

Surname						Other Names					
Centre Number						Candidate Number					
Candidate Signature											

For Examiner's Use

General Certificate of Education
June 2007
Advanced Level Examination



BIOLOGY (SPECIFICATION B)
Unit 5 The Environment

BYB5/W

Tuesday 19 June 2007 9.00 am to 10.15 am

<p>For this paper you must have:</p> <ul style="list-style-type: none"> a ruler with millimetre measurements. <p>You may use a calculator.</p>
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Time allowed: 1 hour 15 minutes

Instructions

- Use blue or black ink or ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- Answer the questions in **Section A** and **Section B** in the spaces provided.
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information

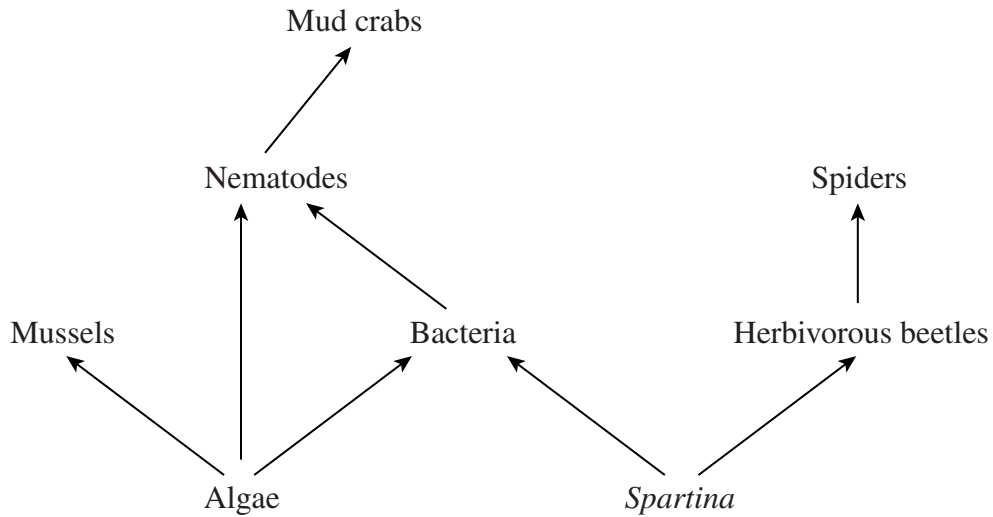
- The maximum mark for this paper is 66.
- The marks for questions are shown in brackets. One mark will be awarded for Quality of Written Communication.
- You are reminded of the need for good English and clear presentation in your answers.
- Use accurate scientific terminology in all your answers.
- Answers for **Section A** are expected to be short and precise.
- Answer questions in **Section B** in continuous prose where appropriate. Quality of Written Communication will be assessed in these answers.
- You are reminded that this test requires you to use your knowledge of Modules 1-4 as well as Module 5 in answering synoptic questions. These questions are indicated by the letter **S**.

For Examiner's Use			
Question	Mark	Question	Mark
1			
2			
3			
4			
5			
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7			
8			
Total (Column 1) →			
Total (Column 2) →			
Quality of Written Communication			
TOTAL			
Examiner's Initials			

SECTION A

Answer **all** questions in the spaces provided.

- 1 The diagram shows a food web in a salt-marsh ecosystem.



- (a) Name the tertiary consumer in this food web.

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(1 mark)

- (b) (i) Sketch a pyramid of biomass for this food web.

(1 mark)

- (ii) Suggest suitable units to represent biomass in this pyramid.

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(1 mark)

S (c) The faeces of mussels contain phosphates which other organisms use for growth. Give **two** ways in which phosphates are used for growth in other organisms.

1

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2

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(2 marks)

S (d) Plants living in a salt-marsh ecosystem regularly encounter conditions of high salt concentration. Many of these plants have root cells with a very high solute concentration and this enables them to survive in this ecosystem. Explain how.

