



Microbiology (infectious diseases, aseptic technique, WBCs and the immune response)



119 minutes



119 marks

Q1. (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

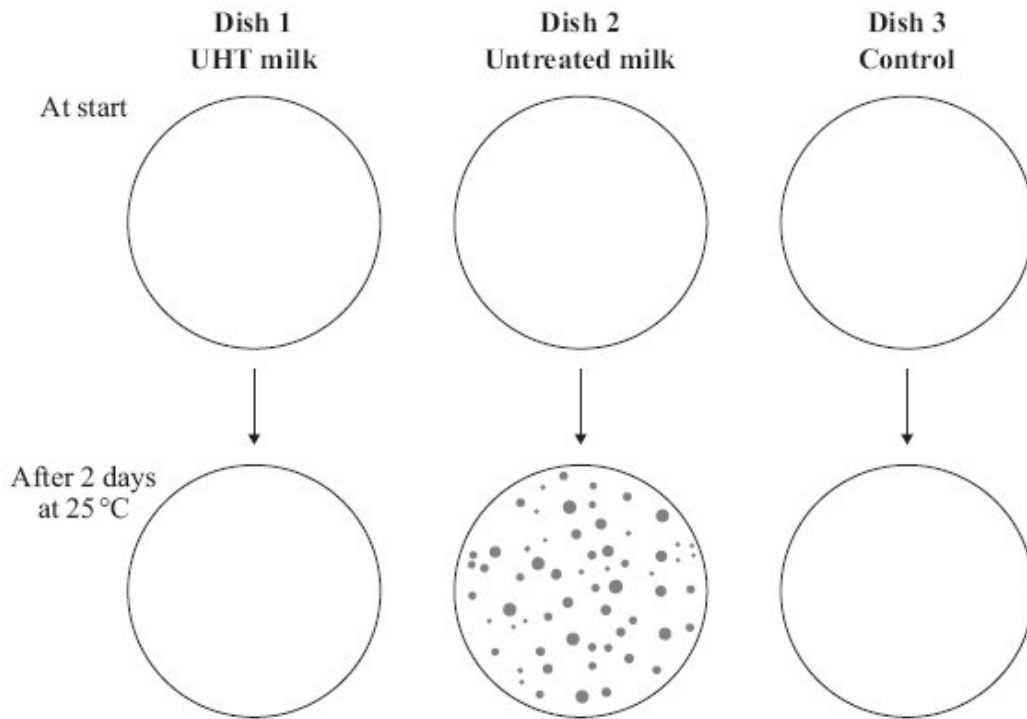
(3)

(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.

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.....

(1)

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

.....
.....

(1)

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

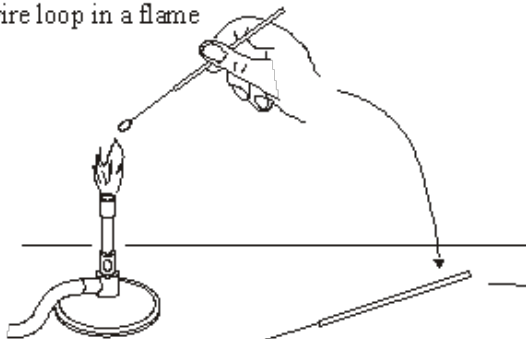
Give **one** reason why.

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(1)
(Total 6 marks)

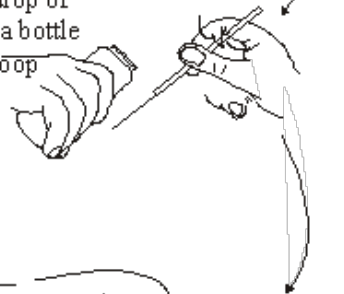
Q2. The diagram shows how a student transferred some sour milk from a bottle to a Petri dish of nutrient agar.

