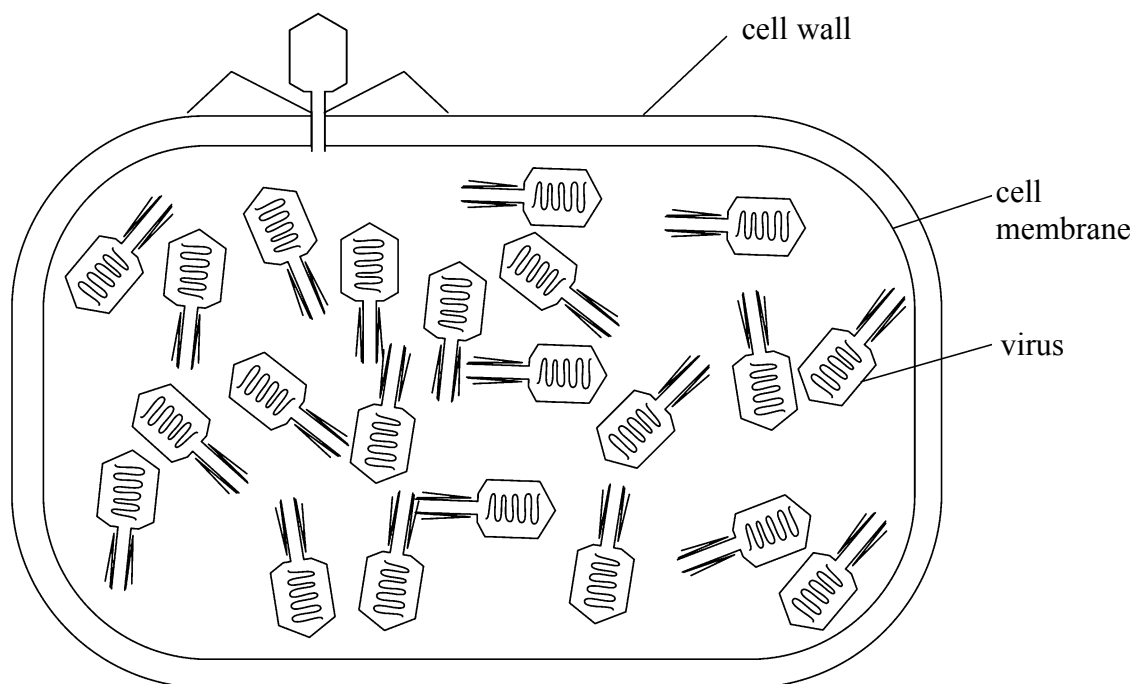


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1. The diagram shows a bacterium that has been attacked by a virus.



Use the diagram to help you to explain the stages in which a bacterium is attacked and destroyed by a virus.



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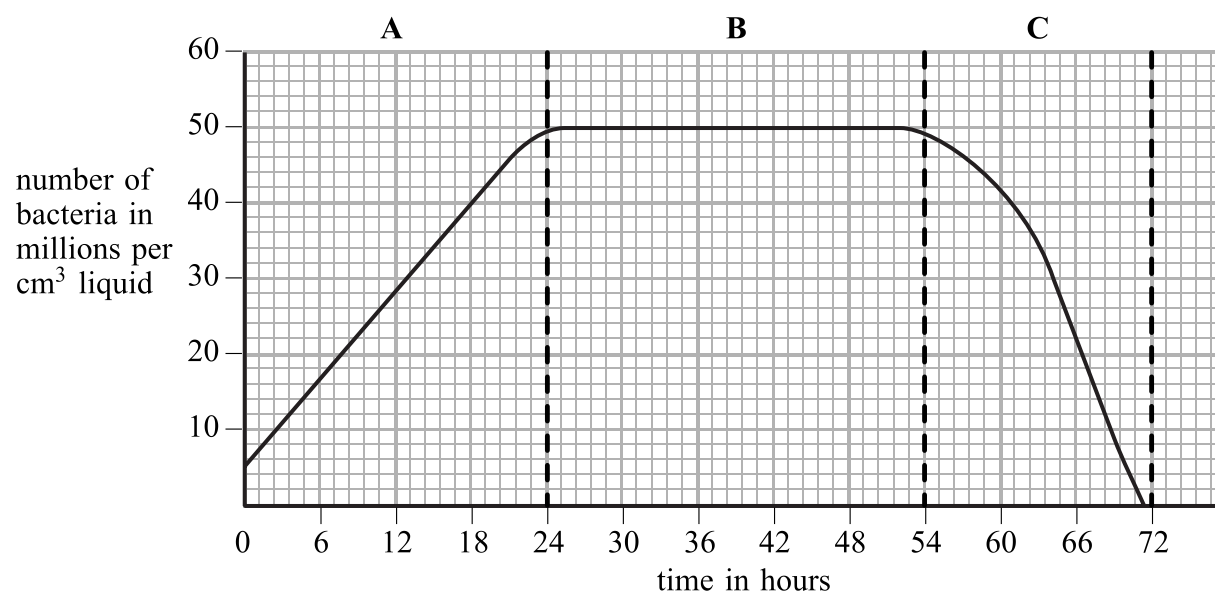
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Q1

