OCR
Oxford Cambridge and RSA

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Wednesday 24 May 2017 – Afternoon

GCSE GATEWAY SCIENCE
BIOLOGY B

B731/01 Biology modules B1, B2, B3 (Foundation Tier)

Candidates answer on the Question Paper.
A calculator may be used for this paper.

OCR supplied materials:
None

Other materials required:
- Pencil
- Ruler (cm/mm)

Duration: 1 hour 15 minutes

* B 7 3 1 0 1 *

Candidate forename		Candidate surname	

Centre number						Candidate number				

INSTRUCTIONS TO CANDIDATES

- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Write your answer to each question in the space provided. If additional space is required, you should use the lined page(s) at the end of this booklet. The question number(s) must be clearly shown.
- Do **not** write in the barcodes.

INFORMATION FOR CANDIDATES

- The quality of written communication is assessed in questions marked with a pencil (✎).
- The number of marks is given in brackets **[ ]** at the end of each question or part question.
- The total number of marks for this paper is **75**.
- This document consists of **28** pages. Any blank pages are indicated.

Answer **all** the questions.

SECTION A – Module B1

1 The table shows information about the contents of two types of sausage.

All the figures are for **100 g** of the sausages.

	Pork sausages 	**Vegetarian sausages** 
protein in g	10	9
fat in g	22	8
carbohydrate in g	10	13
fibre in g	0	6

(a) Look at the table and finish this statement.

The pork sausage contains **more** energy than the vegetarian sausage.

The main reason for this is because the pork sausage contains more ..... .

[1]

(b) A boy has a mass of 50 kg.

(i) Calculate his estimated average daily requirement (EAR) for protein.

Use this formula to work out your answer.

EAR in g = 0.6 × body mass in kg

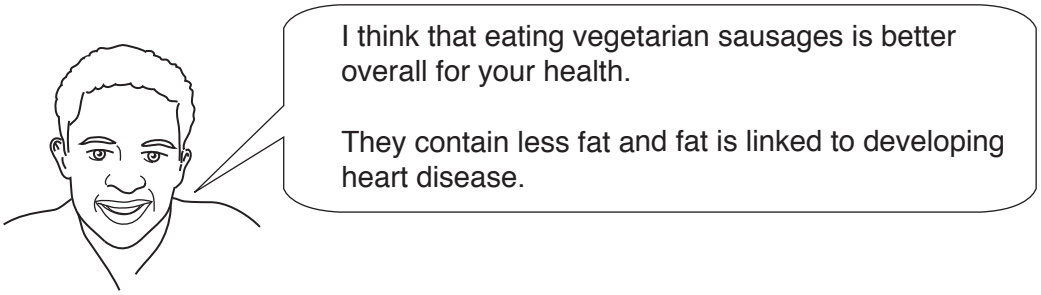
EAR = ... g **[1]**

(ii) The boy ate 150 g of the pork sausages.

What percentage of his EAR would this provide?

answer = ... % **[2]**

(c) Another boy makes two comments about eating vegetarian sausages rather than pork sausages.



For each of the boy's comments write about whether it contains scientific **facts** or just **opinion**.

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..... **[2]**

2 Read this article about a disease that occurs in South America.

Doctors concerned about spread of disease

Zika is a disease that is caused by a virus.

It is spread by mosquitoes.

In most people the disease is quite mild.
However, there is evidence that in pregnant women it can slow the growth of the baby's brain.

The disease cannot be treated by antibiotics.

Scientists are trying to develop a vaccine for the zika virus.

(a) The mosquito spreads zika but the disease is caused by a virus.

What word is used to describe the role of the **virus** in this disease?

Put a (ring) around the correct answer.

antiviral **pathogen** **protozoa** **vector**

[1]

(b) The human body has defences against the entry of microorganisms that cause disease.

Describe **two** of these defences and explain why they can **not** stop the zika virus.

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..... **[3]**

(c) The article says that the virus can cause damage to the brain of unborn babies.

Which part of the baby includes the brain?

