Surname		Other Names	
Centre Number		Candidate Number	
Candidate Signature			

General Certificate of Education
June 2007
Advanced Level Examination

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

AQA

ASSESSMENT and
QUALIFICATIONS
ALLIANCE

Friday 22 June 2007   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 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 the spaces provided.
- **Section A** and **Section B** will be marked by different examiners.
  You must ensure than 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 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**.

BYB7/A

SECTION A

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

1   Bacteria were grown in a liquid culture medium. The graph shows the growth of the population of bacteria and changes in pH of the medium.

Number of bacteria

Number of
bacteria in the
population

pH

pH

Time / h
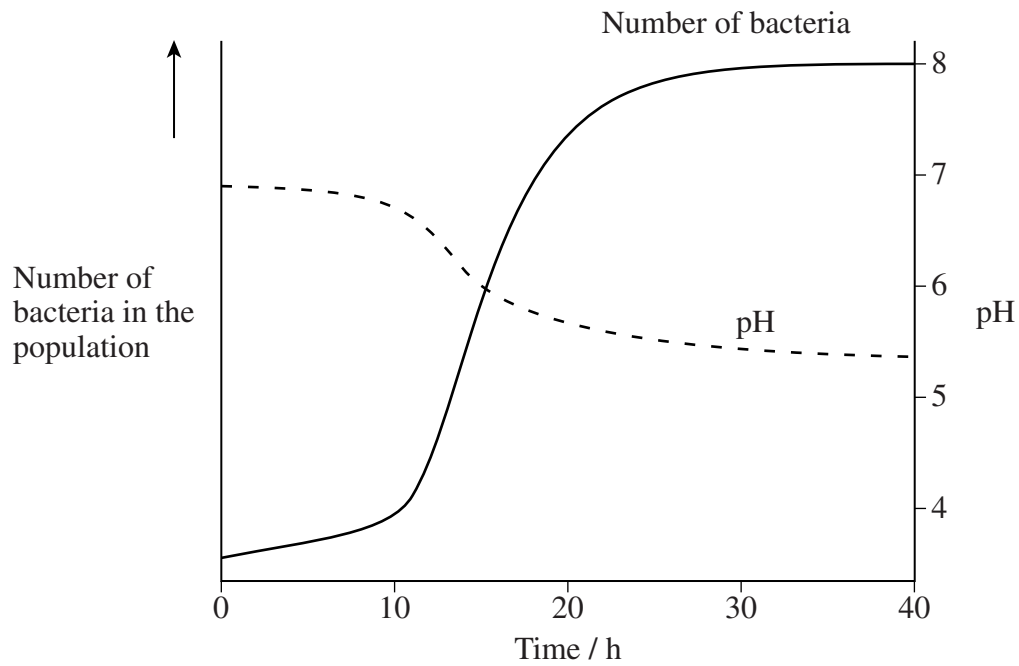
(a)   Explain the changes in the number of bacteria between

   (i)   0 and 10 hours

   ....

   ....
   (1 mark)

   (ii)   10 and 15 hours.

   ....

   ....
   (1 mark)

(b) Suggest **one** explanation for the change in pH.

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(1 mark)

S (c) A pH of 5.4 may stop the growth of the population. Suggest how.

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(3 marks)

