Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2015–2016

Double Award Science: Biology

GSD12

Unit B1
Higher Tier

[GSD12]

WEDNESDAY 11 NOVEMBER 2015, MORNING

TIME

1 hour.

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 down the right-hand side of pages indicate the marks awarded to each question or part question.
Quality of written communication will be assessed in Question **3(a)**.

For Examiner's use only	
Question Number	Marks
1	
2	
3	
4	
5	
6	
7	
8	
Total Marks	

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Examiner Only
Marks | Remark

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.

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

[4]

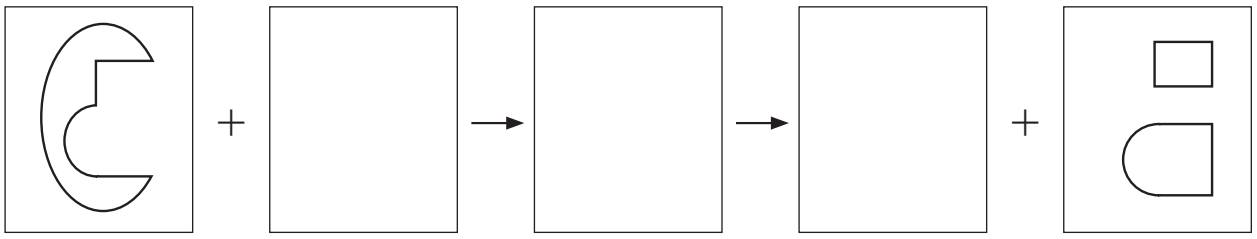
(b) Give **two** conditions that affect enzyme activity.

1. _____

2. _____ [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.



Enzyme | Substrate | Enzyme substrate complex | | Products

[3]

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

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

1. _____

2. _____

3. _____ [3]

Examiner Only	
Marks	Remark

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

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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

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. 5

Older matriarchs move their family groups over long distances to find water and food when they are scarce. 7

Family groups with older matriarchs had the lowest baby elephant death rates during a drought. 9

Male lions can overpower and kill baby elephants. 11

When older matriarchs recognise a roar from a male lion they will make their family groups come close together. 13

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

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]

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

_____ [1]

(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]

(d) **(i)** Use the information in the passage to draw a food chain that includes elephants. (Lines 4, 5 and 11)

[2]

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

Label the organisms in the pyramid.

[2]

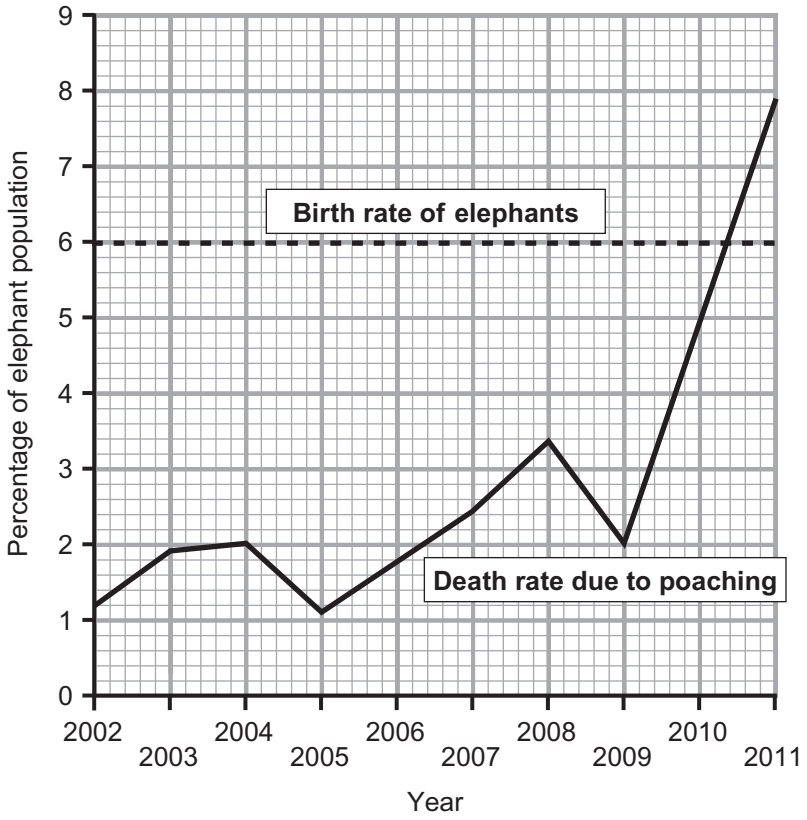
Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

(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.



