AQA

General Certificate of Secondary Education
Foundation Tier
June 2013

Additional Science   **BL2FP**
Unit Biology B2

F

Biology
Unit Biology B2

Tuesday 14 May 2013   **9.00 am to 10.00 am**

For this paper you must have:
- a ruler.
You may use a calculator.

Time allowed
- 1 hour

Instructions
- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information
- The marks for questions are shown in brackets.
- The maximum mark for this paper is 60.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.
- Question 9(b) should be answered in continuous prose.
  In this question you will be marked on your ability to:
  – use good English
  – organise information clearly
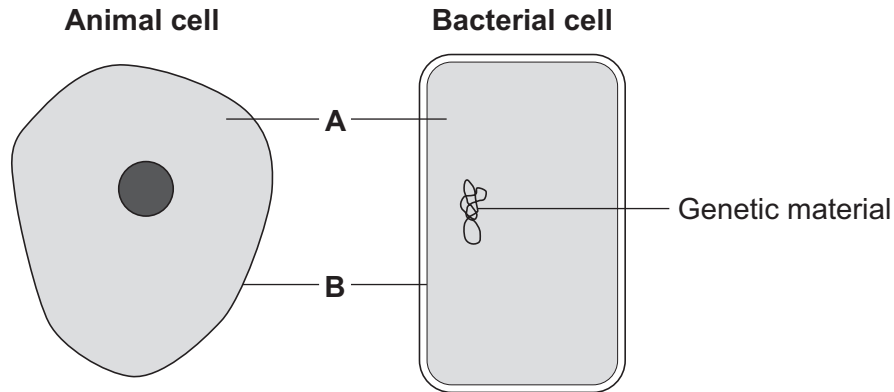 – use specialist vocabulary where appropriate.

Advice
- In all calculations, show clearly how you work out your answer.

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

1   The diagrams show an animal cell and a bacterial cell.

Animal cell   **Bacterial cell**

A

Genetic material

B

1 (a) (i)   Structures **A** and **B** are found in both the animal cell and the bacterial cell.

Use words from the box to name structures **A** and **B**.

cell membrane	chloroplast	cytoplasm	vacuole

A ....

B ....

(2 marks)

1 (a) (ii)   Both cells contain genetic material.

Name the structure in the animal cell that contains genetic material.

....

(1 mark)

1 (b)   **List A** gives three structures found in animal cells.

List B gives four functions of cell structures.

Draw **one** line from each structure in **List A** to its correct function in **List B**.

List A – Structure   **List B – Function**

Controls what substances
enter the cell

Cell membrane

Photosynthesis

Mitochondrion

Protein synthesis

Ribosome

Respiration

(3 marks)

6

Turn over for the next question

Turn over ▶

4

Do not write outside the box

2 Evolution is the development of new species over time.
Evidence for evolution comes from *fossils*.

2 (a) (i) What is a *fossil*?

....

....

....

....

(2 marks)

2 (a) (ii) How can fossils give evidence for evolution?

....

