



General Certificate of Secondary Education  
2016–2017

Centre Number

--	--	--	--	--

Candidate Number

--	--	--	--

---

# Double Award Science: Biology

Unit B1  
Higher Tier

**MV18**

[GSD12]

**WEDNESDAY 9 NOVEMBER 2016, 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 seven** 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.

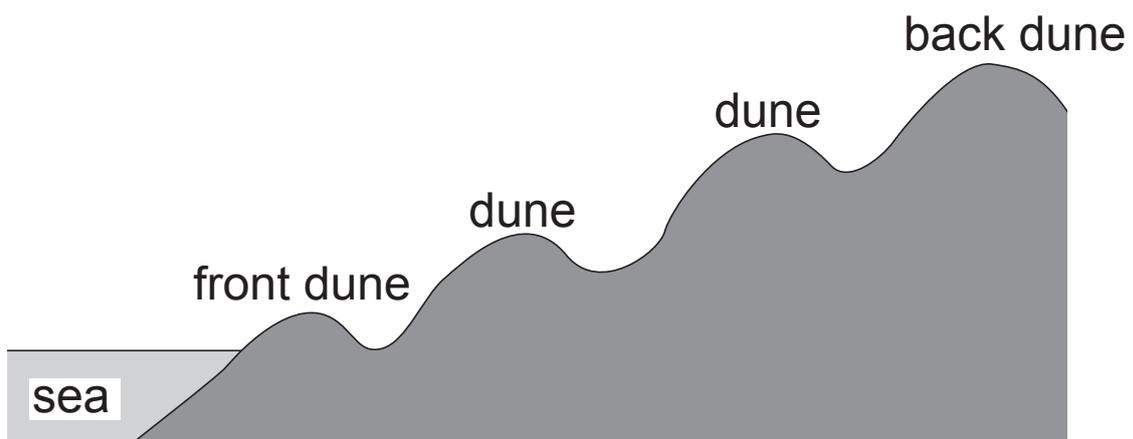
Quality of written communication will be assessed in Question **2(a)**.

1 Marram grass is a plant found growing on sand dunes.

The photograph shows marram grass growing on sand dunes.



The diagram shows four sand dunes.





- (b) The pupils investigated two abiotic factors. These were the salt content and the pH of the sand the marram grass was growing in.

The table shows the pupils' results.

Distance from the front sand dune/metres	Percentage cover of marram grass	Salt content/ arbitrary units	pH
0	10	6.5	7.4
8	20	6	7.6
16	33	5.5	7.8
24	40	4.5	7.9
32	50	2.5	8.1
40	5	1.5	7.2

Use the results in the table to answer the following questions.

- (i) Describe the **trend** in the percentage cover of marram grass from the front sand dune to the back sand dune. [1 mark]

---



---



---

- (ii) Give the salt content and pH of the sand that is best for the growth of the marram grass. [2 marks]

Salt content \_\_\_\_\_ arbitrary units

pH \_\_\_\_\_

(c) What would the pupils have used to measure the pH of the sand? [1 mark]

