

**Q1.** The following are precautions taken when preparing a streak of bacteria on an agar jelly plate.

Give a reason for each.

- (i) The inoculating loop is heated in a hot bunsen flame.

REASON:

.....  
.....

(1)

- (ii) The loop is allowed to cool before putting it into the bacterial culture.

REASON:

.....  
.....

(1)

- (iii) The lid of the petri dish is only partly opened.

REASON:

.....  
.....

(1)

- (iv) The petri dish is sealed with sticky tape.

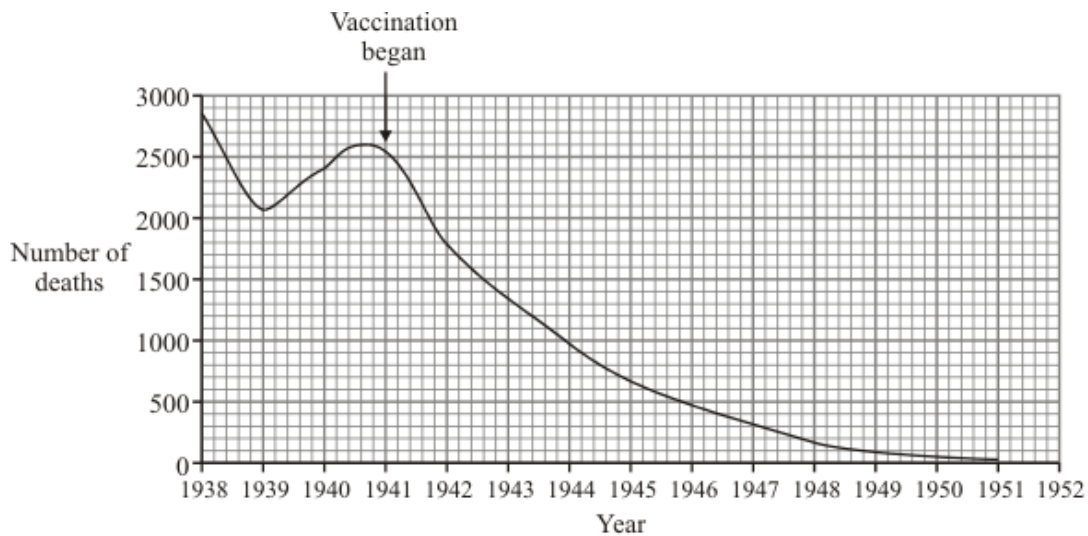
REASON:

.....  
.....

(1)

**(Total 4 marks)**

- Q2.** Diphtheria is a disease of the human breathing system. The graph shows the number of deaths from diphtheria in the United Kingdom between 1938 and 1951. Vaccination against diphtheria was begun in 1941.



- (a) What evidence in the graph suggests that vaccination protects people from diphtheria?

.....

(1)

- (b) Complete the passage by choosing the correct words from the box.

<b>antibodies</b>	<b>bacteria</b>	<b>platelets</b>
<b>red blood cells</b>	<b>white blood cells</b>	

During vaccination, harmless ..... are injected into the body.

This causes ..... to make ..... which help to protect the body against diphtheria.

(3)

(Total 4 marks)

- Q3.** In the eighteenth century, surgeons did not wear special clothing or wash their hands before operations. Many of their patients died from infections.

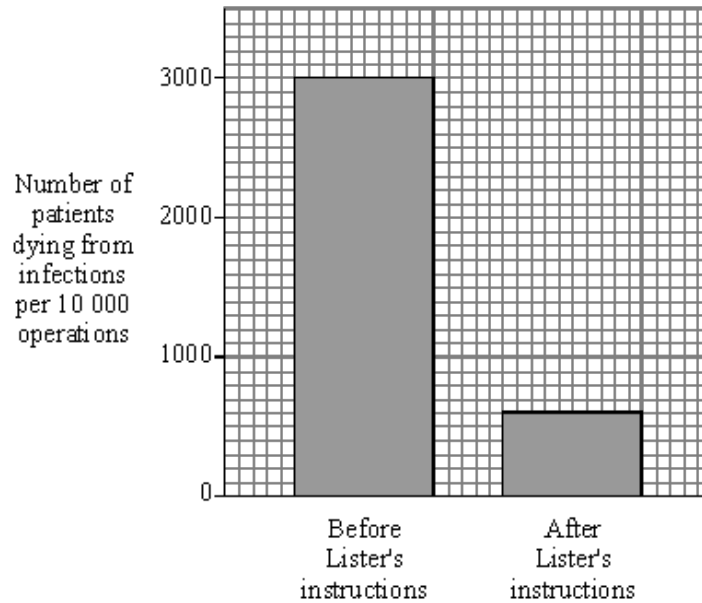
- (a) Suggest why patients often died from infections after operations.

.....

(1)

- (b) In the nineteenth century, Joseph Lister told surgeons to use sprays of carbolic acid in operating theatres and to wash their hands.

The graph shows the effect that using Lister's instructions had on the number of patients who died from infections after surgery.



Describe how Lister's instructions affected the number of patients dying from infections after surgery.

.....

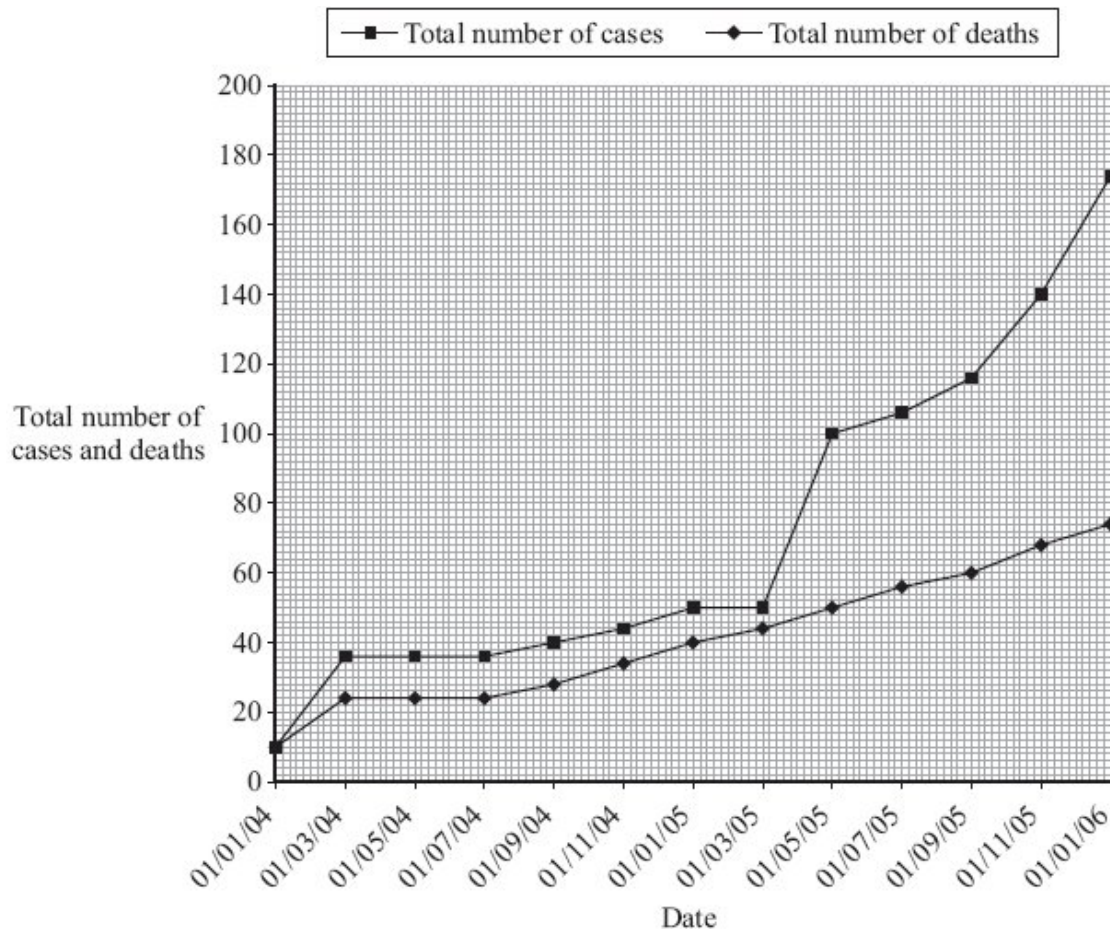
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(2)  
(Total 3 marks)