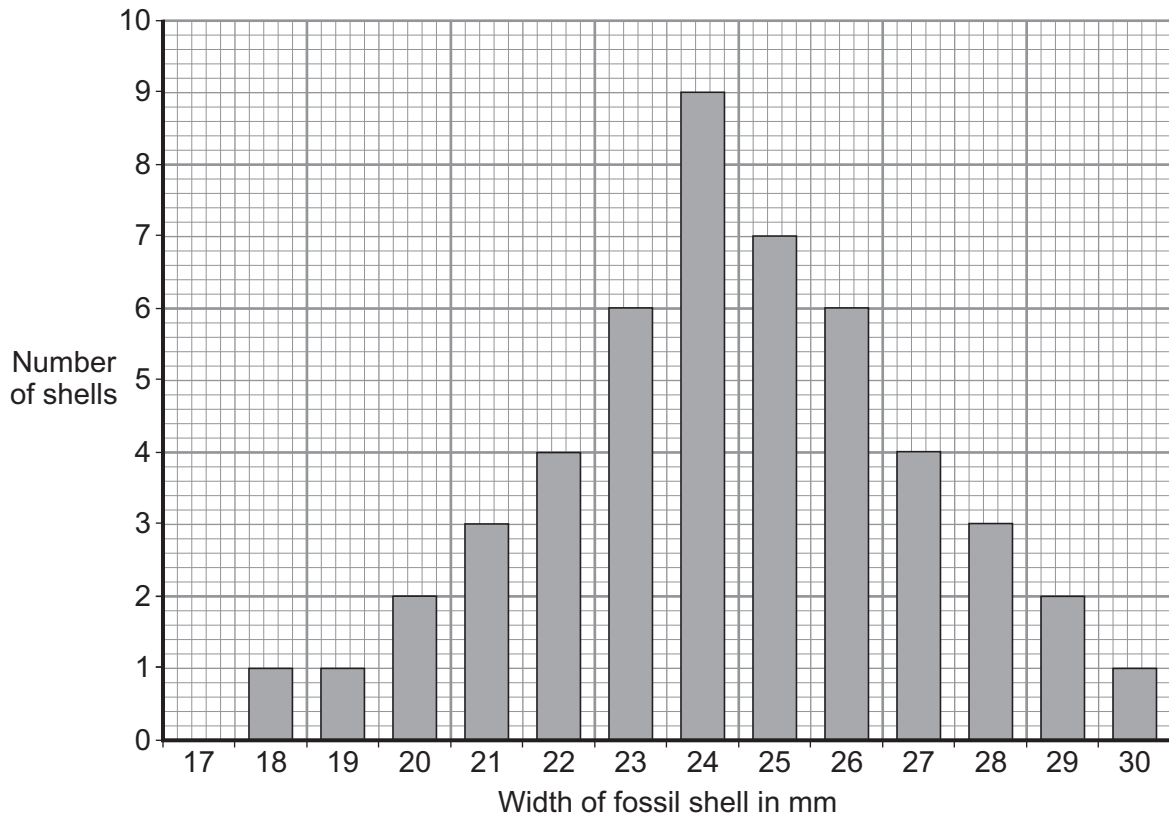...

(1 mark)

2 (b) A species of snail lived 400 million years ago.
Scientists measured the width of 49 fossil shells of this snail.

The bar chart shows the scientists' results.

2 (b) (i) What is the range of the values for the width of the fossil shells for this species?

From .... to ....

(1 mark)

2 (b) (ii) The scientists **cannot** be sure that this is the full range of fossil shell widths for this species.

Why?

....

....

(1 mark)

2 (c) This species of snail became extinct 380 million years ago.

Give **one** possible reason why species become extinct.

....

....

(1 mark)

6

Turn over for the next question

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ANSWER IN THE SPACES PROVIDED

3 (a) (i)   Mitosis and meiosis are types of cell division.

For each feature in the table, tick (✓) **one** box to show if the feature occurs:

- only in mitosis
- only in meiosis.

Feature	Only in mitosis (✓)	Only in meiosis (✓)
Produces new cells during growth and repair		
Produces gametes (sex cells)		
Produces genetically identical cells		

(2 marks)

3 (a) (ii)   Name the organ that produces gametes (sex cells) in:

a man ....

a woman. ....

(2 marks)

3 (b)   **X** and **Y** chromosomes are the sex chromosomes. They determine a person's sex.

What sex chromosomes will be found in the body cells of:

3 (b) (i)   a man ....

(1 mark)

3 (b) (ii)   a woman? ....

(1 mark)

3 (c)   A man and a woman decide to have a child.

What is the chance that the child will be a boy? ....
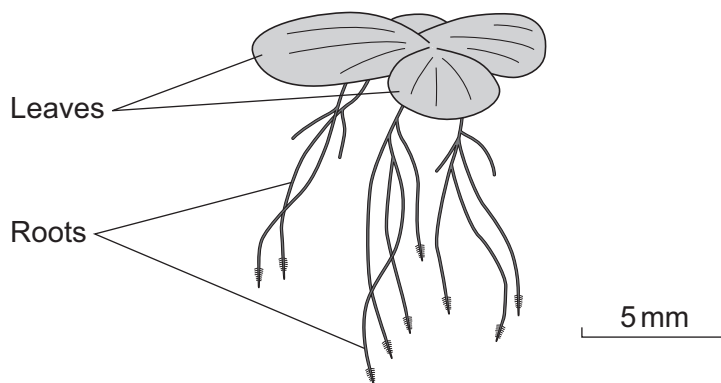
(1 mark)

7

Turn over ▶

4 Duckweed is a plant. Duckweed grows in ponds. The leaves of duckweed float on the surface of the water and its roots hang down in the water.

