4.3 Infection and Response
Higher / Foundation

Name: __________________________
Class: __________________________
Date: __________________________

Time: 167 minutes
Marks: 167 marks

Comments:
Q1.

In 2014 there was an outbreak of Ebola virus disease (EVD) in Africa.

At the time of the outbreak there were:

• no drugs to treat the disease
• no vaccines to prevent infection.

(a) By March 2015 there were an estimated 9850 deaths worldwide from EVD.

The number of deaths is an estimate.

Suggest why it is an estimate rather than an exact number.

___________________________________________________________________
___________________________________________________________________
(1)

(b) Why were no antibiotics used to treat EVD?

___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
(1)

(c) After the outbreak began, drug companies started to develop drugs and vaccines for EVD.

A drug has to be thoroughly tested and trialled before it is licensed for use.

Testing, trialling and licensing new drugs usually takes several years.

Draw one line from each word about drug testing to the definition of the word.

<table>
<thead>
<tr>
<th>Word about drug testing</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dose</td>
<td>Side effects making the person ill</td>
</tr>
<tr>
<td>Efficacy</td>
<td>The concentration of the drug to be used and how often the drug should be given</td>
</tr>
<tr>
<td>Toxicity</td>
<td>Whether the drug works to treat the illness</td>
</tr>
</tbody>
</table>

(2)

(d) The results of drug testing and drug trials are studied in detail by other scientists.
Q2.

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.

(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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_____________________________________________________________________________________
Q3.

(a) Name **two** types of microbe which cause disease in humans.

1. ______________________________________

2. ______________________________________

(b) Why do we feel ill when we have an infectious disease?

___________________________________________________________________

___________________________________________________________________

(c) Give **two** ways in which white blood cells protect us against disease.

1. _________________________________________________________________

___________________________________________________________________

2. _________________________________________________________________

___________________________________________________________________

(d) Explain, as fully as you can, how immunisation protects us against a named disease.

Name of disease: ____________________________________________________

How immunisation protects us: _________________________________________

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Q4.

(a) **List A** gives the names of three stages in trialling a new drug.

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

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

| List A Stage | List B Information |
Tests on humans including a placebo
- Used to find if the drug is toxic

Tests on humans using very small quantities of the drug
- The first stage in the clinical trials of the drug

Tests on animals
- Used to find the optimum dose of the drug
- Used to prove that the drug is effective on humans

(b) Read the passage.

**Daily coffee dose delays development of Alzheimer’s in humans.**

Alzheimer’s is a brain disease that causes memory loss in elderly people. Scientists studied 56 mice that had been genetically engineered to develop Alzheimer’s.

Before treatment all the mice did badly in memory tests.

Half the mice were given a daily dose of caffeine in their drinking water. The dose was equivalent to the amount of caffeine in six cups of coffee for a human.

The other mice were given ordinary water.

After two months, the caffeine-drinking mice did better in memory tests than the mice drinking ordinary water.

The headline for the passage is not justified.

Explain why as fully as possible.
Q5.
A child has a sore throat. The mother takes the child to the doctor. The doctor says that the child has a bacterial infection.

Explain how the infection makes the child ill.

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_______________________________________________________________________
_______________________________________________________________________
_______________________________________________________________________

(Total 6 marks)

Q6.
Antibiotics are used to treat bacterial infections, but not viral infections.

(a) Explain why antibiotics are not effective against viral infections.

_______________________________________________________________________
_______________________________________________________________________
_______________________________________________________________________

(2)

(b) New strains of bacteria have developed that are resistant to antibiotics. There is no effective treatment against these resistant strains.

What must be done to make sure we will be able to treat bacterial infections in the future?

_______________________________________________________________________
_______________________________________________________________________
_______________________________________________________________________

(2)

(Total 4 marks)
Q7.
Many diseases are caused by viruses. Children are given vaccines to protect them against viral disease.

(a) Explain how vaccination protects a child against a viral disease.
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(b) In the 1990s many people thought that the MMR vaccine caused autism in some children. This is why the Japanese government stopped using the MMR vaccine.

The graph gives information about the percentage of Japanese children who developed autism during the 1990s.

The data in the graph support the view that there is no link between MMR vaccination and autism.
Q8.

In the 1800s, many women died in hospital of childbed fever after giving birth.

The graph shows the percentage of mothers who died from childbed fever each year in a hospital in Vienna.

Death rates are shown for two wards at the hospital.

