



General Certificate of Secondary Education
2016–2017

Centre Number

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Candidate Number

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Double Award Science: Biology

Unit B1
Higher Tier



[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 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 **2(a)**.

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

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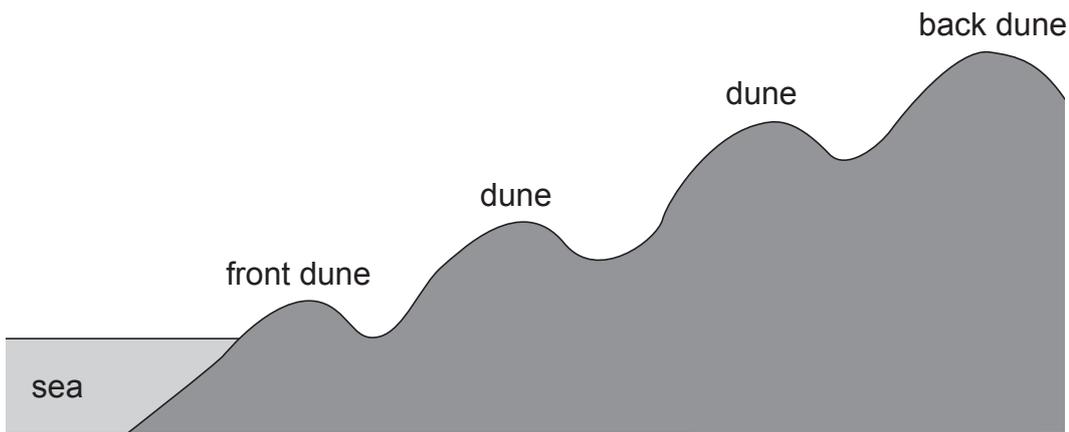
1 Marram grass is a plant found growing on sand dunes.

The photograph shows marram grass growing on sand dunes.



© Annie Haycock / Science Photo Library

The diagram shows four sand dunes.



Source: Principal Examiner

Examiner Only	
Marks	Remark
○	○

- (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

Source: Principal Examiner

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

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

_____ [1]

- (ii) Write down the salt content and pH of the sand that is best for the growth of the marram grass.

Salt content _____ arbitrary units

pH _____ [2]

- (c) What would the pupils have used to measure the pH of the sand?

_____ [1]

- (d) Write down **one biotic** factor that may affect the distribution of the marram grass in the sand dunes.

_____ [1]

Examiner Only

Marks Remark

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(Questions continue overleaf)

- 3 (a) When the leaves of trees drop to the ground they are decomposed by different types of fungi. These fungi produce enzymes to break down the different substances in the leaves. **Table 1** shows information about three types of fungi and the enzymes they produce.

Table 1

Fungus	Enzyme produced	Substance broken down by enzyme
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

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

Source: Principal Examiner

Examiner Only	
Marks	Remark
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- (i) Look at **Table 2**. What substance do you think will take the **longest** time to be broken down?

Substance _____

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

_____ [3]

- (ii) What **type of fungus** gave the fastest rate of substance breakdown in the leaves?
Use the information in **Tables 1** and **2** to answer this question.

Type _____ [1]

- (iii) Calculate the rate of breakdown of starch **per week** in the leaves over the 15 week period.
Use the data in **Table 2** to do this.

Show your working out.

_____ % per week [2]

- (iv) What substance will be produced when amylase breaks down starch in the leaves?

_____ [1]

Examiner Only	
Marks	Remark

(b) Other fungi and bacteria continue to decompose the leaves.
This means that minerals are released into the soil.

(i) Write down the name of the plant cells that absorb minerals from the soil.

_____ [1]

(ii) These plant cells also absorb **another substance** as well as minerals. Write down the name of this **other substance**.

_____ [1]

(iii) What substance do plants make from the nitrates they absorb from the soil?

_____ [1]

(c) (i) Write down **three** features that give the small intestine a large surface area for the absorption of digested foods in humans.

1. _____

2. _____

3. _____ [3]

(ii) Respiratory surfaces in humans have a large surface area. Write down **two** other adaptations of respiratory surfaces in humans.