The drawing shows a duckweed plant.

Leaves

Roots

5 mm

4 (a) Duckweed roots absorb nitrate ions from the water.
The nitrate ions help the duckweed to grow.

Draw a ring around the correct answer to complete the sentence.

Duckweed needs nitrate ions to make

| carbohydrate. |
| fat. |
| protein. |

(1 mark)

4 (b) Some students grew duckweed plants in three different solutions of mineral ions, **A**, **B** and **C**, and in distilled water (**D**).

Table 1 shows the concentrations of mineral ions in each of **A**, **B**, **C** and **D** at the start of the investigation.

Table 1

Mineral ion	Concentration of mineral ions in mg per dm³ at the start of the investigation			
	A	**B**	**C**	**D**
Nitrate	1000	4	4	0
Phosphate	300	0	0	0
Magnesium	200	84	24	0

The students counted the number of duckweed leaves in **A**, **B**, **C** and **D** at the start of the investigation and after 28 days.

Table 2 shows their results.

Table 2

	A	**B**	**C**	**D**
Number of leaves at start	4	4	4	4
Number of leaves after 28 days	50	27	14	6

4 (b) (i) Using **Table 1** and **Table 2**, describe the effect of magnesium ions on the growth of duckweed.

....

....

(1 mark)

4 (b) (ii) Solution **A** contained the highest concentration of nitrate ions.

One student said, 'The results show that nitrate ions are needed for the growth of duckweed.'

What evidence in **Table 2** supports what the student said?

....

....

(1 mark)

4 (c) The students measured the growth of the duckweed by counting the number of leaves.

4 (c) (i) Suggest a better method of measuring the growth of the duckweed.

....

....

(1 mark)

4 (c) (ii) Suggest why your method is better than the students' method.

....

....
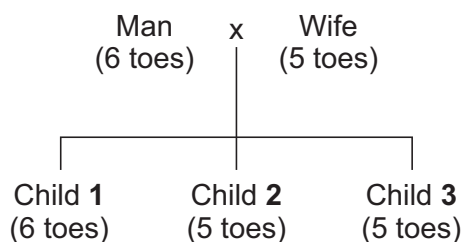
(1 mark)

5

Turn over ▶

5 Polydactyly is an inherited condition. Polydactyly is controlled by a dominant allele.

The photograph shows the foot of a baby with polydactyly.

A man and his wife have three children. The man has polydactyly.

The diagram shows the inheritance of polydactyly in this family.
The diagram also shows the number of toes each person has on each foot.

```
        Man      x      Wife
      (6 toes)        (5 toes)
          |
    ┌─────────────┼─────────────┐
  Child 1      Child 2       Child 3
 (6 toes)     (5 toes)      (5 toes)
```

In the rest of this question, the following symbols are used to represent alleles.

D = allele for polydactyly (6 toes on each foot)
d = allele for 5 toes on each foot

5 (a) (i) How many alleles for the number of toes will there be in **one** sperm cell?

(1 mark)

5 (a) (ii) Complete the sentence.

A sperm cell joins with an egg cell in a process called ....

(1 mark)

5 (b) (i) What combination of alleles does the man have?

Tick (✓) **one** box.

DD ☐

Dd ☐

dd ☐

(1 mark)

5 (b) (ii) What combination of alleles does the man's wife have?

Tick (✓) **one** box.

DD ☐

Dd ☐

dd ☐

(1 mark)

5 (c) Draw a ring around the correct answer to complete each sentence.

5 (c) (i) The man and his wife plan to have a fourth child.

The probability that this child will have 6 toes on each foot is

| 1 in 2. |
| 1 in 3. |
| 1 in 4. |

(1 mark)

5 (c) (ii) When Child **2** grows up, he marries a woman with 5 toes on each foot.

