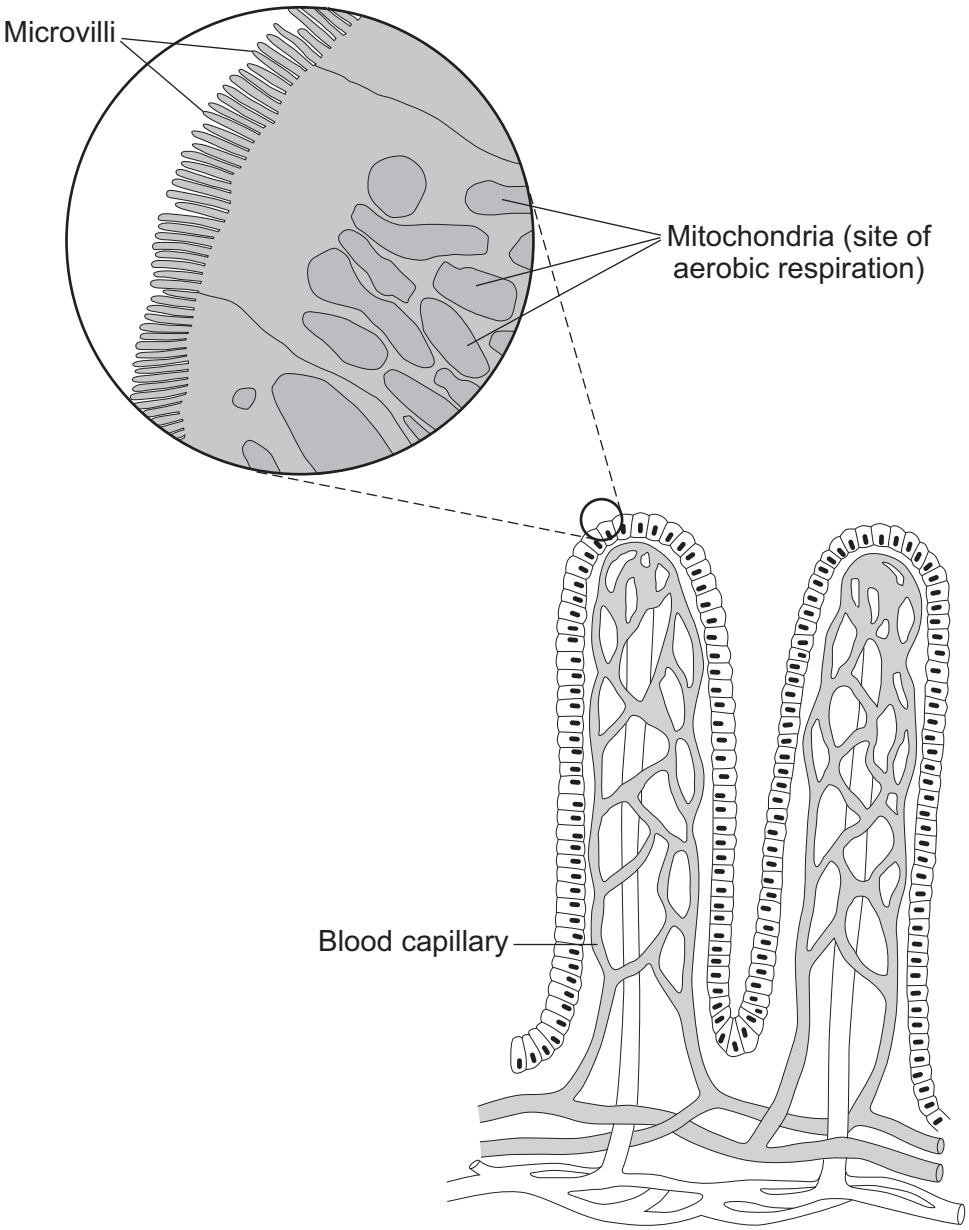
4.2.2.1 The human digestive system

Question 16

June 2011 | BLY3H | Original Q5 | Legacy

5 The villi of the small intestine absorb the products of digestion.

The diagram shows two villi. It also shows parts of some of the surface cells of a villus, as seen with an electron microscope.



4.2.2.1 The human digestive system

Question 16 · continued

Describe and explain how the villi are adapted to maximise the rate of absorption of the products of digestion.

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(5 marks)

5

4.2.2.1 The human digestive system

Question 17

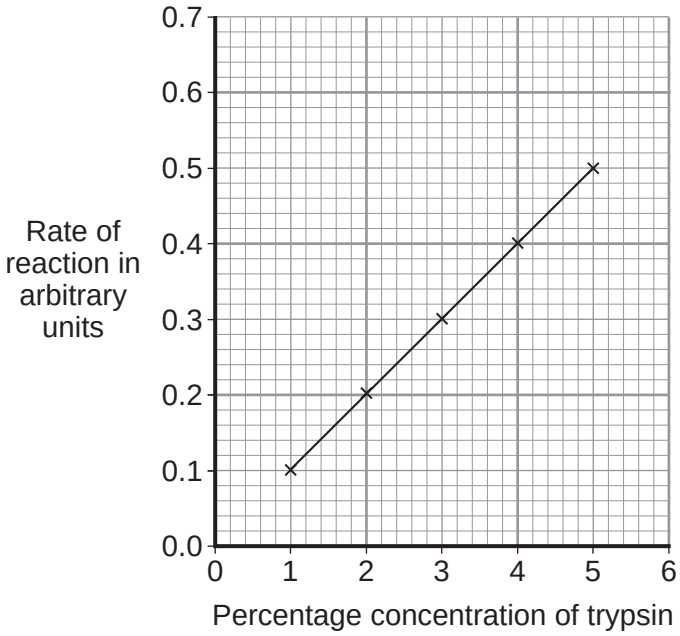
January 2013 | BL2HP | Original Q2 | Legacy

2 Trypsin is a protease enzyme. Trypsin will digest a protein called gelatine which covers the surface of photographic film.

Some students investigated the time taken to digest the gelatine with trypsin.
The students used five different concentrations of trypsin.

The rate of reaction was calculated from the time taken for the gelatine to be digested.

The graph shows the students' results.



2 (a) (i) Describe the relationship between the concentration of trypsin and the rate of reaction.

.....

.....

.....

.....

(2 marks)

2 (a) (ii) Use the graph to predict the rate of reaction with 6% trypsin.

..... arbitrary units

(1 mark)

4.2.2.1 The human digestive system

Question 17 · continued

2 (b) In industry, trypsin is used to pre-treat some baby foods.
In their experiment, the students used 1–5% trypsin at 20°C.
The baby food manufacturers make most profit if they use 0.5% trypsin at 35°C.

Suggest why the manufacturers make most profit with these conditions.

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(4 marks)

2 (c) (i) Describe the effect trypsin would have on the baby food.

.....

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.....

(2 marks)

2 (c) (ii) Apart from protease enzymes, give **one** other use of a **named** enzyme in industry.

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.....

(2 marks)

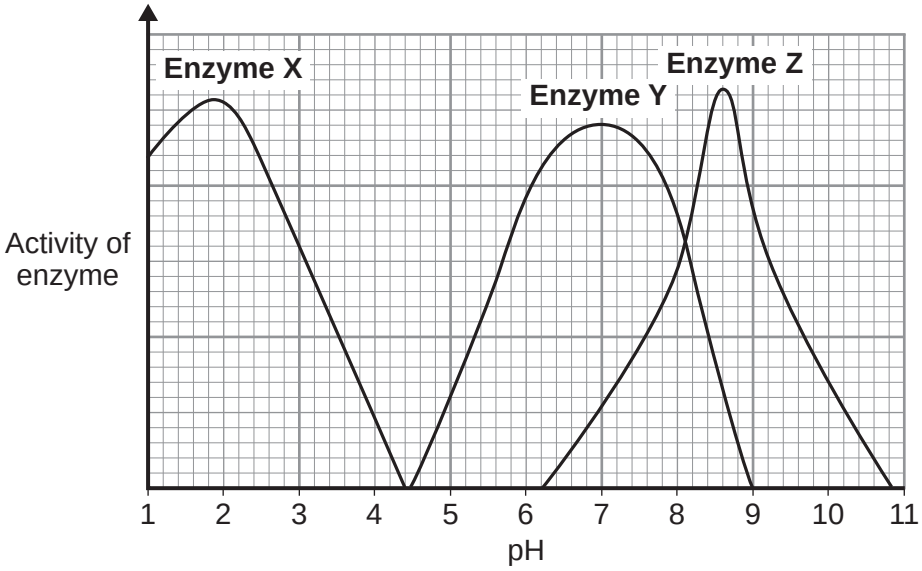
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4.2.2.1 The human digestive system

Question 18

June 2013 | BL2HP | Original Q3 | Legacy

3 (a) The graph shows the effect of pH on the activities of three enzymes, **X**, **Y** and **Z**.
These enzymes help to digest food in the human digestive system.
Each enzyme is produced by a different part of the digestive system.



3 (a) (i) What is the optimum (best) pH for the action of enzyme **Z**?

.....

