

New  
Specification



Centre Number

71	
----	--

Candidate Number

--

General Certificate of Secondary Education  
2011–2012

## Double Award Science: Biology

Unit B1

Higher Tier

[GSD12]

TUESDAY 8 NOVEMBER 2011

1.30 pm–2.30 pm



### 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 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 **questions requiring extended answers**.

For Examiner's  
use only

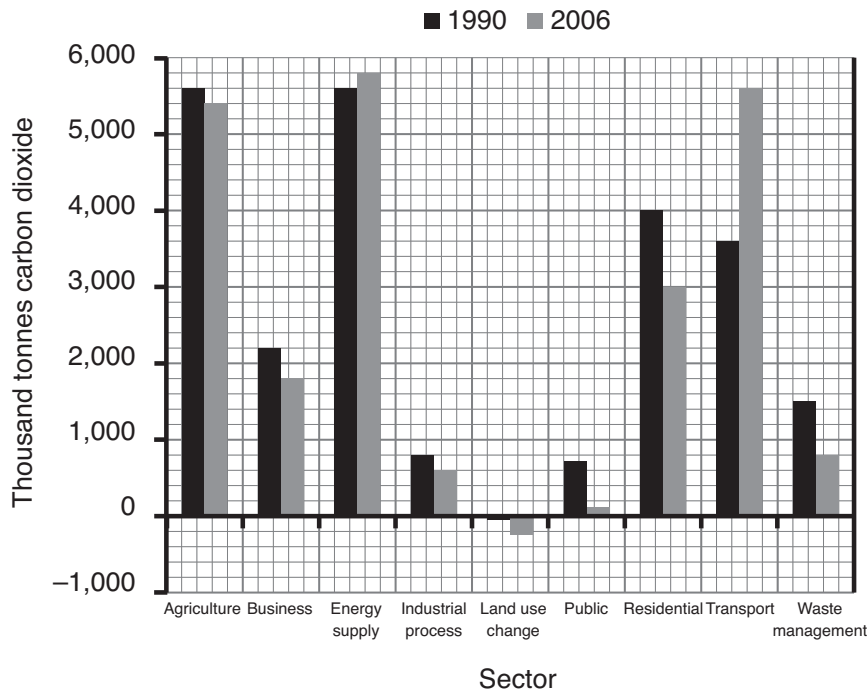
Question Number	Marks
1	
2	
3	
4	
5	
6	
7	

Total  
Marks

--



1 Carbon dioxide is a greenhouse gas. The graph shows the levels of greenhouse gas emissions from different sources in Northern Ireland in 1990 and 2006.



© Crown copyright - NIEA

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

(a) What are the **three** main sectors that contributed to greenhouse gas emissions in 2006?

\_\_\_\_\_ [1]

(b) What is the general trend for greenhouse gas emissions in the time period from 1990 to 2006? Give any examples of exceptions to this trend.

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_ [2]

Examiner Only	
Marks	Remark

(c) Suggest **one** reason why it is difficult to reduce greenhouse gas emissions.

\_\_\_\_\_ [1]

(d) Why is it important to monitor greenhouse gas emissions?

\_\_\_\_\_ [1]

(e) Explain **one** harmful consequence of global increases in greenhouse gases on:

climate \_\_\_\_\_ [1]

