



Rewarding Learning

General Certificate of Secondary Education  
2015–2016

Centre Number

--	--	--	--	--

Candidate Number

--	--	--	--	--

---

# Double Award Science: Biology

Unit B1  
Higher Tier

[GSD12]

MV18

WEDNESDAY 11 NOVEMBER 2015, MORNING

---

## Time

1 hour, plus your additional time allowance.

## Instructions to Candidates

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.

Write your answers in the spaces provided in this question paper.

Answer **all eight** questions.

## Information for Candidates

The total mark for this paper is 70.

Figures in brackets printed at the end of each question indicate the marks awarded to each question or part question.

Quality of written communication will be assessed in Question **3(a)**.

- 1 (a) The table gives some information about enzymes made in the body, their substrates and their products.

Complete the table by filling in the boxes. [4 marks]

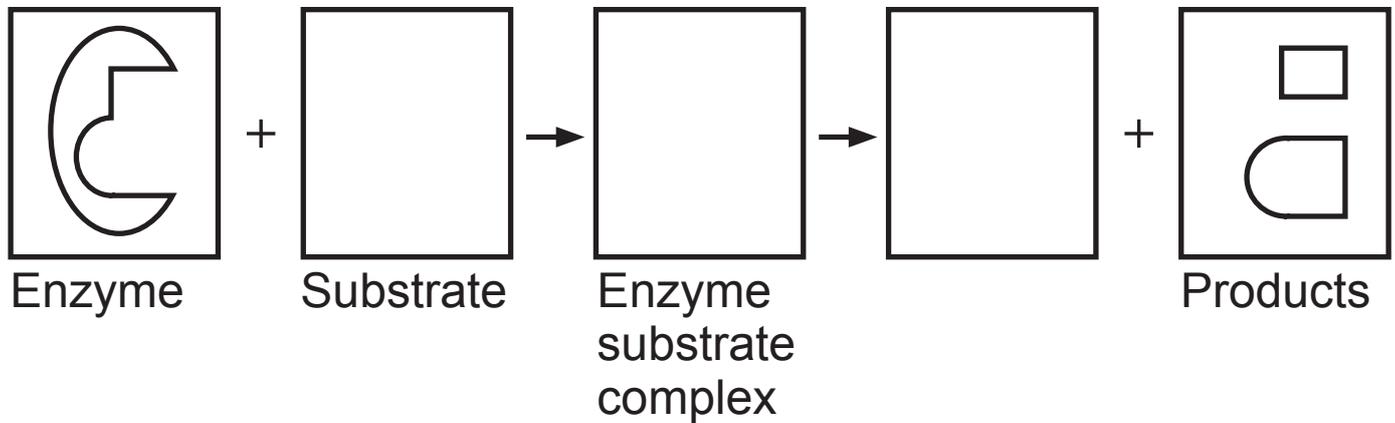
Enzyme	Substrate	Product(s)
	starch	glucose
protease		
lipase		fatty acids and glycerol

- (b) Give **two** conditions that affect enzyme activity.  
[2 marks]

1. \_\_\_\_\_
2. \_\_\_\_\_

(c) Enzymes work using the lock and key model.

Draw diagrams in the boxes to complete the lock and key model for the enzyme given. [3 marks]



(d) The small intestine is adapted for its functions.

Give **three** ways in which the small intestine is adapted to increase its surface area. [3 marks]

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_

- 2 The passage gives information from long term studies about elephant populations in two African countries, Kenya and Tanzania.

	Line
A family group of elephants consists of related females and their young.	1
Eleanor was nearly 50 years old when she died in Kenya. She was the matriarch, the oldest and most experienced elephant of her family group.	3 5
The matriarch remembers information about the locations of water, roots, fruits, grasses and tree barks that the family group may not have visited for many years.	7 9
Older matriarchs move their family groups over long distances to find water and food when they are scarce.	11
Family groups with older matriarchs had the lowest baby elephant death rates during a drought.	13
Male lions can overpower and kill baby elephants.	15
When older matriarchs recognise a roar from a male lion they will make their family groups come close together.	17

Use the information in the passage and your knowledge to answer the following questions.

- (a) Give **one other** natural factor, apart from drought, that can affect elephant populations. [1 mark]
- 

- (b) Suggest why older matriarchs will make their family groups come close together when they hear the roar of a male lion. [1 mark]
- 

- (c) These studies were carried out in Kenya and Tanzania.

Suggest why it is important to carry out more studies of elephant populations in other African countries.

