Surname		Other Names	
Centre Number			Candidate Number									
Candidate Signature												

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General Certificate of Education
June 2003
Advanced Level Examination

ASSESSMENT and QUALIFICATIONS ALLIANCE

BIOLOGY (SPECIFICATION B) BYB7/A
Unit 7 Section A Microbes and Disease

Thursday 19 June 2003 1.30 pm to 3.45 pm

In addition to this paper you will require:
- Section B provided as an insert (enclosed).
- 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 A** 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 extra 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 A** is 50.
- Mark allocations are shown in brackets.
- 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.
- You are advised to spend 1 hour on **Section A**.
- You are reminded that **Section A** requires you to use your knowledge of Modules 1-5 as well as Module 7 in answering synoptic questions. These questions are indicated by the letter **S**.

For Examiner's Use			
Number	Mark	Number	Mark
1			
2			
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7			
Total (Column 1) →			
Total (Column 2) →			
TOTAL			
Examiner's Initials			

SECTION A

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

1 (a) The table describes two structures found in some bacteria. Complete the table with the name of each structure.

Description	Name of structure
Circular piece of DNA in the cytoplasm of some cells	
Reduces the rate of water loss and protects against phagocytosis	

(2 marks)

S (b) Some photosynthesising bacteria have flagella. They live in places where the light intensity is high. Suggest how a high light intensity enables these bacteria to keep their flagella moving.

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(3 marks)

5

2 In an investigation, the growth of a yeast culture was measured by turbidimetry. Every hour a 2 cm^3 sample was removed from the culture and mixed with 8 cm^3 of nutrient solution. This diluted sample was placed in a colorimeter and the percentage of light absorbed was measured. The results are shown in **Figure 1**.

The number of yeast cells required to produce different turbidities was also measured. The results are shown in **Figure 2**.

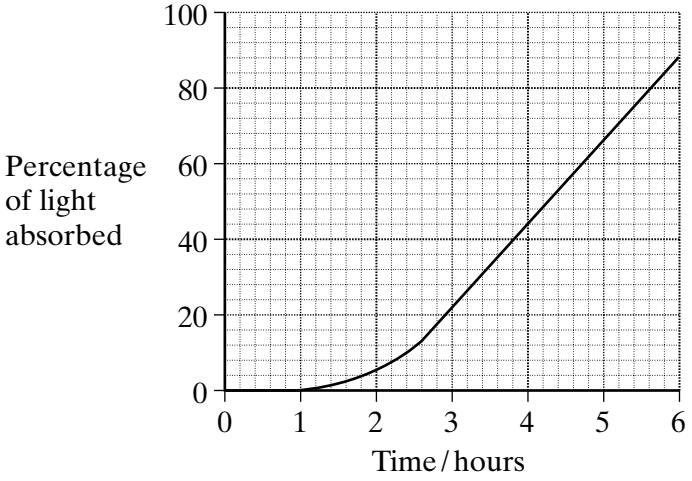

Figure 1

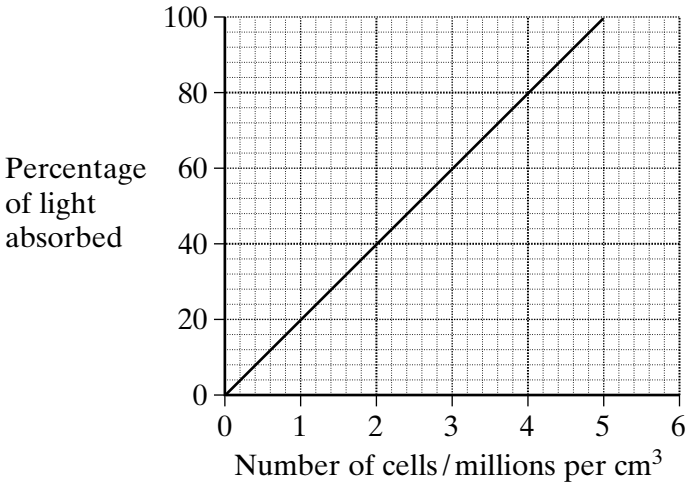

Figure 2

(a) (i) Explain why turbidity can be used to measure the growth of a culture of microorganisms.

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(1 mark)

(ii) Explain the shape of the curve in **Figure 1**.

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(2 marks)

(b) Name a technique which could be used to count the number of cells in the cultures used for **Figure 2**.

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(1 mark)

(c) Calculate the number of yeast cells present in 1 cm^3 of culture when the culture had been growing for 4 hours. Show your working.

Answer .....

(2 marks)

6

3 (a) Describe why vaccination would prevent the spread of influenza through a population.

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(2 marks)

S (b) Describe the role of a human cell in producing new capsids when a virus infects the cell.

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(4 marks)

6

4 Typhoid fever is caused by the endotoxin released from *Salmonella typhi*.

(a) Describe the difference between an endotoxin and an exotoxin.