1. _____

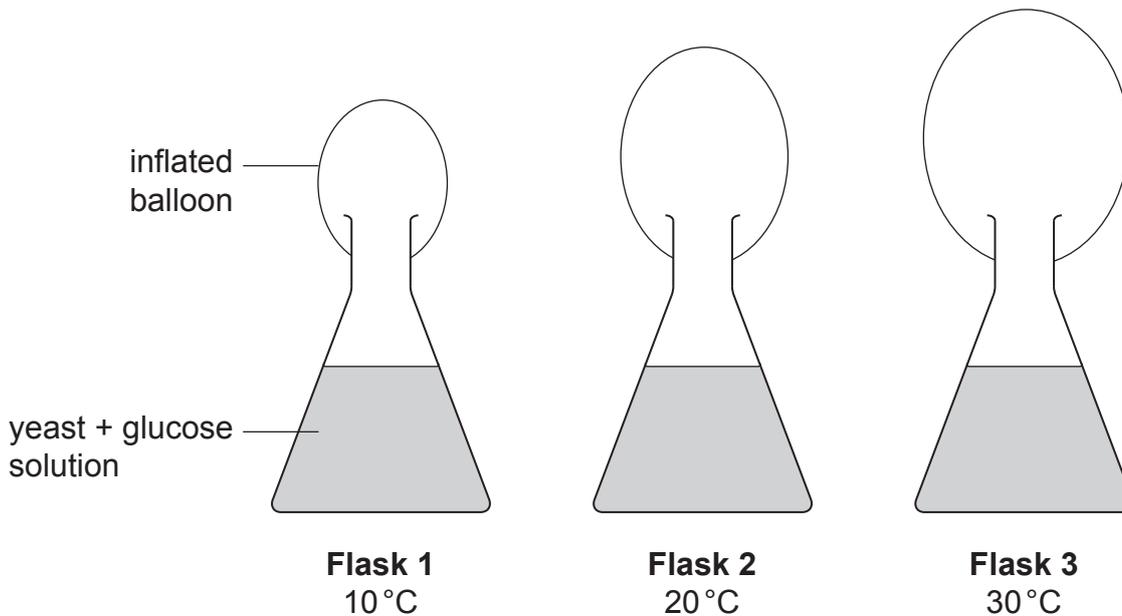
2. _____ [2]

Examiner Only	
Marks	Remark

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- 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 (a balloon that had nothing in it) 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 got.



Source: Principal Examiner

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

[3]

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

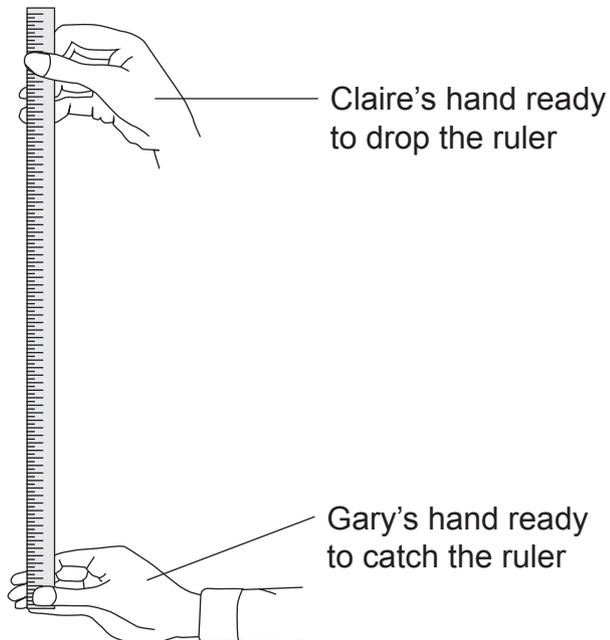
(i) Write down the names of the parts of the Central Nervous System (CNS).

_____ and _____ [1]

(ii) Write down the name of **one** effector in the body.

_____ [1]

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



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Marks	Remark
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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.