(1 mark)

3 (a) (ii) The stomach makes a substance that gives the correct pH for enzyme action in the human stomach.

Name this substance. .....

(1 mark)

3 (a) (iii) Which enzyme, **X**, **Y** or **Z**, will work best in the human stomach?

.....

(1 mark)

4.2.2.1 The human digestive system

Question 18 · continued

3 (b) *In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.*

Different parts of the human digestive system help to break down molecules of fat so that they can be absorbed into the body.

Describe how.

To gain full marks you should refer to:

- the enzyme and where the enzyme is produced
- the products of digestion
- any other chemicals involved.

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(6 marks)

9

4.2.2.1 The human digestive system

Question 19

June 2014 | BL2HP | Original Q1 | Legacy

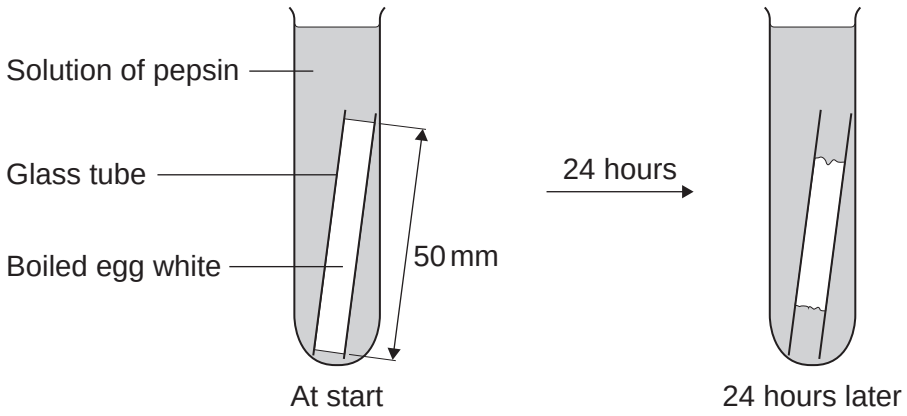
1 Some students investigated the effect of pH on the digestion of boiled egg white by an enzyme called pepsin. Egg white contains protein.

The students:

- put a glass tube containing boiled egg white into a test tube
- added a solution containing pepsin at pH 7
- set up six more tubes with solutions of pepsin at different pH values
- left the test tubes for 24 hours at room temperature.

Figure 1 shows one of the test tubes, at the start and at the end of the 24 hours.

Figure 1



1 (a) (i) Name the product of protein digestion.

[1 mark]

.....

1 (a) (ii) What type of enzyme digests protein?

Tick (✓) **one** box.

[1 mark]

amylase ☐

lipase ☐

protease ☐

4.2.2.1 The human digestive system

Question 19 · continued

1 (b) The egg white in each tube was 50 mm long at the start of the investigation. **Table 1** shows the students' results.

Table 1

pH	Length in mm of boiled egg white after 24 hours
1	38
2	20
3	34
4	45
5	50
6	50
7	50

1 (b) (i) At which pH did the pepsin work best?

[1 mark]

pH .....

1 (b) (ii) The answer you gave in part **(b)(i)** may not be the exact pH at which pepsin works best.

What could the students do to find a more accurate value for this pH?

[2 marks]

.....

.....

.....

.....

1 (b) (iii) There was no change in the length of the egg white from pH 5 to pH 7.

Explain why.

[2 marks]

.....

.....

.....

.....

Question 1 continues on the next page

4.2.2.1 The human digestive system

Question 19 · continued

1 (c) Pepsin is made by the stomach.

Name the acid made by the stomach which allows pepsin to work well.

[1 mark]

.....

8

4.2.2.1 The human digestive system

Question 20

June 2015 | BL2HP | Original Q1 | Legacy

1 Lipase is an enzyme that digests fat.

1 (a) (i) Complete the equation to show the digestion of fat.

Use the correct answer from the box.

[1 mark]

glucose	**glycerol**	**glycogen**

fat $\xrightarrow{\text{lipase}}$ fatty acids + ...

1 (a) (ii) Name **one** organ that makes lipase.

[1 mark]

.....

1 (b) Some students investigated the effect of bile on the digestion of fat by lipase.

The students:
1 mixed milk and bile in a beaker
2 put the pH sensor of a pH meter into the beaker
3 added lipase solution
4 recorded the pH at 2-minute intervals
5 repeated steps 1 to 4, but used water instead of bile.

Suggest **two** variables that the students should have controlled in this investigation.

[2 marks]

1 .....

.....

2 .....

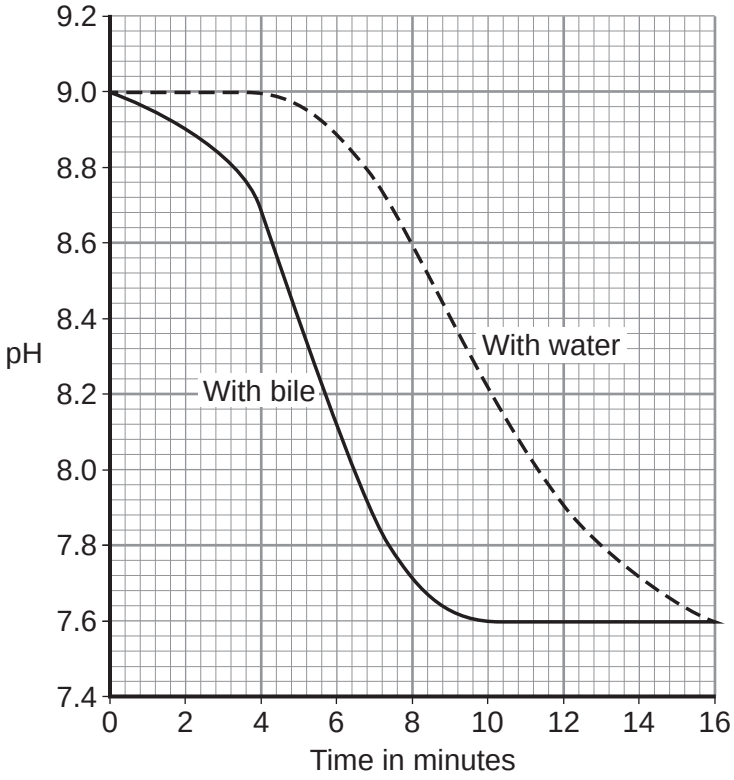
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4.2.2.1 The human digestive system

Question 20 · continued

1 (c) **Figure 1** shows the students' results.

Figure 1



1 (c) (i) Why did the pH decrease in both investigations?

[1 mark]

.....

.....

1 (c) (ii) Bile helps lipase to digest fat.

What evidence is there in **Figure 1** to support this conclusion?

[1 mark]

.....

.....

1 (c) (iii) Suggest **one** reason why the contents of both beakers had the same pH at the end of the investigations.

[1 mark]

.....

.....

7

4.2.2.1 The human digestive system

Question 21

June 2016 | BL2HP | Original Q4 | Legacy

4 The stomach is an organ.

4 (a) To which organ system does the stomach belong?

[1 mark]

The _____ system

4 (b) The stomach wall contains the following types of tissue:

- epithelial tissue
- glandular tissue
- muscular tissue.

4 (b) (i) What is the function of epithelial tissue in the stomach?

[1 mark]

_____

_____

4 (b) (ii) Describe the functions of glandular tissue in the stomach.

[3 marks]

_____

_____

_____

_____

_____

_____

4 (b) (iii) Describe how muscular tissue helps the stomach to function.

[2 marks]

_____

_____

_____

_____

7

4.2.2.1 The human digestive system

Question 22

June 2017 | BL2HP | Original Q3 | Legacy

3 Amylase is an enzyme that breaks down starch.

3 (a) Complete the equation to show the breakdown of starch.

[1 mark]

Starch $\xrightarrow{\text{amylase}}$ _____

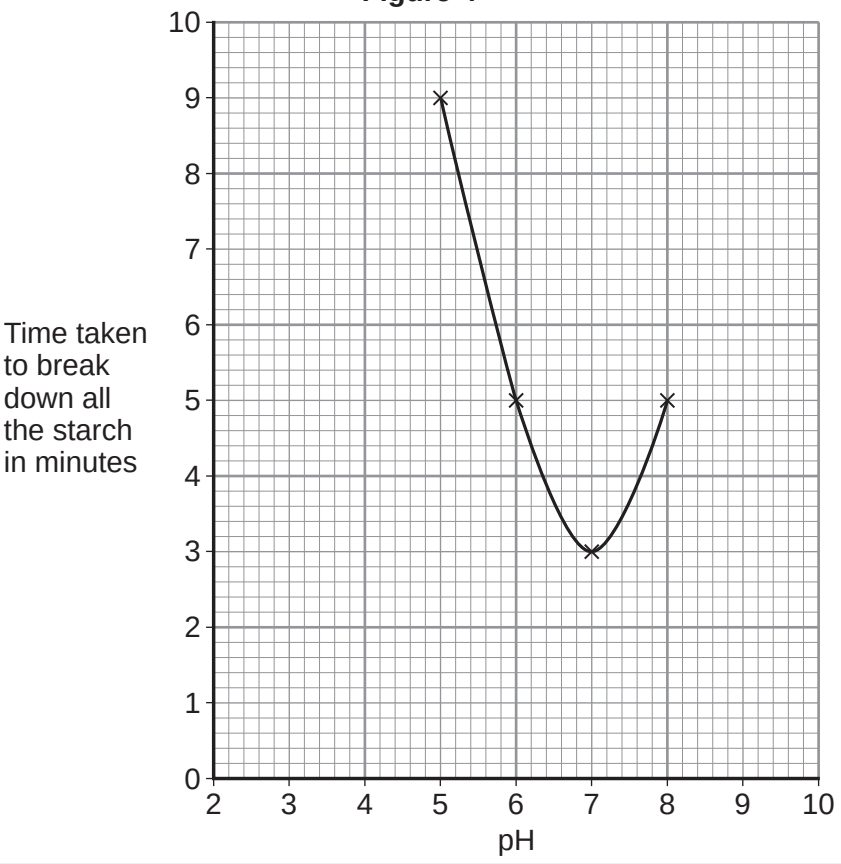
3 (b) Some students investigated the effect of pH on the activity of amylase.