---

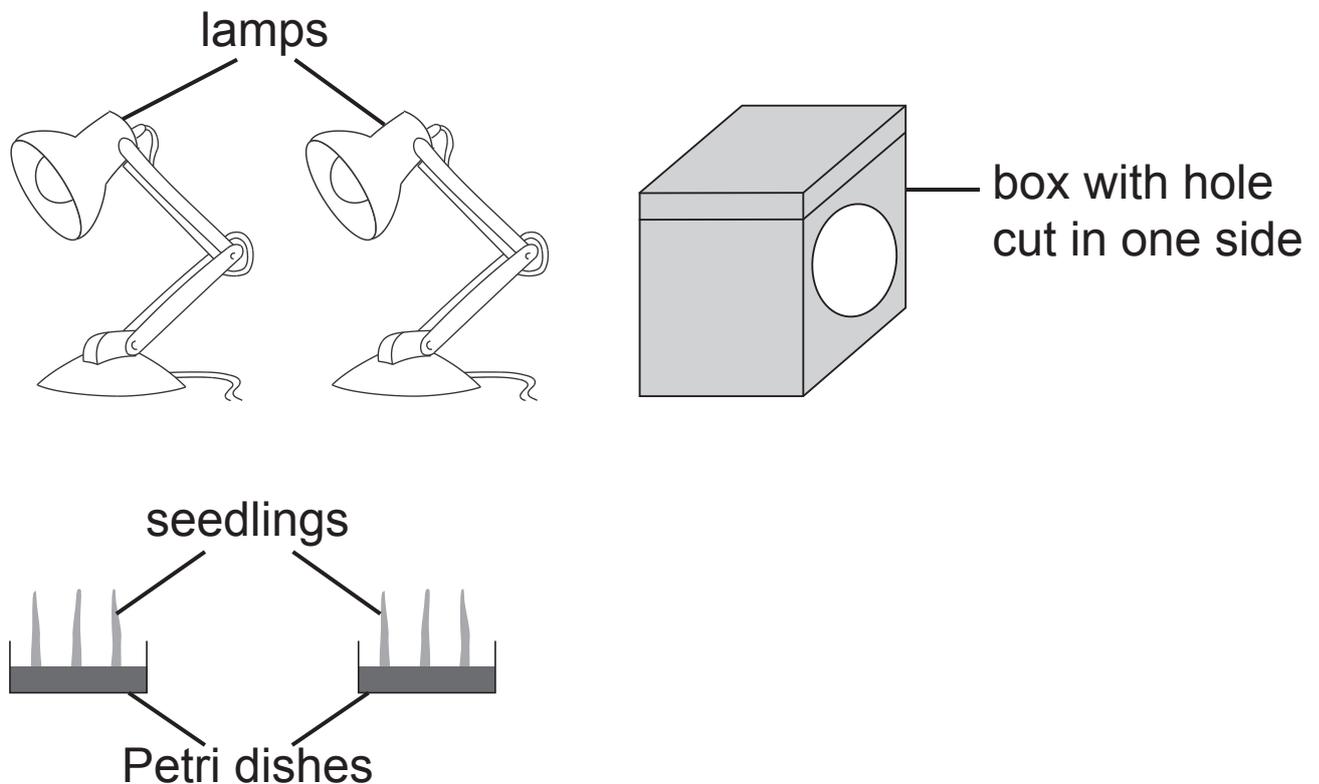
(d) Give **one biotic** factor that may affect the distribution of the marram grass in the sand dunes. [1 mark]

---

2 The growth response of a plant to light is called phototropism.

Cathy was asked to carry out an experiment to compare the **growth response** of plant seedlings to light shining from above and to light shining from one side.

(a) Describe how she would use the apparatus and materials in the diagram to carry out this experiment.





(b) Describe the results you would expect Cathy to obtain.  
[2 marks]

---

---

---

---

(c) Give **two** factors she would have controlled in this experiment. [2 marks]

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

(d) (i) Which part of the seedlings responds to light?  
[1 mark]

---

(ii) Name the plant hormone which causes this response to light. [1 mark]

---

**BLANK PAGE**

**(Questions continue overleaf)**

- 3 (a) When the leaves of trees drop to the ground they are decomposed by various types of fungi.

These fungi produce enzymes to break down the different substances in the leaves.

**Table 1** gives information about three types of fungi and the enzymes they produce.

**Table 1**

<b>Fungus</b>	<b>Enzyme produced</b>	<b>Substance broken down by enzyme</b>
Type 1	Lignase	Lignin, a woody substance in plant cell walls
Type 2	Amylase	Starch, found in leaf cells
Type 3	Cellulase	Cellulose, found in plant cell walls

**Table 2** shows the percentage of substances **remaining** in the decomposing leaves over a period of 15 weeks.

**Table 2**

<b>Time/ weeks</b>	<b>Percentage of substance remaining/%</b>		
	<b>Lignin</b>	<b>Starch</b>	<b>Cellulose</b>
0	100	100	100
5	100	70	100
10	100	40	80
15	90	10	60

- (i) Use the information in **Table 2** opposite to suggest which substance will take the **longest** time to be broken down. [3 marks]

Substance \_\_\_\_\_

Explain your answer using **data** from **Table 2**.