**Q4.** Scientists began to keep records of cases of H5N1 bird flu in humans in January 2004.

The graph shows the total number of cases of bird flu in humans and the total number of deaths up to January 2006.



(a) (i) How many people had died from bird flu up to 01/07/05?

.....

(1)

(ii) Describe, as fully as you can, how the number of cases of bird flu in humans changed between 01/07/04 and 01/01/06.

.....

.....

.....

.....

(2)

- (b) At present, humans can only catch bird flu from contact with infected birds. The bird flu virus may mutate into a form that can be passed from one human to another.

Explain why millions of people may die if the bird flu virus mutates in this way.

.....

.....

.....

.....

(2)  
(Total 5 marks)

##

- (a) Use words from the box to complete the sentences about curing disease.

antibiotics	antibodies	antitoxins	painkillers	statins
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The substances made by white blood cells to kill pathogens are called.....

The substances made by white blood cells to counteract poisons produced by pathogens are called .....

Medicines which kill bacteria are called .....

(3)

- (b) The MMR vaccine protects people against three diseases.

Write down the names of **two** of these diseases.

1 .....

2 .....

(2)

- (c) All vaccinations involve some risk.

The table shows the risk of developing harmful effects:

- from the disease if a child is **not** given the MMR vaccine;
- if a child **is** given the MMR vaccine.

Harmful effect	Risk of getting the harmful effect from the disease (if not vaccinated)	Risk of getting the harmful effect from MMR vaccine
Convulsions	1 in 200	1 in 1000
Meningitis	1 in 3000	Less than 1 in 1 000 000
Brain damage	1 in 8000	0

A mother is considering if she should have her child vaccinated with the MMR vaccine.

Use information from the table to persuade the mother that she should have her child vaccinated.

.....

.....

.....

.....

(2)

- (d) The vaccine used to protect us from the Hepatitis B virus is produced by genetic engineering.

Yeast cells are used to produce the vaccine.

Use words from the box to complete the sentence.

<b>chromosomes</b>	<b>drugs</b>	<b>enzymes</b>	<b>genes</b>	<b>hormones</b>
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To produce the vaccine ..... are used to cut out .....

from the Hepatitis B virus which are then inserted into the yeast cells.

(2)

(Total 9 marks)

**Q6.** Pathogens can enter the body and cause disease.

- (a) (i) Name **one** type of medicine which kills bacteria in the body.

.....

(1)

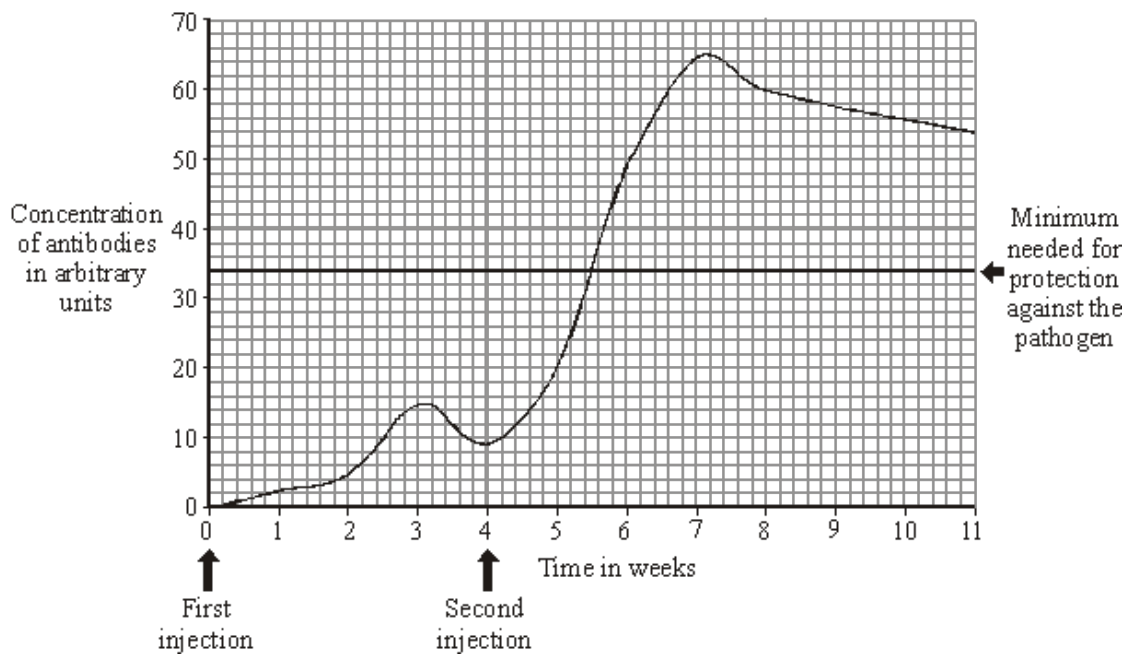
- (ii) Name **one** type of medicine which helps to relieve the symptoms of infectious disease.

.....

(1)

- (b) Vaccination protects us from pathogens.

The graph shows the concentration of antibodies in the blood of a person after two injections of vaccine given four weeks apart.



- (i) How long after the first injection did it take for the concentration of antibodies to reach the minimum level for protection against the pathogen?

..... weeks

(1)

- (ii) Describe what happened to the concentration of antibodies in the blood from week 0 to week 7.

.....

.....

.....

.....

.....

.....

(3)

- (iii) Would you expect the concentration of antibodies to stay above the level needed for protection against the pathogen over the next ten years?