The students:

- put 5 cm^3 of pH5 solution + 1 cm^3 of amylase solution into a test tube
- put 4 cm^3 of starch suspension into a second test tube
- left both test tubes at room temperature for 5 minutes
- mixed the contents of the two test tubes
- removed a small sample of the mixture at 1-minute intervals
- tested each sample for starch
- timed how long it took to break down all the starch
- repeated each of the above steps at pH6, pH7 and pH8.

Figure 4 shows the students' results.

Figure 4



4.2.2.1 The human digestive system

Question 22 · continued

3 (b) (i) Give **two** variables which were controlled in this investigation.

[2 marks]

1 _____

_____

2 _____

_____

3 (b) (ii) The students tested samples of the reaction mixture for starch.
In each test, they added one drop of the reaction mixture to one drop of iodine solution on a white tile.

- Iodine solution = light brown colour
- Iodine solution + starch = dark blue colour

Predict the colour seen in the iodine test on the samples of the pH6 reaction mixture at 4 minutes and at 6 minutes.

[1 mark]

4 minutes _____

6 minutes _____

3 (b) (iii) The students concluded that amylase works best at pH7.
This may **not** be a valid conclusion.

Suggest **two** improvements to the investigation that would increase the validity of the students' conclusion.

[2 marks]

1 _____

_____

2 _____

_____

Question 3 continues on the next page

4.2.2.1 The human digestive system

Question 22 · continued

3 (b) (iv) The students repeated the investigation at pH3.

What result would you expect at pH3?

Give a reason for your answer.

[2 marks]

8

4.2.2.1 The human digestive system

Question 23

June 2018 | 8461/1H | Original Q6

0 6 Cystic fibrosis (CF) is a genetic disorder caused by a change in a gene.

0 6 . 1 What molecule are genes made of?

[1 mark]

0 6 . 2 CF affects the cell membranes of cells in the lungs and digestive system.

What is the function of the cell membrane?

[1 mark]

0 6 . 3 In a person with CF, cells lining the lungs and digestive system create too much mucus.

The mucus can:

- block the duct leading from the pancreas to the small intestine
- block the tubes leading to the alveoli in the lungs.

Explain why children with CF grow more slowly than children without CF.

[6 marks]

4.2.2.1 The human digestive system

Question 23 · continued

Table 6 shows information about people in the UK in 2015.

Table 6

	Median age in years
People with CF	19
Whole population	40

0 6 . 4 Describe how the median age of a group of people can be determined.

[2 marks]

0 6 . 5 Suggest **one** reason why the median age for people with CF is lower than the median age for the whole population.

[1 mark]

4.2.2.1 The human digestive system

Question 23 · continued

0 6 . 6 People with a lung function below 30% may need a lung transplant.

Table 7 gives information about people with CF in 2015.

Table 7

Lung Function (%)	Percentage of people with CF
>75	22
51 – 75	72
30 – 50	4
<30	2

In 2015, the total number of people with CF in the UK was 10 800.

Calculate how many people with CF in the UK in 2015 would **not** need a lung transplant.

[2 marks]

Number of people = _____

4.2.2.1 The human digestive system

Question 23 · continued

0 6 . 7 Lung transplants from donors have risks. One risk is organ rejection.

Scientists are researching how to solve the problem of organ rejection and hope to use stem cells to create healthy lungs.

The healthy lungs can then be transplanted into CF patients without the risk of organ rejection.

Describe how scientists may use stem cells to create healthy lungs that are **not** rejected by the CF patient.

[4 marks]

0 6 . 8 Some people disagree with the use of stem cells because of the risk of cancer.

Give **one** other reason why some people disagree with the use of stem cells to create new organs for transplants.

[1 mark]

18

4.2.2.1 The human digestive system

Question 24

June 2018 | 8461/1H | Original Q7

0 7 **Table 8** shows information about some food components in cow's milk.

Table 8

	Value per 500 cm^3	Recommended Daily Allowance (RDA) for a typical adult
Energy in kJ	1046	8700
Fat in g	8.4	70.0
Salt in g	0.5	6.0
Calcium in mg	605	1000
Vitamin B-12 in µg	4.5	2.4

0 7 . 1 How much **more** milk would a typical adult have to drink to get their RDA for calcium compared with the amount of milk needed to get their RDA for vitamin B-12?

[3 marks]

Volume of milk = _____ cm^3

4.2.2.1 The human digestive system

Question 24 · continued

0 7 . 2 Describe how a student could test cow's milk to show whether it contains protein and different types of carbohydrate.

[6 marks]

Question 7 continues on the next page

Question 24 · continued

A scientist investigated the effect of bile on the breakdown of fat in a sample of milk.

The scientist used an indicator that is colourless in solutions with a pH lower than 10, and pink in solutions with a pH above 10.

This is the method used.

1. Add 1 drop of bile to a test tube and one drop of water to a second test tube.

2. Add the following to each test tube:
   - 5 cm^3 of milk
   - 7 cm^3 of sodium carbonate solution (to make the solution above pH 10)
   - 5 drops of the indicator
   - 1 cm^3 of lipase.

3. Time how long it takes for the indicator in the solutions to become colourless.

The results are shown in **Table 9**.

Table 9

	Time taken for the indicator to become colourless in seconds
Solution with bile	65
Solution without bile	143

0 7 . 3 Explain why the indicator in both tubes became colourless.

[3 marks]

4.2.2.1 The human digestive system

Question 24 · continued

0 7 . 4 Give the reason why the measurement of the time taken for the indicator to become colourless might be inaccurate.

[1 mark]

0 7 . 5 Explain the difference in the results for the two test tubes in **Table 9**.

[3 marks]

16

4.2.2.1 The human digestive system

Question 25

0 8 Pancreatic cancer develops when a malignant tumour grows inside the pancreas.

0 8 . 1 The pancreas produces digestive enzymes.

What is an enzyme?

[2 marks]

0 8 . 2 Carbohydrase is an enzyme produced by the pancreas.

Name **two** other organs in the digestive system that produce carbohydrase.

[2 marks]

1 _____

2 _____

0 8 . 3 One symptom of pancreatic cancer is weight loss.

Explain how pancreatic cancer may cause a person to lose weight.

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

[4 marks]

4.2.2.1 The human digestive system

Question 25 · continued

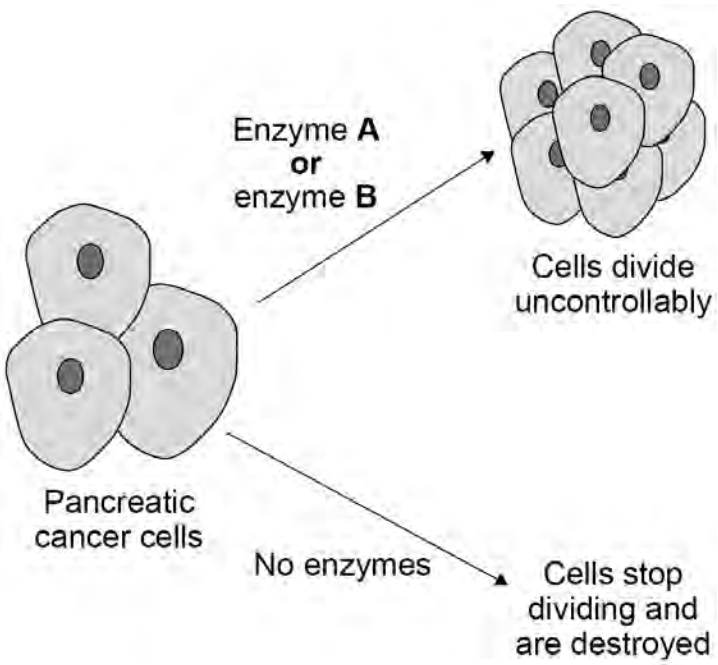
Enzyme **A** and enzyme **B** are involved in controlling cell division in pancreatic cancer cells.