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(2 marks)

QUESTION 4 CONTINUES ON THE NEXT PAGE

(b) **Figure 1** shows changes in the number of *S. typhi* cells found in the blood, faeces and urine of a person who has consumed water contaminated with this bacterium. The person had not previously suffered from typhoid fever.

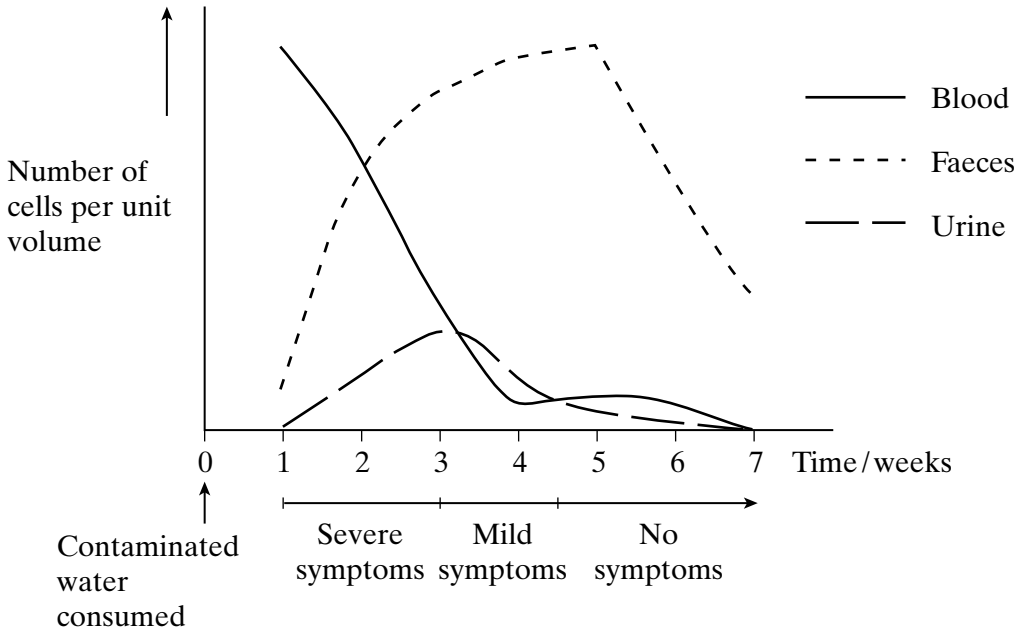

Figure 1

(i) *S. typhi* is easily transmitted from person to person. Explain the evidence for this from **Figure 1**.

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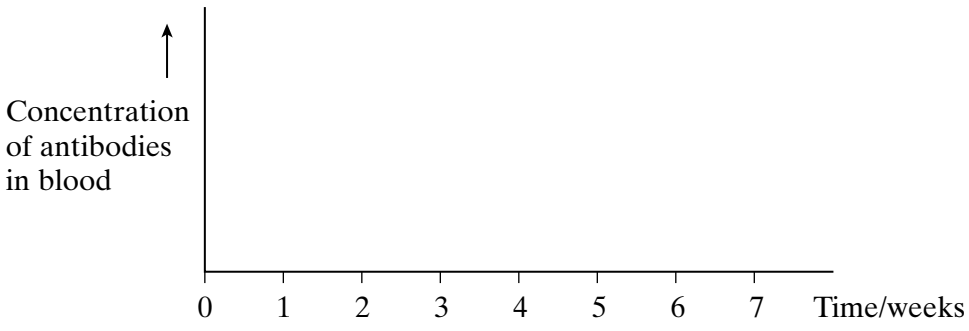
(2 marks)

(ii) On **Figure 2**, sketch a curve to show the changes in the concentration of antibodies produced in the blood of this person against *S. typhi*.



(2 marks)

Figure 2

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S (c) Suggest how *S. typhi* cells get into the urine of a sufferer.

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(3 marks)

9

TURN OVER FOR THE NEXT QUESTION

5 (a) Describe **one** way in which antibiotics prevent the growth of bacteria.