---

---

---

---

- (ii) Use the information in **Tables 1** and **2** opposite to give the **type of fungus** that gave the fastest rate of substance breakdown in the leaves. [1 mark]

Type \_\_\_\_\_

- (iii) Use the data in **Table 2** opposite to calculate the rate of breakdown of starch **per week** in the leaves over the 15 week period. [2 marks]

**Show your working.**

\_\_\_\_\_ % per week

(iv) What substance will be produced when amylase breaks down starch in the leaves? [1 mark]

\_\_\_\_\_

(b) Other fungi and bacteria continue to decompose the leaves.

This results in minerals being released into the soil.

(i) Name the plant cells that absorb minerals from the soil. [1 mark]

\_\_\_\_\_

(ii) Name **another** substance, apart from minerals, that these cells absorb from the soil. [1 mark]

\_\_\_\_\_

(iii) What substance do plants make from the nitrates they absorb from the soil? [1 mark]

\_\_\_\_\_

(c) (i) State **three** features that give the small intestine a large surface area for the absorption of digested foods in humans. [3 marks]

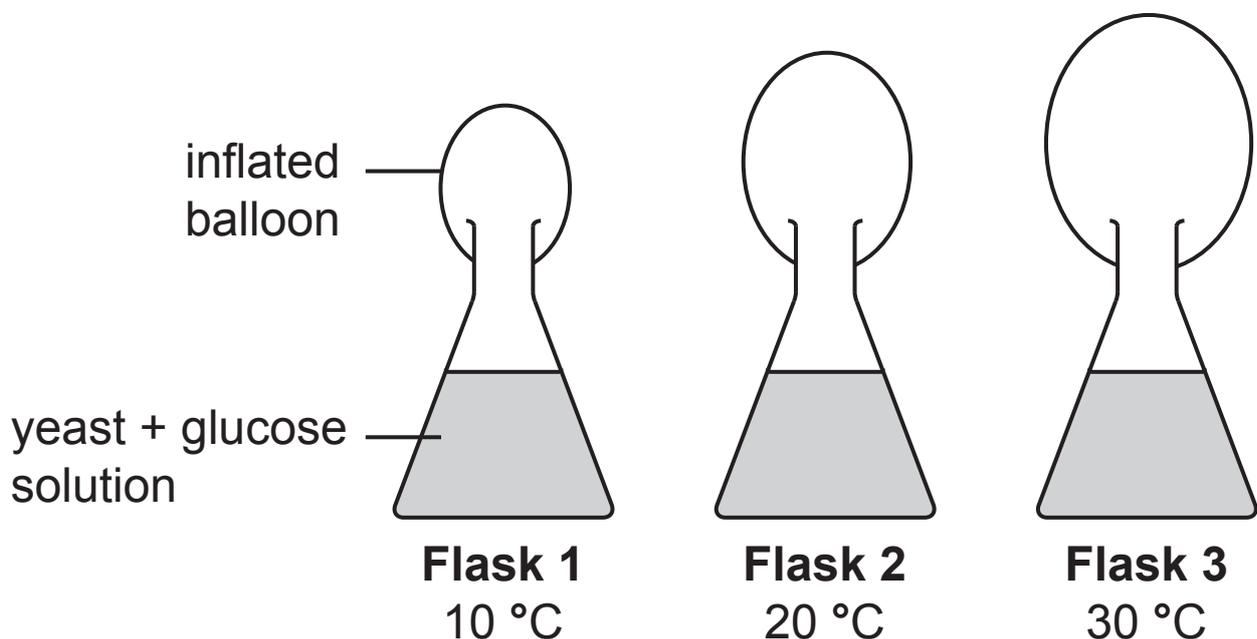
1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_

(ii) Other than having a large surface area, give **two** adaptations of respiratory surfaces in humans. [2 marks]

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

- 4 Paula carried out an investigation into the effect of temperature on the growth of yeast. She added an equal amount of a yeast and glucose solution to each of three flasks. Paula then attached a deflated balloon to the top of each flask. She kept the flasks at the temperatures shown on the diagram for four hours.

The diagram shows the results Paula obtained.



