Surname		Other Names	
Centre Number			Candidate Number									
Candidate Signature												

For Examiner's Use

General Certificate of Education
June 2008
Advanced Level Examination

ASSESSMENT and QUALIFICATIONS ALLIANCE

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

Wednesday 18 June 2008 1.30 pm to 3.45 pm

For this paper you must have:
- 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 black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Answers written in margins or on blank pages will not be marked.
- If you need extra space use page 14 for your answers.
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information

- The maximum mark for **Section A** is 50.
- The marks for questions are shown in brackets.
- You are reminded of the need for good English and clear presentation in your answers.
- Use accurate scientific terminology in your answers.
- You are advised to spend 1 hour on **Section A**.
- You are reminded that **Section A** requires you to use your knowledge of different parts of the specification as well as Module 7 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			
6			
7			
Total (Column 1) →			
Total (Column 2) →			
TOTAL			
Examiner's Initials			

SECTION A

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

1 A human baby has antibodies in its blood when it is born, giving it a form of natural immunity to some diseases. These antibodies come from its mother.

1 (a) (i) Name the type of natural immunity described above.

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(1 mark)

1 (a) (ii) The antibodies from the mother will give the baby immunity to only some diseases. Explain why.

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(1 mark)

(Extra space) .....

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S 1 (b) A breast-fed baby gets antibodies from its mother's milk. Some of these antibodies are then absorbed through the lining of the gut. Antibodies are proteins. Suggest how the baby's gut allows the absorption of these antibodies.

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(2 marks)

4

2 (a) Exotoxins and endotoxins are released by bacteria. Describe how

2 (a) (i) exotoxins are released

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(1 mark)

2 (a) (ii) endotoxins are released.

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(1 mark)

2 (b) The bacterium *Staphylococcus aureus* produces an exotoxin called leucocidin. Leucocidin kills macrophages. This increases the invasiveness of the bacterium. Explain how.

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(3 marks)

(Extra space) .....

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5

3 (a) Many antigens are proteins.

3 (a) (i) What is an antigen?

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(1 mark)

S 3 (a) (ii) Give **one** feature of the structure of proteins that causes them to be antigens.

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(1 mark)

3 (b) Vaccines contain antigens from disease-causing organisms. Some vaccines contain dead organisms, but the rubella vaccine contains a live, non-virulent strain of the disease-causing virus.

Explain the advantage of using

3 (b) (i) a living virus

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(2 marks)

3 (b) (ii) a non-virulent virus.

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(1 mark)

S 3 (c) Restriction endonuclease enzymes may be used in the production of genetically engineered antigens. Describe how.

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(2 marks)

(Extra space) .....

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7

Turn over for the next question

4 Students measured the growth of a yeast population in a liquid culture medium. They took a sample of the culture every two hours. They used a haemocytometer to find the population density of the yeast cells in each sample.

4 (a) (i) The culture was stirred throughout the investigation. Explain why.

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(1 mark)

(Extra space) .....

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4 (a) (ii) Describe **two** aseptic techniques that the students should have used when removing samples from the culture flask.

1 .....

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2 .....

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(2 marks)

(Extra space) .....

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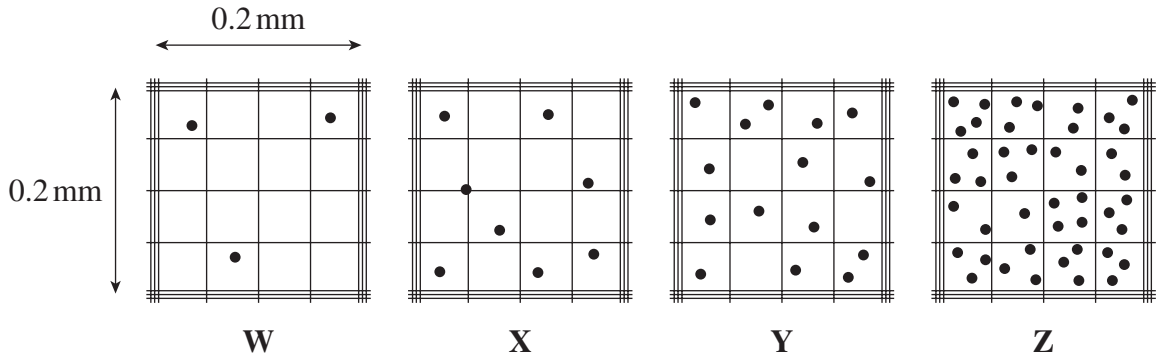
4 (b) The diagrams show the yeast cells within typical large squares of the haemocytometer using samples taken at four time intervals. The samples were undiluted. The large square measures 0.2 mm × 0.2 mm and has a depth of 0.1 mm.