1 The student heated a wire loop in a flame

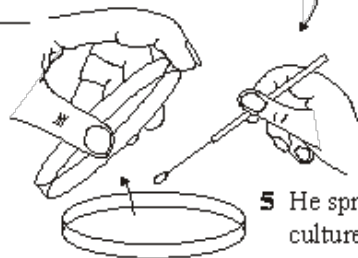


2 He placed the wire loop on the bench to cool

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

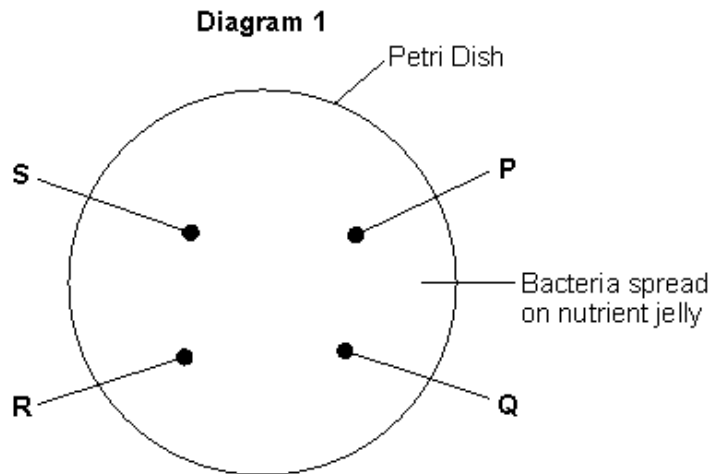
Prevents air entering

Risk of growth of pathogens decreased

(Total 4 marks)

Q3. 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)

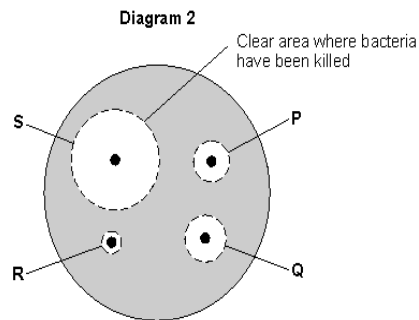
- (b) What is the maximum temperature at which bacteria should be incubated in a school laboratory?

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)

- Q4.** (i) Give **two** ways in which white blood cells protect us from disease.

1

.....

2

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(2)

(ii) Explain, as fully as you can, how immunisation protects us from disease.

.....

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(3)
(Total 5 marks)

Q5. Read the passage about the use of antibiotics in food production.

People do not always agree about the use of antibiotics in food production.
Some farmers put low doses of antibiotics in feed for animals such as cattle and sheep. Antibiotics help to keep animals disease-free. Antibiotics also help animals to grow.
The use of antibiotics in livestock feed means that there is a higher risk of antibiotic-resistant bacteria developing. These could be dangerous to human health.

(a) Explain how a population of antibiotic-resistant bacteria might develop from non-resistant bacteria.

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(3)

(b) Suggest **two** reasons why it is an advantage to keep farm animals disease free.

1

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2

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.....

(2)
(Total 5 marks)

Q6. 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.

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

(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 Semmelweiss help to reduce the problems caused by MRSA?

.....
.....

(1)

(Total 8 marks)

Q7. 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.

antibody	bacteria	immune	resistant	viruses
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Overuse of antibiotics might speed up the development

of strains of

(2)

(Total 7 marks)

Q8. The body's immune system protects us from diseases.

Describe the different ways in which white blood cells protect us from infectious diseases.

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(4)

(Total 4 marks)

Q9. (a) Explain, as fully as you can, how the body's white blood cells respond to infections.

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(4)

- (b) Describe, in as much detail you can, how **one** method of immunisation protects us from a named disease.

Name of disease

How immunisation protects us from this disease.

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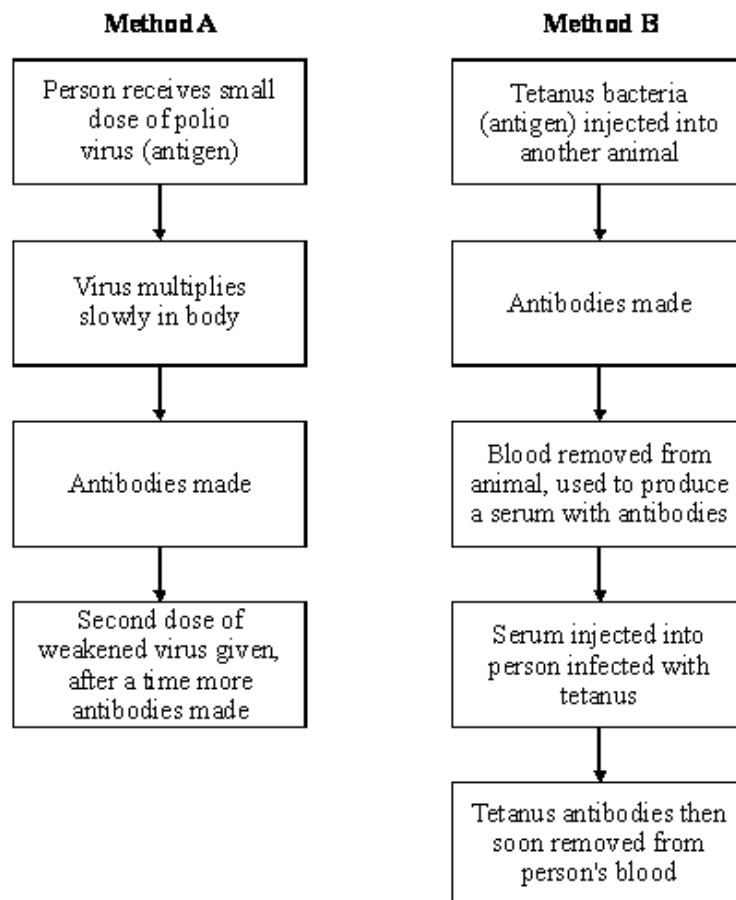
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(3)
(Total 7 marks)