- (a) Explain why the balloon in flask 3 had the **biggest** increase in size. [3 marks]

---

---

---

---

---

---

---

---

**(b)** Paula took a sample of the contents of flask 3 at the start of her investigation and again after four hours, when the balloon had stopped inflating. She carried out a Benedict's test on the two samples.

Describe and explain the results that Paula would have obtained from both samples. [2 marks for each part]

**(i)** At the start \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**(ii)** After four hours \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

The yeast carried out anaerobic respiration. As well as a gas, another substance was produced by the yeast in the flasks.

**(c)** Name this substance. [1 mark]  
\_\_\_\_\_

5 (a) The Central Nervous System (CNS) controls and coordinates the responses in the body between the receptors and effectors.

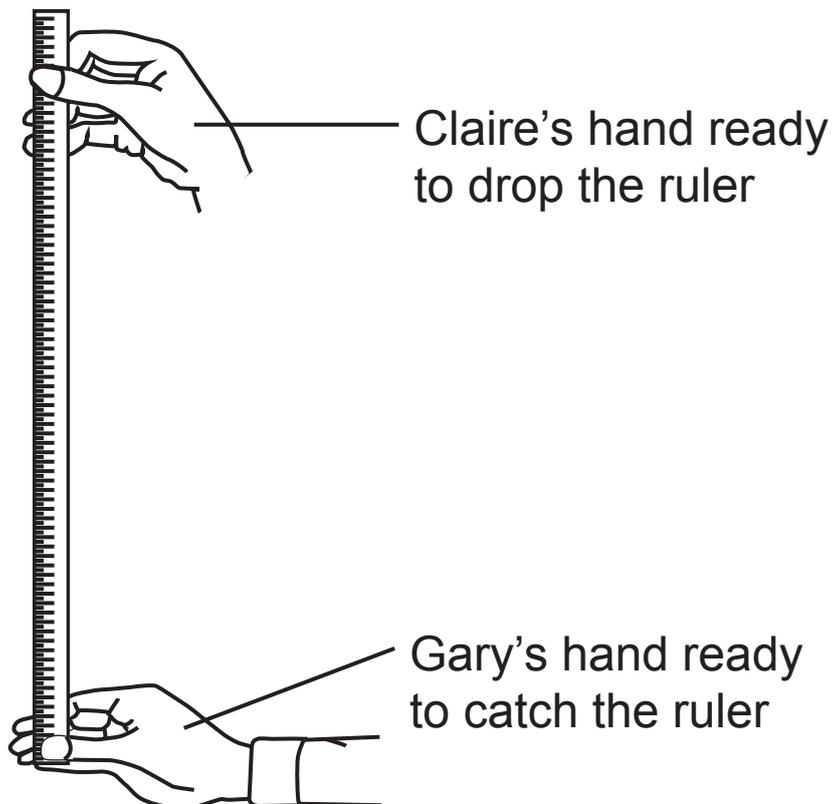
(i) Name the parts of the Central Nervous System (CNS). [1 mark]

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

(ii) Name **one** effector in the body. [1 mark]

\_\_\_\_\_

(b) The diagram shows an experiment two students carried out to measure the time taken to catch a ruler.



Claire dropped the ruler four times and recorded the distance it dropped each time before Gary caught it. These distances were converted to the time taken to catch the ruler.

The table shows the results.

Ruler drop	Time taken to catch the ruler/s	
1	0.168	
2	0.165	
3	0.120	
4	0.169	
	Average time	0.156

(i) The result from ruler drop 3 made this experiment less reliable.