[1 mark]

---

**(d) (i)** Use the information in the passage to draw a food chain that includes elephants. (Lines 6, 7, 8 and 15)  
[2 marks]

**(ii)** Draw a pyramid of biomass for this food chain.

Label the organisms in the pyramid. [2 marks]

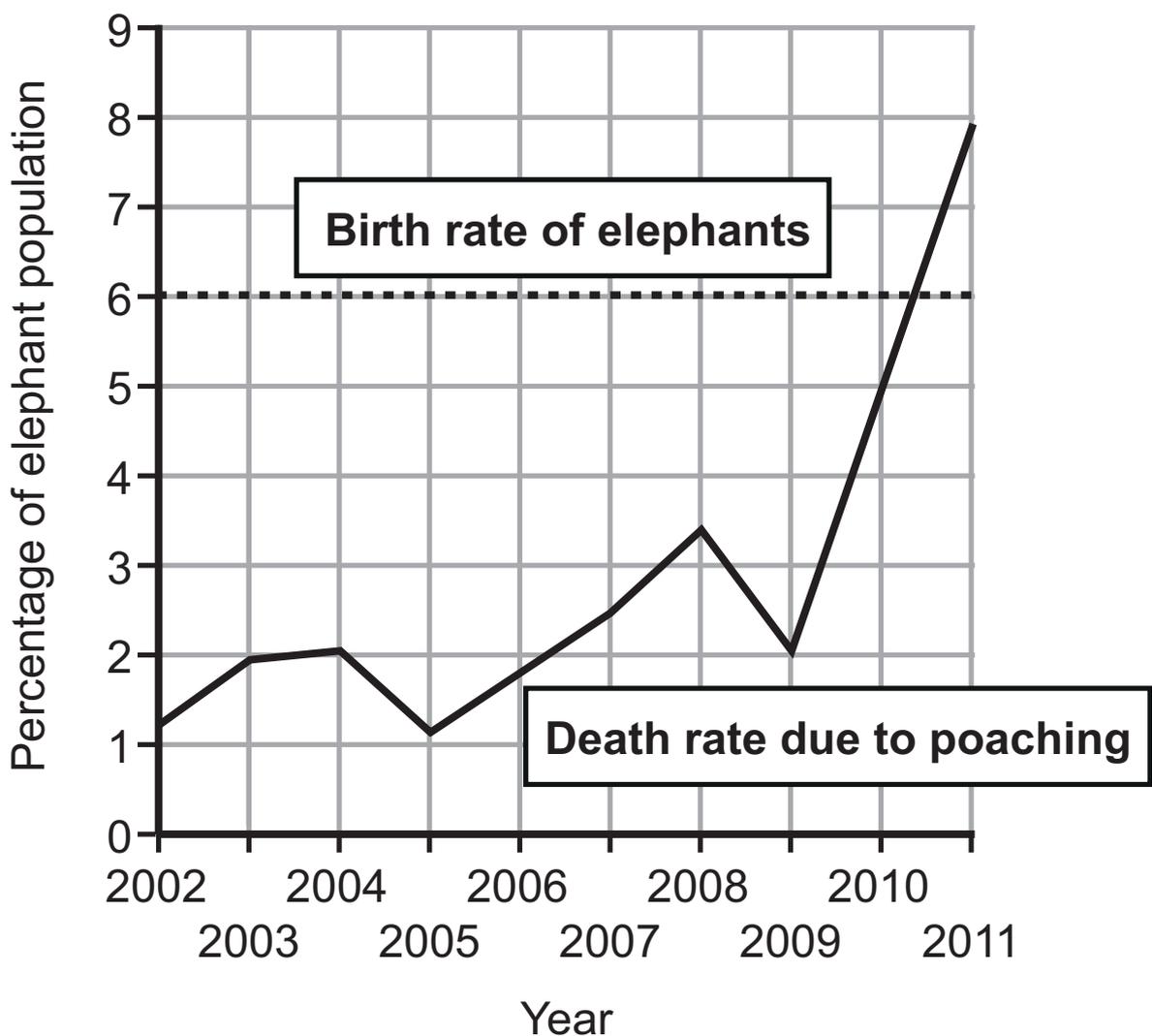
**BLANK PAGE**

**(Questions continue overleaf)**

(e) Poachers are hunters who kill elephants for their ivory tusks.

The graph shows elephant death rates due to poaching from 2002 to 2011. It also shows the birth rate of elephants.

Both rates are shown as a percentage of the elephant population.