Put a tick (✓) next to the correct answer.

peripheral nervous system	☐
sense organs	☐
central nervous system	☐
circulatory system	☐

[1]

(d) Scientists are trying to develop a vaccine for zika.

Explain why vaccines are tested before they are used on the whole population.

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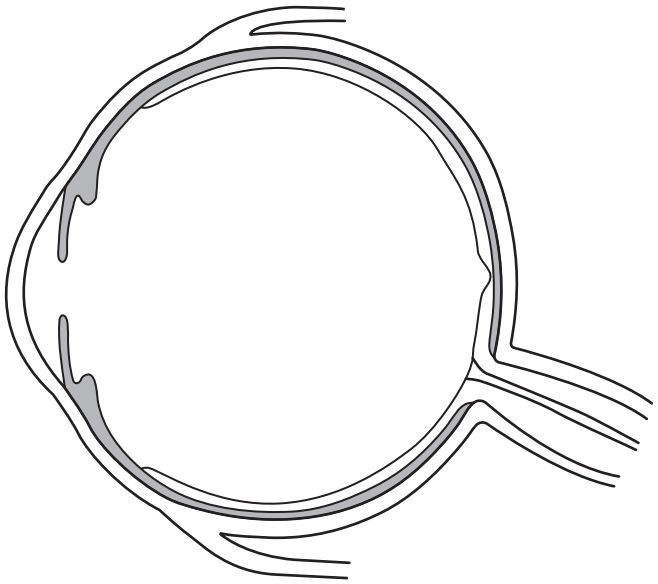
..... **[2]**

3 The diagram shows a section through the human eye.



(a) Complete the diagram by drawing the **lens** in its correct place. **[1]**

(b) Some humans and animals have an inherited condition called cornea plana.

It causes the cornea to be less curved than normal.

This can lead to long-sight in humans.

(i) Label the diagram with an **X** to show the position of the cornea. **[1]**

(ii) What are the symptoms of long-sight in humans?

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..... **[2]**

(c) Scientists performed an experiment on mice to try and work out how cornea plana is inherited.

They mated together two mice who had normal vision.

There were nine offspring and three had cornea plana.

Complete these sentences about the inheritance of cornea plana.

Cornea plana is caused by a change to a gene.

A change in a gene is called a ..... .

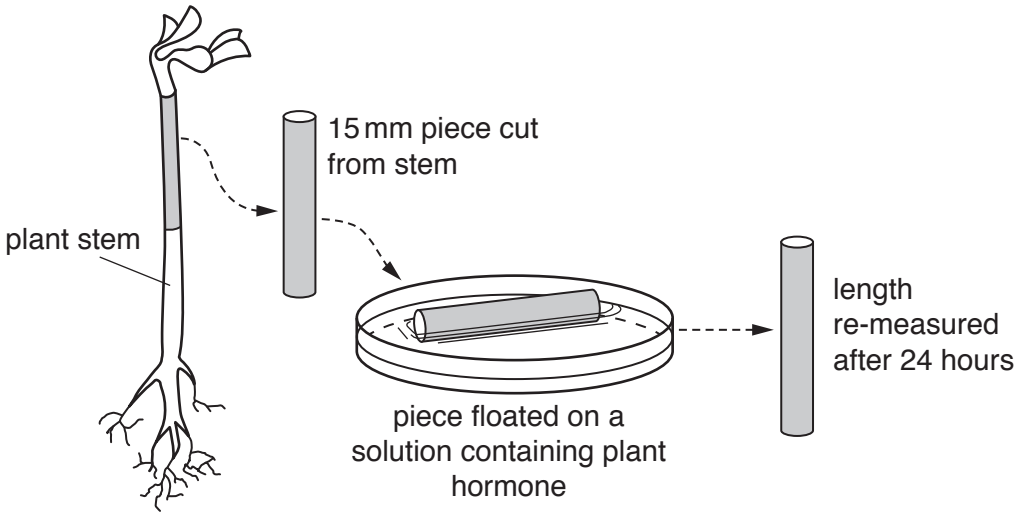
The allele that causes cornea plana is ..... to the normal allele.