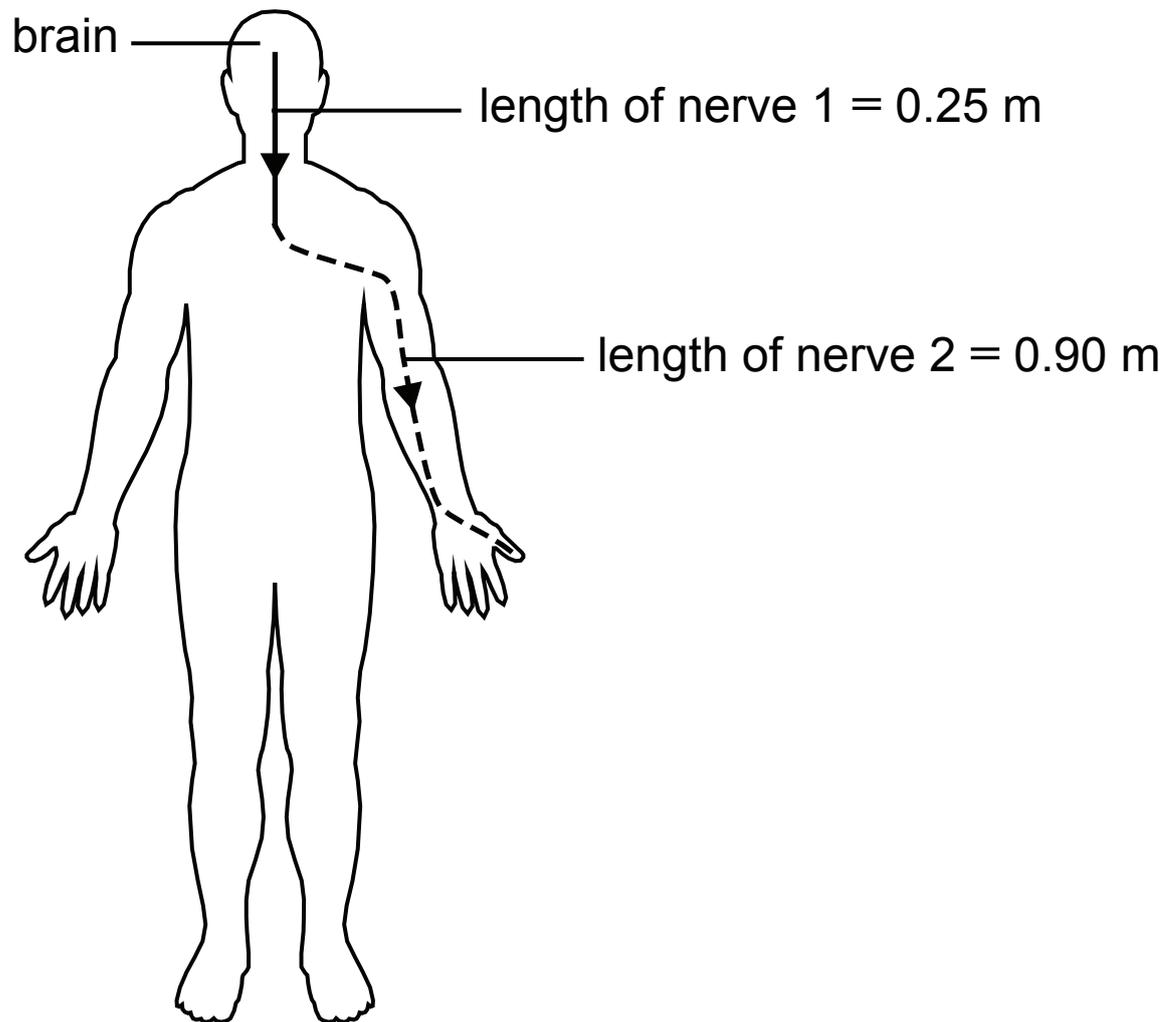
Explain why. [1 mark]

---

---

---

The diagram shows the approximate lengths of Gary's nerves involved in catching the ruler.



The speed of a nerve impulse can be obtained using the equation

$$\text{Speed m/s} = \frac{\text{Distance travelled by the impulse along the nerves}}{\text{Time}}$$

The average time taken for Gary to catch the ruler was 0.156 s.

(ii) Use this average time and the information above to calculate the speed of Gary's nerve impulse when catching the ruler.