There were approximately 2000 cells per mm^3 at six hours. Which grid, **W**, **X**, **Y** or **Z**, best represents the sample at six hours? Use an appropriate calculation to support your answer.

Grid ..... *(3 marks)*

6

Turn over for the next question

5 (a) What name is given to asexual reproduction in bacteria?

.....

(1 mark)

5 (b) Scientists investigated the effect of three different culture media on the growth of a bacterial population. For each culture they recorded the time taken for the population to double.

The table shows the substances present in each culture and the doubling time. Acetate can be used as a respiratory substrate by these bacteria.

	Substance present in culture medium				
Culture	**Glucose**	**Acetate**	**Amino Acids**	**Ammonium salts**	**Doubling time / minutes**
1		✓		✓	300
2	✓			✓	50
3	✓		✓	✓	25

S 5 (b) (i) The population of bacteria in culture **1** spent more time in the lag phase before moving into the exponential phase. Suggest why.

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(3 marks)

5 (b) (ii) Explain the difference in rate of population growth between cultures **2** and **3**.

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(1 mark)

(Extra space) .....

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S 5 (c) Bacteria have a rapid rate of reproduction. This can be an advantage in a changing environment. Explain how.

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(3 marks)

8

Turn over for the next question

6 (a) Give **two** advantages of growing microorganisms in a continuous culture rather than a batch culture.

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2 .....

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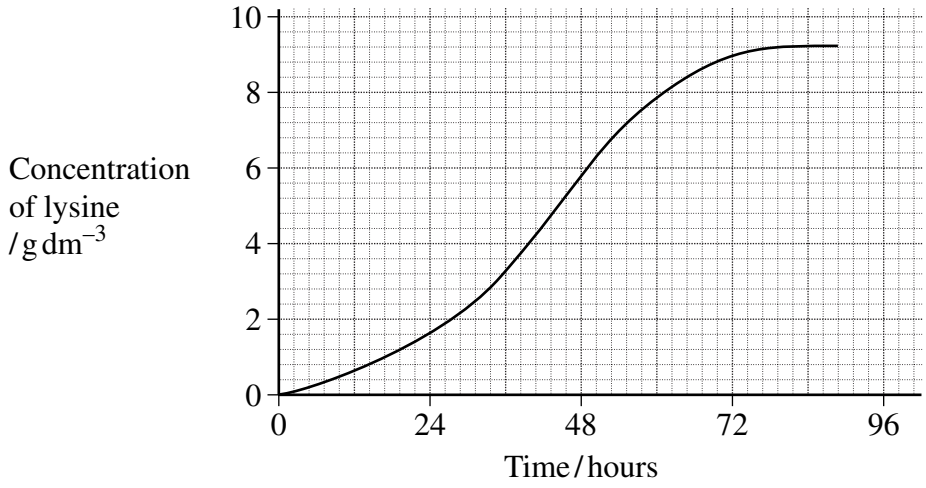
(2 marks)

6 (b) The graph shows the production of the amino acid lysine by *Corynebacterium glutamicum*. Glucose is used as the source of carbon.



6 (b) (i) Urea, $CO(NH_2)_2$, is added to the growth medium for the production of lysine. Suggest why.

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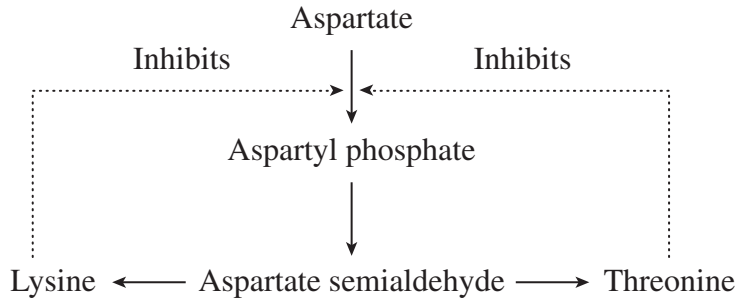
(1 mark)

6 (b) (ii) Use the graph to calculate the maximum rate of lysine production per hour. Show your working.