Most cancer cells produce both enzyme **A** and enzyme **B**.

Some people have a gene mutation that stops cancer cells producing enzyme **B**.

Figure 9 shows how cell division is controlled in pancreatic cancer cells.

Figure 9



4.2.2.1 The human digestive system

Question 25 · continued

Scientists have developed a drug that inhibits enzyme **A**.

The drug is given to pancreatic cancer patients who have the gene mutation that stops cancer cells producing enzyme **B**.

The drug only targets cancer cells.

0 8 . 4 Explain why the drug can be used to treat pancreatic cancer in patients with the gene mutation.

Use information from **Figure 9**.

[3 marks]

0 8 . 5 Explain why the drug could **not** be used to treat pancreatic cancer in a patient that produces both enzyme **A** and enzyme **B**.

[2 marks]

Question 8 continues on the next page

4.2.2.1 The human digestive system

Question 25 · continued

0 8 . 6 The drug was trialled before it was licensed for use.

To improve validity of the results in the trial:

- some patients were given a placebo
- a double-blind trial was used.

Give reasons why a placebo and a double-blind trial were used.

[2 marks]

A placebo _____

_____

_____

A double-blind trial _____

_____

_____

0 8 . 7 One stage in a drug trial is to test the drug on healthy volunteers.

What is the next stage in the drug trial?

[1 mark]

Tick (✓) **one** box.

Testing on all patients with the disease ☐

Testing on human tissue ☐

Testing on live animals ☐

Testing on volunteers with the disease ☐

4.2.2.1 The human digestive system

Question 25 · continued

0 8 . 8 A monoclonal antibody has been produced to treat pancreatic cancer.

Explain how the monoclonal antibody works to treat pancreatic cancer.

[3 marks]

19

4.2.2.1 The human digestive system

Question 26

November 2020 | 8461/1H | Original Q4

0 4 . 1 Lipases break down lipids.

Which **two** products are formed when lipids are broken down?

[2 marks]

Tick (✓) **two** boxes.

- Amino acids ☐
- Fatty acids ☐
- Glucose ☐
- Glycerol ☐
- Glycogen ☐

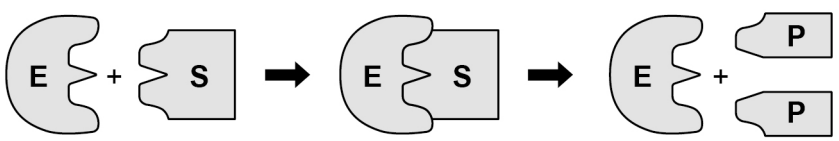
4.2.2.1 The human digestive system

Question 26 · continued

One model used to explain enzyme action is the 'lock and key theory'.

Figure 7 shows a model of the theory.

Figure 7



Key
E Enzyme
S Substrate
P Product

0 4 . 2 Explain the 'lock and key theory' of enzyme action.

Use information from **Figure 7** in your answer.

[3 marks]

0 4 . 3 There are many different types of lipase in the human body.

Why does each different type of lipase act on only **one** specific type of lipid molecule?

[1 mark]

4.2.2.1 The human digestive system

Question 26 · continued

Students investigated the presence of starch and glucose in the leaves of geranium plants.

This is the method used.

1. Place two identical geranium plants on a bench near a sunny window for two days.

2. After two days:
   - leave one plant near the window for two more days.
   - place one plant in a cupboard with no light for two more days.

3. Remove one leaf from each plant.

4. Crush each leaf to extract the liquid from the cells.

5. Test the liquid from each leaf for glucose and for starch.

0 4 . 4 Describe how the students would find out if the liquid from the leaf contained glucose.

[3 marks]

0 4 . 5 Describe how the students would find out if the liquid from the leaf contained starch.

[2 marks]

4.2.2.1 The human digestive system

Question 26 · continued

Table 2 shows the students' results.

Table 2

Test	Leaf from plant kept in light for four days	Leaf from plant kept in light for two days and then no light for two days
Glucose	Strong positive	Weak positive
Starch	Positive	Negative

0 4 . 6 Explain why the leaf in the light for four days contained both glucose and starch.

[2 marks]

0 4 . 7 Explain why the leaf left in a cupboard with no light for two days did contain glucose but did **not** contain starch.

[3 marks]

0 4 . 8 Suggest **one** way the students could develop the investigation to find out more about glucose and starch production in plants.

[1 mark]

17

4.2.2.1 The human digestive system

Question 27

November 2021 | 8461/1H | Original Q5

0 5 Amylase is an enzyme that breaks down starch.

0 5 . 1 Amylase is a polymer of smaller molecules.

Name the type of smaller molecule.

[1 mark]

_____

0 5 . 2 Name the **three** parts of the human digestive system that produce amylase.

[2 marks]

1 _____

2 _____

3 _____

0 5 . 3 Explain how amylase breaks down starch.

Answer in terms of the 'lock and key theory'.

[3 marks]

_____

_____

_____

_____

_____

_____

Question 5 continues on the next page

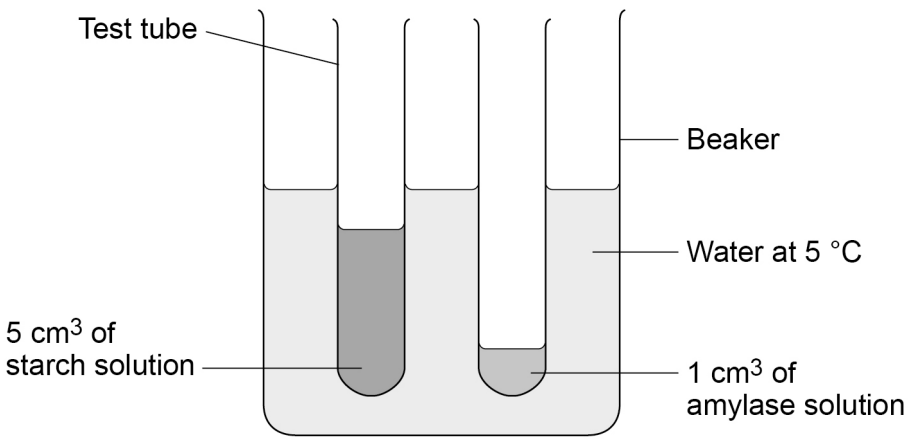
4.2.2.1 The human digestive system

Question 27 · continued

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

Figure 8 shows the apparatus used.

Figure 8



This is the method used.

1. Set up the apparatus as shown in **Figure 8**.
2. After 5 minutes, pour the starch solution into the amylase solution and mix.
3. Remove one drop of the starch-amylase mixture and place onto a spotting tile.
4. Immediately add two drops of iodine solution to the starch-amylase mixture on the spotting tile.
5. Record the colour of the iodine solution added to the starch-amylase mixture.
6. Repeat steps 3 to 5 every minute until the iodine solution stays yellow-brown.
7. Repeat steps 1 to 6 using water at different temperatures.

4.2.2.1 The human digestive system

Question 27 · continued

0 5 . 4 Name **two** control variables the student used in the investigation.

[2 marks]

1 _____

2 _____

0 5 . 5 Why did the student leave the starch solution and amylase solution for 5 minutes before mixing them?

[1 mark]

_____

_____

Question 5 continues on the next page

4.2.2.1 The human digestive system

Question 27 · continued

Table 3 shows the results of the investigation.

Table 3

Temperature in °C	Time taken until iodine solution stays yellow-brown in minutes
5	did not become yellow-brown
20	5
35	2
50	7
65	14
80	did not become yellow-brown

0 5 . 6 What conclusion can be made about the effect of temperature on amylase activity between 20 °C and 65 °C?

[1 mark]

4.2.2.1 The human digestive system

Question 27 · continued

0 5 . 7 Explain the results at 5 °C and at 80 °C.

Use **Table 3**.

[5 marks]

0 5 . 8 The student investigated the effect of temperature on amylase activity.

Describe how the student could extend the investigation to determine the effect of a different factor on amylase activity.

[2 marks]

17

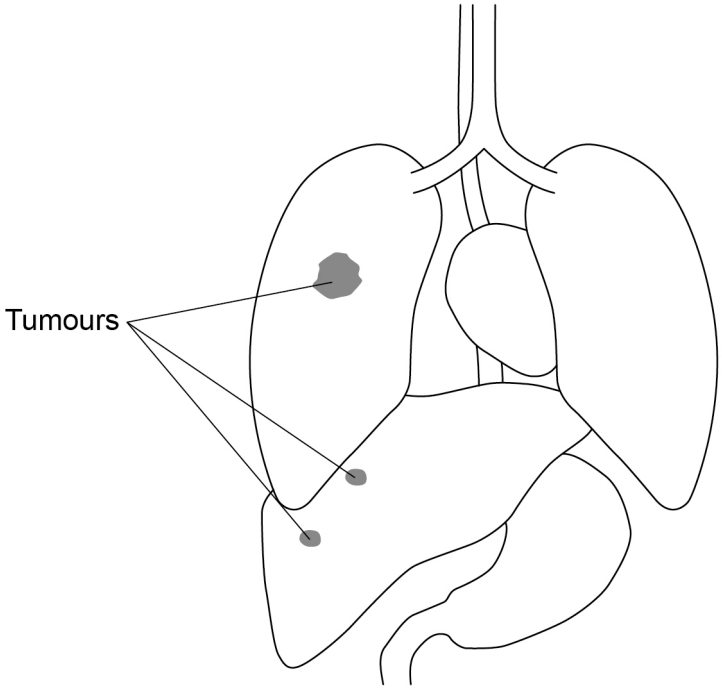
4.2.2.1 The human digestive system

Question 28

November 2021 | 8461/1H | Original Q7

0 7 **Figure 11** shows where three of the same type of tumour were found in a patient.

