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Centre Number					Candidate Number				
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General Certificate of Education  
June 2005  
Advanced Level Examination



**BIOLOGY (SPECIFICATION B) BYB678/B**  
**Unit 6 Section B Applying Biological Principles**  
**Unit 7 Section B Applying Biological Principles**  
**Unit 8 Section B Applying Biological Principles**

Friday 24 June 2005 1.30 pm to 3.45 pm

**In addition to this paper you will require:**

- Section A;
- a ruler with millimetre measurements.

You may use a calculator.

Time allowed: The total time for Section A and Section B of this paper is 2 hours 15 minutes.

**Instructions**

- Use blue or black ink or ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** the questions in **Section B** in the spaces provided. All working must be shown.
- **Section A** and **Section B** will be marked by different examiners. You must ensure that any supplementary sheets are fastened to the appropriate question paper answer book.
- Do all rough work in this book. Cross through any work you do not want marked.

**Information**

- The maximum mark for **Section B** is 50.
- Mark allocations are shown in brackets.
- You are reminded that all questions in this **Section B** are synoptic (indicated by the letter **S**). You must use your knowledge of different parts of the specification when answering this section.
- You are advised to spend 1 hour 15 minutes on **Section B**.
- You are reminded of the need for clear presentation in your answers. All answers should be in good English and should use accurate scientific terminology.

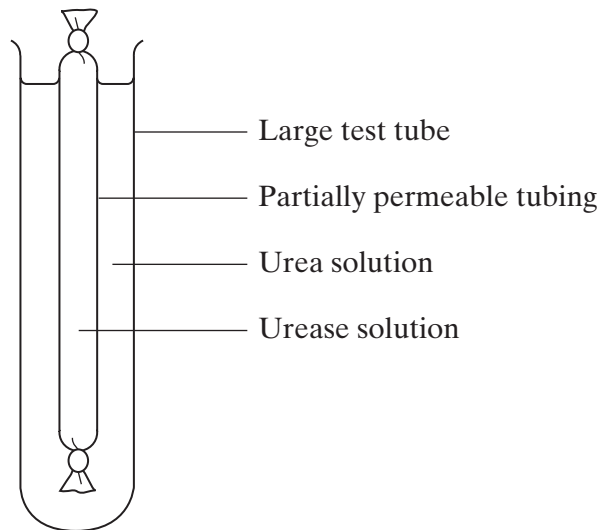
For Examiner's Use			
Number	Mark	Number	Mark
1			
2			
3			
4			
Total (Column 1)		→	
Total (Column 2)		→	
TOTAL			
Examiner's Initials			

**SECTION B**

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

**S 1** Urease is an enzyme which hydrolyses urea to ammonia and carbon dioxide. The ammonia produces an alkaline solution.

In an experiment, a solution of urease was placed in tubing made from a partially permeable membrane. This tubing was put into a large test tube containing urea solution, as shown in the diagram. A control was set up with urease solution in the tubing and water outside.



After 5 minutes, samples were taken from inside and outside the tubing in each of the test tubes. The samples were tested with an indicator that is yellow below pH 8.0 and blue above pH 8.0. The results are shown in the table.

Tube	Contents		Colour with indicator after 5 minutes	
	Inside tubing	Outside tubing	Inside tubing	Outside tubing
<b>A</b>	Urease solution	Urea solution	Blue	Yellow
<b>B</b>	Urease solution	Water	Yellow	Yellow

(a) Explain the result for tube **A**.

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(3 marks)

(b) The solutions inside and outside the tubing in tube **B** were tested after 30 minutes for the presence of protein.

(i) Describe how the presence of protein in a sample of a solution could be detected.

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(2 marks)

(ii) What results of the tests for protein would you expect for tube **B**? In each case explain your answer.

Inside the tubing

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Outside the tubing

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(2 marks)

(c) Describe how you would carry out an investigation to find the optimum temperature for the activity of urease.