[2]

4 Growth in plants is controlled by chemicals called plant hormones.

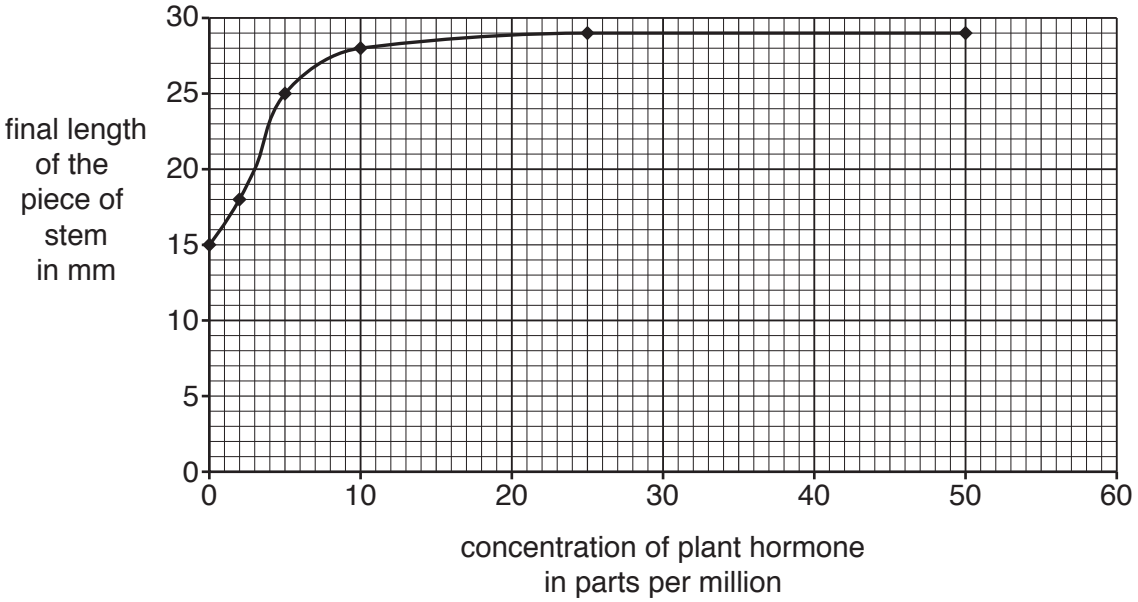
Students want to measure the effect of a plant hormone on the growth of plant stems.

The diagram shows their method.



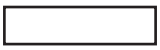
They repeated the experiment with different concentrations of plant hormones.

The graph shows their results.



9

The diagram shows a piece of stem that has been floating in plant hormone.



Describe what the graph shows about the effect of plant hormones on the stem.

Use a ruler and the graph to work out what concentration of plant hormone **this** piece of stem was floating in.

The quality of written communication will be assessed in your answer to this question.

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..... **[6]**

SECTION B – Module B2

5 Nitrogen is an important element found in living organisms.

Read this article about nitrogen and plants.

Nitrogen – the farmers' friend

Plants are surrounded by plenty of nitrogen gas in the air but cannot use it.

The main way they get nitrogen is from the soil.

Plants need nitrogen for growth.

When farmers harvest their crops they dig the remains of the plant into the soil.

This will help their crops grow next year.

(a) What percentage of the air surrounding plants is nitrogen gas?

Put a (ring) around the correct answer.

0.04 **21** **50** **78** **95**

[1]

(b) Plants cannot use the nitrogen gas in the air.

Put a tick (✓) next to the **main** reason for this.

It is not very reactive. ☐

It is colourless. ☐

It cannot get into plants. ☐

It is too high in the atmosphere. ☐

[1]

(c) Put a tick (✓) next to the **main** way that nitrogen is taken up by plant roots.

as nitrates	☐
as proteins	☐
as carbon dioxide	☐
as nitrogen gas	☐

[1]

(d) Explain what happens to the dead plants that are dug into the soil and why this helps new crops grow.