Figure 11



Malignant tumours are cancers.

0 7 . 1 Describe what happens to cells when a tumour forms.

[1 mark]

0 7 . 2 What evidence is there in **Figure 11** to suggest that the tumour in the lung is malignant?

[1 mark]

4.2.2.1 The human digestive system

Question 28 · continued

0 7 . 3 Some types of cancer can cause the numbers of blood components in a person's body to fall to a dangerously low level.

A person with one of these types of cancer may experience symptoms such as:

- tiredness
- frequent infections
- bleeding that will not stop after the skin is cut.

Explain how a very low number of blood components in the body can cause these symptoms.

[6 marks]

Question 7 continues on the next page

Question 28 · continued

Some patients with a very low number of blood cells may be given a blood transfusion.

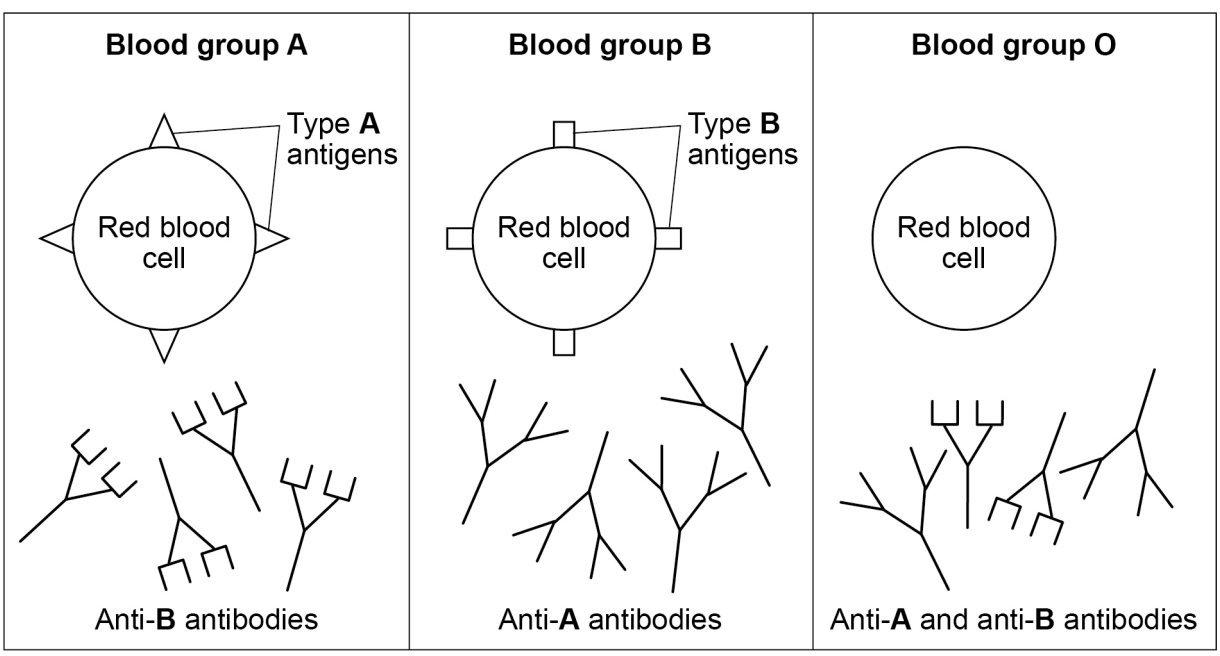
A blood transfusion is where a patient receives blood from a donor.

Different people have different blood groups.

Figure 12 shows:

- the red blood cells found in people with different blood groups
- the antibodies that can be made by people with different blood groups.

Figure 12



Antibodies can bind to antigens that have complementary shapes.

When antibodies bind to the antigens on red blood cells, many red blood cells begin to clump together.

Each red blood cell is about 8 μm in diameter.

Many capillaries have an internal diameter of about 10 μm.

4.2.2.1 The human digestive system

Question 28 · continued

In one type of blood transfusion, **only** red blood cells from a donor are transferred to the patient.

0 7 . 4 It is dangerous for a patient with blood group **A** to receive red blood cells from a donor with blood group **B**.

Explain why.

[3 marks]

0 7 . 5 Explain why blood group **O** red blood cells can be given to patients with any blood group.

[2 marks]

Question 7 continues on the next page

4.2.2.1 The human digestive system

Question 28 · continued

0 7 . 6 **Table 4** shows some of the risks associated with blood transfusions.

Table 4

Risk	Probability of risk occurring
Allergic reaction	0.9 %
Hepatitis B infection	1 in (3×10^5)
Hepatitis C infection	6.7×10^{-7}
Kidney damage	1 in 70 000

Which risk has the **lowest** probability of occurring?

[1 mark]

Tick (✓) **one** box.

Allergic reaction ☐

Hepatitis B infection ☐

Hepatitis C infection ☐

Kidney damage ☐

4.2.2.1 The human digestive system

Question 28 · continued

0 7 . 7 A person has a tumour blocking the tube leading from the gall bladder to the small intestine.

Explain why this person would have difficulty digesting fat.

[5 marks]

19

4.2.2.1 The human digestive system

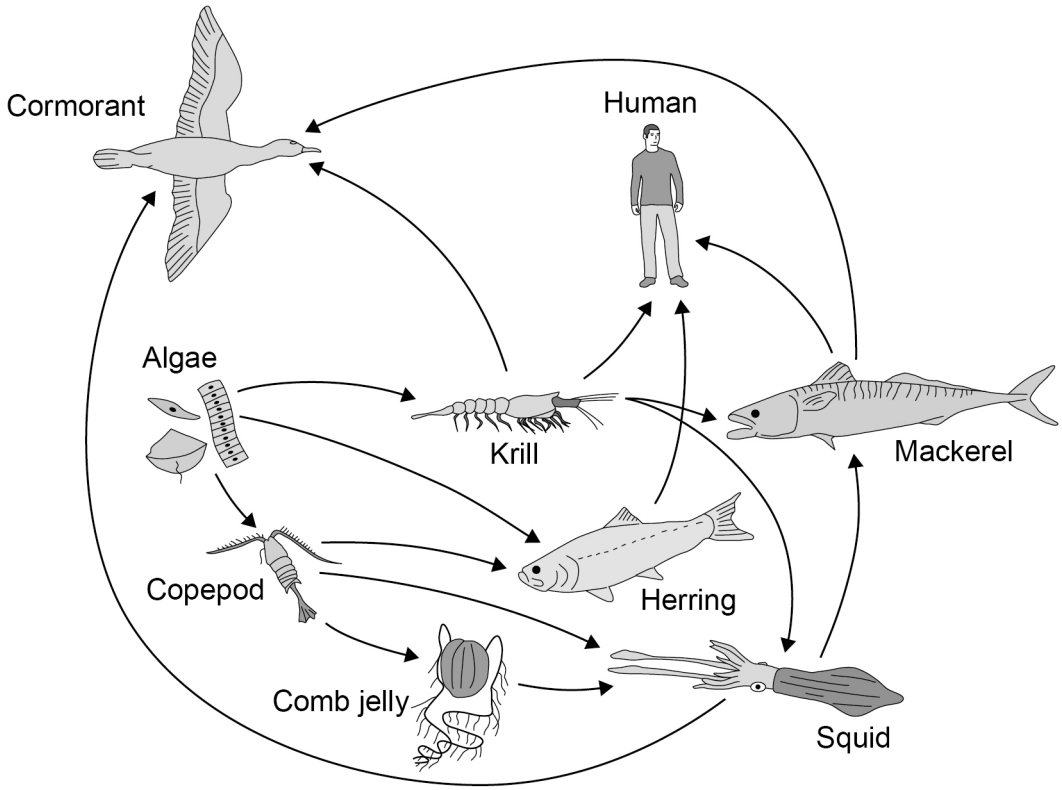
Question 29

November 2021 | 8461/2H | Original Q7

0 7 A food web contains several food chains.

Figure 9 shows a food web.

Figure 9



Not to scale

0 7 . 1 The animals in **Figure 9** get their energy by eating other organisms.

Describe how the algae get energy.

[2 marks]

0 7 . 2 Name **one** primary consumer in **Figure 9**.

[1 mark]

4.2.2.1 The human digestive system

Question 29 · continued

0 7 . 3 Name **one** producer in **Figure 9**.