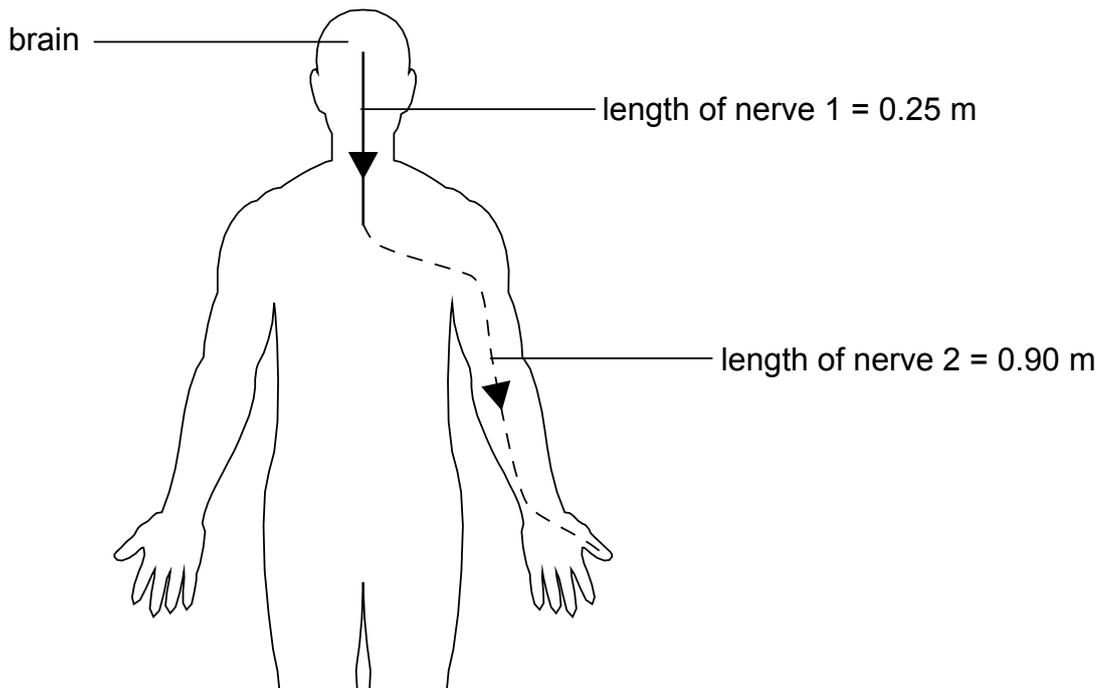
The table shows the results.

Ruler drop	Time taken to catch the ruler/s	
	Marks	Remark
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]

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



Source: Principal Examiner

You can work out the speed of a nerve impulse by 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. Write your answer to two decimal places.

Show your working out.

_____ m/s [2]

Examiner Only	
Marks	Remark

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

Write down the name of another communication system in the body.

_____ [1]

Examiner Only	
Marks	Remark

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.

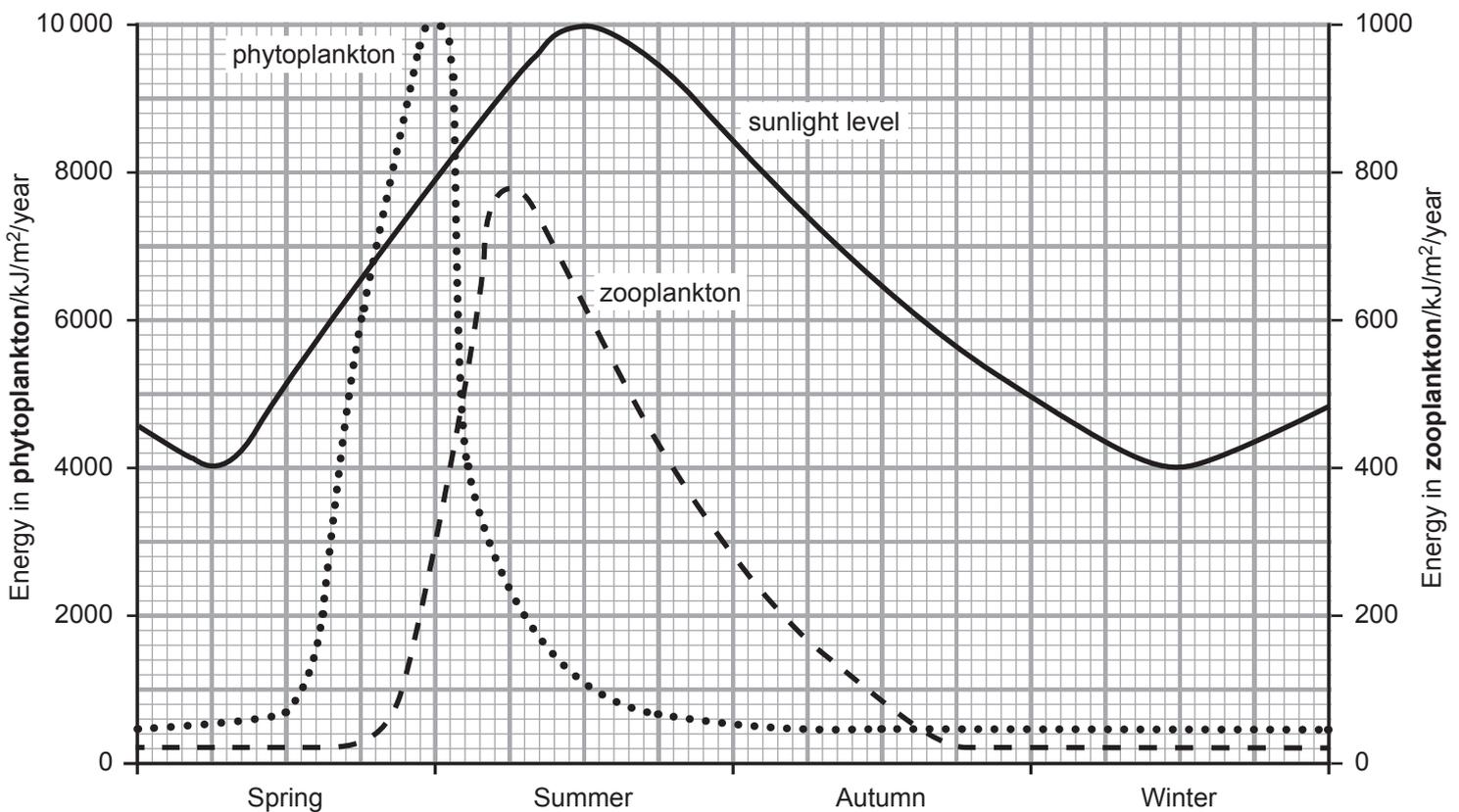
phytoplankton → zooplankton → small fish → large fish