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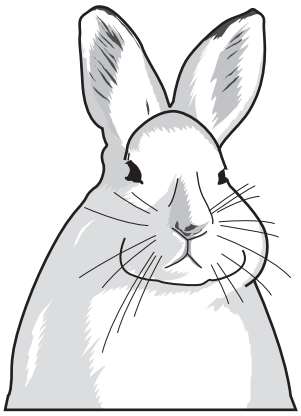
..... **[3]**

6 Snowshoe hares live in parts of Canada.

They are preyed on by animals called lynx.



snowshoe hare

lynx

(a) The eyes of the hare are in a different position on the head compared to the lynx.

Explain this difference.

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..... **[2]**

(b) Where the lynx and hares live there is snow on the ground for long periods of time.

Scientists have made observations to explain why snowshoe hares have white fur.

Here are their observations.

A Hares are all born with slightly different coloured fur.

B Lynx are trying to find food and hares are trying not to be eaten.

C The hares with the fur colour best suited to the conditions survive.

D The hares that survive pass on their genes for fur colour.

Charles Darwin made observations about natural selection.

Match the scientists' observations to Charles Darwin's observations by writing the correct letter **A**, **B**, **C** and **D** in the table.

Charles Darwin's observation	Scientists' observation
survival of the fittest	
competition for resources	
inheritance of successful adaptations	
presence of natural variation	

[2]

(c) Scientists think that increasing levels of carbon dioxide pollution may make the weather in Canada warmer.

Warmer weather might affect the survival of snowshoe hares.

In 2015 the scientists collected data about the survival of the hares.

They also predicted how the hares will survive in the future if the weather gets warmer.

Their results are shown in the table.

Year	2015	2050	2080
percentage chance of a hare surviving one year	9.3	8.2	7.0

Write about how an increase in carbon dioxide levels can make the weather warmer.

How can warmer weather explain the predictions about the survival of the hares?

The quality of written communication will be assessed in your answer to this question.

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..... **[6]**

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7 The diagram shows a ladybird.

(a) Ladybirds are arthropods.

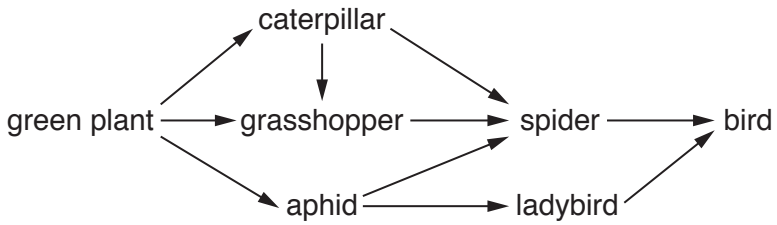
Draw a line to join the **kingdom** that contains the arthropods to the **class** that ladybirds belong to.

Only draw **one** line.

kingdom	**class**
animals	arachnids
fungi	crustaceans
plants	insects
prokaryotes	myriapods
protoctista	

[2]

(b) The diagram shows a garden food web containing ladybirds.



(i) What is the source of energy for this food web?

..... **[1]**

(ii) The grasshopper is **both** a primary and a secondary consumer.

Explain why it is both.

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..... **[2]**

(iii) The people who own the garden buy a cat.

The cat spends a lot of time in the garden and frightens away birds.

Explain what might happen to the numbers of ladybirds in the garden.

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..... **[2]**

(c) Harry has been looking at the ladybirds on a bush in the garden.

He knows that there are two main types of ladybird living in the area.

The two main types of ladybird can have different numbers of spots on their body.

Type of ladybird	Number of spots on the body
harlequin	15–21
7 spot	7

On the bush there are 30 ladybirds with a total number of 480 spots.

Harry is talking to two of his friends.

Harry
The mean (average) is 16 spots per ladybird so they must all be harlequins.

Tom
I think you have calculated your mean wrong so there could be both types of ladybird.

Sam
I think that your mean is correct but there could still be both types of ladybird present.

Which friend's answer is correct?

