Surname		Other Names	
Centre Number		Candidate Number	
Candidate Signature			

AQA
ASSESSMENT and
QUALIFICATIONS
ALLIANCE

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

Tuesday 28 January 2003   9.00 am to 11.15 am

In addition to this paper you will require:
- Section B (attached);
- a ruler with millimetre measurements.

You may use a calculator.

For Examiner's Use			
Number	Mark	Number	Mark
1			
2			
3			
4			
5			
6			
7			
Total (Column 1) →			
Total (Column 2) →			
TOTAL			
Examiner's Initials			

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 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 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 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**.

SECTION A

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

1   The drawing is from an electron micrograph of a bacterium.
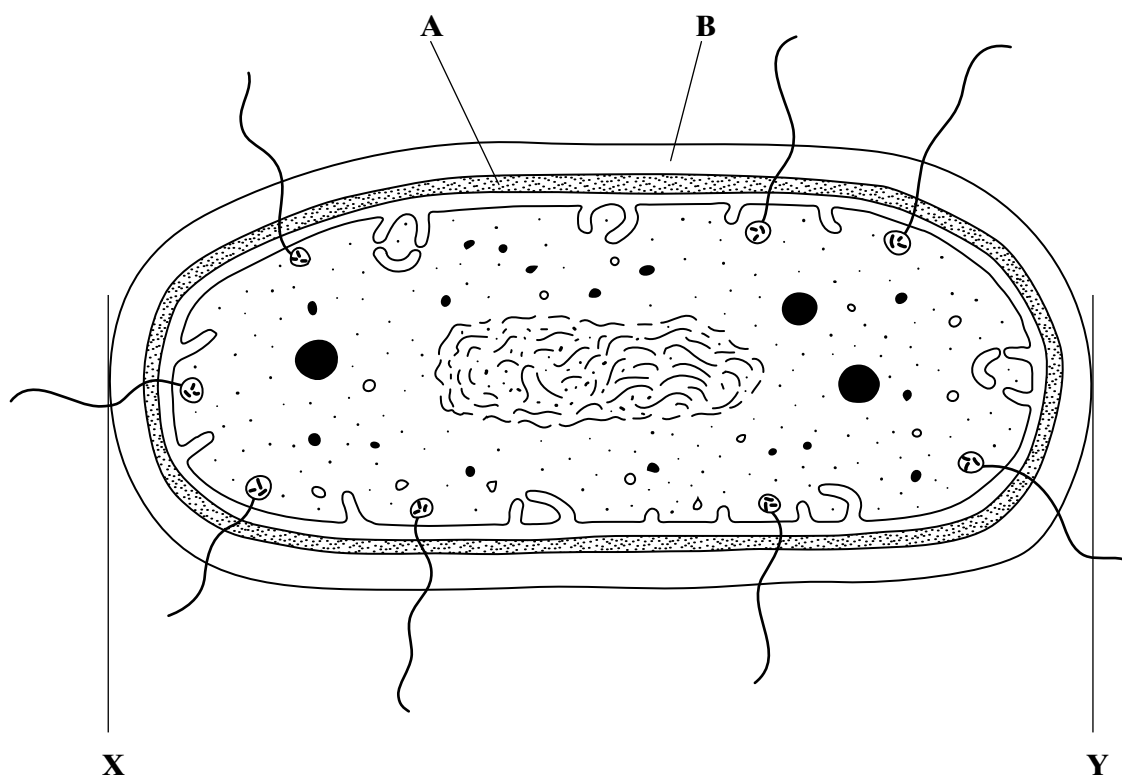
(a)   Name parts **A** and **B**.

A ....

B ....

(2 marks)

(b)   The length of the bacterium between **X** and **Y** is 6.5 µm. Calculate the magnification of the drawing. Show your working.

Answer ....

(2 marks)

S (c)   Give **two** similarities between a mesosome of a bacterium and a crista of a mitochondrion.

1 ....

....

2 ....

....

(2 marks)

6

TURN OVER FOR THE NEXT QUESTION

Turn over ▶

2 The number of bacteria in a sample of river water was investigated using the technique of dilution plating.

(a) Describe how the river water should be diluted to 1 in 1000.

....

....

....

....

....

....