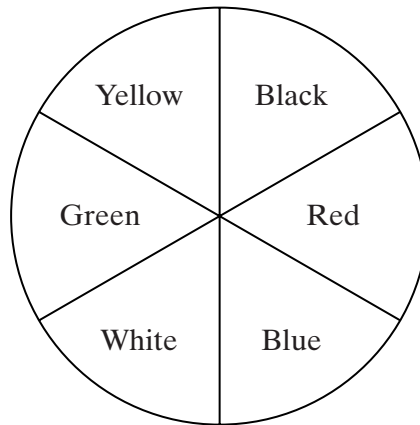
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(3 marks)

10

Turn over 

- S 2** In an investigation by a student into the responses of maggots, the bottom of a large box was marked with six coloured segments, as shown in the diagram.



30 maggots were placed on each segment in the box. A transparent cover was put on the box and light bulbs were positioned so that the segments were evenly illuminated. The positions of the maggots were recorded after one hour. The intensity of the light reflected by each segment was measured.

The experiment was repeated three more times. The total number of maggots in each segment from the four experiments is shown in the table.

<b>Colour of segment</b>	<b>Intensity of reflected light /arbitrary units</b>	<b>Total number of maggots</b>
Black	4	154
Red	25	229
Blue	10	178
White	44	47
Green	25	48
Yellow	40	64

(a) Give **one** conclusion about the responses of maggots which is supported by these results.

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Give the evidence from the table for your conclusion.

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(2 marks)

(b) The chi-squared test was used to analyse the data. For the results obtained, suggest **one** null hypothesis which might be analysed by a chi-squared test.

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(1 mark)

(c) It was suggested that the movement of the maggots might have been influenced by the Earth's magnetic field. Suggest **one** simple way of repeating the investigation which would avoid this possibility.

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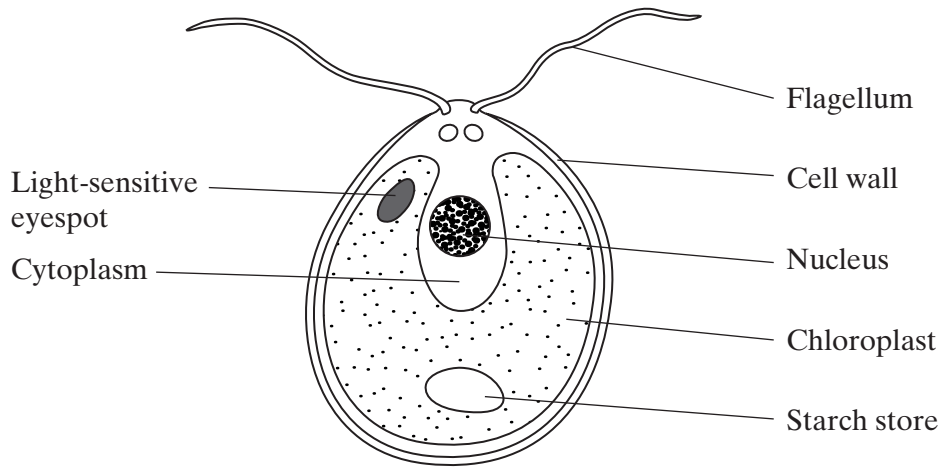
(1 mark)



**TURN OVER FOR THE NEXT QUESTION**

**Turn over**

**S 3** The diagram shows a single-celled organism called *Chlamydomonas*.



- (a) *Chlamydomonas* lives in fresh-water ponds. It uses its flagella to swim towards light of moderate intensity but away from very bright light.

Using information in the diagram, explain the advantage of this behaviour.

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(2 marks)

(b) A *Chlamydomonas* cell has two flagella. These flagella contain a single sort of protein. A flagellum consists of a bundle of 242 filaments. Each filament consists of 7500 protein molecules. Each protein molecule contains 900 amino acid units.

- (i) What would be the minimum number of nucleotides in the coding region of the mRNA used to synthesise this protein?

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(1 mark)

- (ii) In an investigation, a culture of *Chlamydomonas* was treated in a way that caused them to lose their flagella without any other damage to the cells. The flagella grew back to their original length in 60 minutes.