Explain your answer.

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..... **[2]**

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SECTION C – Module B3

8 **(a)** The table shows two components of blood.

Component	Job
red blood cells	.....
platelets	.....

Complete the table by writing the jobs in the empty boxes. **[2]**

(b) Camels are animals that live in hot deserts.

The table shows some differences between camel blood and human blood.

Animal	Number of red blood cells per mm^3 of blood	Volume of one red blood cell in arbitrary units
Camel	7	40
Human	5	90

(i) Use the table to put a (ring) around the words in bold that best complete these sentences.

In 1 mm^3 of camel's blood there are **equal numbers of** / **fewer** / **more** red blood cells compared to 1 mm^3 of human blood.

Each camel red blood cell is **larger than** / **smaller than** / **the same size as** a human red blood cell.

[2]

(ii) The percentage of blood that is red blood cells can be calculated using this formula.

$$\text{\% of blood} = \frac{\text{number of red blood cells per mm}^3\text{ of blood} \times \text{volume of one red blood cell}}{10}$$

Calculate the percentage of **camel blood** that is red blood cells.

Use the figures in the table and the formula.

answer = ... %
[2]

(iii) Human blood is **45%** red blood cells.

If an animal does not drink for some time the percentage of red blood cells in the blood can increase.

This can be dangerous.

Camels and humans have a different percentage of red blood cells in their blood.

Suggest why.

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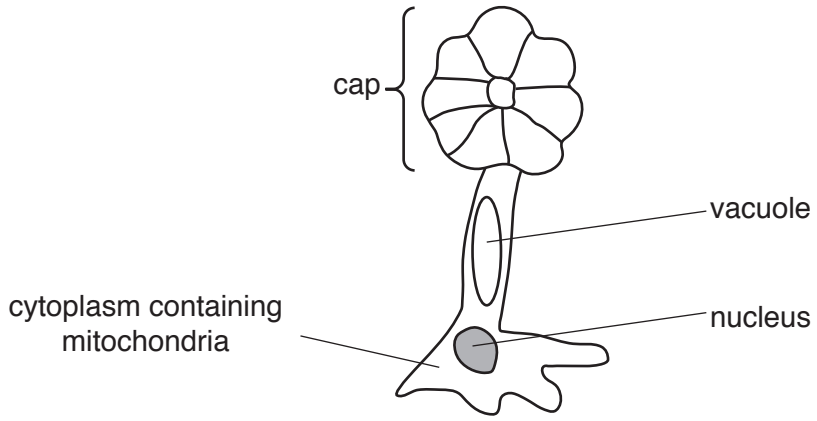
..... **[1]**

9 **(a)** *Acetabularia* is a single-celled organism that lives in the sea.

It has rather an unusual shape.



Draw lines to join each **structure** in *Acetabularia* to its **job**.