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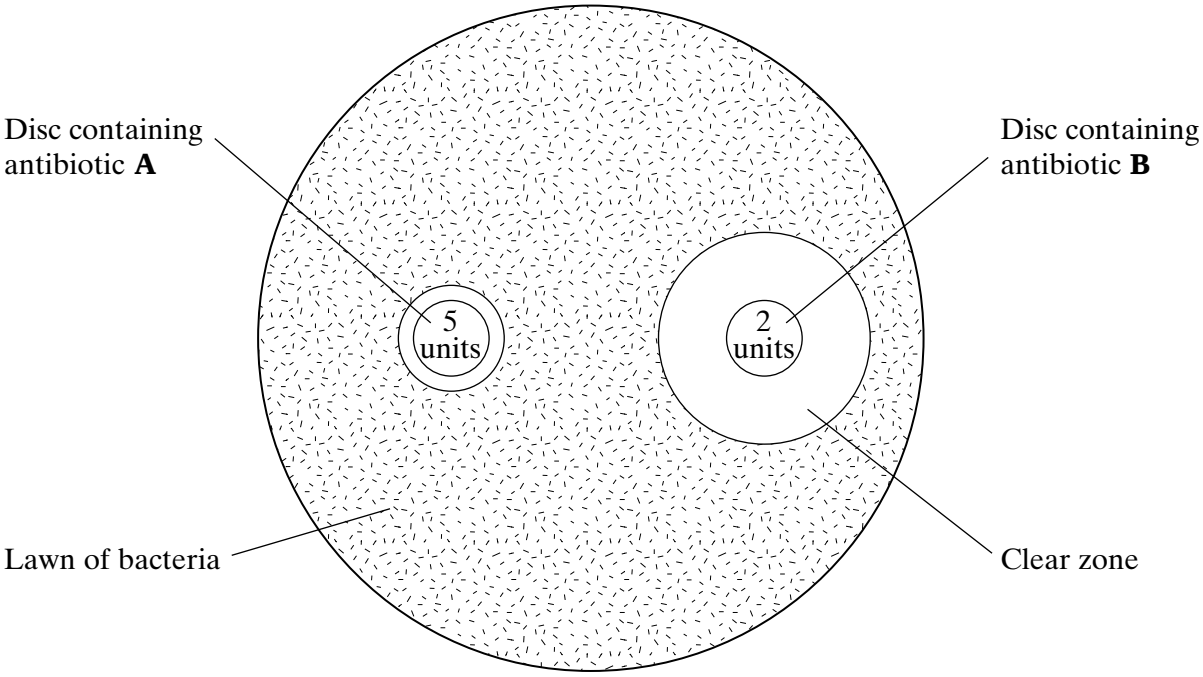
(1 mark)

(b) Filter paper discs soaked in two types of antibiotic were placed on a lawn of bacteria growing in a Petri dish. The concentration of antibiotic dissolved in each disc is shown.



(i) Explain why clear zones formed around both filter paper discs.

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(1 mark)

(ii) How many times more effective is antibiotic **B** than antibiotic **A**? Explain how you arrived at your answer.

Answer .....

Explanation .....

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(2 marks)

4

TURN OVER FOR THE NEXT QUESTION

6 One blood group system is Rhesus. Rhesus positive people have rhesus antigens on their red blood cells. Rhesus negative people have no rhesus antigens. To find out whether a person is rhesus positive or negative, a sample of blood is mixed with rhesus antibodies.

(a) Explain why rhesus positive blood agglutinates when it is mixed with rhesus antibodies.

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(1 mark)

(b) A person who is rhesus negative will produce rhesus antibodies if rhesus antigens get into the blood.

(i) Describe how these antibodies are produced.

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(5 marks)

(ii) Explain how antibodies are produced more quickly if the same type of antigen gets into the blood on a second occasion.

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(2 marks)

S (c) In some pregnancies, rhesus antibodies move from the blood of the mother into the blood of a rhesus positive fetus. These antibodies destroy some red blood cells in the fetus. When the baby is born it will suffer from blue-baby syndrome.

Babies who suffer from blue-baby syndrome may breathe at an unusually high rate. Suggest an explanation for this.

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(2 marks)

10

TURN OVER FOR THE NEXT QUESTION

7 (a) Explain **one** advantage of immobilising enzymes used in industrial processes.

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(2 marks)

(b) A biosensor can be used to detect the presence of heroin in a urine sample. Two different enzymes and a colourless dye are immobilized on absorbent paper. The reaction that takes place when the paper is dipped into a solution containing heroin is summarized in the diagram.

(i) Explain why the biosensor does not distinguish between heroin and morphine.

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(2 marks)

S (ii) Explain why other substances in the urine are unlikely to produce the red colour.

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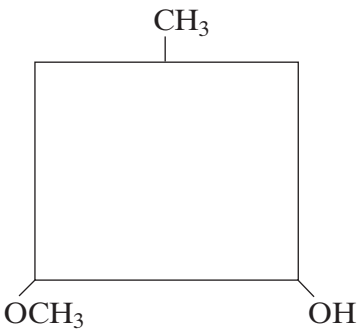
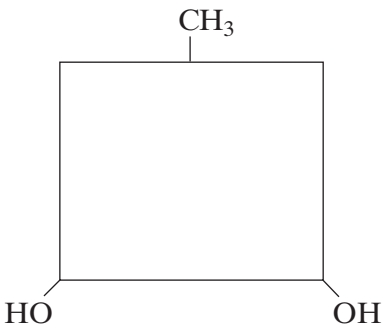
(2 marks)

S (iii) Codeine is a drug used to relieve mild pain. The simplified diagrams show codeine and morphine molecules.



Codeine



Morphine

Suggest why codeine prevents the biosensor from detecting heroin.

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(4 marks)

10

END OF SECTION A

SECTION B IS PROVIDED SEPARATELY