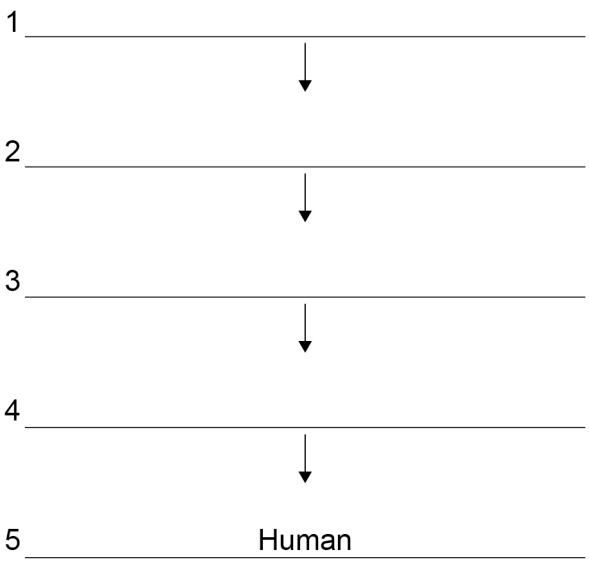
[1 mark]

0 7 . 4 The different food chains in **Figure 9** have different numbers of organisms.

Complete **Figure 10** to show a food chain in **Figure 9** with **five** organisms, including the human.

[1 mark]

Figure 10



0 7 . 5 **Figure 9** shows that mackerel eat krill and squid.

The biomass of mackerel is much less than the combined biomass of krill and squid.

One reason for this is that the mackerel cannot digest all parts of the krill and squid.

Give **two** other reasons.

[2 marks]

1

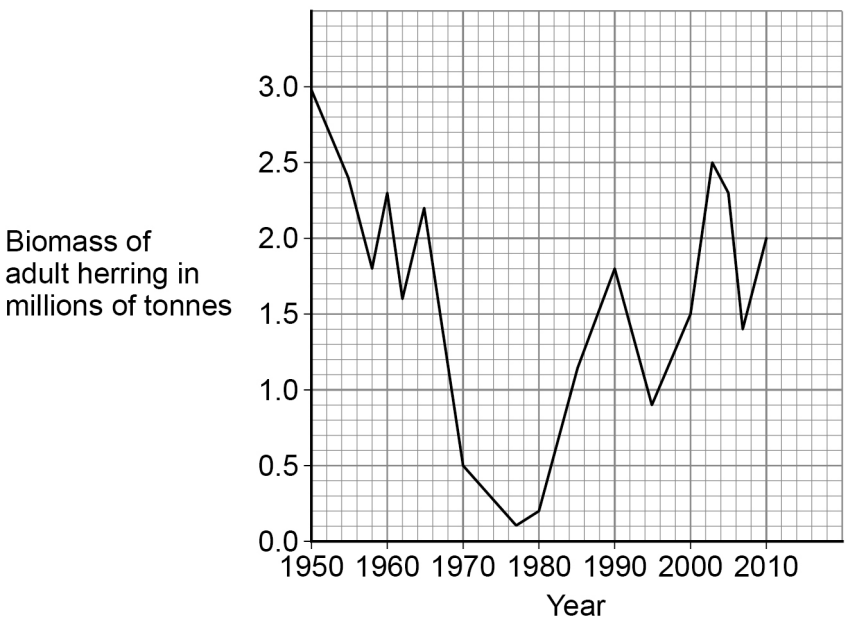
2

4.2.2.1 The human digestive system

Question 29 · continued

Figure 11 shows how the biomass of adult herring in the North Sea has changed between 1950 and 2010.

Figure 11



0 7 . 6 Calculate the percentage decrease in the biomass of herring between 1960 and 1977.

Give your answer to the nearest whole number.

[4 marks]

Percentage decrease = _____ %

Question 29 · continued

0 7 . 7 Too many herring were caught by fishermen between 1960 and 1977.

Herring can live for up to 12 years and begin to reproduce when 3 to 4 years old.

Laws have been introduced to help conserve herring:

- 1977 to 1981 – herring fishing was banned in the North Sea
- 1984 to present day – control of mesh size of fishing nets
- 1997 to present day – fishing quotas were introduced
- 1998 to present day – herring fishing was banned in breeding grounds during the breeding season.

Figure 12 shows how a minimum mesh size helps to conserve herring.

Figure 12

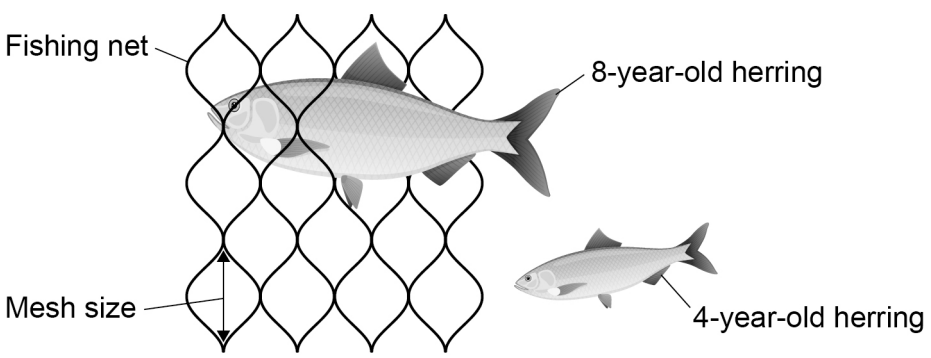
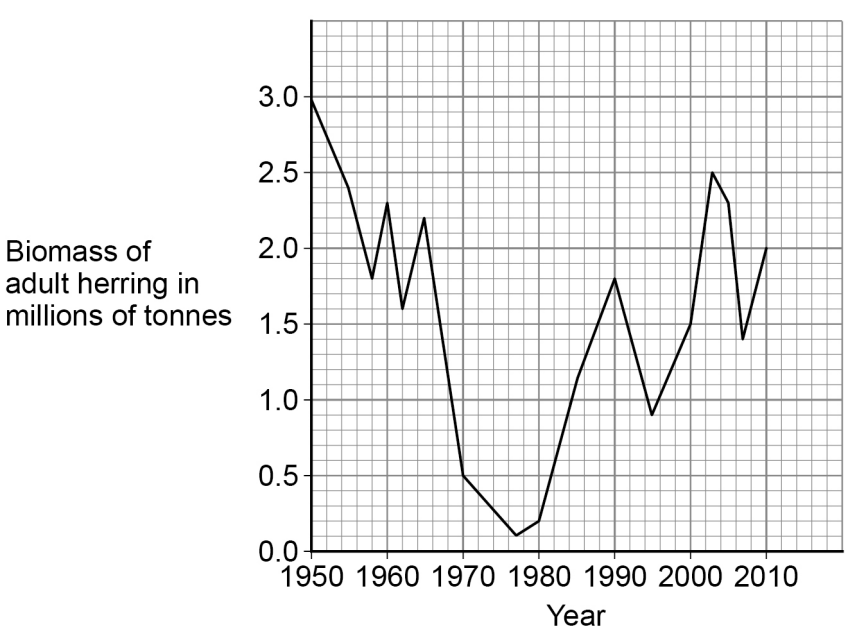


Figure 11 is repeated below.

Figure 11



4.2.2.1 The human digestive system

Question 29 · continued

Evaluate the effect of these laws on the conservation of herring stocks.

Use data from **Figure 11** and information from **Figure 12** in your answer.

[6 marks]

17

4.2.2.1 The human digestive system

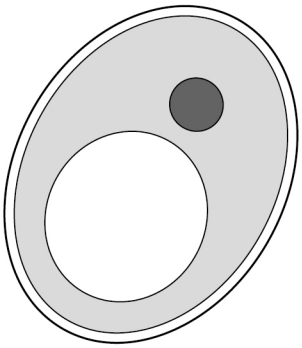
Question 30

June 2022 | 8461/1H | Original Q2

0 2 Plant cells and fungal cells are similar in structure.

Figure 2 shows a fungal cell.

Figure 2



0 2 . 1 Name **one** structure in **Figure 2** which is present in both plant cells and fungal cells but **not** in animal cells.

[1 mark]

0 2 . 2 Which disease is caused by a fungus?

[1 mark]

Tick (✓) **one** box.

- Gonorrhoea ☐
- Malaria ☐
- Measles ☐
- Rose black spot ☐

Question 2 continues on the next page

4.2.2.1 The human digestive system

Question 30 · continued

0 2 . 3 A fungal cell divides once every 90 minutes.

How many times would this fungal cell divide in 24 hours?

[2 marks]

Number of times cell divides in 24 hours = _____

Question 30 · continued

Some types of fungal cell are grown to produce high-protein food.

The high-protein food can be used to make meat-free burgers.

0 2 . 4 Where is protein digested in the human digestive system?

[1 mark]

Tick (✓) **one** box.

- Large intestine ☐
- Liver ☐
- Salivary glands ☐
- Stomach ☐

0 2 . 5 Which chemical could be used to test if the burgers contain protein?

[1 mark]

Tick (✓) **one** box.