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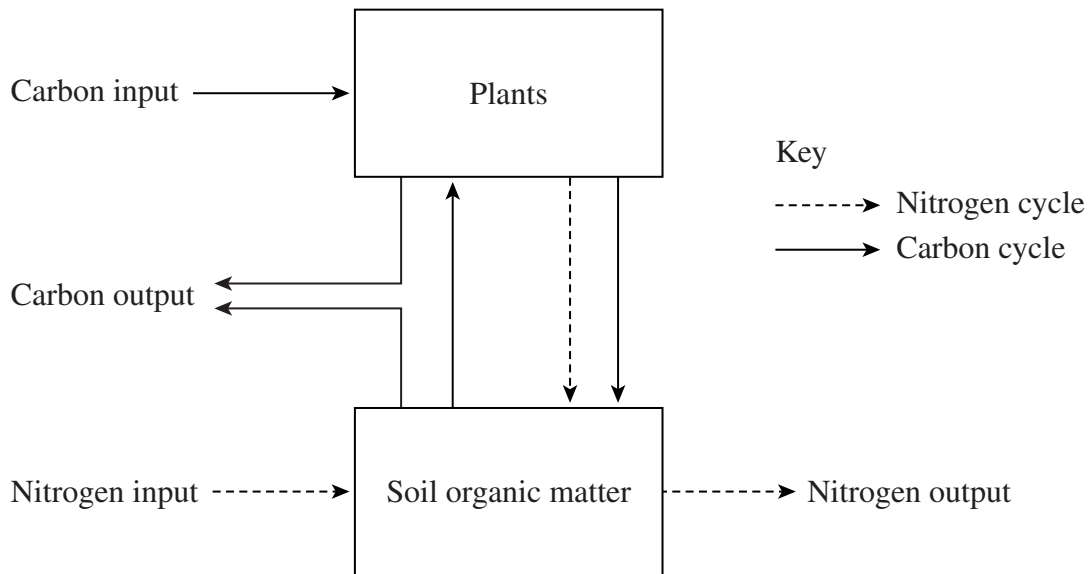
(2 marks)

7

Turn over for the next question

Turn over ►

2 Arctic tundra is an ecosystem found in very cold climates. The diagram shows some parts of the carbon and nitrogen cycles in arctic tundra.



(a) Name the process represented by

(i) carbon output

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(1 mark)

(ii) nitrogen input.

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(1 mark)

S (b) An increase in temperature causes an increase in carbon input. Explain why.

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(2 marks)

S (c) Fungi obtain their nutrients from the organic matter in soil. Explain how.

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(3 marks)