- (i) If the trend in death rate due to poaching from 2009 to 2011 continues, suggest the effect on the elephant population over the next ten years. [1 mark]

---

---

- (ii) In Africa, the elephant population at the end of 2011 was 350 thousand (350 000).

Using **only** the birth rate shown on the graph opposite, calculate what the elephant population would be at the end of 2012. [3 marks]

**Show your working.**

\_\_\_\_\_ thousand

- (iii) Suggest why this population figure would be greater than the **actual** elephant population at the end of 2012. [1 mark]

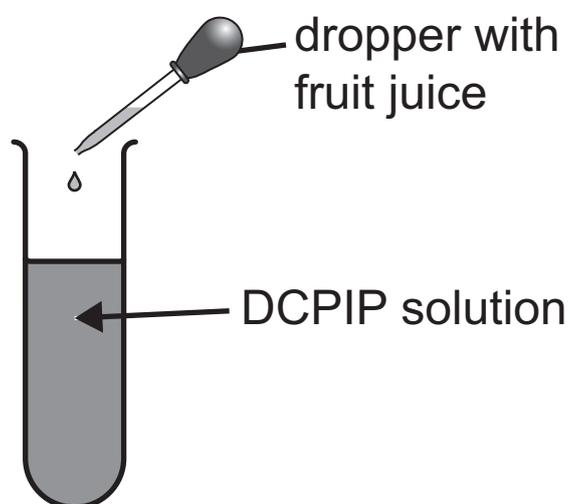
---

---

- 3 (a) Sophie carried out an investigation to compare the vitamin C content of three fruit juices, **X**, **Y** and **Z** using DCPIP solution.

She recorded the number of drops of fruit juice needed to make the DCPIP solution change colour for each of the fruit juices.

The diagram shows the apparatus she used and her results.



Fruit juice	Number of drops needed to make DCPIP change colour
<b>X</b>	20
<b>Y</b>	5
<b>Z</b>	10



(b) 10 mg of vitamin C are needed to make the DCPIP solution change colour.

Calculate the vitamin C content in mg in each drop of fruit juice X. [2 marks]

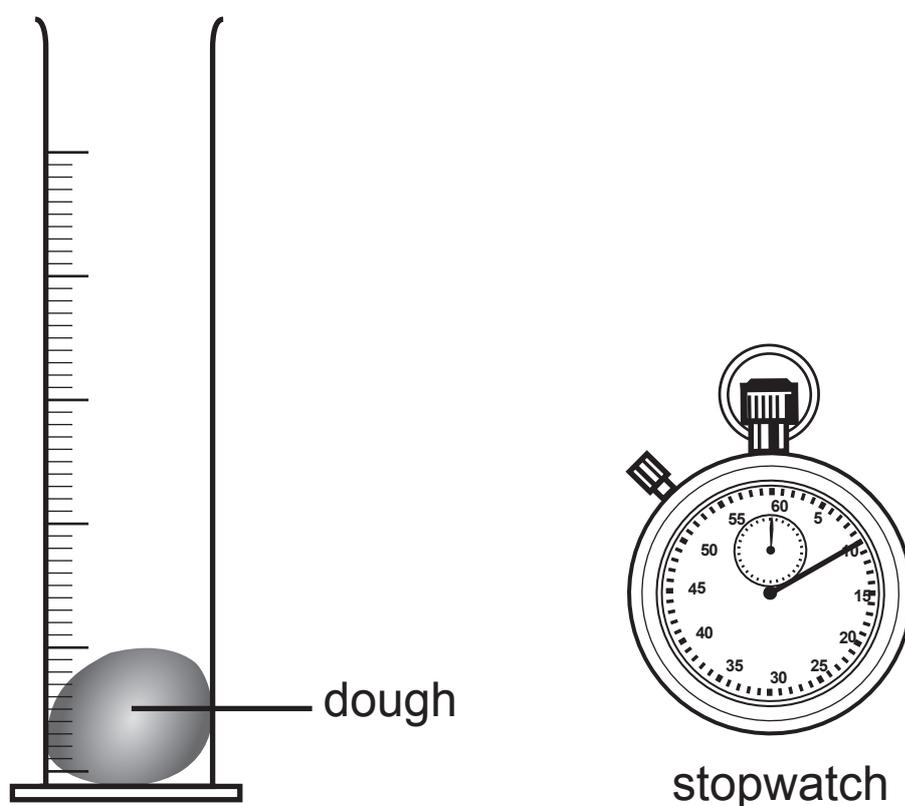
**Show your working.**

\_\_\_\_\_ mg

- 4 Bread is made from dough. Dough is a mixture of flour, water, sugar and yeast. The dough is left to rise (increase in volume) for a period of time before it is put into the oven to bake.