plants \_\_\_\_\_

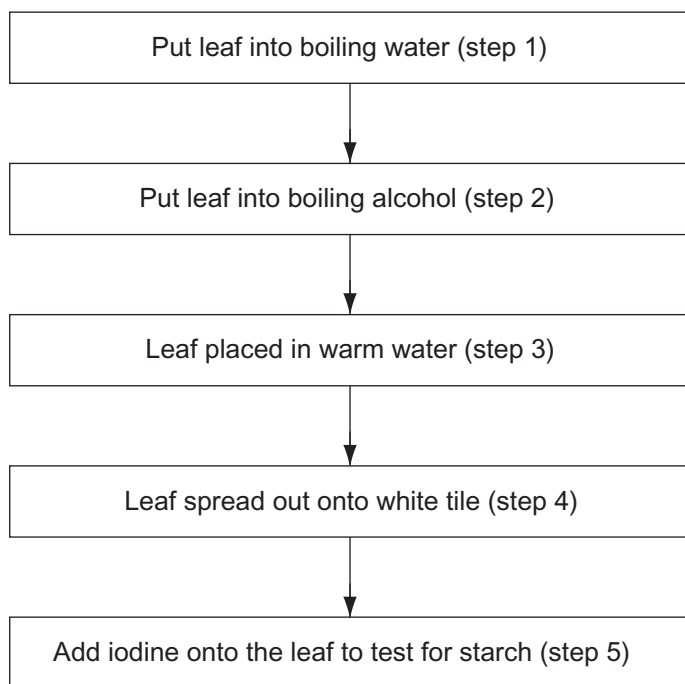
\_\_\_\_\_ [1]

Examiner Only	
Marks	Remark



**BLANK PAGE**  
**(Questions continue overleaf)**

3 The flow diagram shows the steps involved in testing a leaf for starch.



(a) What safety precaution must be taken during step 2?

\_\_\_\_\_ [1]

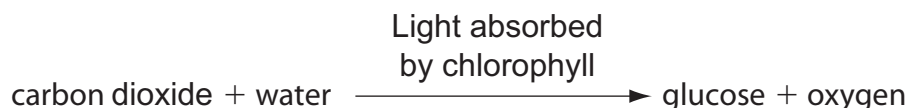
(b) Explain the significance of step 3.

\_\_\_\_\_ [1]

(c) After step 5, what colour will the leaf be if starch is present?

\_\_\_\_\_ [1]

(d) The overall equation for photosynthesis is given below.



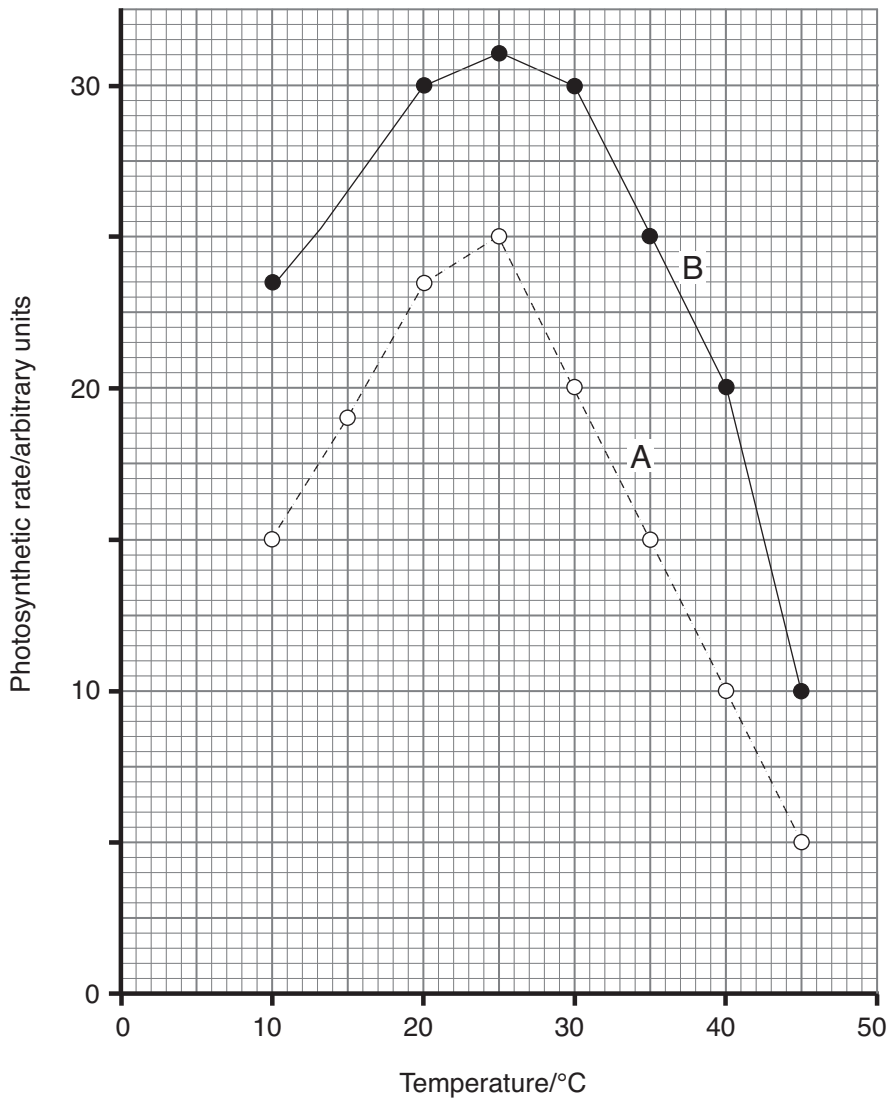
As well as being converted to starch for storage, describe two other ways in which the glucose is used by the plant.