The probability that their first child will have 6 toes on each foot is

| 0. |
| 1 in 2. |
| 1 in 4. |

(1 mark)

Turn over ▶

6

6 (a) Use words from the box to complete the equation for aerobic respiration.

alcohol	glucose	lactic acid	water

.... + oxygen ⟶ carbon dioxide + ... (+ energy)

(2 marks)

6 (b) Some students investigated the effect of temperature on the rate of aerobic respiration in earthworms.

The diagram shows the apparatus the students used.
When the tap is closed, the bead of liquid moves to the left as the earthworms take in oxygen.
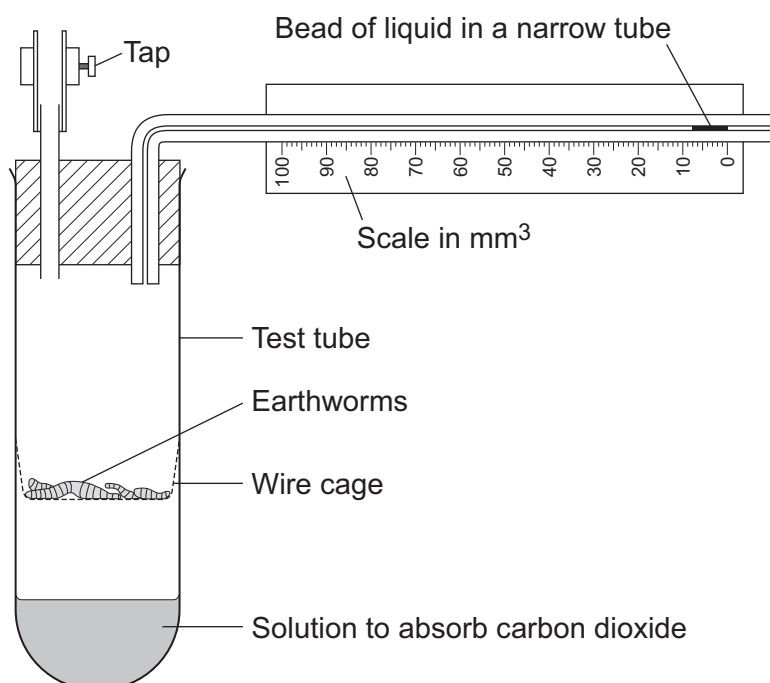
The students put the test tube into a water bath at 20 °C for 10 minutes.
They left the tap open during this time.

Why did the students put the test tube in the water bath at 20 °C for 10 minutes?

Tick (✓) **one** box.

Because the air contains more oxygen at 20°C. ☐

Because the air contains less carbon dioxide at 20°C. ☐

So the earthworms' body temperature would change to 20°C. ☐

(1 mark)

Question 6 continues on the next page

Turn over ▶

6 (c) The students then:

- closed the tap
- started a stopwatch
- recorded the position of the bead of liquid every 2 minutes for 10 minutes
- repeated the experiment at 10 °C.

The graph shows the students' results.
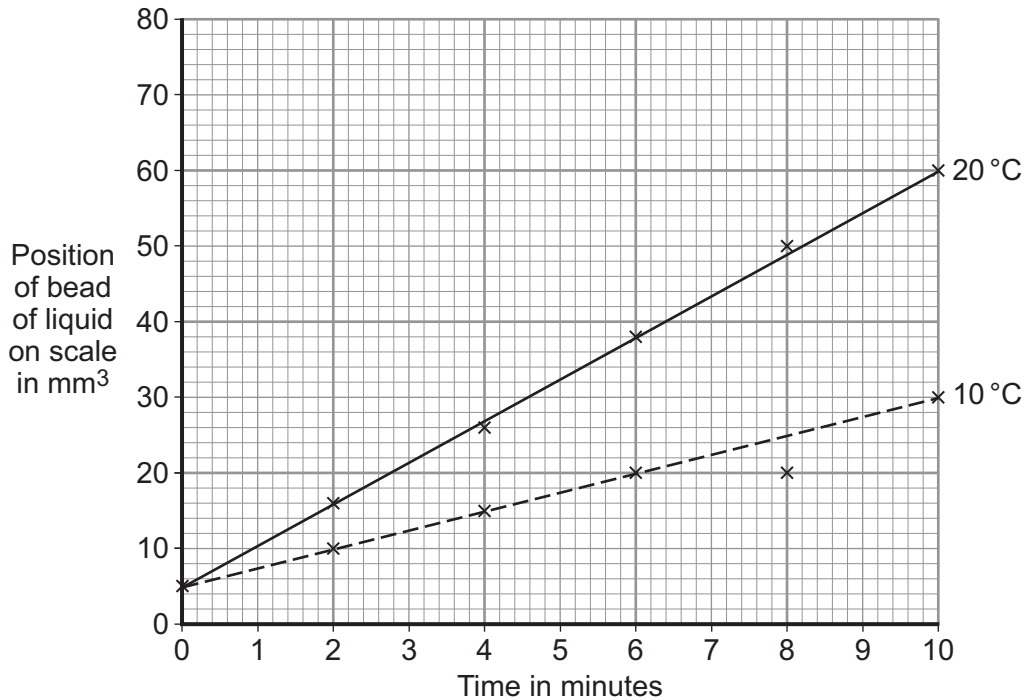
6 (c) (i) How much oxygen did the earthworms take in during the 10 minutes at 20 °C?