John carried out an experiment to measure the volume of dough when left for 50 minutes at 20°C (room temperature).

He used the apparatus shown in the diagram.



The yeast in the dough carry out anaerobic respiration.

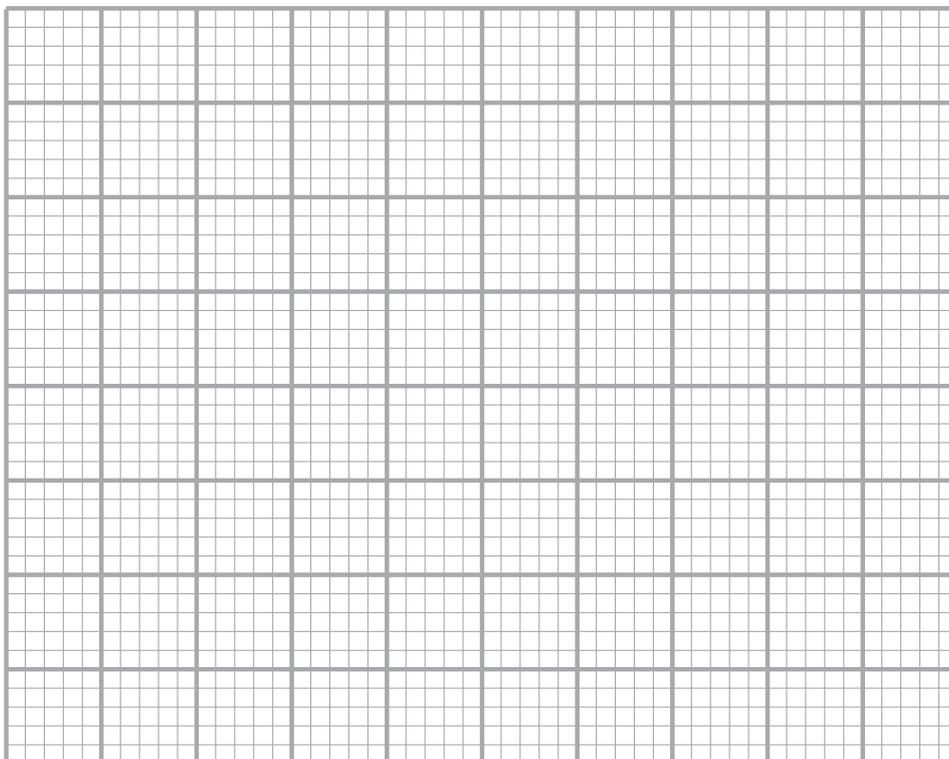
- (a) Name the gas produced during anaerobic respiration in this experiment. [1 mark]

\_\_\_\_\_

- (b) The table gives the results for the volume of dough when left at 20°C over a 50 minute period.

Time/min	Volume of dough/cm <sup>3</sup>
0	20
10	24
20	32
30	48
40	66
50	66

- (i) Draw a graph of these results on the grid using the most appropriate method. [4 marks]



(ii) Between which 10 minute period did the dough rise fastest? [1 mark]

\_\_\_\_\_ and \_\_\_\_\_ minutes

(iii) John repeated the experiment but forgot to add yeast to the other ingredients.

Describe and explain how this would have affected the volume of the dough. [2 marks]

\_\_\_\_\_  
\_\_\_\_\_

(c) Name the substance produced by anaerobic respiration in mammalian muscles. [1 mark]

\_\_\_\_\_

- 5 (a) The table shows sections of three different types of nerve cells and the speed in metres per second (m/s) at which nerve impulses travel along them.

Description of nerve cell	Speed of nerve impulse m/s
thin fibre with no covering 	1.5
thin fibre with covering 	3
thick fibre with covering 	120

- (i) Use the information in the table to give **two** factors that cause an increase in the speed of impulse in the different types of nerve cells. [2 marks]

1. \_\_\_\_\_

2. \_\_\_\_\_

- (ii) Calculate how many **times** faster an impulse is carried by the fastest nerve cell compared to an impulse carried by the slowest nerve cell. [1 mark]