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

2. \_\_\_\_\_ [2]

Examiner Only	
Marks	Remark

- (e) The graph below shows the effect of temperature on the photosynthetic rate of two tomato plants, A and B. Seedling A was planted two weeks later than seedling B. The plants were well watered with plenty of sunlight and carbon dioxide. The investigation was carried out early in the growing season.



- (i) Suggest appropriate units of measurement for the photosynthetic rate of the tomato plants.

\_\_\_\_\_ [1]

- (ii) Suggest and explain why plant B has a higher rate of photosynthesis at all temperatures compared to plant A.

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_ [2]

Examiner Only	
Marks	Remark

(iii) In many plants growing in this country the optimum (best) temperature for photosynthesis is 25 °C. Suggest why the photosynthetic rate declines above 25 °C.

---

---

[2]

Examiner Only	
Marks	Remark



**BLANK PAGE**  
**(Questions continue overleaf)**

- 4 (a) The diagram shows a substrate along with several enzymes and possible products. The letters E, S and P refer to enzyme, substrate and product respectively.

Enzymes:



Substrate:



Possible products:



- (i) From the diagrams pick the enzyme that would react with the substrate.

\_\_\_\_\_ [1]

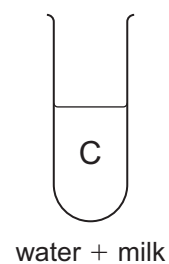
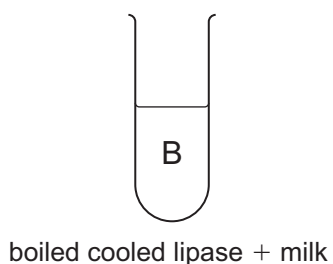
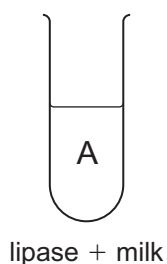
- (ii) Choose from the diagram the products that would be formed when the substrate reacted with the enzyme.

\_\_\_\_\_ and \_\_\_\_\_ [2]

- (iii) Name this model of enzyme action.

\_\_\_\_\_ [1]

- (b) Three test tubes were placed in a water bath at 30 °C for 20 minutes and then samples were removed from the test tubes and their pH tested. The results are shown in the table.



Examiner Only

Marks Remark

Results

A	B	C
pH 5	pH 7	pH 7

Examiner Only	
Marks	Remark

Describe and account for the results for test tubes **A**, **B** and **C**.

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

---

---

---

---

---

---

---

---

---

---

---

---

[6]

- (c) During the process of digestion the body produces bile salts that are emptied into the small intestine. They convert fats into smaller globules of fat.

Suggest how the results from the experiment would have differed if bile salts had been added to test tube **A** at the start of the experiment. Explain your answer.

---

---

---

---

---

[3]

5 Nitrate must be present in the soil for crop growth.

(a) Explain why nitrate uptake by plant roots is faster in well oxygenated (aerated) soils.