6

Turn over for the next question

2 The diagram shows apparatus used for the continuous culture of a species of microorganism.
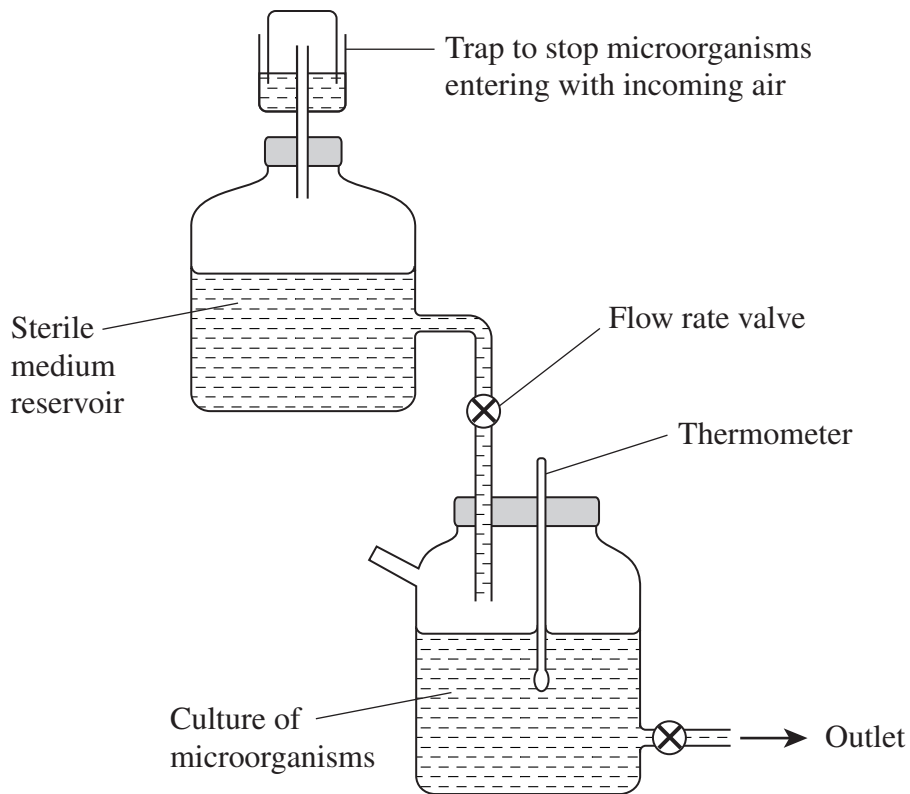
(a) (i) Explain **one** way in which the apparatus keeps the population of microorganisms growing rapidly.

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(2 marks)

(ii) Suggest and explain **one** modification to the apparatus which would maintain optimum conditions for growth.

Modification ....

Explanation ....

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(2 marks)

(b) (i) Give **one** commercial advantage of using a continuous culture.

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....

(ii) Some substances cannot be produced by continuous fermentation. Give **one** reason why.

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....

(2 marks)

6

Turn over for the next question

Turn over ▶

3 The diagram shows a bacterium.
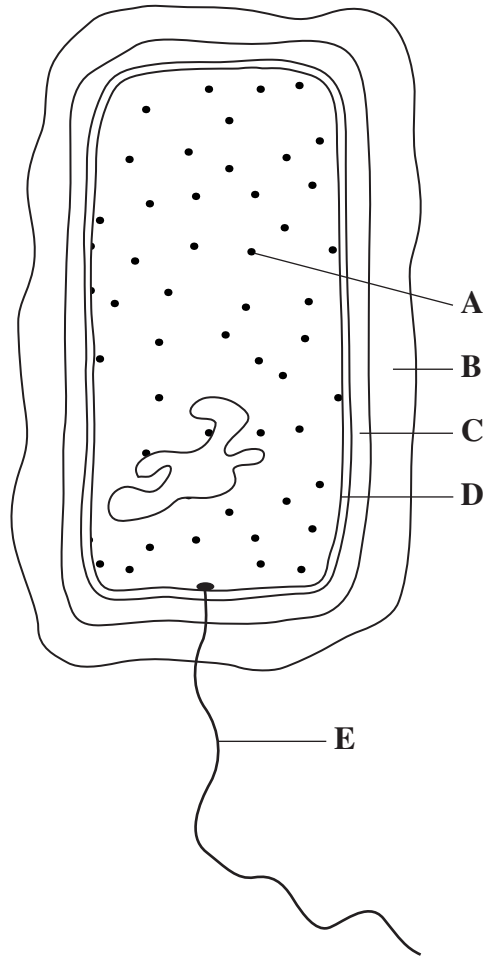
(a) Give **two** letters that label structures present in all bacteria.

....