- Benedict's reagent ☐
- Biuret reagent ☐
- Ethanol ☐
- Iodine solution ☐

Question 2 continues on the next page

4.2.2.1 The human digestive system

Question 30 · continued

0 2 . 6 **Table 3** shows some information about burgers made from meat and meat-free burgers.

Table 3

	Mass per 100 g of burger	
	Burgers made from meat	**Meat-free burgers**
Protein in g	14.0	9.0
Fibre in g	0.9	5.5
Fat in g	16.0	5.2
Carbohydrate in g	15.5	15.1
Cholesterol in mg	120.0	0.0

Evaluate the use of burgers made from meat compared with meat-free burgers in providing humans with a healthy, balanced diet.

Use information from **Table 3** and your own knowledge.

[6 marks]

4.2.2.1 The human digestive system

Question 30 · continued

12

Turn over for next question

4.2.2.1 The human digestive system

Question 31

June 2024 | 8461/1H | Original Q2

0 2 Cystic fibrosis (CF) is an inherited disorder caused by a faulty gene.

0 2 . 1 Where in a cell would the CF gene be found?

[1 mark]

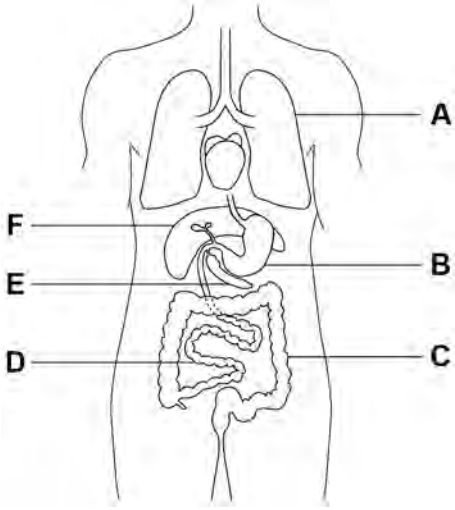
CF affects many organs in the body.

The main organs affected are:

- the lungs
- the pancreas
- the small intestine.

0 2 . 2 **Figure 2** shows organs of the human body.

Figure 2



Which letters in **Figure 2** show the lungs, the pancreas and the small intestine?

[1 mark]

Tick (✓) **one** box.

A, **D** and **E** ☐

A, **E** and **F** ☐

B, **C** and **D** ☐

B, **C** and **F** ☐

Question 2 continues on the next page

4.2.2.1 The human digestive system

Question 31 · continued

0 2 . 3 The pancreas produces several digestive enzymes.

CF reduces the amount of each enzyme that reaches the small intestine.

Explain why a person with CF has:

- difficulty digesting food
- difficulty gaining body mass.

[6 marks]

4.2.2.1 The human digestive system

Question 31 · continued

0 2 . 4 Gas exchange happens in the alveoli in the lungs.

Describe **three** features of the alveoli that help maximise gas exchange.

[3 marks]

1 _____

_____

2 _____

_____

3 _____

_____

0 2 . 5 CF reduces the amount of oxygen that can enter the blood from the alveoli.

Explain how a reduced amount of oxygen entering the blood will affect the human body.

[3 marks]

_____

_____

_____

_____

_____

_____

14

4.2.2.1 The human digestive system

Question 32

June 2024 | 8461/1H | Original Q3

0 3 Cake and bread each contain the same two types of carbohydrate.

0 3 . 1 Describe the chemical tests that could be used to show the presence of the two types of carbohydrate in cake.

Include a risk assessment in your answer.

[6 marks]

Question 3 continues on the next page

4.2.2.1 The human digestive system

Question 32 · continued

A student investigated three types of bread.

For each type of bread, the student:

- put a square piece of bread into their mouth
- did **not** chew the bread
- recorded the time taken for the bread to taste sweet.

Table 2 shows the results.

Table 2

Type of bread	Time taken for bread to taste sweet in seconds
Brown	43
White	35
Wholemeal	57

0 3 . 2 What was the dependent variable in the investigation?

[1 mark]

0 3 . 3 Give **one** control variable the student should have used in the investigation.

[1 mark]

4.2.2.1 The human digestive system

Question 32 · continued

0 3 . 4 During the investigation, the bread began to taste sweet in the student's mouth.

Explain why the bread tasted sweet.

[3 marks]

0 3 . 5 Suggest **one** reason why the results of the investigation were **not** valid.

Do **not** refer to control variables in your answer.

[1 mark]

12

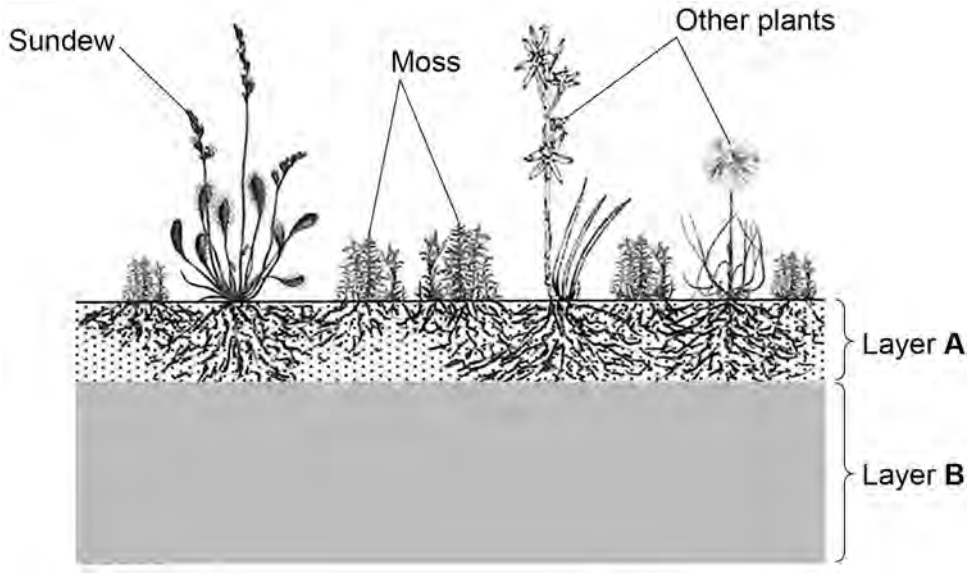
4.2.2.1 The human digestive system

Question 33

0 2 Peat bogs are estimated to contain twice as much carbon as all the world's forests.

Figure 2 shows a section through part of a peat bog.

Figure 2



Layer **A** contains a lot of air.

Layer **B**:

- contains the dead remains of plants
- has a low pH
- contains very little oxygen
- contains carbon dioxide and methane.

4.2.2.1 The human digestive system

Question 33 · continued

0 2 . 1 Explain why most of the dead remains of plants in layer **B** do **not** decay.

[3 marks]

0 2 . 2 The peat bog in **Figure 2** is a stable community.

The moss produces biomass at a rate of 340 g/m^2/year.

What is the approximate biomass of the moss that becomes biomass in primary consumers?

[1 mark]

Tick (✓) **one** box.

- 0.34 g/m^2/year ☐
- 3.4 g/m^2/year ☐
- 34 g/m^2/year ☐
- 340 g/m^2/year ☐

Question 2 continues on the next page

4.2.2.1 The human digestive system

Question 33 · continued

The sundew plant shown in **Figure 2** on page 4 has leaves with sticky hairs that trap and digest insects.

Digestion of the insects releases phosphates and simple compounds of nitrogen that are used by the sundew plant.

0 2 . 3 What substance can the sundew plant make using the **phosphates**?

[1 mark]

Tick (✓) **one** box.

- Cellulose ☐
- DNA ☐
- Glycerol ☐
- Starch ☐

0 2 . 4 What substance can the sundew plant make using the **nitrogen**?

[1 mark]

Tick (✓) **one** box.

- Fatty acid ☐
- Glucose ☐
- Lactic acid ☐
- Protein ☐

0 2 . 5 Humans have destroyed large areas of peat bog to collect peat.

The peat provides fuel and provides compost for gardeners to use.

The peat comes from layer **B** in **Figure 2** on page 4.

Layer **B**:

- contains the dead remains of plants
- has a low pH
- contains very little oxygen
- contains carbon dioxide and methane.

Figure 3 shows the removal of peat from a peat bog.

Figure 3



Explain how the destruction of peat bogs and the use of peat affects the temperature of the Earth's atmosphere.

[4 marks]

10

4.2.2.1 The human digestive system

Question 34

0 2 Eating too much carbohydrate can cause obesity.

0 2 . 1 Name **one** disease that obesity is a risk factor for.

[1 mark]

Table 1 shows information about sugar intake and obesity in different countries.

Table 1

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

4.2.2.1 The human digestive system

Question 34 · continued

0 2 . 2 Complete **Figure 2**.