Give your answer to two decimal places. [2 marks]

**Show your working.**

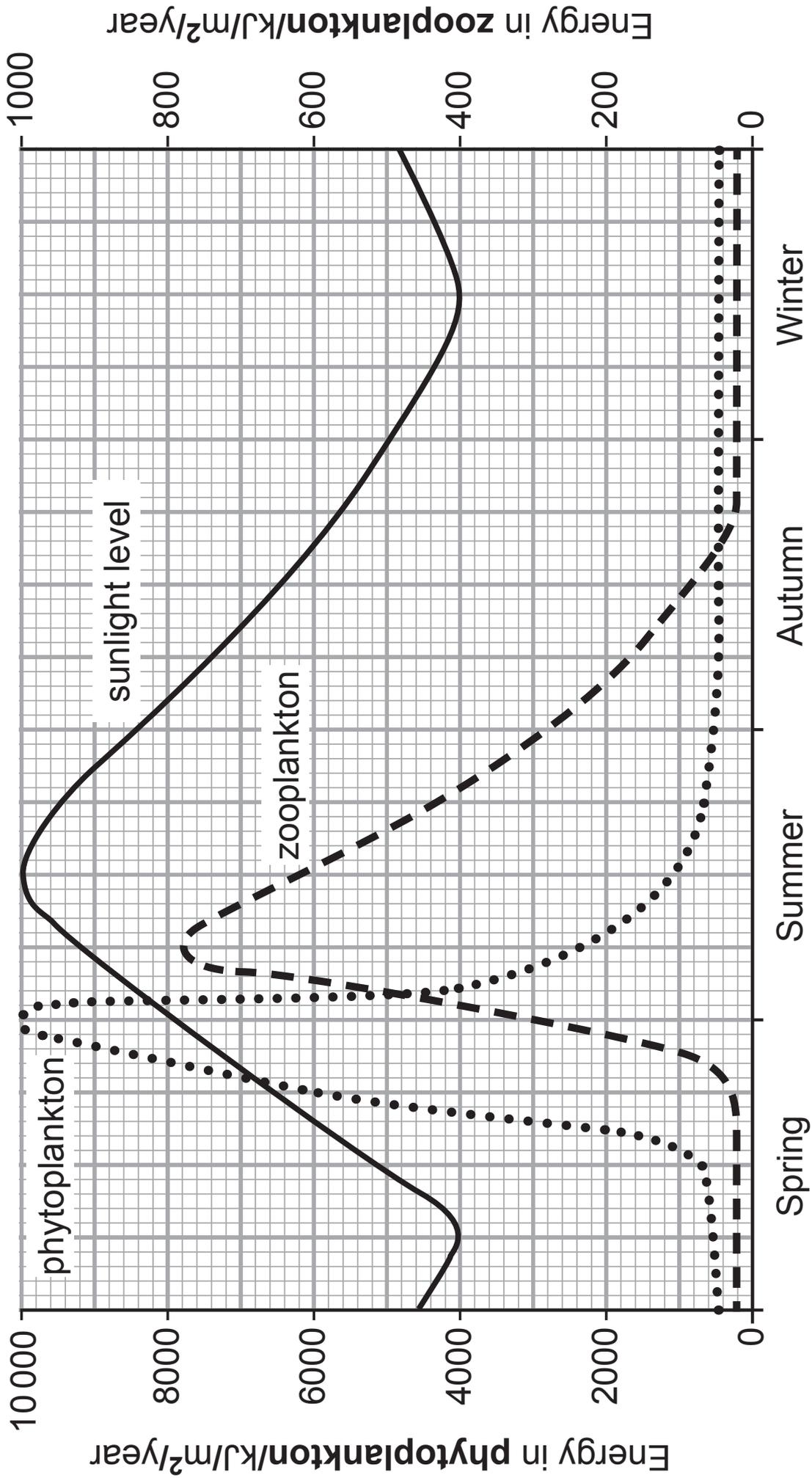
\_\_\_\_\_ m/s

(c) The nervous system is one communication system in the body.

Name another communication system in the body.

[1 mark]

\_\_\_\_\_



6 Phytoplankton are small plants found in ponds, lakes and seas.

Zooplankton are small animals which feed on the phytoplankton.

The food chain in a lake is given below.

phytoplankton → zooplankton → small fish → large fish

(a) Suggest **one** reason why very little of the sunlight energy reaching the lake is converted into energy in the phytoplankton. [1 mark]

---

---

(b) The graph opposite shows data for the amount of **energy** ( $\text{kJ/m}^2$ ) in a lake in one year for phytoplankton and zooplankton.

The graph is using **two different scales**.

The graph also shows the sunlight levels.