- Q10.** The diagram shows two methods which are used to give humans protection against disease. **Method A** shows active immunity and **Method B** shows passive immunity. **Method A** can be used against polio. **Method B** is often used against tetanus.



(a) What is the name of the substances produced by the body which destroy harmful viruses and bacteria?

.....

(1)

(b) Why does **Method A** give long lasting protection against polio?

.....

(1)

(c) Why does **Method B** not give long lasting protection against tetanus?

.....

(1)

(d) In immunisation against polio a second dose of the weakened virus is given (this is known as a booster). Suggest why this booster is necessary.

.....

(1)

(e) **Method A** would **not** be helpful for a person who had just been infected with tetanus bacteria. Explain the reason for this.

.....

.....

(2)

(f) Why is **Method B** very good for dealing quickly with an infection of tetanus?

.....

(1)

(Total 7 marks)

Q11. 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:

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.....

(1)

(Total 4 marks)

##

The table shows changes in resistance to the antibiotic penicillin in one species of bacterium between 1991 and 1996.

Years	Percentage of cases where bacteria were resistant to penicillin
1991 – 92	7
1993 – 94	14
1995 – 96	22

A doctor was asked to treat a patient who had a sore throat.

(i) How does penicillin help to treat infection?

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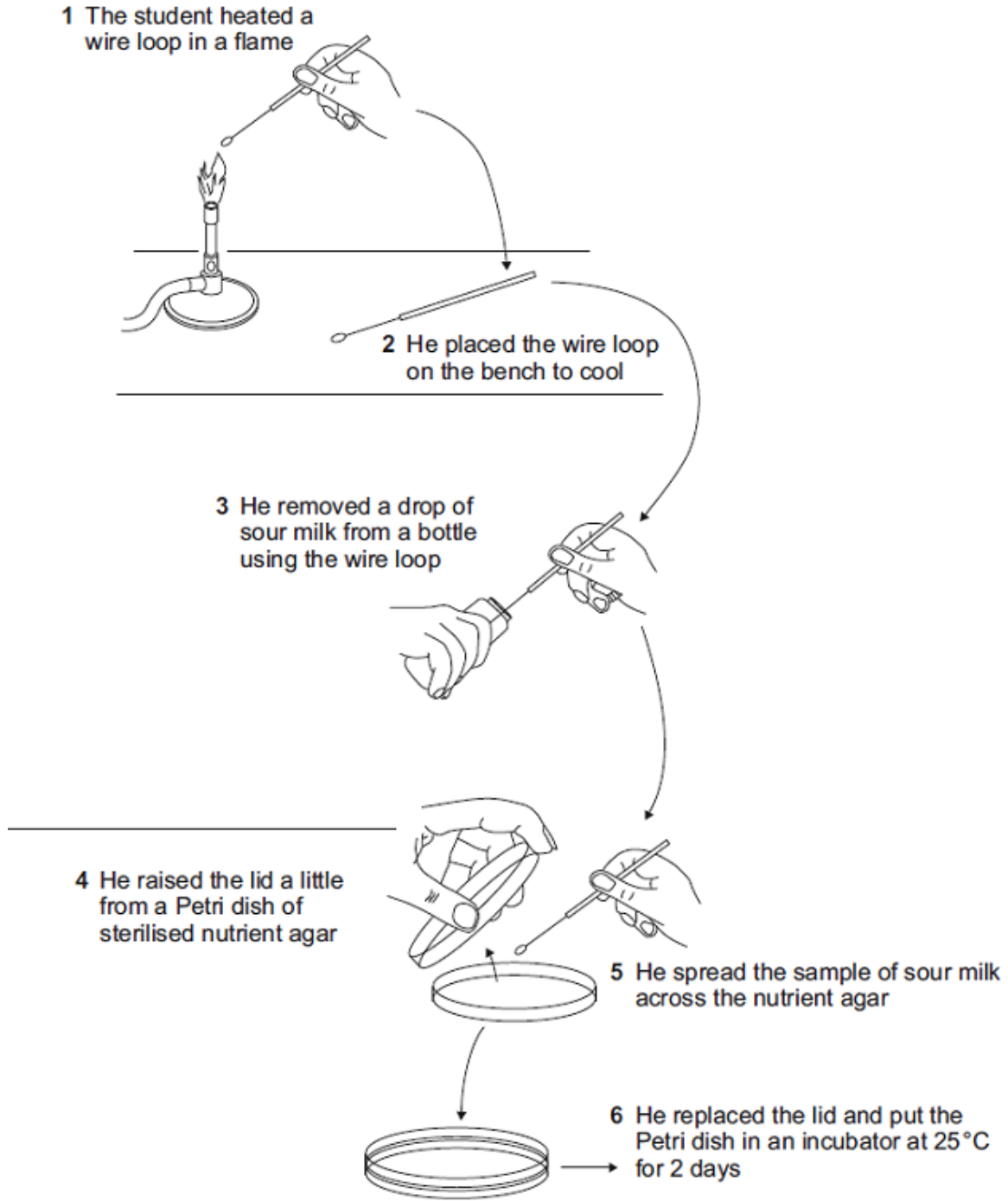
(1)