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

(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]

(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.

Show your working.

_____ thousand [3]

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

_____

_____ [1]

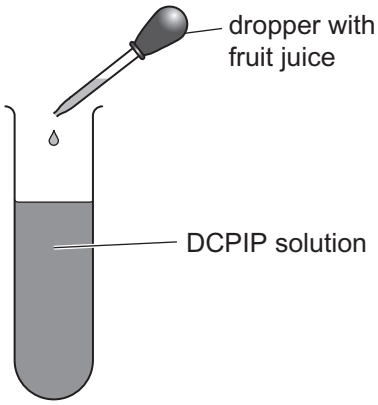
Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

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
X	20
Y	5
Z	10

Use the information above and your knowledge to:

- state the colour change you would expect to see
- give **three** variables that should be controlled in this experiment
- name the fruit juice that had the highest vitamin C content and explain why you chose this fruit juice.

In this question you will be assessed on your written communication skills, including the use of specialist scientific terms.

Examiner Only	
Marks	Remark

_____

_____

_____

_____

_____

_____ [6]

(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**.

Show your working.

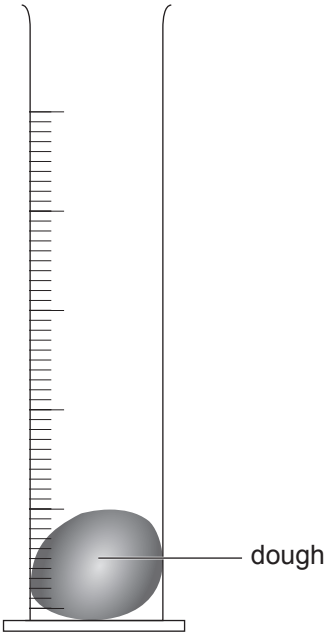
_____ mg [2]

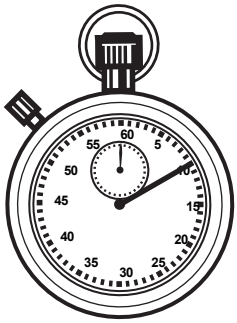
Examiner Only	
Marks	Remark

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.





stopwatch

The yeast in the dough carry out anaerobic respiration.

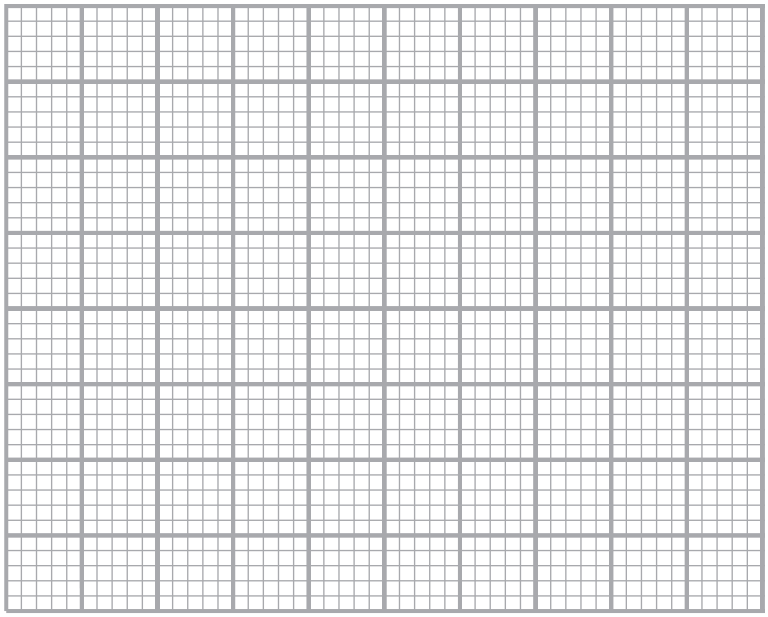
(a) Name the gas produced during anaerobic respiration in this experiment.

_____ [1]

(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^3
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]

(ii) Between which 10 minute period did the dough rise fastest?