(i) Use the information in the graph and your knowledge to suggest **two** reasons for the increase in **energy** in phytoplankton in the spring of this year. [2 marks]

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

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

\_\_\_\_\_

- (ii) Use data from the graph to calculate the percentage of the energy in the phytoplankton that is converted to the energy in the **zooplankton** when both are at their maximum values. [2 marks]

**Show your working.**

\_\_\_\_\_ %

- (iii) Use the information in the graph and the food chain opposite to suggest why the numbers of small fish start to decrease in this lake in late summer/early autumn. [2 marks]

---

---

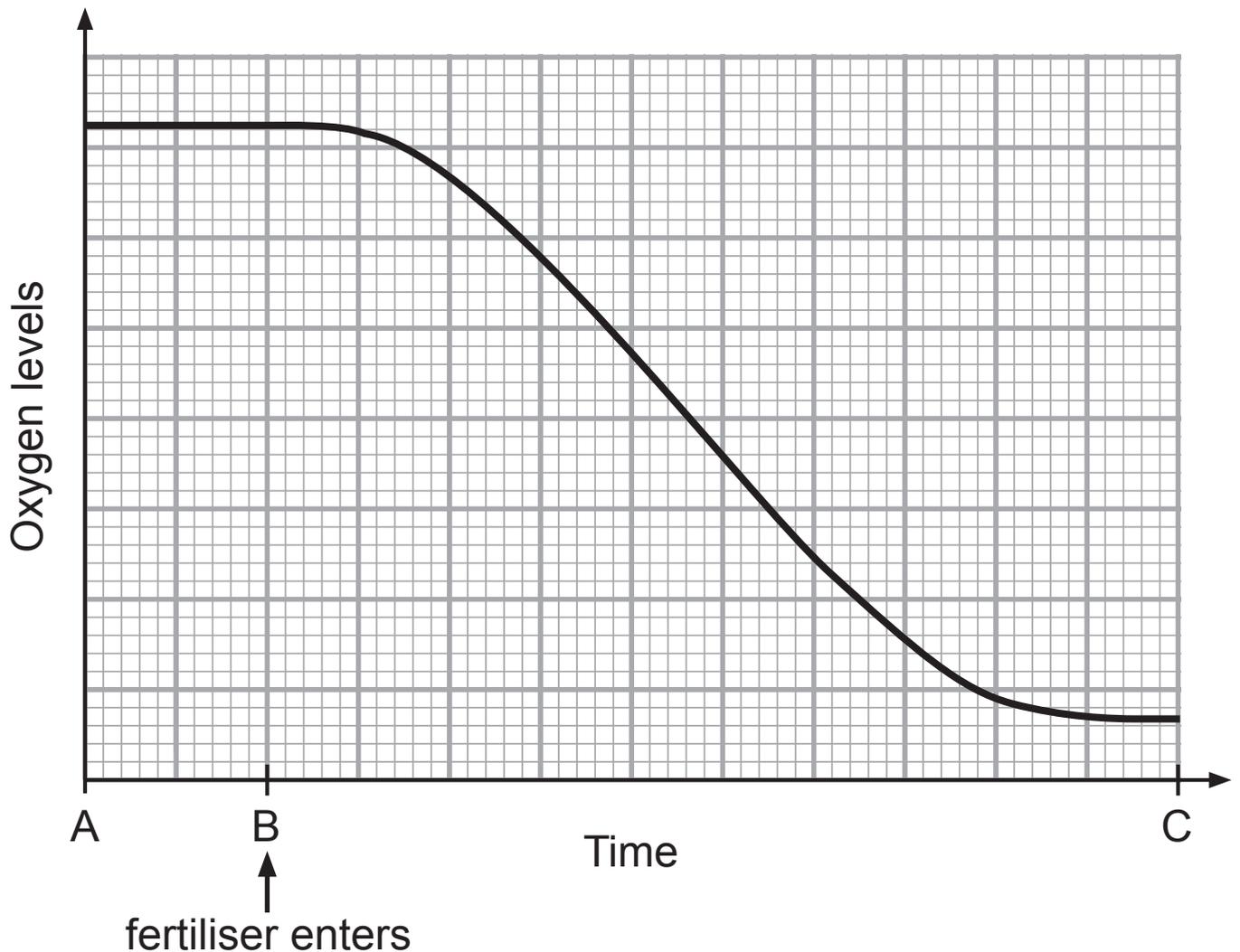
---

**BLANK PAGE**

**(Question continues overleaf)**

(c) In one other year excess fertiliser entered the lake from nearby fields.