(a) Write down **one** reason why very little of the sunlight energy reaching the lake is converted into energy in the phytoplankton.

_____ [1]

(b) The graph shows data for the amount of **energy** (kJ/m²) in a lake in one year for phytoplankton and zooplankton. The graph is using **two different scales**. The graph also shows the sunlight levels.

Examiner Only	
Marks	Remark
○	○



Source: Principal Examiner

- (i) Write down **two** reasons for the increase in **energy** in phytoplankton in the spring of this year. Use the information in the graph and what you know to help you answer this question.

1. _____

2. _____

_____ [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.

Show your working out.

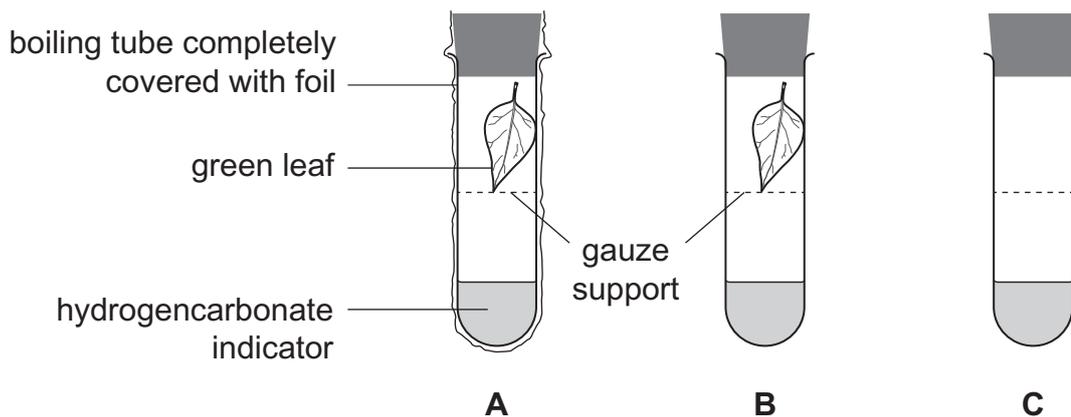
_____ % [2]

- (iii) Why do the numbers of small fish start to decrease in this lake in late summer/early autumn? Use the information in the graph and the food chain opposite to help you answer this question.

_____ [2]

Examiner Only	
Marks	Remark

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.

Write the missing answers in the table below.

Examiner Only	
Marks	Remark
○	○

	Boiling tube	Colour of hydrogen carbonate indicator	Explanation	
(a)	A			[3]
(b)	B			[3]
(c)	C	red		[2]

THIS IS THE END OF THE QUESTION PAPER

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