Draw a ring around your answer.      **Yes / No**

Give a reason for your answer.

.....

.....

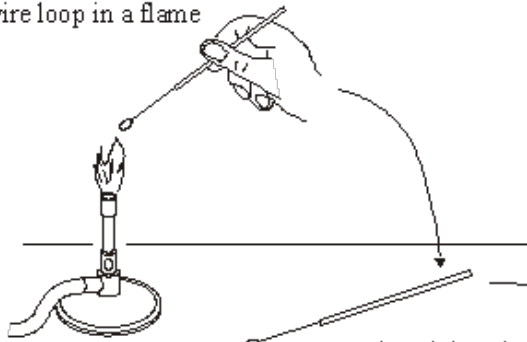
(1)

**(Total 7 marks)**



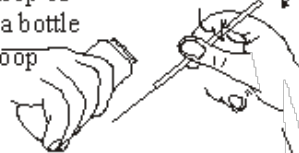
**Q7.** The diagram shows how a student transferred some sour milk from a bottle to a Petri dish of nutrient agar.

- 1** The student heated a wire loop in a flame

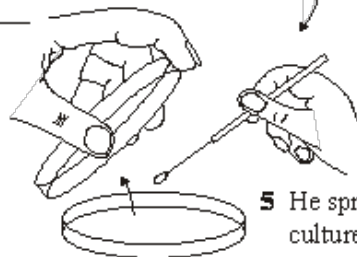


- 2** He placed the wire loop on the bench to cool

- 3** He removed a drop of sour milk from a bottle using the wire loop



- 4** He raised the lid a little from a Petri dish of sterilised nutrient agar



- 5** He spread the sample of bacterial culture across the nutrient agar

- 6** He replaced the lid and put the Petri dish in an incubator at 25 °C for 2 days



**List A** gives four actions carried out by the student.

**List B** gives five possible effects of these actions.

Draw a straight line from each action in List A to its effect in List B.  
Draw only **one** line from each action.

**List A – Action**

**List B – Effect**

Heating loop in flame	Risk of contamination with bacteria increased
Placing loop on bench to cool	Risk of bacteria entering decreased
Only lifting lid of petri dish a little	Kills bacteria
Placing petri dish in incubator at 25°C rather than 35°C	Prevents air entering
	Risk of growth of pathogens decreased

(Total 4 marks)

**Q8.** Polio is a disease caused by a virus. In the UK, children are given polio vaccine to protect them against the disease.

(a) In the sentences below, draw a ring around the correct words in each box.

(i) It is difficult to kill the polio virus inside the body

because the virus

is not affected by drugs  
lives inside cells  
produces antitoxins

(1)

(ii) The vaccine contains an

active
infective
inactive

form of the polio virus.
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(1)

(iii) The vaccine stimulates the white blood cells to

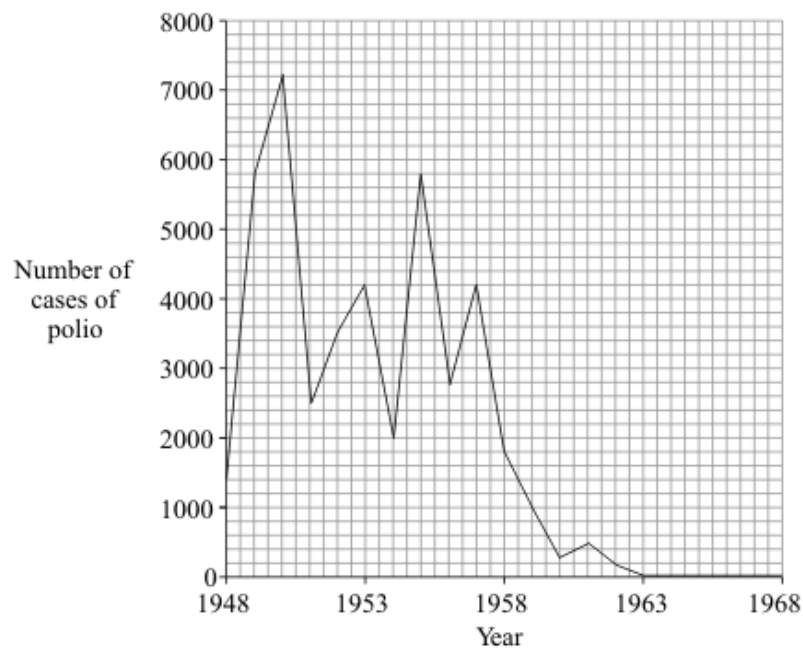
produce

antibiotics
antibodies
drugs

which destroy the virus.
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(1)

(b) The graph shows the number of cases of polio in the UK between 1948 and 1968.



(i) In which year was the number of cases of polio highest?

.....

(1)

(ii) Polio vaccination was first used in the UK in 1955.

How many years did it take for the number of cases of polio to fall to zero?

.....

(1)

- (iii) There have been no cases of polio in the UK for many years. But children are still vaccinated against the disease.

Suggest **one** reason for this.

.....

.....

(1)  
(Total 6 marks)

- Q9.** (a) Microorganisms can be grown on agar jelly in a Petri dish.

**List A** gives three actions used when growing microorganisms.

**List B** gives four possible effects of these actions.

Draw a straight line from each action in **List A** to its effect in **List B**.

**List A – Action**

**List B – Effect**

The agar jelly is heated at  
120°C for 30 minutes

To reduce the growth of  
pathogens

Make sure the temperature for  
growing the microorganisms is  
no higher than 25 °C

To kill unwanted  
microorganisms

The lid of the Petri dish is held  
on with tape

To prevent microorganisms from  
the air getting into the Petri dish

To prevent oxygen entering the  
Petri dish

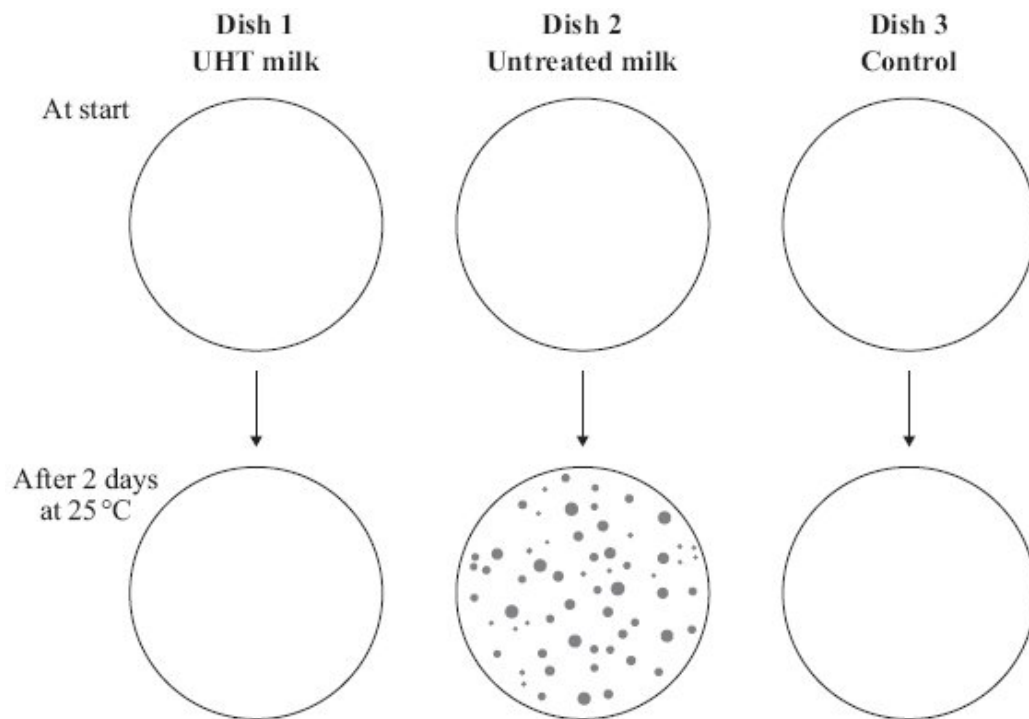
(3)