The graph shows oxygen levels in the lake before and after the excess fertiliser had entered the lake.



(i) Explain what happened in the lake to cause the decrease in oxygen levels between times B and C. [4 marks]

---



---



---



---

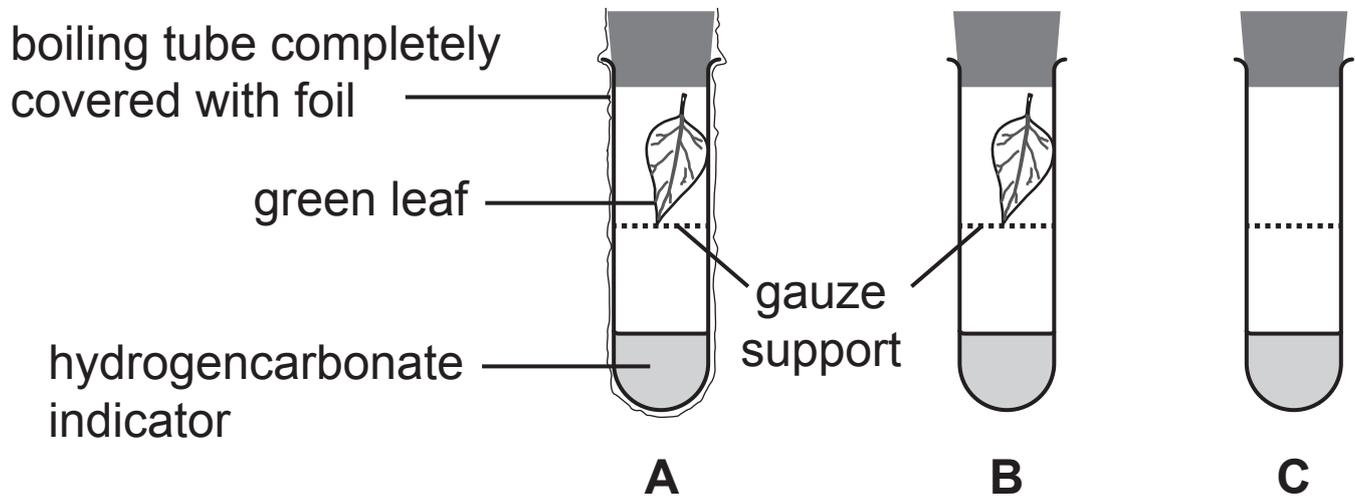


---



7 John carried out an investigation into photosynthesis and respiration.

The diagram shows how he set up the investigation.



He left the boiling tubes for two days **in light** and then recorded the colour of the hydrogencarbonate indicator in each test tube.

Complete the table by writing in the empty boxes.  
[(a) and (b) 3 marks each, (c) 2 marks]

	<b>Boiling tube</b>	<b>Colour of hydrogen carbonate indicator</b>	<b>Explanation</b>
(a)	<b>A</b>		
(b)	<b>B</b>		
(c)	<b>C</b>	red	

---

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

---

**SOURCES**

Q1.....© Annie Haycock / Science Photo Library

Q1(b) ..... Source: Principal Examiner

Q2..... Source: Principal Examiner

Q3(a) ..... Source: Principal Examiner

Q4..... Source: Principal Examiner

Q5(a).....© Advanced Biology, Principles & Applications by C.J. Clegg and D.G. Mackean. Published by Hodder Education (ISBN: 9780719550782) "Reproduced by permission of Hodder Education"

Q5(b) ..... Source: Modified from Clegg and Mackean Advanced Study Guide ISBN 0-7195-5358-X

Q5(b)(i) .. Source: Principal Examiner

Q6(b) ..... Source: Principal Examiner

Q6(c)..... Source: Principal Examiner

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

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.