---



---



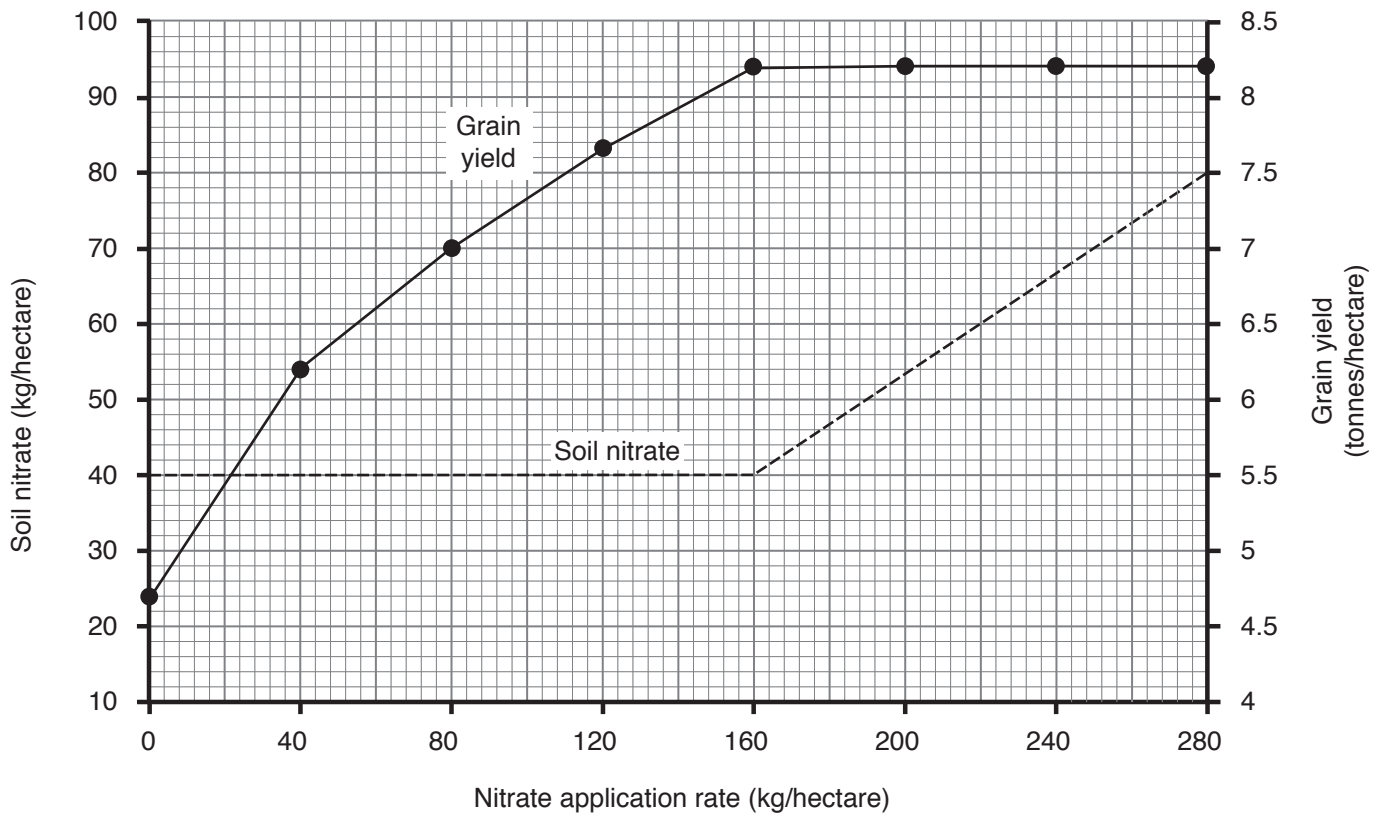
---



---

[3]

(b) The graph shows the effect of nitrate fertiliser application rate on the grain yield of wheat. One hectare is an area of 10 000 m<sup>2</sup>. The amount of nitrate in the soil is also shown at the different nitrate applications.