How many amino acid molecules would be incorporated into each growing flagellum per minute? Show your working.

Answer .....  
(2 marks)

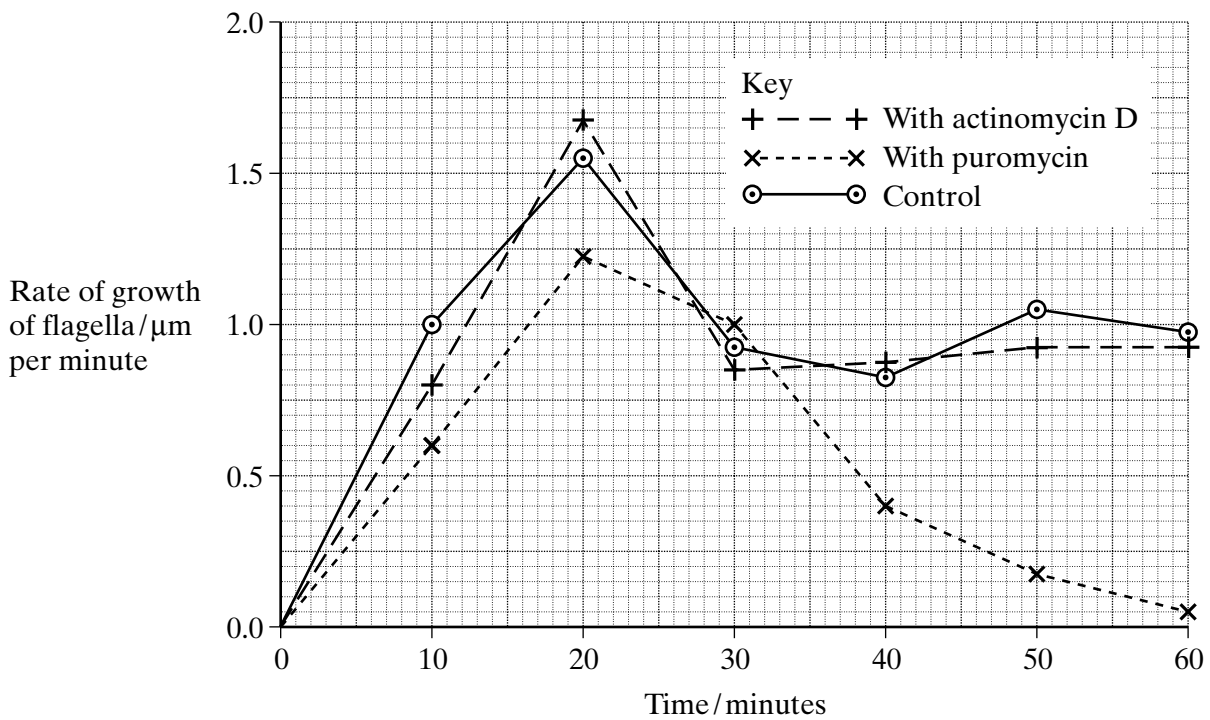
**QUESTION 3 CONTINUES ON THE NEXT PAGE**

**Turn over** ►

(c) The researchers investigated the rate at which the flagella grew in three different media.

1. A medium containing actinomycin D, which prevents transcription by binding to the guanine in DNA
2. A medium containing puromycin, which prevents translation by attaching to ribosomes
3. A control medium

The results are shown in the graph.



(i) Describe how the rate of growth was affected by puromycin.

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(2 marks)

(ii) The researchers concluded

1. that the cells used mRNA that is already present in the cytoplasm for the regrowth of the flagella;
2. that some of the regrowth uses protein molecules already present in the cell.

Explain the evidence for each of these conclusions.

1 .....

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2 .....

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(4 marks)

11

**TURN OVER FOR THE NEXT QUESTION**

**Turn over** ▶







Handwriting practice area consisting of 25 horizontal dotted lines.

Turn over 