- In **Ward 1** doctors delivered the babies. The doctors worked in many different wards. The doctors also carried out investigations on dead bodies.
- In **Ward 2** midwives delivered the babies. The midwives only worked in **Ward 2**.

(a) What conclusion can be made from the data between 1840 and 1846?
Suggest a reason for this.

(b) Ignaz Semmelweis was a doctor at the hospital. He was very worried about the number of women who died after child birth.

In 1847, Semmelweis introduced a new policy. This policy led to a reduction in the number of deaths.

(i) What policy did Semmelweis introduce?

(ii) Suggest why this policy led to a reduction in the number of deaths.

Q9.

Read the following passage.

One of the deadliest diseases seems to be making a comeback in Britain. Doctors are alarmed at the rising number of cases of tuberculosis (TB). TB is caused by microbes called bacteria. When people carrying the TB bacteria cough or sneeze, the TB bacteria get into the air. Other people may then breathe them in.

(a) Which organs will be infected first when someone breathes in the TB bacteria?

(b) Explain how the TB bacteria inside the body may cause disease.

(c) Name one other group of microbes that often causes disease.
(d) Suggest why people who live in overcrowded areas are more likely to catch TB than people who live in less crowded areas.

__________________________________________________________

(1)

(e) 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.

____________________________________________________________

(3)

(Total 8 marks)

Q10.
Read the passage about antibiotics.

People do not always agree about the use of antibiotics in food production.

If we put low doses of antibiotics in feed for animals such as cattle and sheep, it helps to produce high-quality, low-cost food. Antibiotics help to keep animals disease-free. They also help animals to grow. Animals get fatter quicker because they do not waste energy trying to overcome illness.

The use of antibiotics in livestock feed means that there is a higher risk of antibiotic-resistant bacteria developing. The rapid reproduction of bacteria means there is always a chance that a population of bacteria will develop which is antibiotic-resistant. These could be dangerous to human health.

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

Explain how a population of antibiotic-resistant bacteria might develop from non-resistant bacteria.
Q11.

A young child goes to school for the first time. Soon after, the child gets a cold and a sore throat.

(a) Explain, as fully as you can, what causes the child's illness.

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___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

(b) The doctor tells the child’s mother that children often get ill when they start school and mix with other children.

Why is a child more likely to get an infectious illness when he or she starts school?

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___________________________________________________________________
___________________________________________________________________

(c) The child gets better without taking any medicine. Explain how.

___________________________________________________________________
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(Total 5 marks)
Q12.
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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Q13.
(i) Give two ways in which white blood cells protect us from disease.
1. _________________________________________________________________

___________________________________________________________________

2. _________________________________________________________________

___________________________________________________________________

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

___________________________________________________________________

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___________________________________________________________________

___________________________________________________________________

___________________________________________________________________

Q14.
(a) Explain how diseases caused by bacteria are usually treated by doctors.

_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________

(2)

(b) Explain, as fully as you can, how white blood cells protect us from disease.

_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________

(Total 7 marks)

Q15.

Doctors give antibiotics to patients to kill bacteria in their bodies.

Explain how the overuse of antibiotics has led to the evolution of antibiotic-resistant bacteria.

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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(Total 3 marks)

Q16.
Infections by antibiotic resistant bacteria cause many deaths.

The bar chart below shows information about the number of deaths per year in England from *Methicillin-resistant Staphylococcus aureus* (MRSA) and from *Clostridium difficile* (*C. difficile*) over 4 years.

(a) (i) Describe the trend for deaths caused by *C. difficile*.

(ii) Suggest a reason for the trend you have described in part (a)(i).

Explain your answer.

(iii) Calculate the percentage change in deaths caused by MRSA from 2009 to 2010.

Percentage change in deaths caused by MRSA = ________________ %
(iv) Numbers have not yet been published for 2011.

When the numbers are published, scientists do not expect to see such a large percentage change from 2010 to 2011 as the one you have calculated for 2009 to 2010.

Suggest one reason why.

____________________________________________________________________________

____________________________________________________________________________


(b) Before 2007 there was a rapid increase in the number of deaths caused by MRSA.

Describe how the overuse of the antibiotic methicillin led to this increase.

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____________________________________________________________________________

____________________________________________________________________________

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____________________________________________________________________________


Q17.

Hepatitis B is a liver disease caused by a virus. The virus is found in body fluids such as blood, saliva and urine. Diagram 1 shows the structure of the virus in cross section.