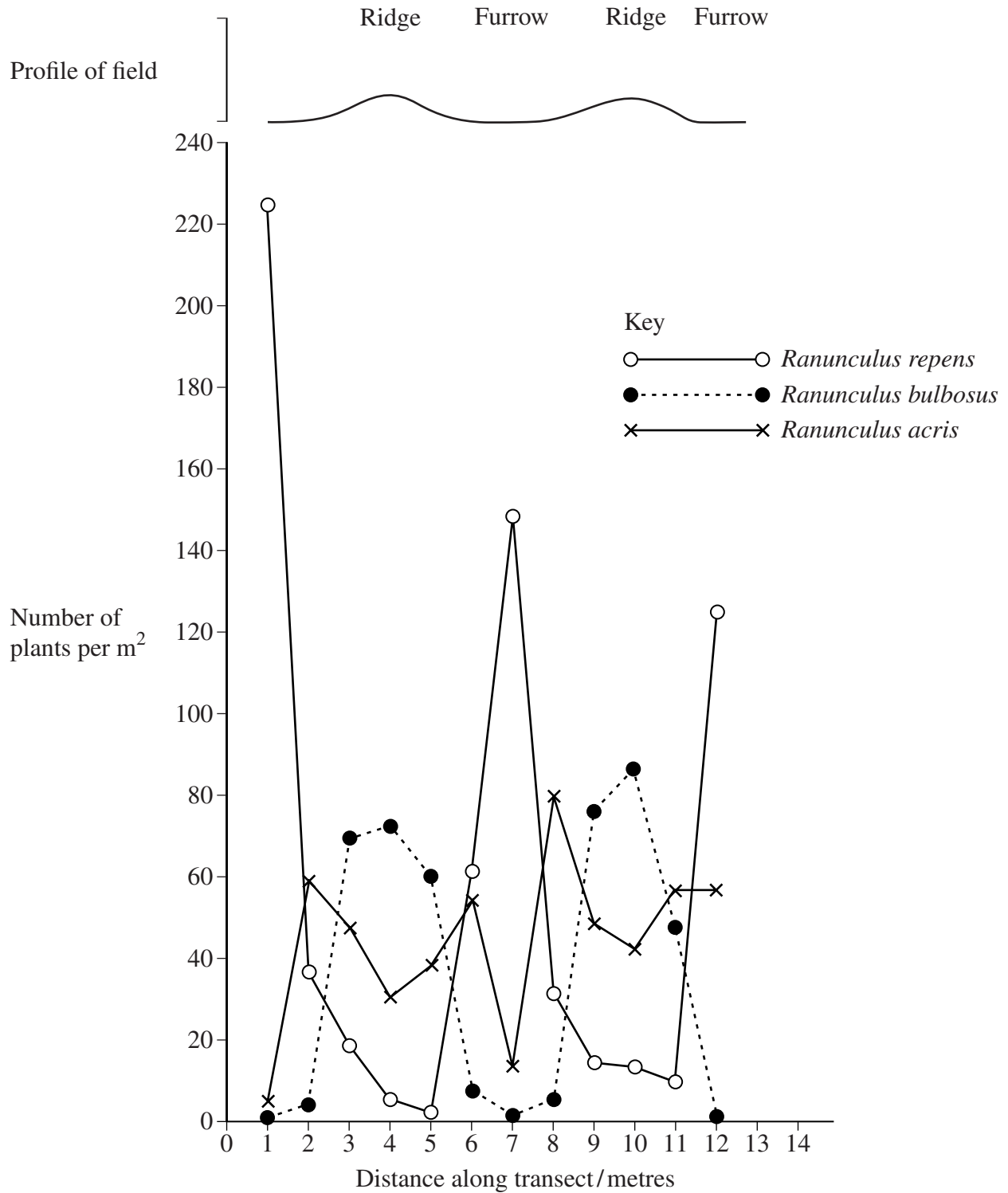
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- 3 Scientists used a line transect to find the distribution of three species of *Ranunculus* (buttercup) in a field. The field consisted of a series of ridges and furrows. **Figure 1** shows the distribution of the species of *Ranunculus* along the line transect.

Figure 1



- (a) Describe how you would use a line transect to obtain data on the distribution of the *Ranunculus* species as shown in **Figure 1**.

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(2 marks)

- (b) Other than soil moisture, give **one** abiotic factor and explain how it could lead to the abundance of *Ranunculus repens* in the furrows of this field.