(b) UHT milk is milk that has been heated to 135 °C, then cooled.

In an investigation, three sterile Petri dishes containing sterile agar jelly were set up as follows.

- UHT milk was added to dish **1**.
- Untreated milk was added to dish **2**.
- Dish **3** was left unopened as a control.
- The dishes were kept at 25 °C for two days.

The results are shown in the diagram below.



(i) Describe the difference in appearance between dishes **1** and **2** after two days.

.....

.....

(1)

(ii) Give **one** reason for this difference.

.....

.....

(1)

(iii) There was no change in the appearance of dish **3** after two days.

Give **one** reason why.

.....  
.....

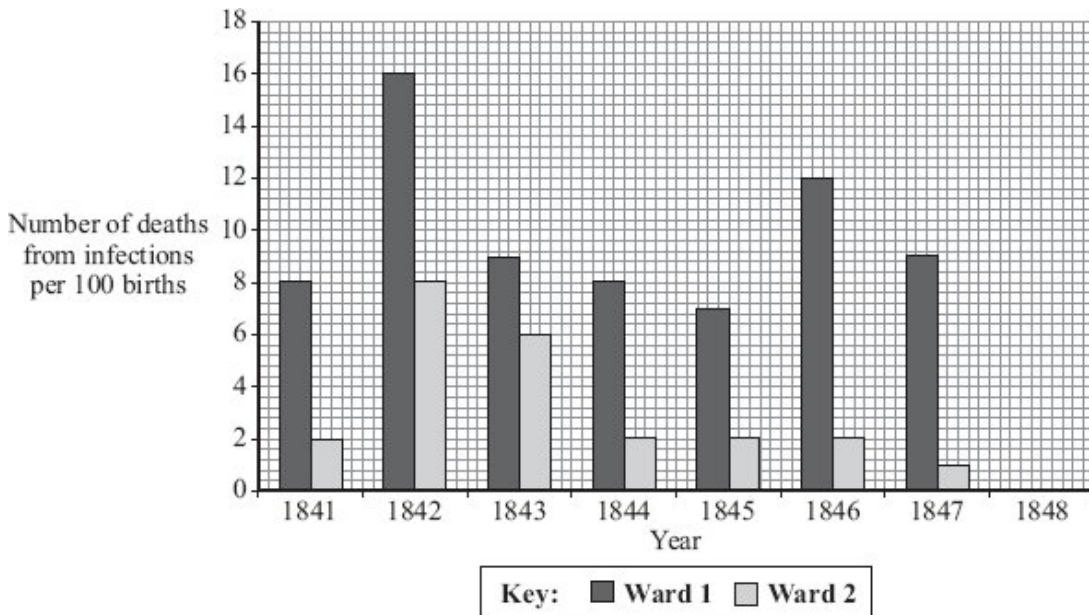
(1)  
(Total 6 marks)

**Q10.** In the 19th century, Dr Semmelweiss investigated infection in a hospital.

He compared the number of deaths of mothers on two maternity wards.

- On **Ward 1**, babies were delivered mainly by doctors. These doctors worked on many different wards in the hospital.
- On **Ward 2**, babies were delivered by midwives. The midwives did **not** work on other wards.

The bar chart shows the results of his investigations.



(a) (i) 600 mothers gave birth on **Ward 2** in 1845.

How many mothers died from infections on **Ward 2** in 1845?

Show clearly how you work out your answer.

.....  
.....

Number of mothers who died .....

(2)

- (ii) Which was the safer ward on which to have a baby?

Draw a ring around your answer. **Ward 1 / Ward 2.**

Using data from the bar chart, give a reason for your answer.

.....  
 .....

(1)

- (b) In January 1848, Dr Semmelweiss asked all doctors to wash their hands before delivering babies.

The table shows the number of deaths on the two wards in 1848.

Ward	Number of deaths from infections per 100 births
Ward 1	3
Ward 2	1

- (i) Plot this data on the bar chart above.

(1)

- (ii) What was the effect on the death rate on **Ward 1** of doctors washing their hands before delivering babies?

.....  
 .....

(1)

- (iii) Suggest an explanation for this effect.

.....  
 .....

(1)

(Total 6 marks)

**Q11.** Dr Semmelweiss collected data about the number of deaths in the two maternity wards in the hospital where he worked.

- From 1833 to 1838 there were the same number of doctors and midwives delivering babies in both **Ward 1** and **Ward 2**.
- From 1839 to 1847 medical students and doctors delivered babies in **Ward 1**; midwives delivered babies in **Ward 2**.

Dr Semmelweiss also noticed that doctors often came straight from examining dead bodies to the delivery ward.

The table shows the number of patients and the number of deaths in the two wards.

Years	Ward	Number of patients	Number of deaths	Death rate as deaths per 1000 patients
1833–1838	Ward 1	23 509	1505	64.0
	Ward 2	13 097	731	55.8
1839–1847	Ward 1	20 204	1989	98.4
	Ward 2	17 791	691	

- (a) (i) Use the formula

$$\text{death rate} = \frac{\text{number of deaths} \times 1000}{\text{number of patients}}$$

to calculate the death rate for **Ward 2** in the years 1839 - 1847.

.....  
 .....

Death rate = ..... deaths per thousand

(2)

- (ii) Suggest a hypothesis for the difference in the death rates on **Ward 1** and **Ward 2** in the years 1839 - 1847.

.....  
 .....  
 .....  
 .....

(2)

- (b) Antibiotics are now used in hospitals.

What is an antibiotic, and what does it do?

.....  
 .....  
 .....

(2)



(c) MRSA is causing problems in hospitals.

Give **one** reason why.

.....  
.....

(1)

(d) How can the work of Semmelweis help to reduce the problems caused by MRSA?