© Agricultural Industries Confederation Ltd

Examiner Only	
Marks	Remark

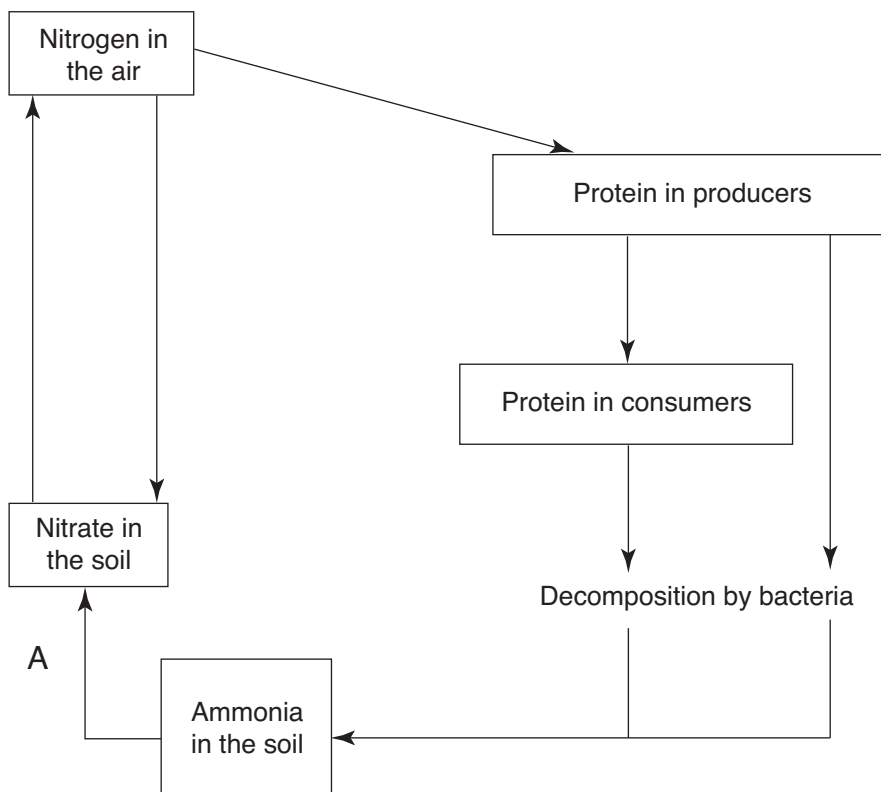
- (i) Use the graph to determine the optimum nitrate application rate for the crop.

\_\_\_\_\_ kg/hectare [1]

- (ii) Suggest why the soil nitrate increases at application rates above 160 kg/hectare.

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_ [2]

- (c) An outline of the nitrogen cycle is shown below.



- (i) Name process A.

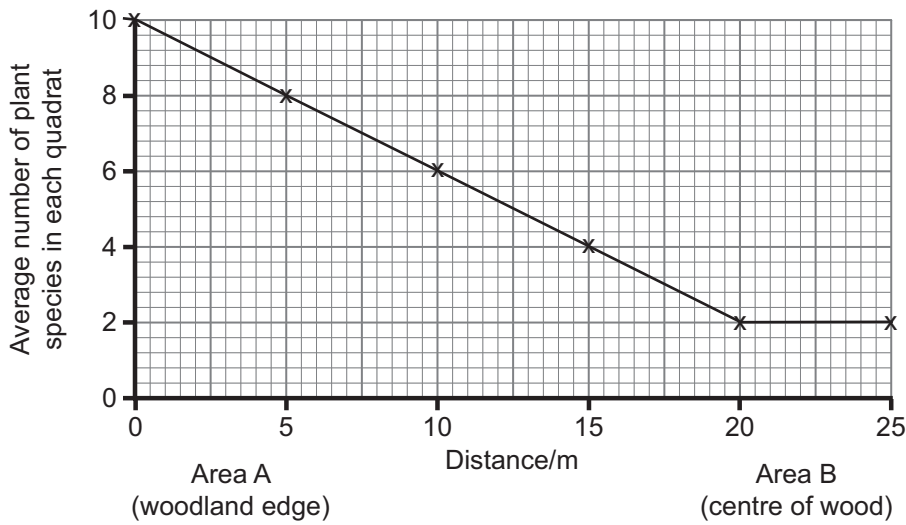
\_\_\_\_\_ [1]

- (ii) Explain how nitrate is lost from waterlogged soils.