![Diagram 1]

(a) The human body has several natural defences against viruses. Some of these prevent viruses from entering the body. Others act once the viruses have entered.

(i) Diagram 2 shows a white blood cell attacking a group of viruses.

Complete diagram 2 by drawing the 2nd stage.
(i) What type of chemical is released by some white blood cells to attack viruses?

________________________________________________________________________________________________________________________________________________________

(1)

(b) Hepatitis B is more likely to be spread among people who share needles when they inject drugs. Use information given at the beginning of this question to explain why this is so.

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________________________________________________________________________________________________________________________________________________________

(2)

(Total 4 marks)

Q18.
The table shows changes in resistance to the antibiotic penicillin in one species of bacterium between 1991 and 1996.

<table>
<thead>
<tr>
<th>Years</th>
<th>Percentage of cases where bacteria were resistant to penicillin</th>
</tr>
</thead>
<tbody>
<tr>
<td>1991 – 92</td>
<td>7</td>
</tr>
<tr>
<td>1993 – 94</td>
<td>14</td>
</tr>
<tr>
<td>1995 – 96</td>
<td>22</td>
</tr>
</tbody>
</table>

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

(i) How does penicillin help to treat infection?

________________________________________________________________________________________________________________________________________________________

(1)
(ii) Use the data in the table to suggest why the doctor should not prescribe penicillin.

___________________________________________________________________

___________________________________________________________________

___________________________________________________________________

___________________________________________________________________

(Total 3 marks)

Q19. The MMR vaccine is used to protect children against measles, mumps and rubella.

(a) Complete the sentences about vaccination.

Vaccines stimulate white blood cells to produce ___________________________ .

This makes children ________________________________________ to the pathogen.

(b) In the 1990s, many people thought that the MMR vaccine caused autism in some children. As a result, the Japanese government stopped using the MMR vaccine.

The graph gives information about the percentage of children in Japan vaccinated with the MMR vaccine and the number of children who developed autism during the 1990s.
(i) Describe how the percentage of children vaccinated with the MMR vaccine changed between 1990 and 1995.

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

(2)

(ii) Does the data in the graph support a link between MMR vaccination and autism?

Draw a ring around your answer. Yes / No

Explain the reason for your answer.

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
Q20. (Total 6 marks)

(a) (i) Some diseases can be tackled by using antibiotics and vaccination. Explain fully why antibiotics cannot be used to cure viral diseases.

________________________________________________________________________________________________________________________________________________________

(ii) A recent study found that babies in 90% of hospitals are infected with the MRSA bacterium. Explain how the MRSA bacterium has developed resistance to antibiotics.

________________________________________________________________________________________________________________________________________________________

(b) A person can be immunised against a disease by injecting them with an inactive form of a pathogen. Explain how this makes the person immune to the disease.

________________________________________________________________________________________________________________________________________________________

Q21. (Total 7 marks)

Controlling infections in hospitals has become much more difficult in recent years. (a) Explain why MRSA is causing problems in many hospitals.

________________________________________________________________________________________________________________________________________________________
(b) The pioneer in methods of treating infections in hospitals was Ignaz Semmelweiss. He observed that women whose babies were delivered by doctors in hospital had a death rate of 18% from infections caught in the hospital. Women whose babies were delivered by midwives in the hospital had a death rate of 2%. He observed that doctors often came straight from examining dead bodies to the delivery ward.

(i) In a controlled experiment, Semmelweiss made doctors wash their hands in chloride of lime solution before delivering the babies. The death rate fell to about 2% – down to the same level as the death rate in mothers whose babies were delivered by midwives.

Explain why the death rate fell.

(ii) Explain how Semmelweiss’s results could be used to reduce the spread of MRSA in a modern hospital.

Q22.

New drugs have to be thoroughly tested before they are sold.

The diagram shows a time line for the testing of a new drug.

**Time in years**

0 1 2 3 4 5 6 7 8 9 10 11 12

**Pre-clinical testing**

Laboratory tests including tests on animals

**Clinical testing**

<table>
<thead>
<tr>
<th>Phase</th>
<th>Phase 2</th>
<th>Phase 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>10–100 volunteers</td>
<td>200–400 patients</td>
<td>3000+ new patients</td>
</tr>
</tbody>
</table>

**Drug on sale**

(a) What is the main purpose of *pre-clinical testing*?
In Phase 1 of the clinical testing, very low doses of the new drug are used on a small number of volunteers.