Use information from the graph to work out your answer.

....

....

....

Volume of oxygen taken in = ... mm^3

(2 marks)

6 (c) (ii) The earthworms took in this volume of oxygen in 10 minutes.

Use your answer from part **(c)(i)** to calculate how much oxygen the earthworms took in each minute.

....

....

Volume of oxygen taken in = ... mm^3 per minute

(1 mark)

6 (c) (iii) The earthworms took in less oxygen each minute at 10 °C than they took in at 20 °C.

Explain why.

....

....

....

....

(2 marks)

6 (d) When drawing the line on the graph for the experiment at 10 °C, the students ignored the reading at 8 minutes.

6 (d) (i) Suggest why they ignored the reading at 8 minutes.

....

....

(1 mark)

6 (d) (ii) One student suggested they should repeat the experiment twice more at each temperature.

How would repeating the experiment improve the investigation?

....

....
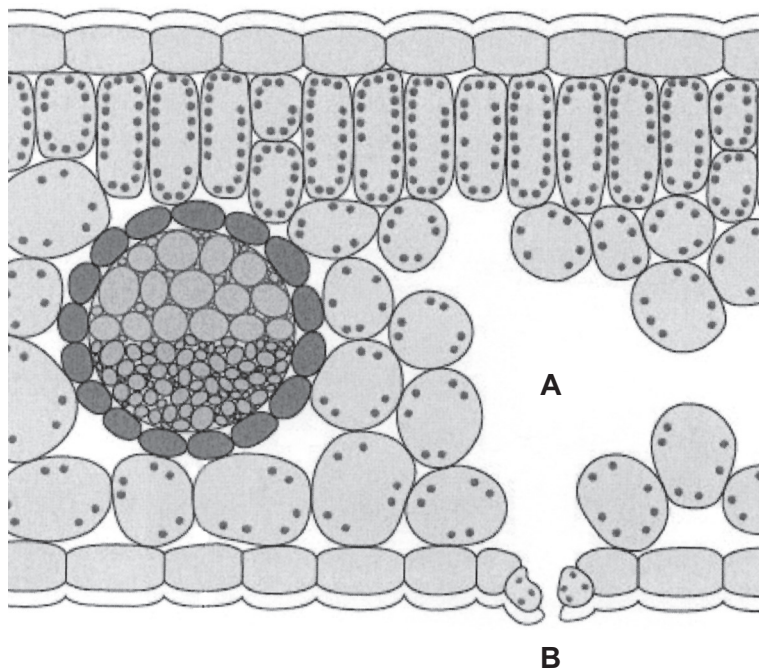
(1 mark)

10

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7 The diagram shows a section through a plant leaf.

7 (a) Use words from the box to name **two** tissues in the leaf that transport substances around the plant.

epidermis	mesophyll	phloem	xylem

.... and ....
(1 mark)

7 (b) Gases *diffuse* between the leaf and the surrounding air.

7 (b) (i) What is *diffusion*?

....

....

....