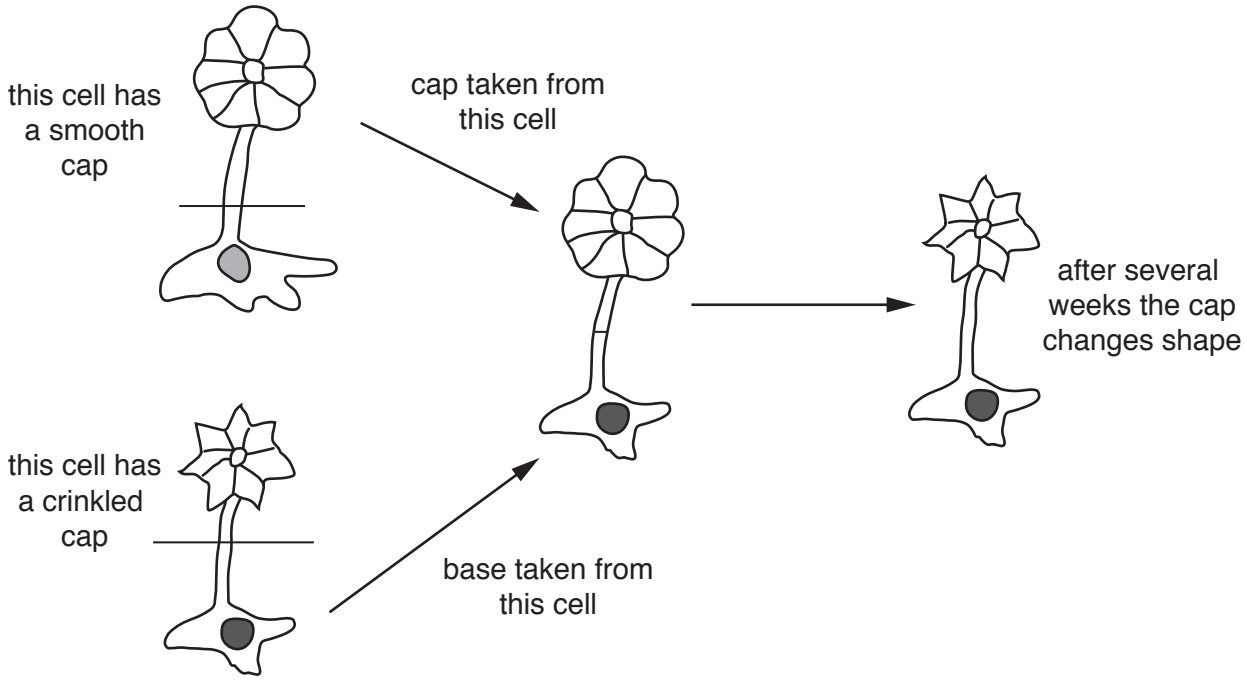
structure	**job**
vacuole	contain chromosomes
mitochondria	support
nucleus	respiration

[2]

(b) A scientist does an experiment with two types of *Acetabularia*.

The two cells have different shaped caps.

The scientist takes parts from each cell and joins them together.



The shape of the cap depends on which **proteins** are made by the cell.

Write about how the making of proteins is controlled in a cell.

Use this idea to explain the results of the scientist's experiment.

The quality of written communication will be assessed in your answer to this question.

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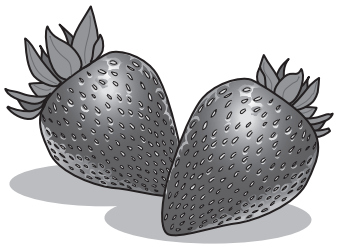
..... **[6]**

10 A farmer is choosing which strawberry plants to grow.

He reads an advert in his farming magazine.

Buy strawberry plants from us!



We have been selectively breeding strawberry plants for many years.

This has produced a plant with very sweet tasting strawberries.

All the plants we sell are clones of this plant.

We guarantee that none of the plants we sell are genetically modified.

(a) Why does selective breeding take many years?

Put a tick (✓) in the box next to the **correct** reason.

It takes a long time for mutations to occur. ☐

Moving genes between plants is difficult. ☐

The plants have to be selected over many generations. ☐

[1]

(b) The company are sure that **every** plant they sell will produce sweet strawberries.

Explain why they are so sure.

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..... **[2]**

(c) The plant company say that none of their plants are genetically modified.

Suggest **two** reasons why the company wants to let people know this.

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..... **[2]**

11 A student answered **three** questions in a biology test.

All his answers contain mistakes.

Explain the student's mistakes in each answer.

(a) Question one: Write down three examples of proteins.

Student's answer: DNA, collagen, insulin

Student's mistake .....

..... **[1]**

(b) Question two: Why are sperm cells and egg cells different in size?

Student's answer: Egg cells are bigger because they supply all the chromosomes and genes for the zygote.

Student's mistake .....

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..... **[2]**

(c) Question three: How do enzymes work?

Student's answer: An enzyme is like a key that fits into a substrate's active site.

Student's mistake .....

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..... **[2]**

END OF QUESTION PAPER

ADDITIONAL ANSWER SPACE

If additional space is required, you should use the following lined page(s). The question number(s) must be clearly shown in the margin(s).