**(b) (i)** What makes up the CNS (Central Nervous System)?  
[1 mark]

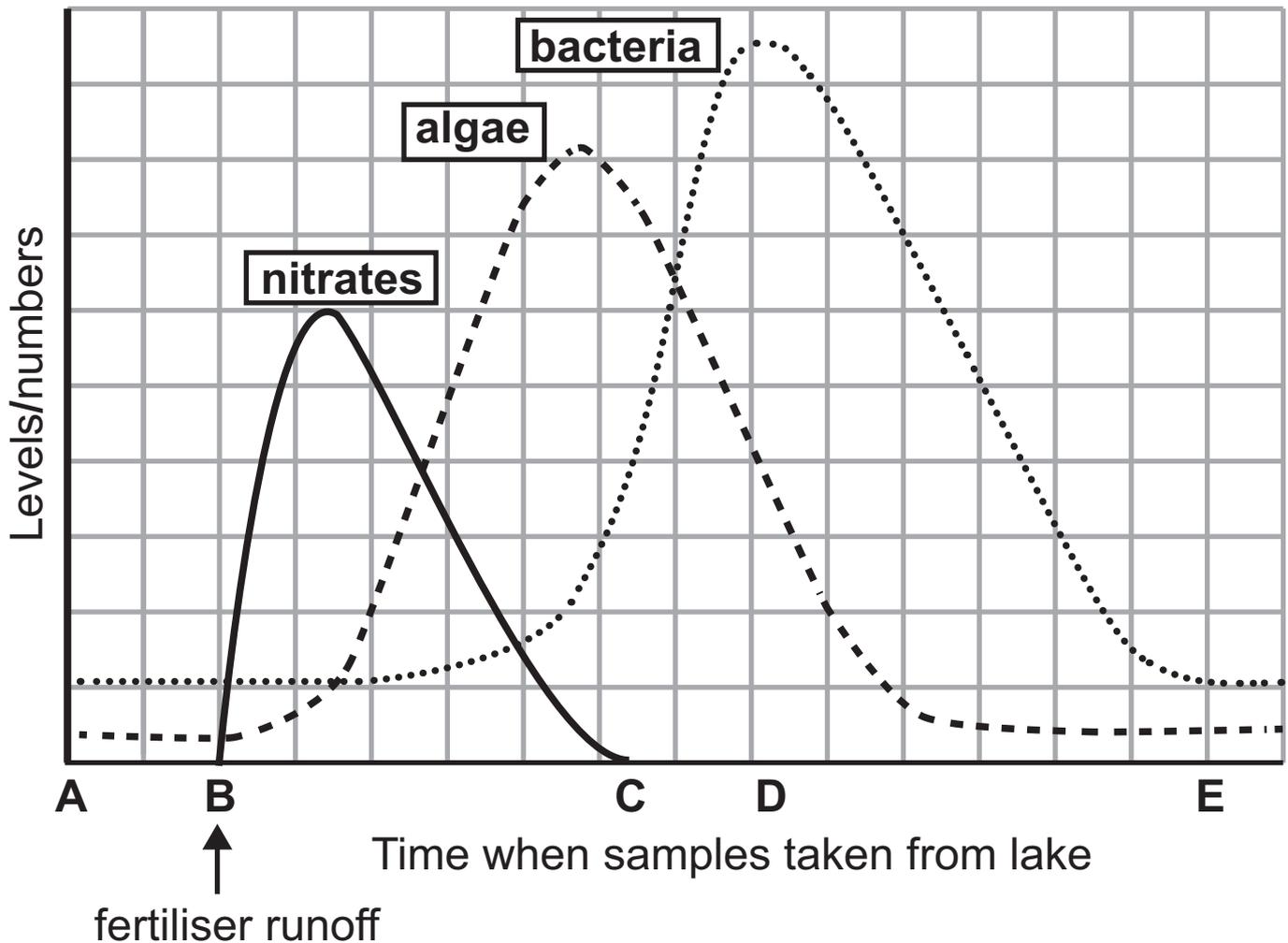
\_\_\_\_\_ and \_\_\_\_\_

**(ii)** What is the role of the CNS in the body?  
[2 marks]

\_\_\_\_\_  
\_\_\_\_\_

- 6 The graph shows changes in levels of nitrates, numbers of algae (plants) and numbers of bacteria in a lake.

The levels and numbers are shown at various times before and after fertiliser had run off from neighbouring fields.



(a) (i) Describe and explain the changes in the numbers of **bacteria** in the lake between times **C** to **E**.  
[5 marks]

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

(ii) Many fish in this lake will die. Explain why.  
[2 marks]

---

---

---

- (b) The table shows two animal species that are indicators of water pollution.