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(1 mark)

(b) Name **one** labelled structure that would affect the pathogenicity of this bacterium. Explain how this structure affects pathogenicity.

Structure ....

Explanation ....

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(3 marks)

S (c) The cell surface membrane of this bacterium transports amino acids into the cell. The cell surface membrane is also where oxidative phosphorylation takes place during aerobic respiration.

Scientists measured the transport of amino acids through the cell surface membranes with and without reduced NAD. The results are shown in the table.

Amino acid	Transport of amino acids through the membrane / arbitrary units	
	With reduced NAD	**Without reduced NAD**
Glutamic acid	2600	188
Aspartic acid	2685	212
Alanine	1520	64

Explain the results.

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(3 marks)

7

Turn over for the next question

Turn over ▶

4 (a) Students estimated the total cell count of bacteria in a liquid culture. They took a known volume from the original culture and diluted it by a factor of 100 000, to give a diluted sample. They then put a drop of this diluted sample on a haemocytometer slide. The diagram shows the bacteria present in a typical large square of the haemocytometer.

0.2 mm

0.2 mm
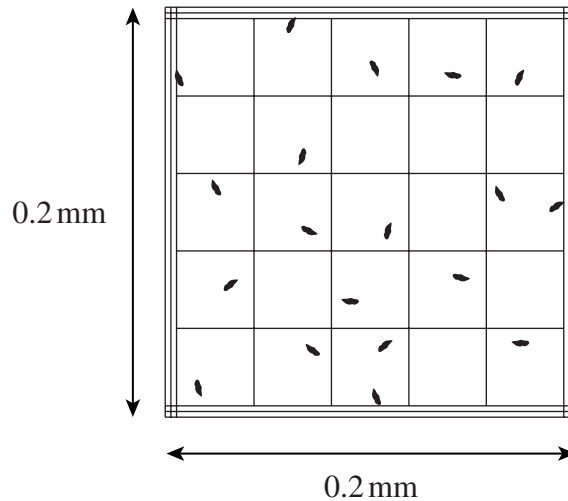
(i) The depth of the chamber is 0.1 mm. Calculate the number of bacteria in $1\,mm^3$ of the diluted sample. Show your working.

.... bacteria per mm^3
(2 marks)

(ii) Calculate the number of bacteria in $1\,cm^3$ of the original culture. Show your working.

.... bacteria per cm^3
(2 marks)

(b) Describe how a viable count for the original culture could be obtained.

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(3 marks)

7

Turn over for the next question

Turn over ▶

There are no questions printed on this page

5 Some antibiotics prevent the synthesis of cell walls by bacteria.

(a) Describe **one** other way in which an antibiotic affects the growth of bacteria.

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(2 marks)

S (b) (i) Antibiotics that prevent the synthesis of cell walls lead to the death of bacteria as a result of osmosis. Explain how.

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(3 marks)

(ii) Explain why this type of antibiotic is **not** harmful to mammalian cells.

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(1 mark)

S (c) Ampicillin is an antibiotic similar to penicillin but more resistant to low pH. It is available in the form of tablets to be taken by mouth. Ampicillin may be more effective than some other antibiotics that are taken by mouth. Suggest why.

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....

(1 mark)