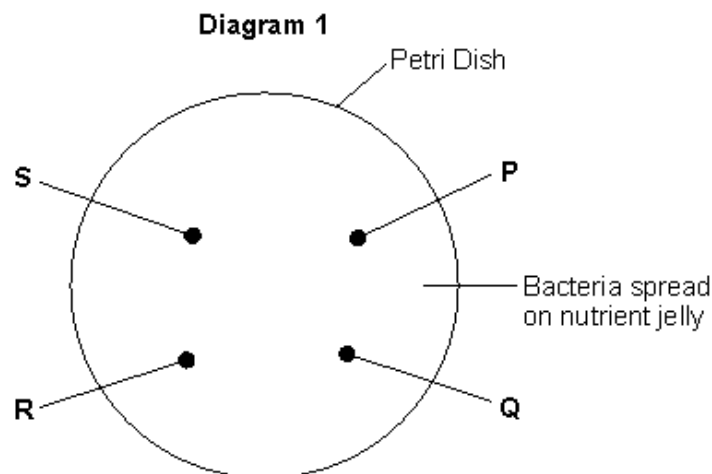
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(1)

(Total 8 marks)

**Q12.** Students investigated how well antibacterial mouthwashes worked. They tested four different mouthwashes, **P**, **Q**, **R** and **S**.

- They spread bacteria on nutrient jelly in a Petri dish.
- They soaked identical discs of filter paper in mouthwashes **P**, **Q**, **R** or **S**.
- They placed the discs on the growing bacteria as shown in **Diagram 1**.
- They covered the Petri dish.
- They incubated the Petri dish for two days.



- (a) The nutrient jelly was heated to 120 °C before being poured into the Petri dish.

Why is this necessary?

Tick (✓) **one** box.

Statement	Tick (✓)
To make bacteria grow more quickly.	
To kill microorganisms.	
To make the nutrients dissolve.	

(1)

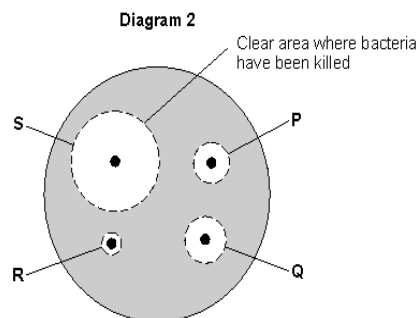
- (b) What is the maximum temperature at which bacteria should be incubated in a school laboratory?

Tick (✓) **one** box.

Temperature	Tick (✓)
15 °C	
25 °C	
37 °C	

(1)

- (c) **Diagram 2** shows the appearance of the Petri dish after two days.



Which mouthwash, **P**, **Q**, **R** or **S** kills most bacteria?

Give **one** reason for your answer.

.....

.....

(2)  
(Total 4 marks)

**Q13.** (a) It is important to prevent contamination when growing microorganisms.

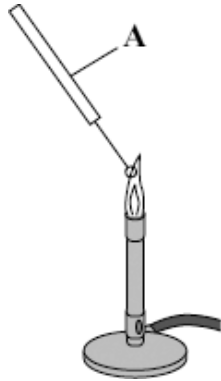
The diagram shows the transfer and culturing of microorganisms.

**Stage V**

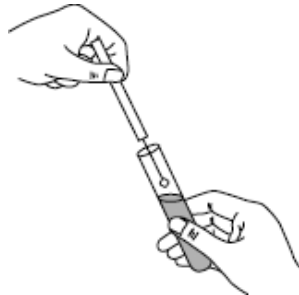


A Petri dish with agar is heated to 150 °C for 50 minutes, then cooled

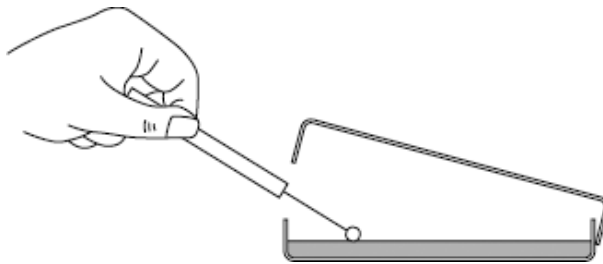
**Stage W**



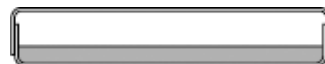
**Stage X**



**Stage Y**



**Stage Z**



Petri dish kept at 25 °C for 48 hours

(i) Name the apparatus labelled **A** in stage **W**.

Draw a ring around **one** answer.

inoculating loop

pipette

thermometer

(1)

- (ii) Give the letters of the **two** stages from **V, W, X, Y** and **Z**, which are carried out to kill microorganisms.

Stages

and

(2)

- (iii) Give the letter of the stage, **V, W, X, Y** or **Z**, where incubation takes place.

Stage

(1)

- (b) A culture medium used for growing microorganisms contains various nutrients.

Which nutrient is the main source of energy for the microorganisms?

Draw a ring around **one** answer.

**carbohydrates**

**mineral ions**

**vitamins**

(1)

(Total 5 marks)

**Q14.** Vaccines protect us against diseases.

- (a) Against which **three** diseases does the MMR vaccine protect us?

Tick (✓) **three** boxes.

Malaria

☐

Measles

☐

Meningitis

☐

Mumps

☐

Rabies

☐

Rubella

☐

(3)