(Total 6 marks)



2. (a) Bacteria were grown in a liquid containing a limited amount of nutrients. The number of bacteria per cm^3 of liquid was measured over 72 hours. The numbers are shown in the graph below.



Use the information in the graph to help you complete the table below. Write the correct letter from the list in each box.

- A
- B
- C

The first one has been done for you.

description of region of graph	letter
most nutrients were available	A
waste products excreted by bacteria were at their highest	
rate of production of bacteria = rate of death of bacteria	
nutrients were running out rapidly	
conditions were perfect for the growth of the bacterial population	

(4)



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blank

(b) Bacteria sometimes produce spores.

(i) Explain why bacteria produce spores.

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(2)

(ii) State **two** environmental conditions which may result in production of spores.

1

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2

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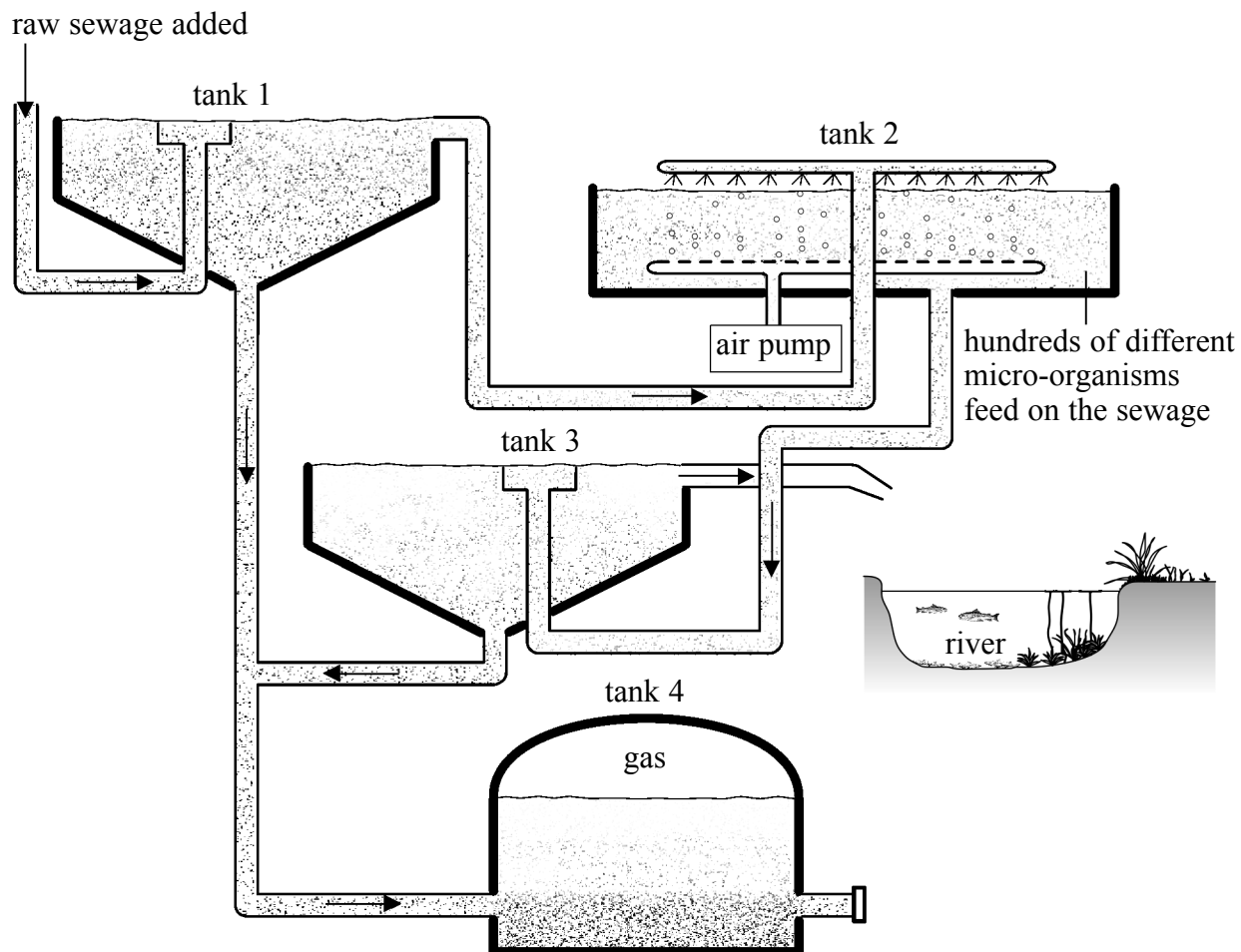
(2)