7

Turn over ▶

6 S (a) Integrase is an enzyme found in the human immunodeficiency virus. This enzyme inserts DNA derived from HIV into human DNA. The diagram shows the stages in this process.
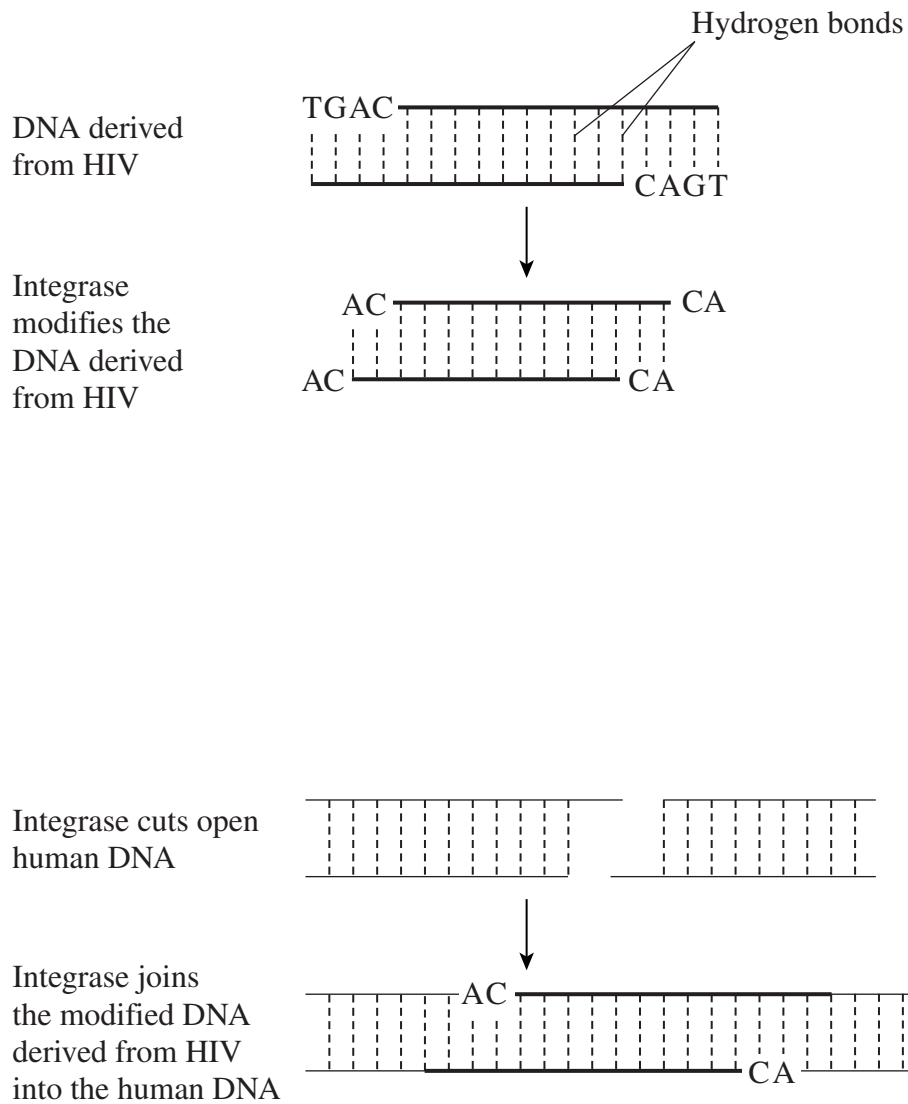
Use the diagram to explain how integrase inserts the DNA derived from HIV into human DNA.

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(3 marks)

(b) (i) Other than integrase, name **one** enzyme present in the human immunodeficiency virus.

....

(1 mark)

(ii) Explain the function of this enzyme.

....

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(1 mark)

S (c) Describe how the mRNA that codes for HIV proteins is produced from DNA.

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(3 marks)

$\boxed{8}$

Turn over for the next question

Turn over ▶

7 (a) Describe how B lymphocytes are involved in the immune response.

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(4 marks)

(b) **S** (i) Influenza viruses have two proteins on their surface, HA and NA. These proteins allow the viruses to bind to receptors on the surfaces of cells lining airways and lungs. Explain how HA and NA proteins bind specifically to receptors on the surfaces of cells.

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(2 marks)

(ii) When an organism is infected with two different strains of influenza virus, base sequences from genes can sometimes be transferred between the two strains. A new virus caused an influenza epidemic in human populations in 1968. Its HA gene contained 1765 bases and 1605 of these were the same sequence as a bird influenza virus gene.

Most people in 1968 were susceptible to influenza caused by the new virus. Explain why.

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(3 marks)

9

END OF SECTION A

SECTION B IS PROVIDED AS AN INSERT

There are no questions printed on this page