(ii) Use the data in the table to suggest why the doctor should **not** prescribe penicillin.

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.....

(2)
(Total 3 marks)

Q13. 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

Fewer bacteria will enter

Placing loop on bench to cool

Kills bacteria

Only lifting lid of Petri dish a little

Prevents air entering

Placing Petri dish in incubator at 25°C

Risk of growth of pathogens decreased

(Total 4 marks)

##

Read the following passage.

One of the deadliest diseases in history to be making a comeback in Britain. Doctors are alarmed at the rising number of cases of tuberculosis (TB) over the past three years, after decades in which it had declined.

In the middle of the last century TB accounted for 16% of all deaths in Britain. The turning point in the fight against TB came in 1882 when Robert Koch identified the bacterium that causes the disease. In 1906 two French scientists began developing the vaccine to provide immunity against TB. The vaccine, BCG, (so-called from the initials of the two scientists) has routinely been injected into children aged 12 or 13 who are not already infected with the TB bacterium. BCG does not protect people who are already infected with TB. Recently, however, some Health Authorities have dropped their school vaccination programme.

(a) People infected with a small number of TB bacteria often do **not** develop the disease.

Explain, as fully as you can, how the body defends itself against the TB bacteria.

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(3)

- (b) The BCG vaccine contains a mild form of the TB bacterium. A person injected with it does **not** develop the disease.

Explain, as fully as you can, how the vaccine makes the person immune to tuberculosis.

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(3)

- (c) Explain why the BCG vaccine is **not** effective as a cure for people who already have tuberculosis.

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(2)

(Total 8 marks)

Q15. Read the article.

Parents all over the world advise children to 'wrap up warm or you'll catch a cold'.
Scientists at Cardiff University recruited 180 volunteers to take part in an investigation to find out if the advice was true. The investigation took place during the city's common cold season.
Half of the volunteers put their feet in bowls of ice cold water for 20 minutes. The other volunteers sat with their feet in empty bowls.
Over the next few days, almost a third of the volunteers who put their feet into cold water developed colds. Fewer than one in ten of the other volunteers developed colds.

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

The advice 'wrap up warm or you'll catch a cold' is an example of

- hearsay.
a hypothesis.
a prediction.

(1)

(b) What was the experimental control in the investigation?

.....

(1)

(c) The scientists did **not** prove that the advice 'wrap up warm or you'll catch a cold' is true.

Explain why.

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(3)

(Total 5 marks)

Q16. (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 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.

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.....

(2)
(Total 7 marks)

Q17. Mumps is a disease caused by a virus. Mumps vaccine is usually given to children as part of the MMR vaccine.

(a) What diseases, other than mumps, does the MMR vaccine protect against?

.....

(2)

(b) Mumps vaccines contain mumps viruses. Suggest why these viruses do not cause mumps.

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(1)

(c) Explain how the vaccine makes someone immune to mumps.

To gain full marks in this question you should write your ideas in good English. Put them into a sensible order and use the correct scientific words.

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(5)

(d) A child who has not been given the mumps vaccine catches mumps. Suggest why a doctor would **not** give antibiotics to cure the child of mumps.

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(1)

(Total 9 marks)

Q18. In the 1800s, many women died from disease after giving birth.

Dr Semmelweis compared the death rates of women in two hospital wards, **Ward A** and **Ward B**.

Table 1 shows some of the results.

Table 1

Year	Percentage (%) of women who died	
	Ward A	Ward B
1834	7.7	7.4
1836	7.5	7.8
1844	8.4	2.1
1846	11.3	2.8

Before 1840

Doctors and nurses worked in **Ward A** and in **Ward B**.
The doctors often worked in other wards with patients who had diseases.
The doctors did **not** wash their hands.