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_ [2]

Examiner Only	
Marks	Remark

6 The graph shows the results obtained by a class during a woodland investigation.



(a) The pupils sampled plants across an area of woodland from Area A (woodland edge) to Area B (centre of wood) and then calculated the average number of plant species/quadrat at 5 m intervals.

(i) Describe the trend shown on the graph from Area A to Area B.

\_\_\_\_\_ [1]

(ii) Suggest **one** environmental condition that could account for the difference in the results between Area A and Area B.

\_\_\_\_\_ [1]

(b) Describe how the pupils would have carried out this investigation and explain how they would have obtained these results.

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

---



---



---



---



---



---

Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

---



---



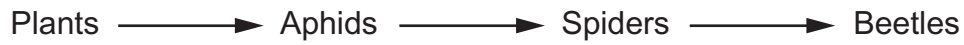
---



---

[6]

(c) The table gives the numbers of organisms from a woodland food chain.

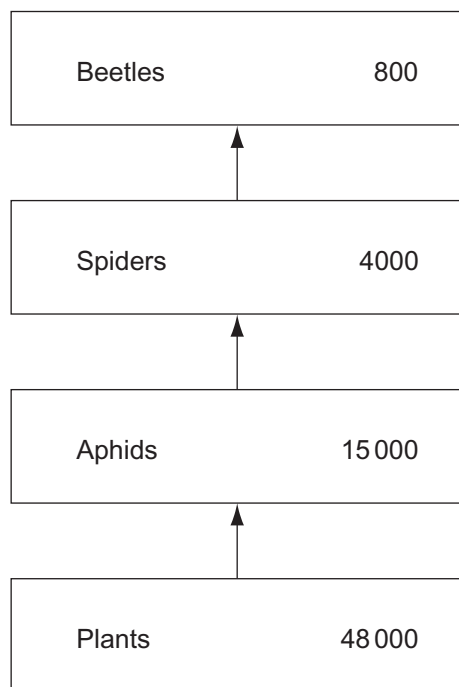


Name of organism	Numbers
Beetles	6
Spiders	50
Aphids	2000
Plants	10

Sketch a pyramid of biomass for this food chain in the space below. Label each trophic level with the name of the organism.

[2]

(d) The diagram shows the energy at different trophic levels in a food chain ( $\text{kJ/m}^2/\text{yr}$ ).



(i) Calculate the percentage energy passed on from the plants to the primary consumer.

Show your working.

\_\_\_\_\_ % [2]

(ii) Give two ways the spiders lose energy.

\_\_\_\_\_ and \_\_\_\_\_ [2]

(iii) Suggest what happens in the next step in the food chain to the energy contained in the beetles.

\_\_\_\_\_ [1]