(i) What is the main purpose of Phase 1 testing?

(ii) In Phase 1 testing, healthy volunteers are used rather than patients. Suggest one reason for this.

What is the main purpose of the Phase 2 and Phase 3 testing?

During Phase 3 testing, many of the patients are given a placebo.

(i) What is meant by a placebo?

(ii) During the testing, who knows which patients are receiving the placebo? Tick (✓) one box.

Only the patients

Only the doctors

Both patients and doctors

Neither patients nor doctors
Diet and exercise affect health.

(a) Many people are obese (very overweight).

Obesity can lead to heart disease.

Other than heart disease, name two conditions which are linked to obesity.

1. _________________________________________________________________
2. _________________________________________________________________

(b) The graph shows the number of deaths from heart disease each year in the UK.

![Graph showing heart disease deaths by age and gender]

The pattern for deaths from heart disease in men is different from the pattern in women.

(i) Give two differences between the patterns for men and women.

1. _________________________________________________________________
2. _________________________________________________________________

(ii) Suggest two reasons for the difference in the number of deaths from heart disease in men and women between the ages of 40 and 60.

1. _________________________________________________________________
2. _________________________________________________________________
(c) Scientists have developed drugs to reduce the concentration of cholesterol in the blood.

Give the **three** main stages in testing a new drug before it is sold to the public.

1. ______________________________________________________________________

2. ______________________________________________________________________

3. ______________________________________________________________________

(Total 9 marks)

Q24.

Some infections are caused by bacteria.

(a) The genetic material is arranged differently in the cells of bacteria compared with animal and plant cells.

Describe **two** differences.

_____________________________________________________________________

_____________________________________________________________________

_____________________________________________________________________

(2)

(b) Tuberculosis (TB) is an infection caused by bacteria.

The table below shows the number of cases of TB in different regions of southern England from 2000–2011.

<table>
<thead>
<tr>
<th>Year</th>
<th>London</th>
<th>South East</th>
<th>South West</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>37</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>2001</td>
<td>36</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>2002</td>
<td>42</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>2003</td>
<td>42</td>
<td>7</td>
<td>4</td>
</tr>
<tr>
<td>2004</td>
<td>42</td>
<td>7</td>
<td>5</td>
</tr>
<tr>
<td>2005</td>
<td>49</td>
<td>8</td>
<td>5</td>
</tr>
</tbody>
</table>
(i) How does the number of cases of TB for London compare with the rest of southern England?

__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________

(1)

(ii) Describe the pattern in the data for cases of TB in the South East.

__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________

(1)

(iii) Describe the pattern in the data for cases of TB in the South West.

__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________

(2)

(c) (i) On the graph paper below:

• plot the number of cases of TB in London

• label both the axes on the graph

• draw a line of best fit.
(ii) Suggest why a student thought the value for 2005 in London was anomalous.

________________________________________________________________________

________________________________________________________________________

(1)

(d) People can be vaccinated against TB.

Suggest how a vaccination programme would reduce the number of people with TB.

Details of how a vaccine works are not required.

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

(2)

(Total 13 marks)

Q25.

The parts of the blood can be separated from each other by spinning the blood in a centrifuge.

The image below shows the separated parts of a 10 cm$^3$ blood sample.
(a) Calculate the percentage of the blood that is made up of plasma.

___________________________________________________________________
___________________________________________________________________

Answer = _______________%

(2)

(b) Name three chemical substances transported by the plasma.
1. _________________________________________________________________
2. _________________________________________________________________
3. _________________________________________________________________

(3)

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

White blood cells are part of the immune system. White blood cells help the body to defend itself against pathogens.

Describe how pathogens cause infections and describe how the immune system defends the body against these pathogens.

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___________________________________________________________________
___________________________________________________________________
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Q26.
MRSA strains of bacteria are causing problems in many hospitals.

(a) The diagram shows a hand-gel dispenser.

Hand-gel dispensers are now placed at the entrance of most hospital wards. Explain why.

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___________________________________________________________________
___________________________________________________________________
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(b) Explain, as fully as you can, how MRSA strains of bacteria became difficult to treat.

___________________________________________________________________
___________________________________________________________________
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___________________________________________________________________

(6) (Total 11 marks)
Q27.

Scientists at a drug company developed a new pain-killing drug, drug X.

(a) Painkillers do **not** cure infectious diseases.

Why?