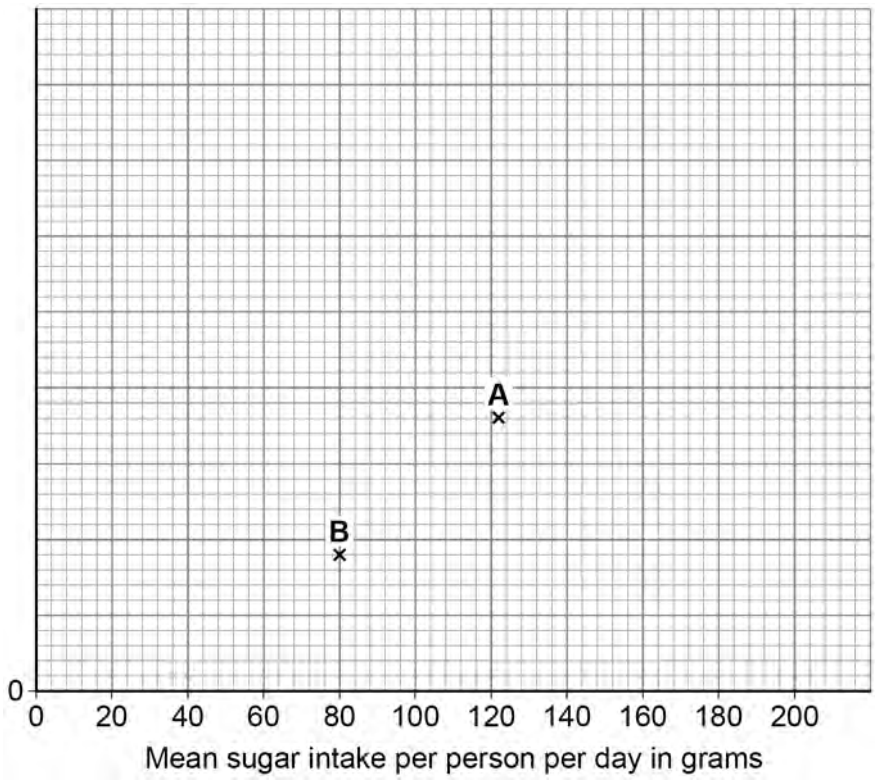
You should:

- label the *y*-axis
- add the scale for the *y*-axis
- plot the data for countries **C**, **D**, **E**, **F** and **G** from **Table 1**
- draw a line of best fit.

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

[4 marks]

Figure 2



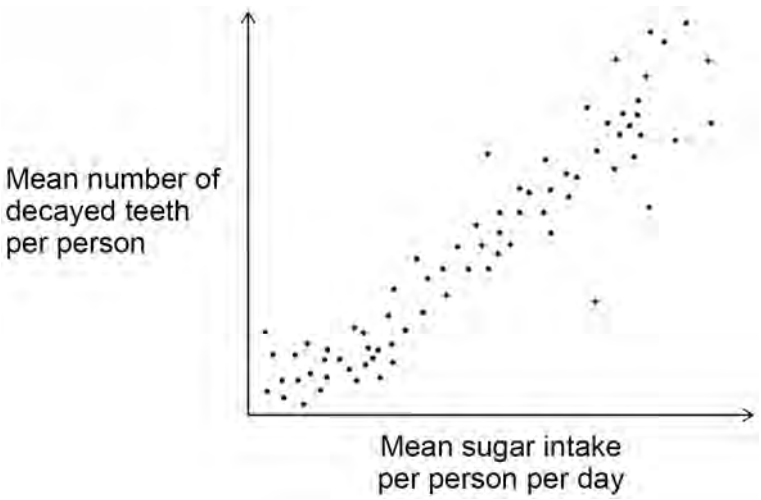
Question 2 continues on the next page

4.2.2.1 The human digestive system

Question 34 · continued

Figure 3 shows information about the relationship between sugar intake and tooth decay.

Figure 3



0 2 . 3 Name the type of graph shown in **Figure 3**.

[1 mark]

0 2 . 4 What relationship is shown between the two variables in **Figure 3**?

[1 mark]

Tick (✓) **one** box.

Inversely proportional ☐

No correlation ☐

Positive correlation ☐

Question 34 · continued

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 2 shows the results.

Table 2

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

0 2 . 5 Explain the results at 30 °C and at 90 °C.

[4 marks]

30 °C _____

_____

_____

_____

90 °C _____

_____

_____

_____

4.2.2.1 The human digestive system

Question 34 · continued

0 2 . 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 2 . 7 Protease enzymes are involved in protein digestion.

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

Complete **Table 3** to identify the organ where each protease enzyme is active.

[2 marks]

Table 3

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

14

4.2.2.1 The human digestive system

Question 35

June 2025 | 8461/1H | Original Q7

0 7 In people with severe liver disease the liver stops working correctly.

A person with severe liver disease can be treated with:

- an injection of embryonic stem cells
  or
- a liver transplant from a donor.

The person's body can reject embryonic stem cells and can reject a liver transplanted from a donor.

0 7 . 1 What property of embryonic stem cells makes them suitable to treat liver disease?

[1 mark]

0 7 . 2 Suggest **one ethical** reason why a person may **not** want an injection of embryonic stem cells.

[1 mark]

4.2.2.1 The human digestive system

Question 35 · continued

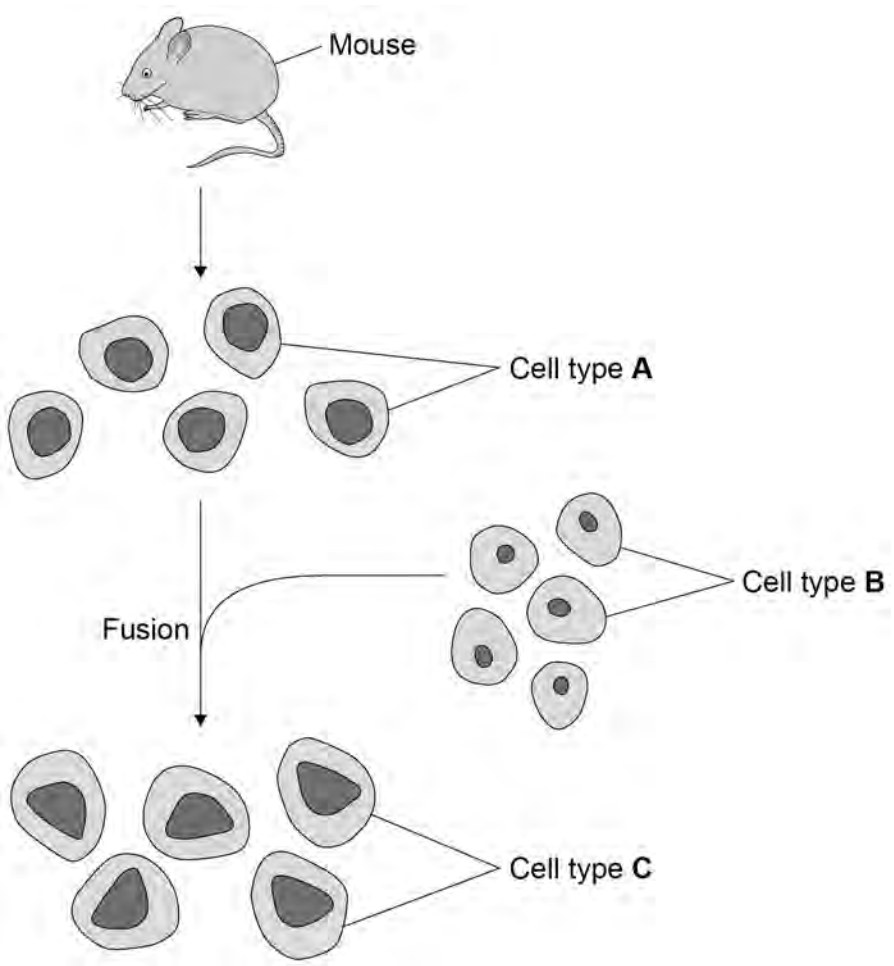
Drugs can be used to reduce the risk of liver rejection after a transplant.

One drug contains monoclonal antibodies.

The monoclonal antibodies are specific to an antigen on the surface of liver cells.

Figure 9 shows part of the process used to create the monoclonal antibodies.

Figure 9



0 7 . 3 Name the **three** types of cell in **Figure 9**.

[3 marks]

A _____

B _____

C _____

4.2.2.1 The human digestive system

Question 35 · continued

0 7 . 4 How is the mouse stimulated to produce cell type **A**?

[1 mark]

0 7 . 5 A patient with severe liver disease was given a liver transplant.

The drug containing the monoclonal antibody is given to the patient.

Explain how the monoclonal antibody stops the patient's white blood cells from attacking the cells of the donor liver.

[3 marks]

0 7 . 6 Give **one** other use of monoclonal antibodies.

Do **not** refer to pregnancy tests.

[1 mark]

Question 7 continues on the next page

4.2.2.1 The human digestive system

Question 35 · continued

The liver produces bile.

Bile is needed for efficient digestion.

0 7 . 7 Where is bile stored in the human body?

[1 mark]

Tick (✓) **one** box.

- Gall bladder ☐
- Kidney ☐
- Pancreas ☐
- Small intestine ☐

0 7 . 8 Explain why a person with severe liver disease has difficulty digesting fats.

[6 marks]

17