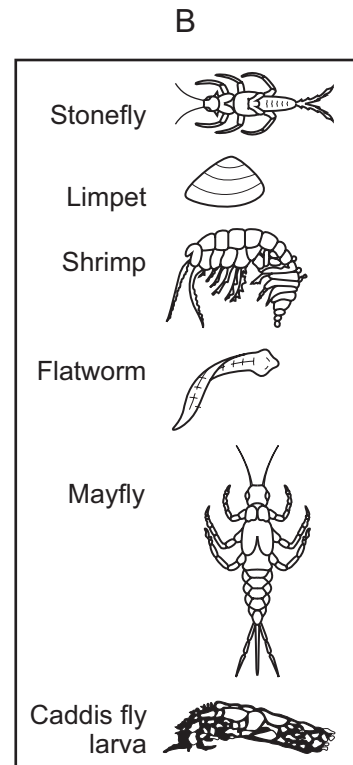
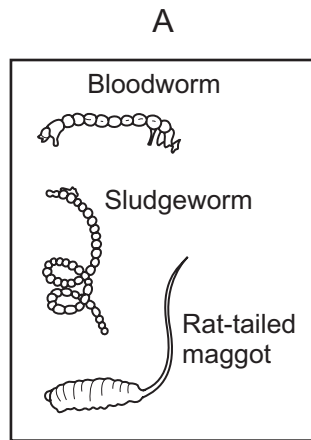
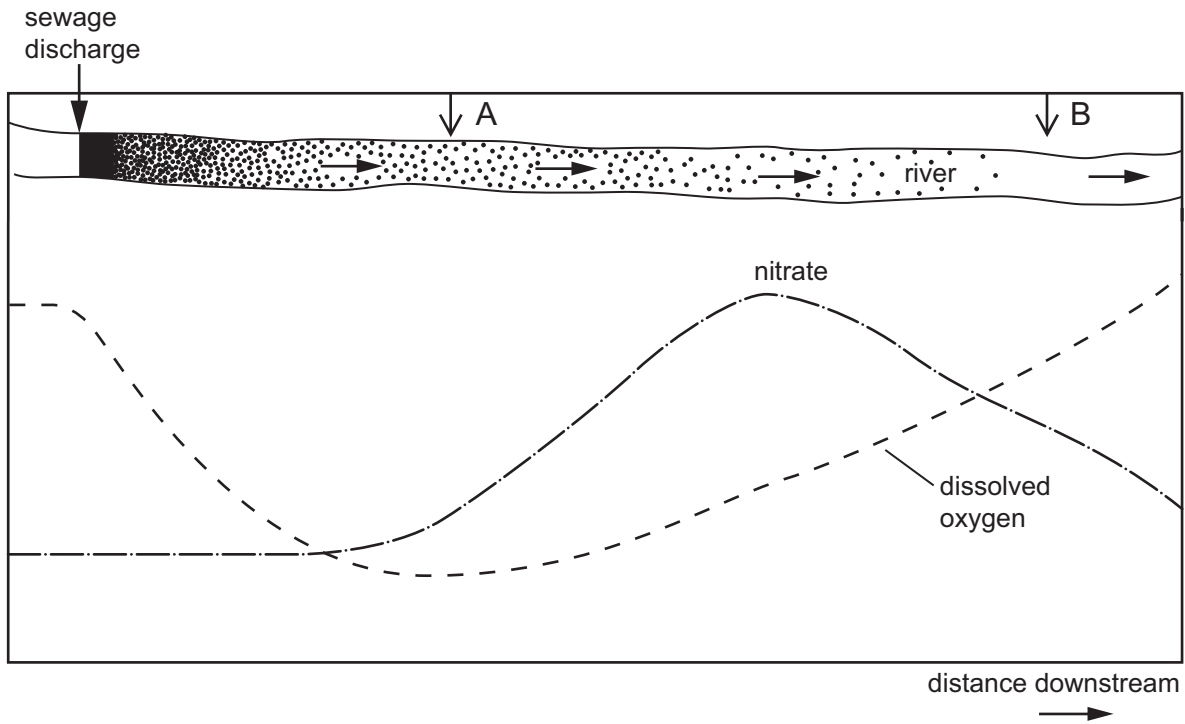
Examiner Only	
Marks	Remark



**BLANK PAGE**

**(Questions continue overleaf)**

7 Untreated sewage is a serious potential pollutant of rivers. The diagram shows the effect of a sewage discharge on the nitrate levels and the dissolved oxygen content of a river. The animal species found at two points, A and B, along the river are also shown.



**(a) (i)** Bloodworms are present in very large numbers near the source of the pollution. What term is used to describe species like this that show the presence of pollution?

\_\_\_\_\_ [1]

**(ii)** Suggest how the bloodworm can tolerate high pollution levels.

\_\_\_\_\_ [1]

**(b)** Explain why there are fewer animal species at point A than at point B.

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_ [3]

**(c)** Describe the process of eutrophication.

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_ [3]

Examiner Only	
Marks	Remark

---

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

---

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.