Q2

(Total 8 marks)



3. The diagram shows a sewage treatment works.



Use the information above and your own knowledge to answer the following questions.

- (a) The table includes the name of each tank in the diagram above. Complete the table by putting one number in each box.

name of tank	number of tank
aerobic digester tank	
anaerobic digester tank	
first settlement tank	
second settlement tank	

(4)



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(b) Put an **X** on the diagram where the least toxic effluent would be. **(1)**

(c) Name the gas produced in tank 4.
..... **(1)**

(d) In which tank are micro-organisms most active?
Give a reason for your answer.
.....
.....
.....
..... **(2)**

(e) Too much disinfectant entered the sewage works from the houses near this treatment works.
Suggest what may happen to the treatment process as a result.
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..... **(2)**

(f) The sludge from tank 4 can be spread on farmland.
Explain why farmers find it useful.
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..... **(2)**

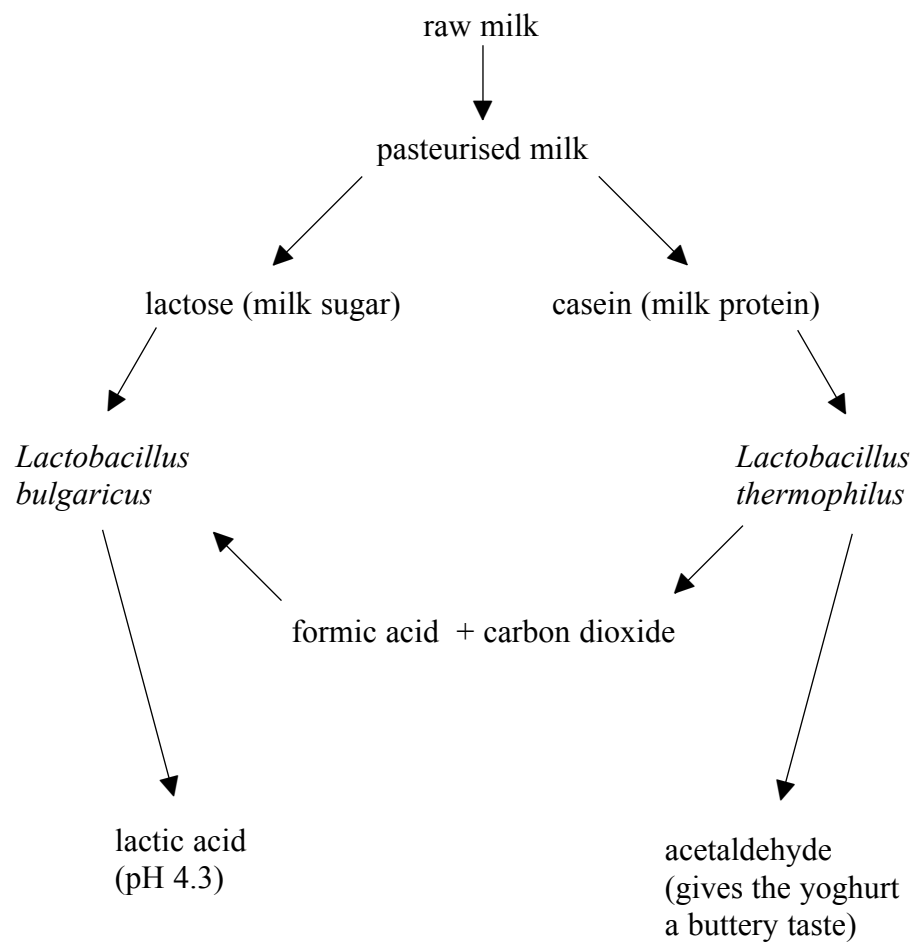
(Total 12 marks)

Q3

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4. The flow diagram shows how one type of yoghurt is produced from raw milk.



Use the flow diagram and your own knowledge to answer the questions below.

(a) (i) Explain how the raw milk would be pasteurised.

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(2)

(ii) Explain why is it important to pasteurise the raw milk at the beginning of the process.

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(2)



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- (b) The bacteria and pasteurised milk are kept at a temperature of 40°C.
Explain why this is necessary.

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(2)

- (c) Explain the function of each type of bacterium in the production of yoghurt.

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(3)

- (d) Explain why the activity of the bacteria decreases at the end of the process.

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(2)

- (e) Explain why it is possible to make more yoghurt by putting a spoonful of this yoghurt into milk.

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(1)

(Total 12 marks)