After 1840

Doctors only worked in **Ward A** and **not** in **Ward B**.
Only nurses worked in **Ward B**.
The nurses did **not** work in other wards with patients who had diseases.

(a) (i) Look at the data for **Ward A** and **Ward B** after 1840.

Describe the effect on death rate of having **only** nurses working in **Ward B** and **not** doctors.

To gain full marks you must refer to the data in **Table 1**.

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(2)

(ii) Suggest an explanation for the difference you described in part (a)(i).

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.....

(2)

- (b) In 1847, Dr Semmelweis told the doctors to wash their hands each time before they began to work in **Ward A**.

Table 2 shows the death rates in the two wards, after 1847.

Table 2

Year	Percentage (%) of women who died	
	Ward A	Ward B
1848	2.7	2.8
1849	2.0	1.9

Dr Semmelweis was right to tell the doctors to wash their hands.

What evidence is there to support Dr Semmelweis telling the doctors to wash their hands?

Use information from **Table 1** and **Table 2** in your answer.

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(3)

- (c) In modern hospitals less than 0.1% of women die from disease after giving birth.

Medical understanding has improved since the 1850s to reduce the death rate.

Other than improvements in hygiene, give **two** reasons for the low death rate from infectious diseases in modern hospitals.

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(2)

(Total 9 marks)

Q19. Influenza is caused by a virus.

- (a) How do viruses cause illness?

.....

.....

(1)

- (b) A British company making a reality television show in the Peruvian Amazon has been accused of starting an influenza epidemic. This epidemic allegedly killed four members of a remote Indian tribe and left others seriously ill.

The members of the television crew did not show symptoms of influenza, but members of the Indian tribe died from the disease.

Suggest an explanation for this.

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(3)
(Total 4 marks)

Q20. A student is given a tube containing a liquid nutrient medium. The medium contains one type of bacterium.

(a) *In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.*

The student is told to grow some of the bacteria on agar jelly in a Petri dish.

Describe how the student should prepare an uncontaminated culture of the bacterium in the Petri dish.

You should explain the reasons for each of the steps you describe.

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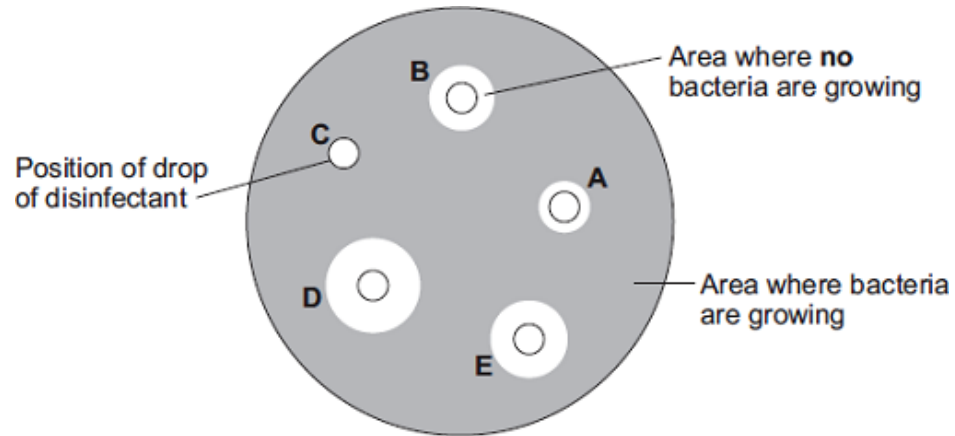
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(6)

- (b) After the culture had been prepared, the student added one drop of each of five disinfectants, **A**, **B**, **C**, **D** and **E**, onto the culture.

The diagram shows the appearance of the Petri dish 3 days later.



- (i) There are areas on the agar jelly where **no** bacteria are growing.

Why?

.....
.....

(1)

- (ii) The student concluded that disinfectant **D** would be the best for using around the home.

Give **one** reason why the student might be correct.

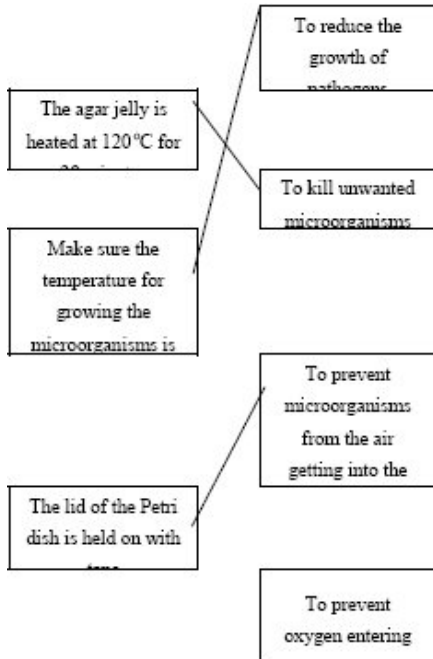
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Give **one** reason why the student might **not** be correct.