Abiotic factor

Explanation

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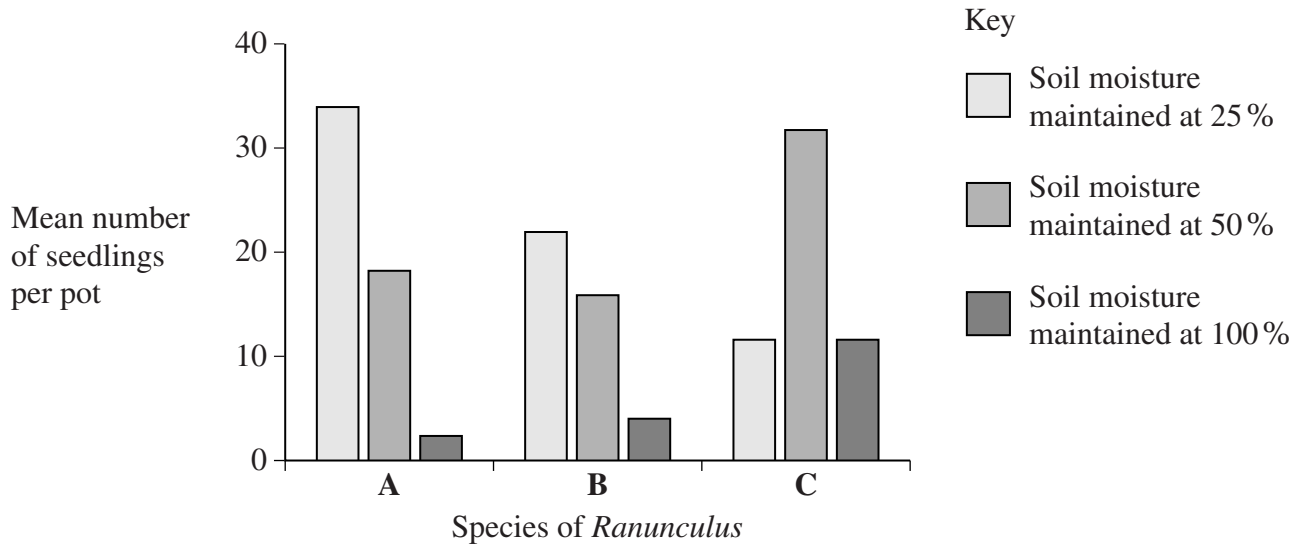
(2 marks)

Question 3 continues on the next page

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- (c) The scientists then investigated the effect of soil moisture on seed germination of the three species of *Ranunculus*. They planted seeds of species **A** in three sets of pots. The soil in one set of pots was maintained at 25% water content, the soil in the second set was maintained at 50% water content and the soil in the third set was maintained at 100% water content. They repeated this with seeds of species **B** and species **C**. Four weeks later, the scientists recorded the mean number of seedlings in the pots in each set. Their results are shown in **Figure 2**.

Figure 2



- (i) Suggest **two** factors which should be controlled during this investigation.

1

2

(2 marks)

- (ii) Use information from **Figure 1** and **Figure 2** to identify each species of *Ranunculus*. Write your answers in the table.

Species	Name of species
A	<i>Ranunculus</i>
B	<i>Ranunculus</i>
C	<i>Ranunculus</i>

(1 mark)

S (iii) Describe how you could determine whether two *Ranunculus* plants belong to the same species.

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(2 marks)

9

Turn over for the next question

Turn over ►

- 4 Biologists investigated the communities in a chalk grassland ecosystem and a heath ecosystem. They recorded the number of animals belonging to different taxa in each ecosystem. The table shows the results.

Taxon	Number of animals	
	Chalk grassland	Heath
Mollusca	147	0
Annelida	46	0
Dermaptera	12	0
Collembola	25	3
Diptera	21	15
Coleoptera	49	62
Lepidoptera	2	11

- (a) Explain what is meant by a community.

.....

 (1 mark)

- (b) Which ecosystem would show the greater stability? Explain your answer.

Ecosystem

Explanation

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 (2 marks)

S (c) Many chalk grassland plants survive winter as underground organs. The main storage compound in these organs is starch.

(i) Explain how starch is broken down to soluble sugars.

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(2 marks)

(ii) The products of starch breakdown are transported and used for the growth of new shoots. Explain how it is transported and used.

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(3 marks)

8

Turn over for the next question

Turn over ►

5 (a) Pesticides are either biodegradable or non-biodegradable. Explain what is meant by biodegradable.

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(2 marks)

S (b) Insecticides are pesticides that kill insects. Suggest how the mode of action of each of the following insecticides affects insects.

(i) Pyrethroids bind to channel proteins for the transport of sodium ions in the membrane of neurones and prevent them from closing.

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(3 marks)

(ii) Hydramethylnon binds to a carrier in the electron transport chain.

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(2 marks)

6 (a) What is a crop monoculture?

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(1 mark)

(b) Describe and explain **two** effects of monoculture on the environment.

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(4 marks)

5

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SECTION B

Answer **all** questions in the spaces provided.