(3 marks)

(b) $0.1\,cm^3$ of each of a range of dilutions was plated on to nutrient agar in Petri dishes and then incubated for two days at $20\,°C$. The results for the 1 in 100 000 dilution are shown in the diagram.
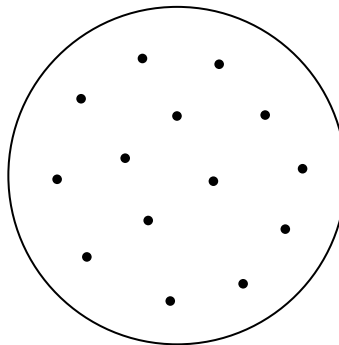
(i) What does each dot on the diagram represent?

....

....

(1 mark)

(ii) Calculate the number of bacteria per cm^3 in this river water. Show your working.

Answer ....per cm^3

(2 marks)

(c) When the number of bacteria in the river water was calculated from the 1 in 1 000 000 dilution, a lower number per cm^3 was obtained. Suggest why.

....

....

(1 mark)

(d) When a haemocytometer was used to determine the number of bacteria, a larger number was obtained for every dilution. Explain why.

....

....

(1 mark)

$\dfrac{\quad}{8}$

TURN OVER FOR THE NEXT QUESTION

Turn over ▶

3 Milk contains a disaccharide called lactose. Milk can be made sweeter by using the enzyme β galactosidase which breaks down the lactose into the monosaccharides glucose and galactose. The enzyme is immobilised by trapping it in alginate beads. The milk is continuously circulated through the beads until all the lactose has been broken down.

The diagram shows the apparatus used.
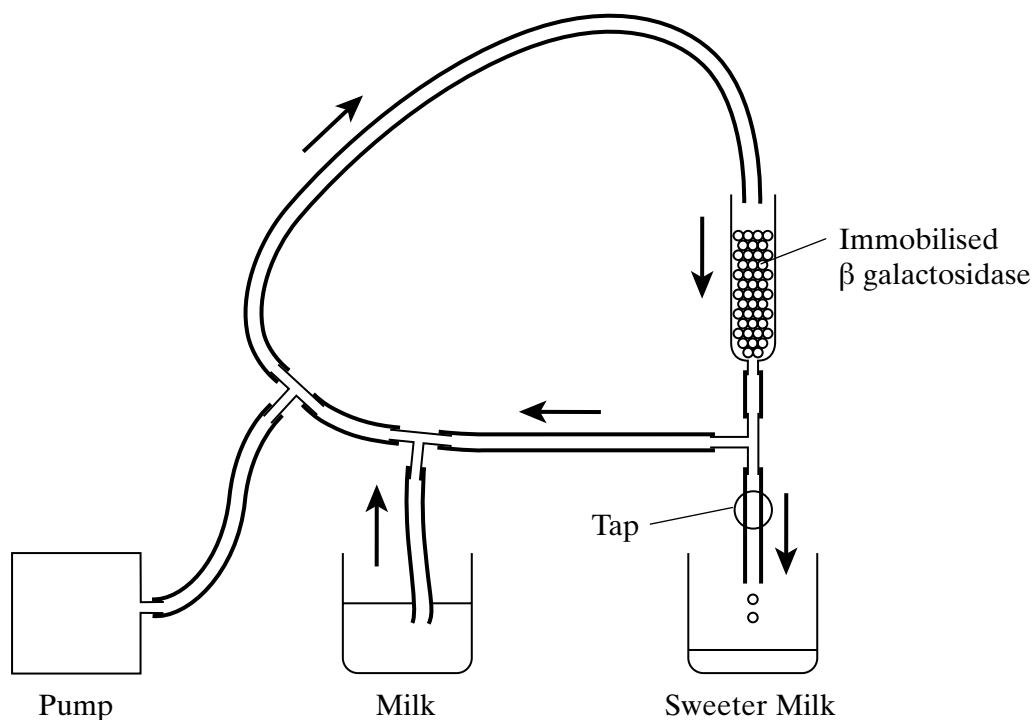
(a) Give **two** advantages of immobilising the β galactosidase used in this process.

1 ....

....

2 ....

....

(2 marks)

S (b) If the enzyme is trapped in a large number of small beads, it produces sweeter milk more quickly than an equal volume trapped in a smaller number of large beads. Explain why.

....

....

(1 mark)

S (c) Lactose, glucose and galactose are all reducing sugars. Suggest how the sweeter milk could be tested to find out if all the lactose had been broken down.

....

....

....

....

(2 marks)

5

TURN OVER FOR THE NEXT QUESTION

Turn over ▶

4 Macrophages are a type of white blood cell involved in protecting against disease. One of their functions is to release substances called pyrogens which cause a fever to develop.