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.....
.....

(2)
(Total 9 marks)

M1. (a) List A – Action List B – Effect



1 mark per correct line
each extra line cancels 1 mark

3

- (b) (i) dish 2 has (colonies of) microorganisms / bacteria / (but there are none in dish 1)
allow fungi / pathogens / microbes / germs
allow more microorganisms in dish 2

1

- (ii) untreated milk contains living microorganisms

or

microorganisms killed by UHT

or

no living microorganisms in UHT milk

ignore microorganisms enter from the air

1

(iii) dish 3 was not opened
*do **not** allow no growth of microorganisms because of lack of air / oxygen*

or

it was sterilised
ignore microorganisms cannot enter from the air

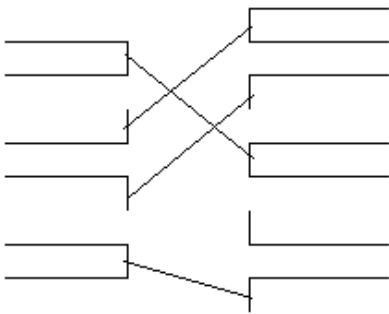
or

nothing / no milk was added

1

[6]

M2.



*1 mark for each line
extra line from List A Action cancels the mark*

[4]

M3. (a) to kill microorganisms
extra boxes ticked cancels the mark

1

(b) 25 °C
extra boxes ticked cancels the mark

1

(c) **S** 1

widest clear area 1

[4]

M4.	(i) 2 of: ingest microbes;)allow higher level answers produce antibodies;)allow cause and effect produce antitoxins)eg antitoxins neutralise poisons = 2 <i>each for 1 mark</i>	2	
	(ii) injection of dead/weak microbes; stimulates antibody production; these can be produced again quickly on new infection or remain for long time to 'combat' new infection <i>each for 1 mark</i>	3	[5]
M5.	(a) idea that bacteria mutate or that there is variation in bacteria	1	
	leading to bacteria /resistant cells that survive antibiotic	1	
	these bacteria (resistant cells) go on to breed	1	
	<i>do not allow bacteria get used to antibiotics or idea that antibiotics change the bacteria or bacteria become immune or references to adaptation or evolution</i>		
	(b) the treated animals do not use energy overcoming illness	1	
	an economic reason, eg treated animals do not infect other animals / farm workers	1	[5]
M6.	(a) (i) 38.84 <i>correct answer with or without working gains 2 marks (691 × 1000) / 17 791 gains 1 mark</i>	2	
	(ii) women in Ward 1 infected	1	
	by pathogens / bacteria / viruses passed on by doctors (who have been in contact with dead bodies)	1	

- (b) medicine / drug 1
 that kills bacteria 1
- (c) resistant to / not killed by antibiotics 1
- (d) Semmelweiss showed that infection could be passed on via touch and so hand washing by doctors / nurses / patients / visitors reduces the risk of infection 1
- [8]**

- M7.** (a) pathogens 1
- (b) (i) A disease affecting people in many countries 1
- (ii) birds fly / migrate
accept converse
- OR
- human contact with birds more likely
birds not contained / difficult to control movement
- OR
- there are more birds (than pigs) 1
- (c) (i) antibiotics (only) kill bacteria
ignore flu is caused by a virus unqualified
- OR
- antibiotics don't kill viruses
ignore virus resistant / immune 1
- (ii) painkillers
accept any correct named painkiller, eg aspirin or paracetamol
allow antivirals / Tamiflu
ignore medicine / tablets 1

(iii) resistant 1
 bacteria 1
in this order

[7]

M8. (wbc) ingest / digest pathogens / bacteria / viruses
allow eat germs
ignore swallow germs
ignore ingest the disease
ignore attack / kill the disease

1

(wbc) produce antibodies

1

(wbc) produce antitoxins

1

any **one** from:

- (antibodies) destroy or kill pathogens / bacteria / viruses / germs
ignore destroy / kill disease
ignore attack / fight pathogens
- (antitoxins) counteract / destroy / neutralise toxins / poisons
ignore attack / killing toxins
- reasonable reference to memory cells **or** rapid production of antibodies upon re-infection

1

[4]

M9. (a) engulf bacteria
 produce antibodies
 produce antitoxins
 effect of antibodies/antitoxins
for 1 mark each