Q4

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5. Read the passage about MRSA.

MRSA HOSPITAL CRISIS!

Patients in hospital are in danger of attack from MRSA. MRSA is methicillin resistant *Staphylococcus aureus*, a strain of a species of bacterium. *Staphylococcus aureus* lives on the skin and in the nose of 30% of the population but rarely causes an infection. Occasionally it may cause pimples or boils. These bacteria can invade open wounds of patients who have had surgery, causing infection. Doctors prescribe antibiotics but they have no effect and some patients have died. The following comments were made in a newspaper article about MRSA.

“In my day, more people were employed as cleaners. Bedding and clothes were washed more often. Surfaces were regularly disinfected and instruments were sterilised. Wounds were cleaned with antiseptics and dressings were changed more often. Antibiotics were always effective. We did not have an MRSA problem.”

“In the past too many antibiotics have been used. They have been used for many conditions and even put in the food of farm animals. Patients often fail to finish a course of antibiotics so many bacteria have remained alive. *Staphylococcus aureus* reproduces quickly which has resulted in the rapid evolution of new strains.”

Use the passage and your own knowledge to answer the questions below.

(a) Name **two** methods used to kill micro-organisms.

1

2

(2)

(b) If a hospital had 200 medical staff, 100 support staff and 300 patients, how many people all together are likely to carry the bacterium *Staphylococcus aureus*? Show your working.

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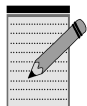
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(2)



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(c) Explain how some *Staphylococcus aureus* bacteria were able to develop resistance to antibiotics.



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(4)



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(d) A test to detect an MRSA carrier includes putting a sterile swab in the nose of a patient and then culturing the bacteria found there. If *Staphylococcus aureus* bacteria are found growing in the culture, some are transferred to produce a pure culture.