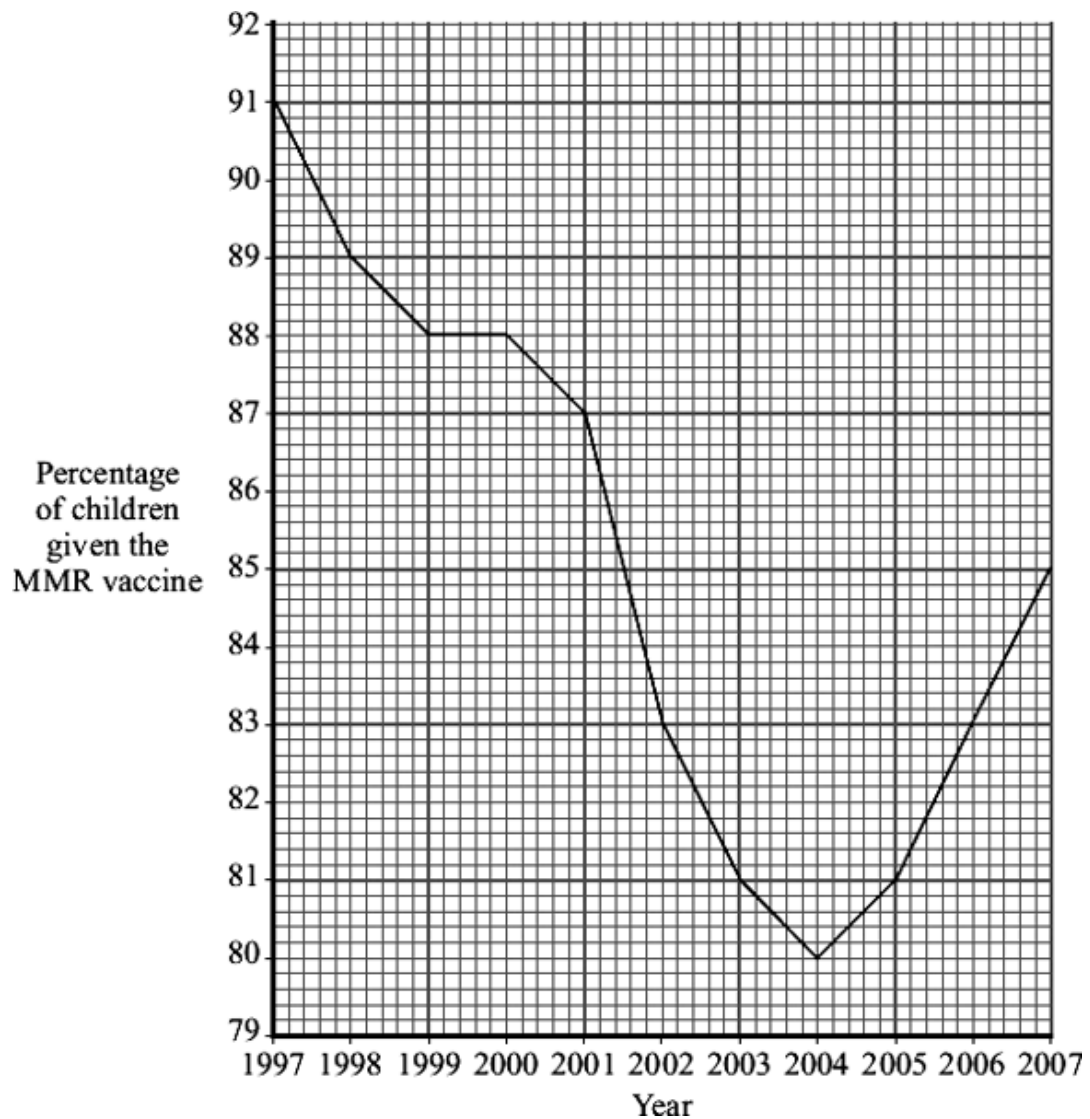
- (b) Draw a ring around the correct word to complete the sentence.

Vaccines cause white blood cells to produce

antibodies.  
cholesterol.  
penicillin.

(1)

The graph shows the percentage of children given the MMR vaccine in the UK between 1997 and 2007.



- (c) (i) Describe the pattern shown by the data on the graph.

.....  
.....  
.....  
.....

(2)

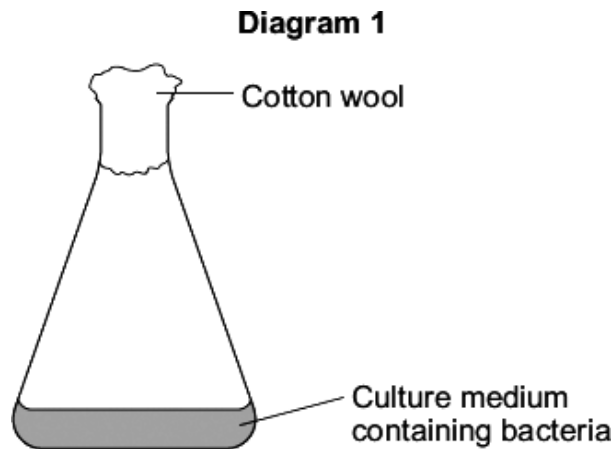
- (ii) Suggest **one** explanation for the change in the percentage of children given the MMR vaccine between 1997 and 2004.

.....  
.....

(1)  
(Total 7 marks)

**Q15.** Some students grew one species of bacterium in a flask.

**Diagram 1** shows the flask.

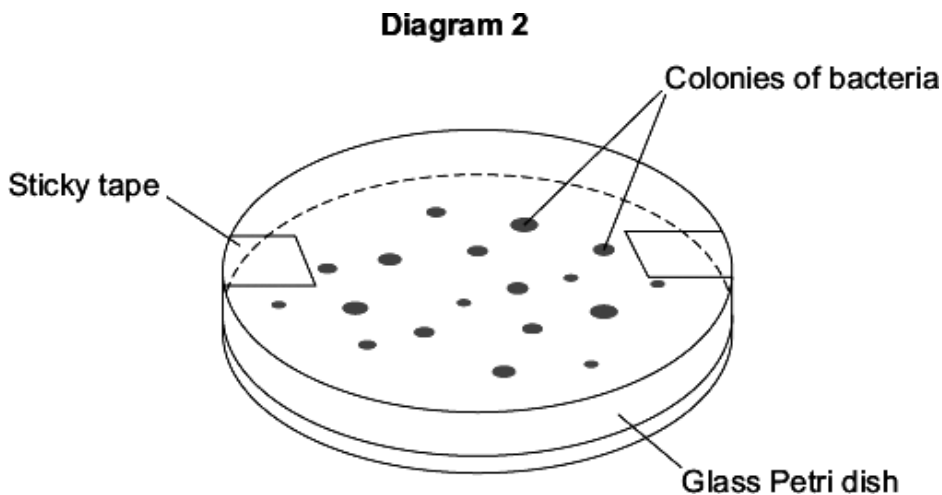


The students wanted to find the number of bacteria in  $1 \text{ cm}^3$  of the culture medium.

The students:

- diluted  $1 \text{ cm}^3$  of the culture medium from the flask with  $999 \text{ cm}^3$  of water
- added  $1 \text{ cm}^3$  of diluted culture to sterilised nutrient agar in a Petri dish
- placed the Petri dish in an incubator at  $25^\circ \text{C}$ .

**Diagram 2** shows the Petri dish after 3 days in the incubator.



- (a) Each colony of bacteria is formed where one bacterium landed on the agar jelly.

How is each colony formed?

.....  
.....

(1)

- (b) Complete the following calculation to find how many bacteria there were in 1 cm<sup>3</sup> of the undiluted culture.

Number of colonies of bacteria in the Petri dish = .....

These colonies were formed from 1 cm<sup>3</sup> of the culture diluted  $\times 1000$ .

Therefore, number of bacteria in 1 cm<sup>3</sup> of undiluted culture = .....

(2)

- (c) It is important to sterilise the culture medium and all the apparatus before use.

Explain why.

.....  
.....  
.....  
.....

(2)

- (d) The bacteria would grow faster at 35 °C. In a school laboratory, the Petri dish should **not** be incubated at a temperature higher than 25 °C.

Why?

.....  
.....

(1)

- (e) The students decided to repeat their investigation.

Why?

.....  
.....

(1)

(Total 7 marks)

**Q16.** (a) **List A** gives the names of three substances. The substances can help ill people.

**List B** gives information about the three substances.

Draw a line from each substance in **List A** to the correct information in **List B**.

List A Substance	List B Information
	White blood cells produce this substance
Antibiotic	
	This substance is used to kill bacteria
Antitoxin	
	This substance lowers blood cholesterol levels
Painkiller	
	This substance relieves only the symptoms of a disease

(3)

(b) Complete the sentences.

A vaccine contains an ..... form of a pathogen.