4

(b) method must be related to disease
 dead/weakened microbes (as appropriate)
 stimulate antibody production
 antibody production rapid if microbe enters again
for 1 mark each

3

[7]

M10. (a) antibodies;

if incorrect term used then penalise in (a) then regard as continuous error for rest of question

1

(b) antibodies remain (for several years)
or are not removed

*accept last a long time **or** not destroyed
or continues to make antibodies
or causes increased number of antibodies **or** more antibodies
or stays in body **or** person has made own antibodies
or if memory cells named must link to antibody production*

1

(c) antibodies removed (from blood);

*accept destroyed **or**
unable to make **or**
replace antibodies **or**
they are not human antibodies **or**
person has not made own antibodies*

1

(d) so more antibodies made;

*accept so enough antibodies made
or so correct amount of antibodies present **or** to keep antibodies high
or so body keeps making antibodies*

1

(e) any **two** from

already has tetanus bacteria in body;

*accept could boost infection **or** make it worse*

would take too long **or**

a long time for antibodies to be made;

*accept too slow forming antibodies
or cannot form correct amount of antibodies*

disease would have effect before antibodies made;

*accept antibodies are specific
or will work for one disease but not another*

2 max

- (f) injection of ready made antibodies;
accept does not have to wait for antibody formation or has large amount of antibodies quickly
or has enough antibodies quickly
or antibodies start working straight away

1

[7]

- M11.** (i) the loop is sterilised
accept to kill anything on the loop

or

- to kill any bacteria on it;
do not credit to clean the loop

1

- (ii) if hot it would kill bacteria picked up (from culture);
accept 'microorganisms' or 'microbes'
accept entry of contaminated air but reject entry of air unqualified

1

- (iii) to prevent entry (from the air) of unwanted bacteria or bacterial spores or fungal spores;
accept so can't breath on it
accept 'microorganisms' or 'microbes'

1

- (iv) so that the (petri) dish is not opened (after bacteria are cultured)
or to reduce evaporation
or drying of the agar,
accept 'microorganisms' or 'microbes'
accept to prevent anything relevant getting in/out
reject references to spillage

1

[4]

- M12.** (i) kills / destroys bacteria **or** prevents growth of bacteria
*do **not** allow germs*
*do **not** allow fights or gets rid of*

1

(ii) any **two** from:

bacteria may be resistant / immune (treatment futile)
or bacteria would not be killed

accept descriptions from table

accept "fights" here

do not accept people resistant

may select for resistant type

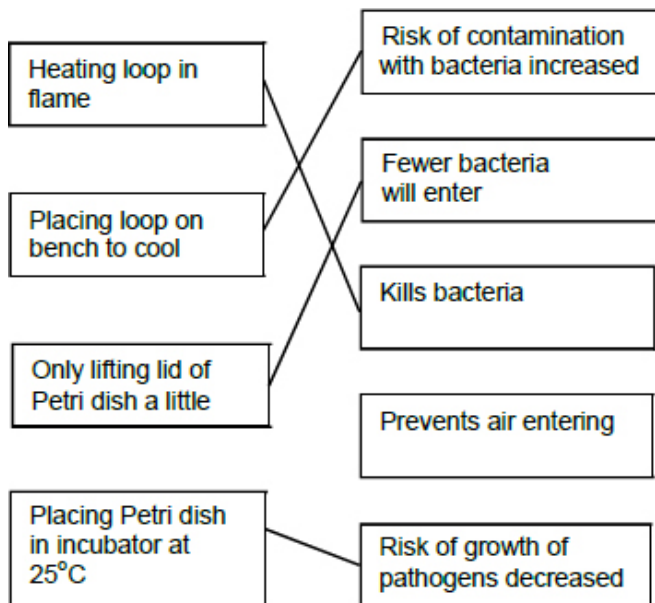
may cause increased incidence of resistance or Penicillin less effective in future

sore throat might be due to a virus – Penicillin would not work

2

[3]

M13.



any box on the left joined to > 1 other box - cancel

[4]

M14.