Mayfly nymphs need well-oxygenated conditions to survive but bloodworms survive best in conditions where there is little oxygen.

Indicator species	Time A	Time D
Mayfly nymph		
Bloodworm		

- (i) Complete the table by writing a ✓ to show if each indicator species is present in large numbers, at times **A** and **D** given on the graph. [1 mark]
- (ii) There would be less algal growth in the lake if the fertiliser runoff occurred in winter rather than in summer.

Suggest **two** reasons for this. [2 marks]

---



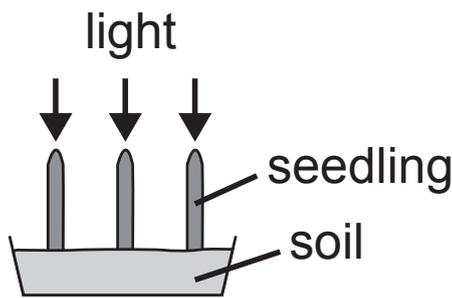
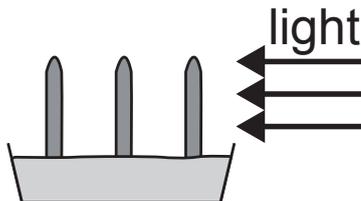
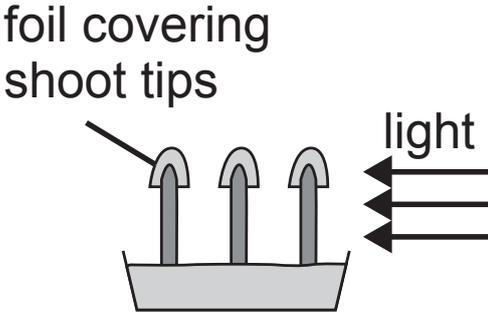
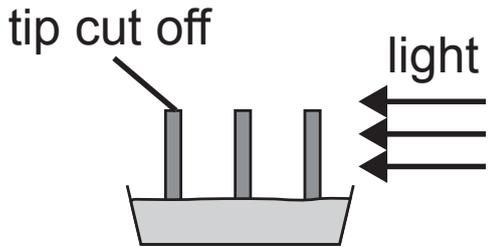
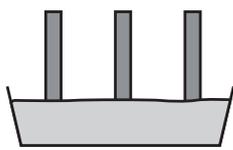
---

**BLANK PAGE**

**(Questions continue overleaf)**

7 The diagram shows four experiments investigating phototropism in plants.

(a) Complete the diagrams for experiments 1, 2 and 3 to show what you would expect to see after four days.  
[4 marks]

Experiment	Start	Four days later
1		
2		
3		
4		

**(b)** Explain why there is no seedling growth in experiment 4.  
[2 marks]

---

---

---

- 8 An area of tropical forest was cleared by burning the trees. The remains of the burnt trees were left to decompose for 3 months.

A crop was planted at 3 months and again at 9 and 15 months. The table shows the nitrate levels in the soil during the period 0 to 20 months.

<b>Time/months</b>	<b>Activity</b>	<b>Nitrate levels in soil/ arbitrary units</b>
0	Ground cleared	100
<b>3</b>	<b>Crop planted</b>	200
8	Crop harvested	140
<b>9</b>	<b>Crop planted</b>	140
14	Crop harvested	90
<b>15</b>	<b>Crop planted</b>	90
20	Crop harvested	50



---

**THIS IS THE END OF THE QUESTION PAPER**

---



**SOURCES**

Q2 - - - - Image of Elephant ©Art Wolfe. Mint Images / Science Photo Library

Q2 - - - - Text © Adapted from Pachyderm politics and the powerful female, by Lesley Evans Ogden, New Scientists, 4th January 2014

Q2(e) - - - Graph © Adapted from Pachyderm politics and the powerful female, by Lesley Evans Ogden, New Scientists, 4th January 2014

Q4 - - - - Images of cylinder and dough and stopwatch © Chief Examiner

Q6 - - - - Graph showing the numbers of bacteria in a lake © Chief Examiner

Q7 - - - - Diagram showing four experiments investigating phototropism in plants © Chief Examiner

Q8 - - - - Source: Principal Examiner

For Examiner's use only	
Question Number	Marks
1	
2	
3	
4	
5	
6	
7	
<b>8</b>	

**Total  
Marks**

Permission to reproduce all copyright material has been applied for.

In some cases, efforts to contact copyright holders may have been unsuccessful and CCEA will be happy to rectify any omissions of acknowledgement in future if notified.