(1)

The MMR vaccine protects children against measles,

mumps and .....

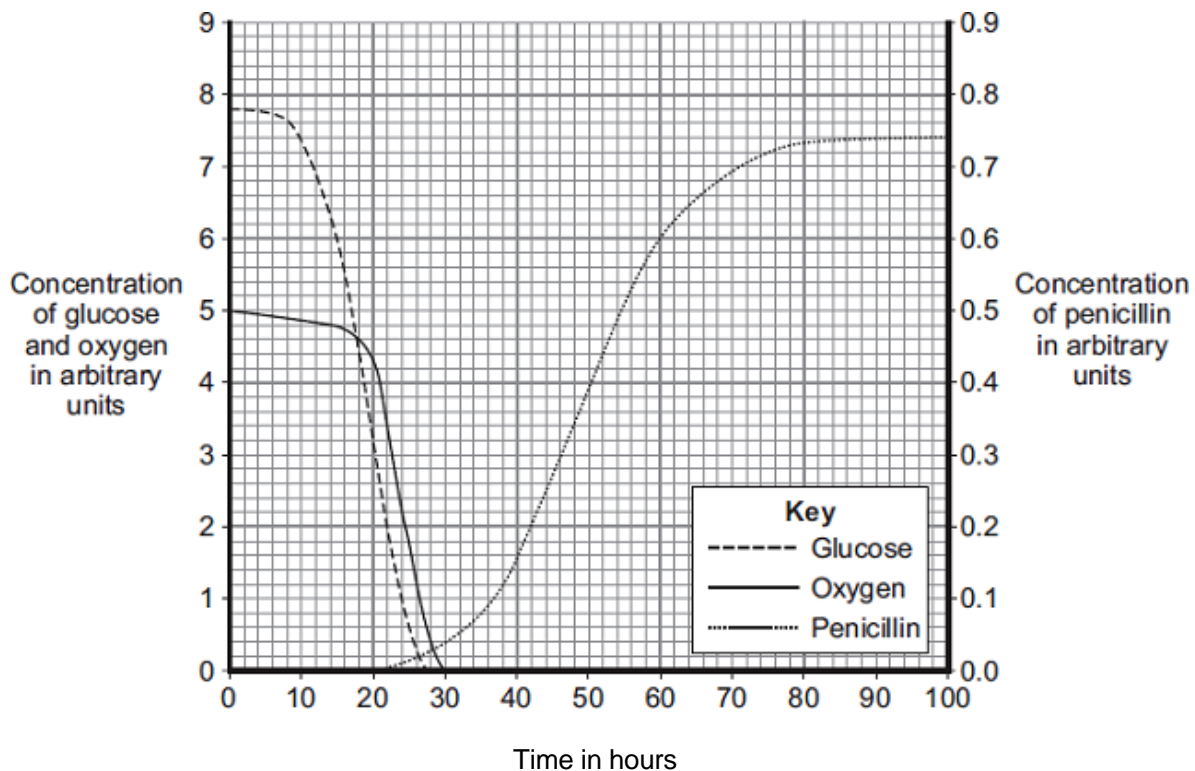
(1)

(Total 5 marks)



**Q17.** The mould *Penicillium* can be grown in a fermenter. *Penicillium* produces the antibiotic penicillin.

The graph shows changes that occurred in a fermenter during the production of penicillin.



(a) During which time period was penicillin produced most quickly?

Draw a ring around **one** answer.

**0 – 20 hours**

**40 – 60 hours**

**80 – 100 hours**

(1)

(b) (i) Describe how the concentration of glucose in the fermenter changes between 0 and 30 hours.

.....

.....

.....

.....

(2)

- (ii) How does the change in the concentration of oxygen in the fermenter compare with the change in concentration of glucose between 0 and 30 hours?

Tick (✓) **two** boxes.

The oxygen concentration changes after the glucose concentration.

☐

The oxygen concentration changes before the glucose concentration.

☐

The oxygen concentration changes less than the glucose concentration.

☐

The oxygen concentration changes more than the glucose concentration.

☐

(2)

- (iii) What is the name of the process that uses glucose?

Draw a ring around **one** answer.

**distillation**

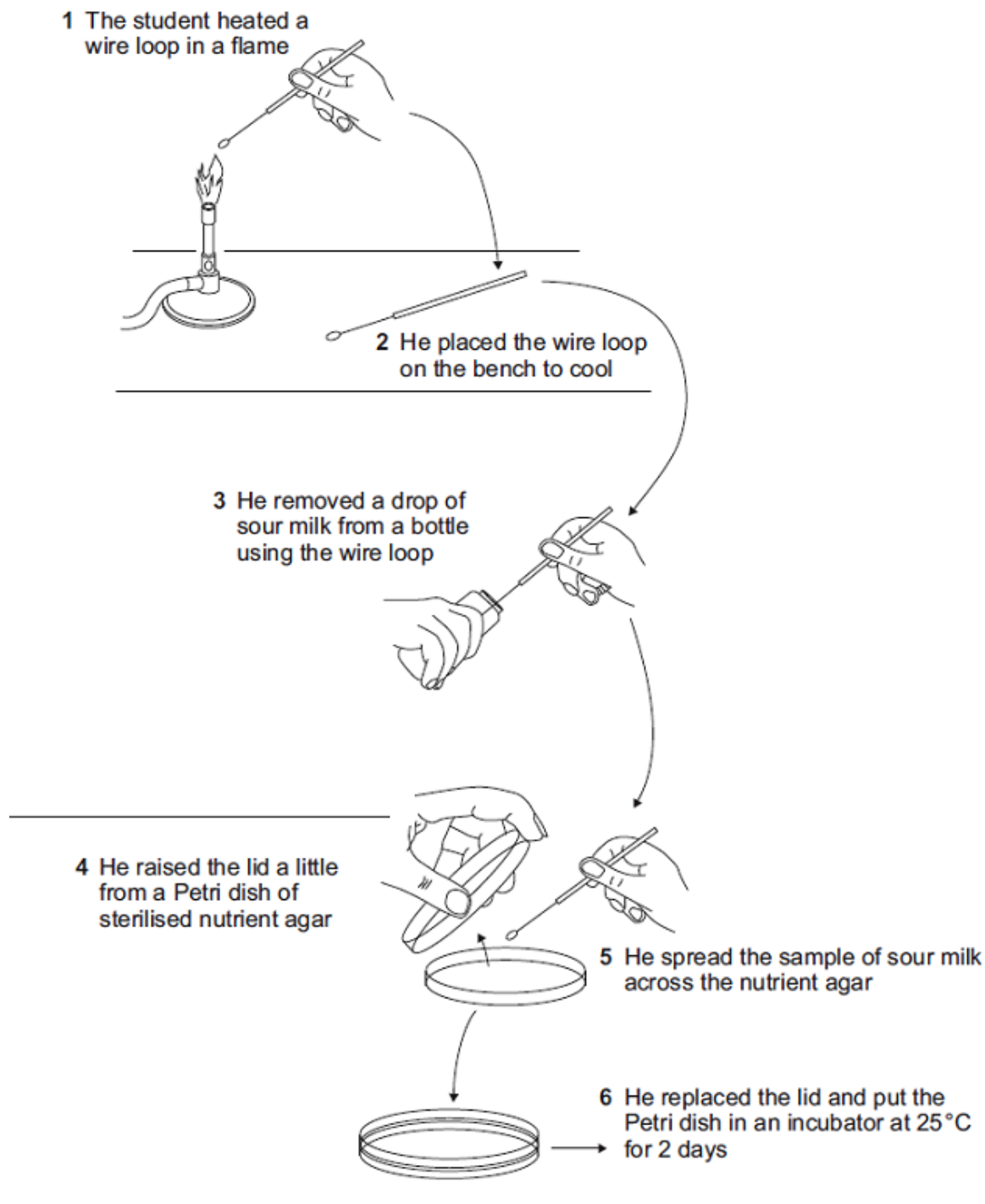
**filtration**

**respiration**

(1)