(a) white cells ingest bacteria
produce antibodies which destroy bacteria
produce antitoxins which counteract poisons produced by bacteria
for 1 mark each

3

(b) dead/mild microbes
stimulate antibody production
white cells can quickly produce these again
for 1 mark each

3

- (c) adds more bacteria (mild)
does not affect TB bacteria
for 1 mark each

2

[8]

M15. (a) hearsay

1

- (b) (volunteers with feet in) empty bowls
accept bowl with no (iced) water
*do **not** accept mention of bowl with iced water*

1

(c) any **three** from:

ignore control variables, eg age, gender

- only some of those whose feet were in cold water caught colds
- some controls caught colds
- only feet were cold in experimental group
allow (control) not wrapped up warm
- only kept feet in cold water for 20 minutes
- insufficient evidence for 'proof' / only showed increased risk
allow small sample size
- don't know activities of individuals before / after the investigation
(eg exposure to cold virus) / reference to immune system
allow investigation done in 'cold season'

3

[5]

M16. (a) antibodies

1

antitoxins

1

antibiotics

1

- (b) any **two** from:
- measles
 - mumps
 - rubella / German measles
- 2
- (c) less / low / no chance of getting named or all condition(s) if vaccinated
- 1
- quantitative figure(s) eg 5 times less likely to get convulsions
- 1
- [7]

- M17.** (a) measles
- ignore mumps*
- 1
- rubella
- accept German measles*
- 1
- (b) viruses are 'dead'
- accept other viral treatments*
- accept 'non-virulent'*
- mild' must be qualified*
- do **not** accept 'small dose'*
- 1
- (c) *The answer to this question requires good English in a sensible order with correct use of scientific terms. Quality of written communication should be considered in crediting points in the mark scheme.*
- Maximum of 4 marks if ideas not well expressed*
- any **five** from:
- contains antigens or proteins
- accept reference to immunological memory or memory cells'*
- white cells (accept lymphocytes)
- do not accept phagocytes*
- idea of specificity in antibodies or antigens
- antibody production
- ignore engulfing*
- antigens destroyed / virus destroyed
- rapid antibody production if infected
- max 5

(d) antibiotics do not kill / affect viruses

1

[9]

M18. (a) (i) lower percentage (of women) who died
allow fewer (women) died

1

numerical reference to a pair of figures to show this
allow any difference in a pair of figures

1

(ii) doctors were not transferring
ignore reference to nurses

1

pathogens / bacteria / viruses / microorganisms / microbes
allow fungi
ignore disease / germs / infection

1

(b) any **three** from:

- lower percentage of patients died (when doctors washed hands or in ward A)
allow fewer for lower percentage
- large decrease or reference to proportional decrease
ignore raw data
- little / no difference / similar to ward B
- continued drop (in ward A)

3

(c) any **two** from:

- better understanding / knowledge of immunity
accept ref to immunisation / vaccination
- better / new drugs
accept examples, e.g. antibiotics / penicillin (discovered)
allow better / new medicines
- sterilisation of equipment **or** isolation of patients **or** some infectious diseases
wiped out **or** earlier identification / treatment of infections
ignore references to general hygiene

2

[9]

M19. (a) produces toxins / damage cells / reproduce rapidly **or** reproduce in cells
ignore invade cells

1

(b) any **three** from:

- TV crew immune / Indians not immune / Indians have weak(er) immune system
ignore resistant
- TV crew had / produced antibodies / Indians had no antibodies **or** antibody production faster in TV crew
- TV crew had previous exposure to flu / had been vaccinated
or
Indian tribe had no previous exposure to flu / had not been vaccinated
allow immunised
- Indians caught disease from TV crew
or
TV crew were carriers (of the virus)

3

[4]

M20. (a) Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also refer to the information in the [Marking guidance](#), and apply a 'best-fit' approach to the marking.

0 marks

No relevant content.

Level 1 (1-2 marks)

There is a brief description of at least one of the stages (pre-inoculation, inoculation, post-inoculation).

Level 2 (3-4 marks)

There is a simple description of at least two stages and an explanation of at least one of them.

Level 3 (5-6 marks)

There is a clear description of all three stages and an explanation of at least two of them.

Examples of Biology points made in the response:

Pre-inoculation

- Petri dish and agar sterilised before use
- to kill unwanted bacteria
- inoculating loop passed through flame / sterile swab
- to sterilise / kill (other) bacteria

Inoculation

- loop/swab used to spread/streak bacterium onto agar

Allow other correct methods, eg bacterial lawns

- lid of Petri dish opened as little as possible
- to prevent microbes from air entering

Post-inoculation

- sealed with tape
- to prevent microbes from air entering
- incubate
- to allow growth of bacteria

6

- (b) (i) bacteria killed / destroyed
ignore fights / attacks / stops growth / got rid of

1

- (ii) *Might be correct*

largest area / space where no bacteria are growing
allow most bacteria killed

1

Might not be correct

(need more evidence as) D may be harmful to people / animals / surfaces
ignore ref to cost / dangerous or harmful unqualified

1

or may work differently with different bacteria

or disinfectants may be different concentrations

ignore different amounts of disinfectant unless reference to different drop size

or may not last as long

ignore take longer to work

allow reference to anomalous result or not repeated

[9]