(a) Give **two** ways in which macrophages protect against disease, other than by producing pyrogens.

1 ....

....

2 ....

....

(2 marks)

S (b) Pyrogens raise the set point for body temperature from 37 °C to a temperature of about 39 °C. Thermoregulatory responses then cause body temperature to increase to the new set point.

Describe and explain how **one** thermoregulatory response would result in body temperature increasing to the new set point.

....

....

....

....

....

....

(4 marks)

6

5 The diagram shows an antibody.
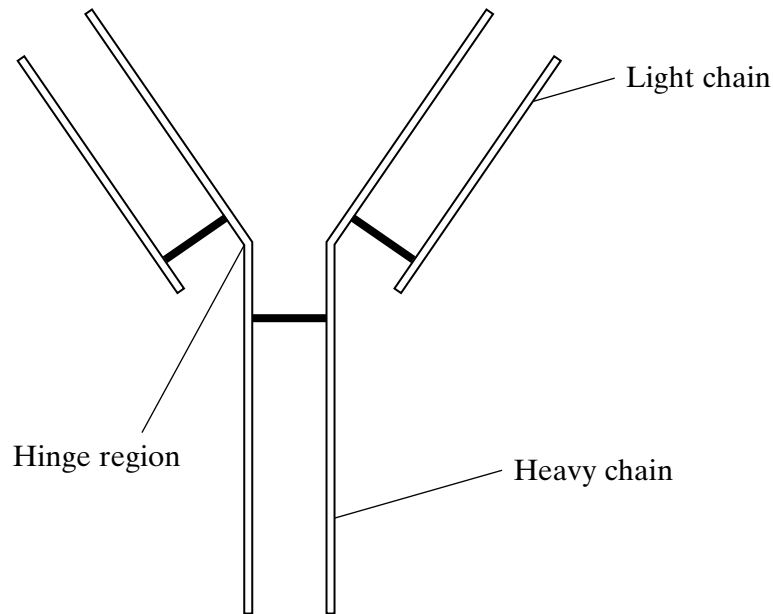
S (a) Each heavy and light chain is made up from one type of monomer. Name the type of monomer in each chain.

....
(1 mark)

(b) Write **X** on the diagram to show where an antigen may form a complex with this antibody. *(1 mark)*

(c) Each antibody can form a complex with only one type of antigen. Explain why.

....

....
(1 mark)

(d) The hinge region of the antibody allows both ends to pivot and rotate in relation to one another. Suggest how this action assists the role of antibodies in agglutination.

....

....

....
(1 mark)

$\dfrac{}{4}$

Turn over ▶

6 (a) Explain how viruses cause damage to cells.

....

....

....

....

....

....

(3 marks)

Hepatitis A is a disease caused by a virus, which can permanently damage the liver and other organs, such as the pancreas.

The hepatitis A virus is an RNA virus usually transmitted by drinking water contaminated with the faeces of infected people. It exists as a single immunological type. Heating the virus to $100\,°C$ for five minutes inactivates its infectivity.

(b) Suggest why the virus causes damage only to some types of human cell.

....

....

(1 mark)

(c) Suggest why effective vaccines cannot be produced using hepatitis A viruses that have been heated to $100\,°C$.

....

....

(1 mark)

(d)   Explain what is meant by hepatitis A virus existing as a *single immunological type*.

....

....

....

....

(2 marks)

S   (e)   Glucose is present in the urine of some people who suffer from hepatitis. Explain how hepatitis may cause this.

....

....

....

....

....

....

....

....

(4 marks)

TURN OVER FOR THE NEXT QUESTION

Turn over ▶

7 (a) Typhoid fever is caused by the bacterium, *Salmonella typhi*. This is a highly infective and highly invasive pathogen.

Explain what is meant by describing *S. typhi* as highly infective and highly invasive.

....

....

....

....

....

....

(3 marks)

(b) People who have recovered from typhoid fever may still have large numbers of *S. typhi* bacteria in their large intestines. These people do not show any symptoms of typhoid fever.

Describe how these people may infect others with *S. typhi*.

....

....

....

....

....

....

(3 marks)

S (c) The antibiotic, chloramphenicol, is used to treat people with typhoid fever. It inhibits an enzyme involved in synthesising proteins on ribosomes.

Suggest and explain how the action of chloramphenicol disrupts protein synthesis.

....

....

....

....

....

....

....

....

(4 marks)

10

END OF SECTION A