(Total 6 marks)

- Q18.** The diagram shows how a student transferred some sour milk from a bottle to a Petri dish of nutrient agar.



**List A** gives four actions carried out by the student.  
**List B** gives five possible effects of these actions.

Draw a straight line from each action in **List A** to its effect in **List B**.  
 Draw only **one** line from each action.

**List A – Action**

**List B – Effect**

Risk of contamination  
with bacteria increased

Heating loop in flame

Placing loop on bench to cool

Only lifting lid of Petri dish a little

Placing Petri dish in incubator at 25°C

Fewer bacteria will enter

Kills bacteria

Prevents air entering

Risk of growth of pathogens decreased

(Total 4 marks)

**Q19.** (a) Use words from the box to complete the sentences about curing disease.

<b>antibiotics</b>	<b>antibodies</b>	<b>antitoxins</b>	<b>painkillers</b>	<b>statins</b>
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The substances made by white blood cells to kill pathogens  
are called .....

The substances made by white blood cells to counteract poisons produced by  
pathogens are called .....

Medicines which kill bacteria are called .....

(3)

(b) The MMR vaccine protects people against three diseases.

Write down the names of **two** of these diseases.

1 .....

2 .....

(2)

- (c) All vaccinations involve some risk.

The table shows the risk of developing harmful effects:

- from the disease if a child is **not** given the MMR vaccine
- if a child **is** given the MMR vaccine.

Harmful effect	Risk of developing the harmful effect from the disease if not given the MMR vaccine	Risk of developing the harmful effect if given the MMR vaccine
Convulsions	1 in 200	1 in 1000
Meningitis	1 in 3000	Less than 1 in 1 000 000
Brain damage	1 in 8000	0

A mother is considering if she should have her child vaccinated with the MMR vaccine.

Use information from the table to persuade the mother that she should have her child vaccinated.

.....

.....

.....

.....

.....

(2)  
(Total 7 marks)

**Q20.** Viruses and bacteria cause diseases in humans.

- (a) Draw a ring around the correct word to complete the sentence.

Organisms that cause disease are called

algae.  
pathogens.  
vaccines.

(1)

- (b) In August 2011 the United Nations gave a warning that there was a new strain of the bird flu virus in China.

Bird flu may kill humans. The new strain of the bird flu virus could cause a *pandemic* very quickly.

- (i) What is a *pandemic*?

Tick (✓) **one** box.

A disease affecting the people all over one country.

☐

A disease affecting hundreds of people.

☐

A disease affecting people in many countries.

☐

(1)

- (ii) The swine flu virus is carried by pigs.

The bird flu virus is likely to spread much more quickly than the swine flu virus.

Suggest **one** reason why.

.....

.....

(1)

This notice is from a doctor's surgery.

**Unfortunately,  
antibiotics  
will NOT get  
rid of your  
flu.**

- (c) (i) Why will antibiotics **not** get rid of flu?

.....

.....

(1)

- (ii) The symptoms of flu include a sore throat and aching muscles.

What would a doctor give to a patient to relieve the symptoms of flu?

.....

(1)

(iii) It is important that antibiotics are **not** overused.

Explain why.

Use words from the box to complete the sentence.

<b>antibody</b>	<b>bacteria</b>	<b>immune</b>	<b>resistant</b>	<b>viruses</b>
-----------------	-----------------	---------------	------------------	----------------

Overuse of antibiotics might speed up the development

of ..... strains of .....

(2)

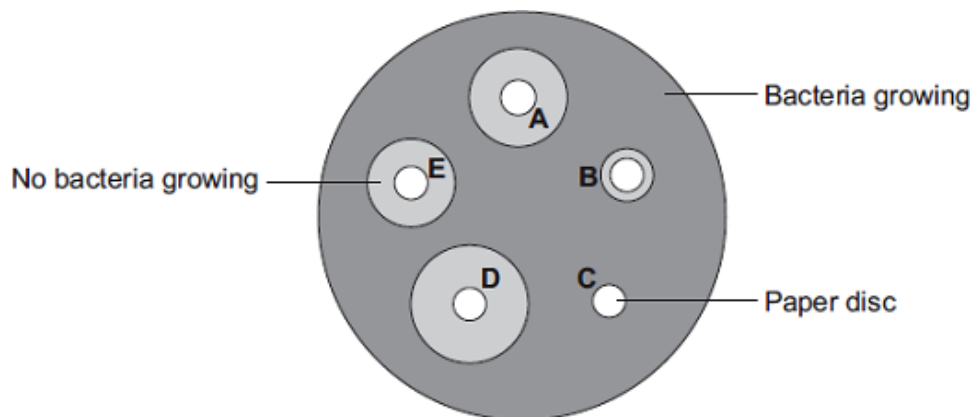
(Total 7 marks)

**Q21.** Students in a school investigated the effect of five different antibiotics, **A**, **B**, **C**, **D** and **E**, on one type of bacterium.

The students:

- grew the bacteria on agar jelly in a Petri dish
- soaked separate paper discs in each of the antibiotics
- put the paper discs onto the bacteria in the Petri dish
- put the Petri dish into an incubator.

The diagram shows what the Petri dish looked like after 3 days.



(a) (i) What is the maximum temperature the incubator should be set at in the school?

Draw a ring around your answer.

**10°C**

**25°C**

**50°C**

(1)

- (ii) Draw a ring around the correct answer to complete the sentence.

The incubator should **not** be set at a higher temperature because the higher

temperature might help the growth of

pathogens.

toxins.

viruses.

(1)

- (b) Which antibiotic, **A**, **B**, **C**, **D** or **E**, would be best to treat a disease caused by this type of bacterium?

Write your answer in the box.

Give the reason for your answer.

.....

.....

(2)

- (c) Antibiotics **cannot** be used to treat diseases caused by viruses.

Why?

Tick (✓) **one** box.

Viruses are not pathogens

☐

There are too many different types of virus

☐

Viruses live inside cells

☐

(1)

(Total 5 marks)