(i) How are bacteria cultured in a hospital laboratory?

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.....
(1)

(ii) Explain why it is essential that safe procedures are followed when creating a pure culture of *Staphylococcus aureus*.

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(1)

(iii) Using the pure *Staphylococcus aureus* culture, how would doctors find out if it is MRSA?

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(2)

(iv) The test for MRSA takes several days to identify a carrier. A new test is being developed that takes only three hours. Suggest how the results from the new test can be used to prevent patients being infected with MRSA.

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(2)

(Total 14 marks)

Q5

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6. (a) A new type of genetically modified plant has been introduced in the USA. The plants are resistant to the herbicide glyphosate. Farmers buy an annual licence for permission to plant the GM seeds. Crop yields are enormous when compared to non-GM crops.

Some facts about the herbicide glyphosate

- farmers spray it on fields containing both the GM crop and weeds
- all plants absorb glyphosate which moves to all of their organs
- this has no effect on the GM crop but affects all other plants
- glyphosate stops the functioning of an enzyme
- this enzyme controls the production of amino acids, essential for living plants
- this enzyme is not found in animals so glyphosate is not toxic to animals.

Use the information above and your own knowledge to answer the questions.

- (i) Explain why the yields of the GM crops sprayed with glyphosate are much greater than yields of non-GM crops.

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(2)

- (ii) Explain why weeds cannot produce proteins essential to life after being sprayed with glyphosate.

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(2)

- (iii) Why are minute quantities of glyphosate in foods considered harmless to consumers?

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(1)



(iv) Suggest **one** potential disadvantage of growing herbicide resistant GM crops.

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(1)

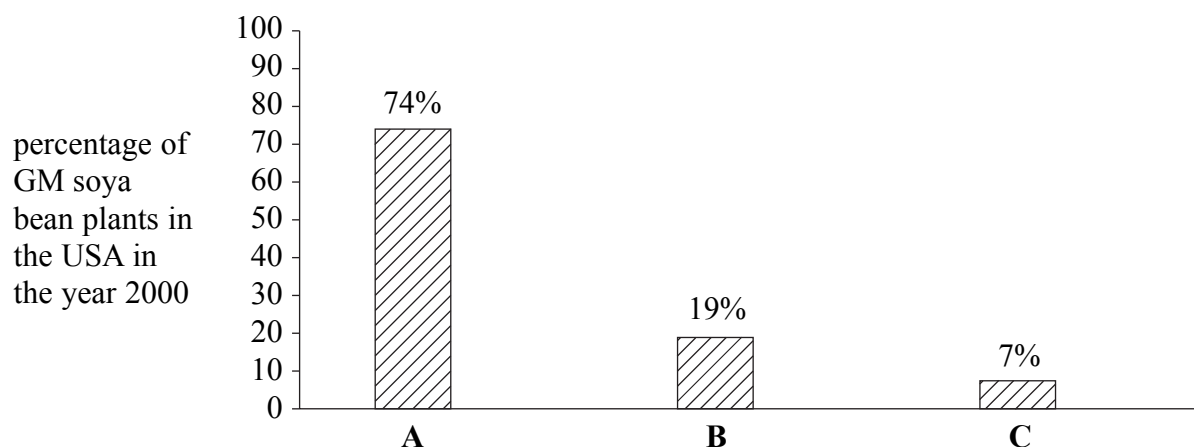
(b) *Bacillus thuringiensis* is a bacterium which produces a protein which is toxic to insects. The gene for this protein has been transferred to some crop plants.

The bar graph shows the relative proportions of three types of GM soya bean plant grown in the USA during the year 2000.

Type A – has resistance to herbicide

Type B – can produce protein toxic to insects

Type C – has resistance to herbicide **and** produces a protein toxic to insects



Suggest the most likely change in the **proportions** of the types of GM soya bean which may be grown in the future. Explain the reason for your answer.

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(2)

Q6

(Total 8 marks)

TOTAL FOR PAPER: 60 MARKS

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