_____ and _____ minutes [1]

(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]

(c) Name the substance produced by anaerobic respiration in mammalian muscles.

_____ [1]

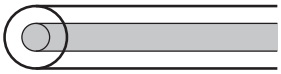
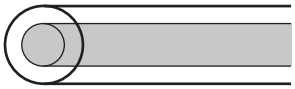
Examiner Only

Marks	Remark

Examiner Only

Marks	Remark

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.

1. _____

2. _____ [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]

(b) **(i)** What makes up the CNS (Central Nervous System)?

_____ and _____ [1]

(ii) What is the role of the CNS in the body?

_____

_____ [2]

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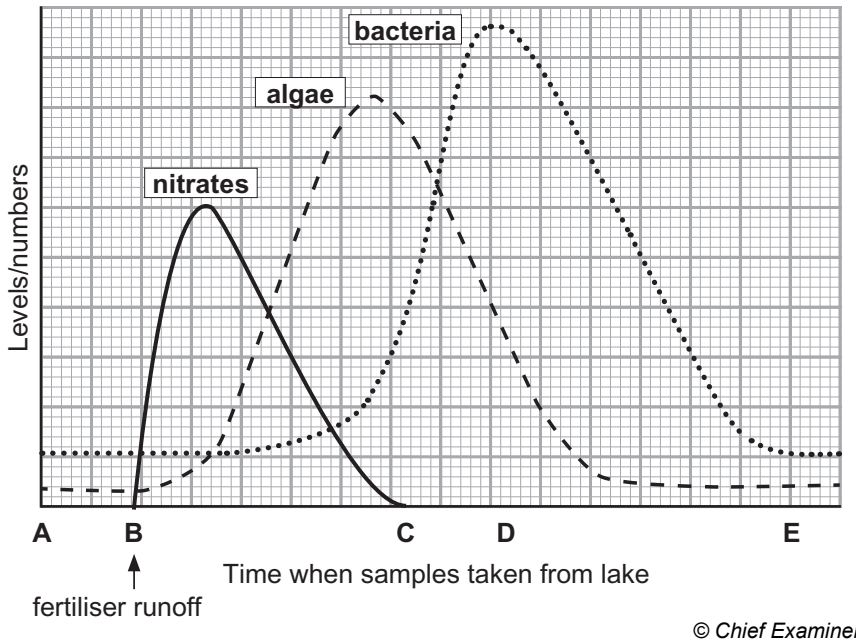
Examiner Only	
Marks	Remark

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]

(ii) Many fish in this lake will die. Explain why.

_____

_____

_____ [2]

(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]

(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.

_____

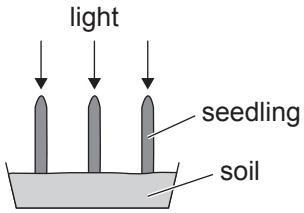
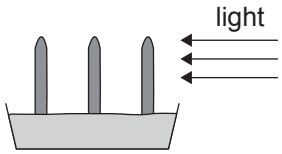
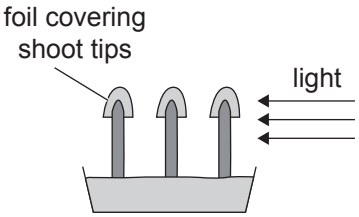
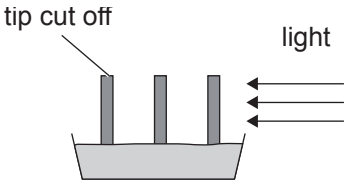
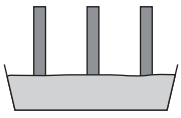
_____ [2]

Examiner Only

Marks	Remark

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.

Experiment	Start	Four days later
1		
2		
3		
4		

[4]

(b) Explain why there is no seedling growth in experiment **4**.

_____

_____

_____ [2]

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(Questions continue overleaf)

Examiner Only

Marks	Remark

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.

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

Source: Principal Examiner

(a) Use your knowledge of the nitrogen cycle and the information in the table to:

- describe and explain the reasons for the changes in soil nitrate levels during the first three months
- describe and explain the **overall** trend in soil nitrate levels from 3 months to 20 months.

Examiner Only

Marks	Remark

[6]

(b) Suggest why this land was abandoned and no crop planted after 20 months.

[1]

THIS IS THE END OF THE QUESTION PAPER