....
(2 marks)

7 (b) (ii) Name **one** gas that will diffuse from point **A** to point **B** on the diagram on a sunny day.

....
(1 mark)

Turn over ▶

8 Some students were asked to investigate the distribution of clover in a field of grass. They noticed that the clover grew in patches amongst the grass.
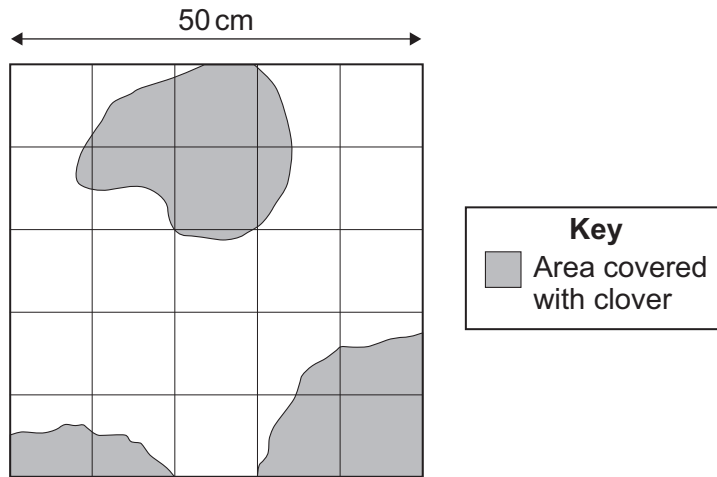
8 (a) The students decided to use quadrats.

Describe how the students should decide where to place the quadrats to investigate the distribution of the clover.

....

....

....

....
(2 marks)

8 (b) The diagram shows one of the quadrats the students used.

8 (b) (i) Estimate the number of squares of the quadrat covered with clover.

....

....

Number of squares = ...
(1 mark)

8 (b) (ii) Describe how you worked out your answer to part **(b)(i)**.

....

....

....
(1 mark)

8 (b) (iii) Use your answer from part **(b)(i)** to calculate the percentage of the quadrat covered by the clover.

....

....

....

Answer = ... %
(2 marks)

8 (c) Suggest **one** factor that could account for the distribution of the clover plants.

....
(1 mark)

7

Turn over for the next question

9 (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.
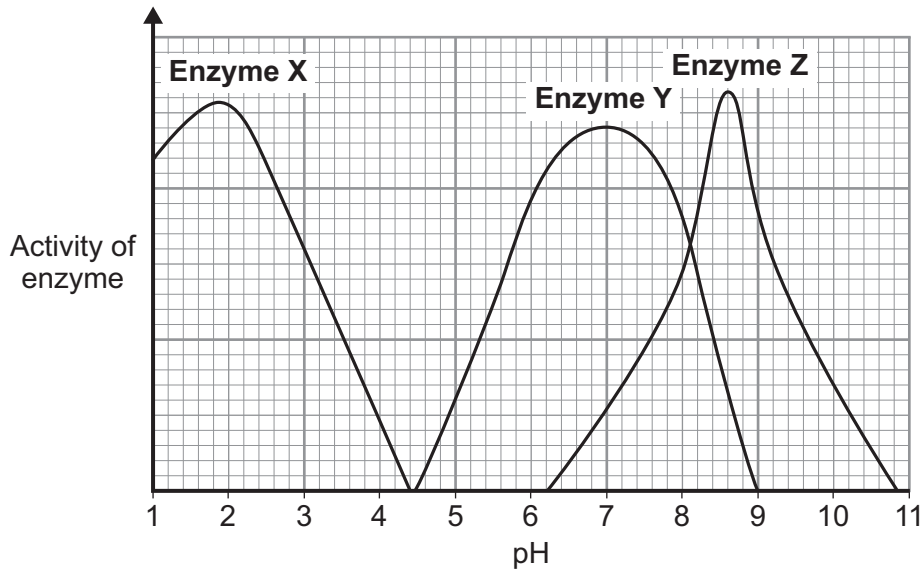
9 (a) (i) What is the optimum (best) pH for the action of enzyme **Z**?

....

(1 mark)

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

Name this substance. ....

(1 mark)

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

....

(1 mark)

9 (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.

(6 marks)

9

END OF QUESTIONS

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