Answer ..... g dm^{-3} h^{-1}

(2 marks)

6 (c) The diagram shows the metabolic pathways for the production of lysine and threonine, another amino acid. High concentrations of lysine or threonine inhibit the first enzyme in the pathway.



S 6 (c) (i) The production of lysine is controlled by negative feedback. Explain how.

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(2 marks)

6 (c) (ii) A mutant strain of the bacterium does not make the enzyme that converts aspartate semialdehyde to threonine. The mutant strain is used in the commercial production of lysine. Explain why.

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(3 marks)

10

7 (a) Mutation of a virus can reduce the ability of the immune system to destroy the virus before it enters a body cell of the host. Explain how.

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(3 marks)

(Extra space) .....

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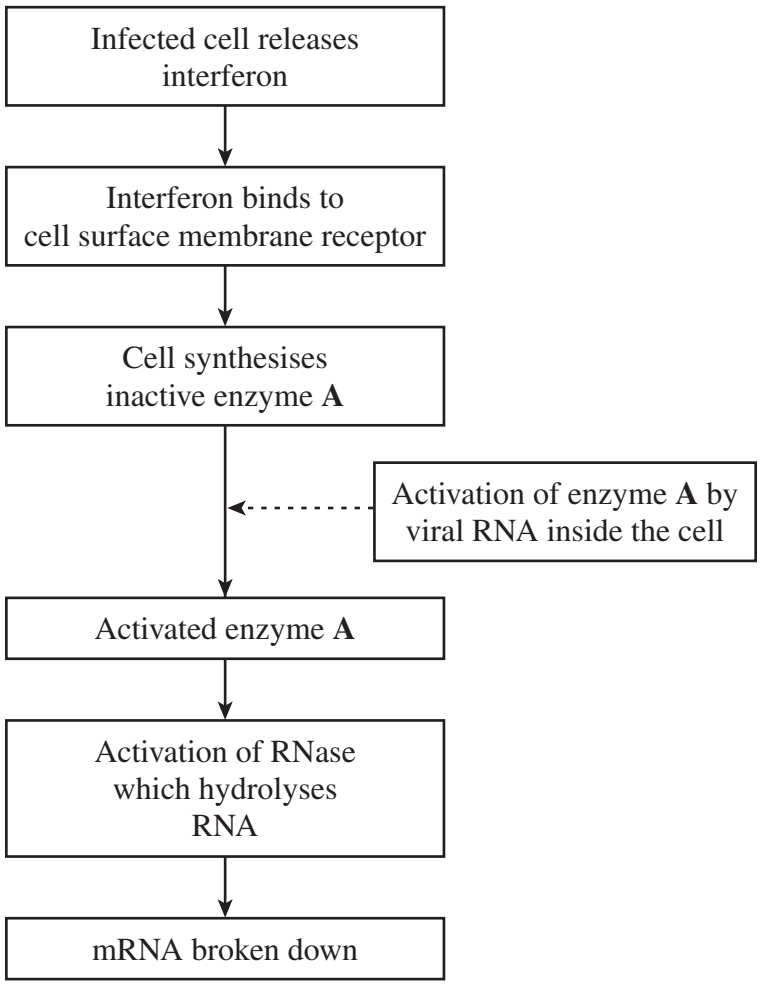
S 7 (b) When a human cell is infected by a virus, the cell produces interferons. Interferons are small proteins which can pass to other cells. The diagram shows the effect of interferon on cells.



S 7 (b) (i) Use the diagram to explain how interferon reduces the spread of a virus in the body of an infected person.

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(6 marks)

S 7 (b) (ii) The process shown in the diagram requires the presence of viral RNA. Explain the advantage of this to the cells of an infected person.

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(1 mark)

10

END OF SECTION A

SECTION B IS PROVIDED AS AN INSERT

If you need extra space use page 14 for your answers.

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