Write answers in continuous prose, where appropriate.
Quality of Written Communication will be assessed in these answers.

- 7 Scientists investigated the use of different habitats by cheetahs in a national park in South Africa. They studied an area consisting of the following types of habitats: bush, savannah and woodland. **Table 1** shows the percentage cover of each type of habitat in the area studied.

Table 1

Type of habitat	Percentage cover of area studied
Bush	15
Savannah	75
Woodland	10

Table 2 shows the number of sightings of cheetahs in each type of habitat.

Table 2

Type of habitat	Number of sightings
Bush	14
Savannah	57
Woodland	9

The scientists decided to carry out a statistical test on their results.

- (a) (i) Explain why it is necessary to apply a statistical test to these results.

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(2 marks)

- (ii) Which statistical test would it be appropriate to use with these results?

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(1 mark)

- (b) (i) Using the information provided in **Table 1** and **Table 2**, complete **Table 3** with the expected number of sightings.

Table 3

Type of habitat	Expected number of sightings
Bush	
Savannah	
Woodland	

(1 mark)

- (ii) How many degrees of freedom would be in the statistical test?

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 (1 mark)

- S** (c) Cheetahs show much less genetic variation than other cats. A reduction in suitable cheetah habitat could lead to a further loss in genetic variation. Explain how.

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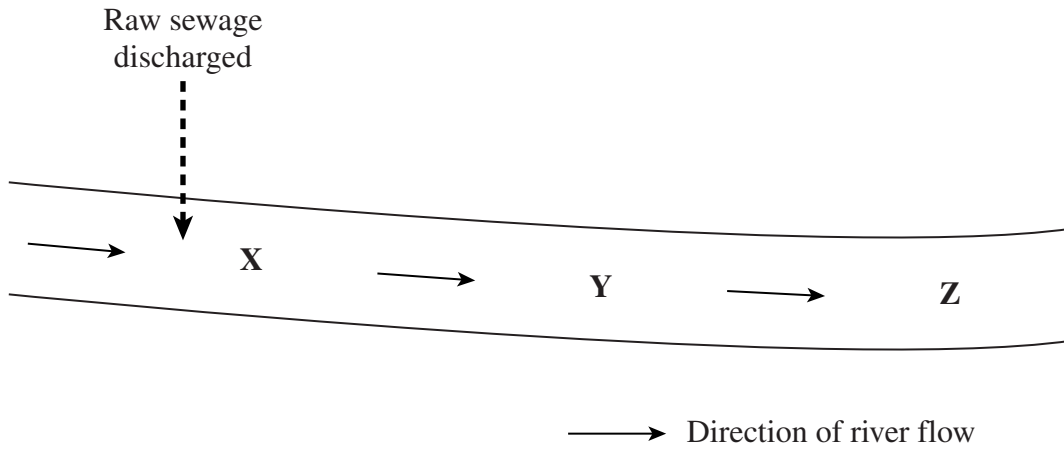
 (2 marks)

- S** (d) Cheetahs have eyes with a very large fovea. Suggest the importance of this for hunting prey.

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 (3 marks)

8 The diagram shows part of a river into which raw sewage is discharged. The table shows the results of a chemical analysis of water samples taken at sites **X**, **Y** and **Z** along the river.



	Site X	Site Y	Site Z
BOD (biological oxygen demand) / mg dm^{-3}	38.0	17.0	3.0
Ammonium ions / mg dm^{-3}	0.3	0.7	0.1
Nitrate ions / mg dm^{-3}	4.0	60.0	7.0

(a) Explain the decrease in BOD from site **X** to site **Z**.

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(3 marks)

(b) Explain the increase in the concentration of ammonium ions and nitrate ions from site X to site Y.

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(4 marks)

S (c) Oil spillages can cause pollution of rivers. Some species of bacteria found in seawater contain a gene which enables them to break down oil into harmless fatty acids. Describe how genetic engineering can be used to produce new strains of bacteria capable of breaking down oil in rivers.

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(5 marks)

END OF QUESTIONS

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1

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