___________________________________________________________________

(1)

(b) The scientists compared drug X with two other pain-killing drugs, drug A and drug B.

In their investigation the scientists:

- chose 600 volunteers. The volunteers were all in pain
- gave 200 of the volunteers a standard dose of drug A
- gave 200 of the volunteers a standard dose of drug B
- gave 200 of the volunteers a standard dose of drug X.

Over the next seven hours the volunteers recorded how much pain they felt.

To get valid results the three groups of volunteers should be matched for as many factors as possible.

Suggest **two** of the factors that should be matched.

___________________________________________________________________

(2)

(c) The graph shows the results of the investigation.

![Graph showing the results of the investigation](image)

(i) How much pain did the volunteers still feel, four hours after taking drug A?
(ii) Give one advantage of taking drug A and not drug B.

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

(1)

(iii) Give two advantages of taking drug B and not drug A.

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

(2)

(d) Drug X is much more expensive than both drug A and drug B.

A pharmacist advised a customer that it would be just as good to take drug A and drug B together instead of drug X.

Do you agree with the pharmacist's advice?

Give reasons for your answer.

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(3)

(Total 10 marks)
Mark schemes

Q1.
   (a) any one from:
       • not all deaths recorded
       • not all causes of deaths recorded
         allow cause may not be known

   (b) antibiotics do not kill viruses
       allow antibiotics only kill bacteria

   (c)
   
   Dose
   Side effects making the person ill
   
   Efficacy
   The concentration of the drug to be used and how often the drug should be given
   
   Toxicity
   Whether the drug works to treat the illness

   all correct for 2 marks
   1 or 2 correct for 1 mark

   (d) any one from:
       • to prevent false claims
       • to make sure the conclusions are correct / valid
       • to avoid bias

Q2.
   (a) hearsay

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

   (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’

Q3.

(a) virus
bacteria (allow fungi, protozoa)

(b) reference to poisons/toxins produced by microbes

(c) 2 of e.g.
  engulf microbes
  produce antibodies
  produce antitoxins

(d) dead/weakened microbes (relevant to named disease)
  method e.g. injection/ swallowed (relevant to named disease)
  body responds by producing antibodies

Q4.

(a)
A

Tests including a placebo

Tests using very small ...

Tests on animals

B

Used to find whether the drug is toxic

The first stage in the clinical trials of the drug

Used to find the optimum dose of the drug

Used to prove that the drug is effective on humans

1 mark for each correct line
mark each line from left hand box
two lines from left hand box cancels mark for that box

(b) any three from:

Students have been informed that the headline is not justified

- reference to reliability, eg only a small number of mice tested
  or trial too short
  or investigation not repeated

- reference to control, eg mice given caffeine not coffee
  or 6 cups (equivalence) is more than 1 dose

- (and) the effect on mice might not be same as on humans
  allow only tested on mice

- (also) text suggests that the treatment improves memory loss (rather than delays it)
  accept text suggests disease cured

or mice already have memory loss or experiment only showed improvement in memory
or does not show delays Alzheimer’s
or experiment not done on old mice
  allow reference to the fact that mice engineered to have it
Q5.
bacteria reproduce rapidly / increase rapidly in numbers produce poisons / toxins
each for 1 mark

Q6.
(a) viruses live / reproduce inside cells

(so) the drug cannot reach the virus
allow (so) cell also damaged

(b) develop new antibiotics

not prescribe antibiotics for viral infections / non-serious infections
allow antibiotics should not be prescribed / used inappropriately
or
allow (patients) should take the complete course of antibiotics

Q7.
(a) dead / inactive form of virus introduced into body

white blood cells stimulated to produce antibodies

correct antibodies rapidly made if the body is infected with the virus

(b) the percentage of children vaccinated fell to zero in 1995

but the number of children developing autism rose and fell during the period when % vaccinations was falling

number of children developing autism peaked after MMR vaccination had ceased

which suggests that something other than MMR vaccination was causing autism

Q8.
(a) more (mothers) died if doctors delivered their babies (rather than midwives)
answer must be comparative
allow more deaths on Ward 1
ignore descriptions of trends

1

doctors spread bacteria / viruses / pathogens / microbes from dead bodies / other patients

allow disease / infection childbed fever
ignore germs

allow doctors did not wash their hands / midwives washed their hands

1

(b) (i) hand-washing

before / after examining patients

ignore between wards

or

between patients

or

after examining dead bodies

1

(ii) removed / killed bacteria / viruses / pathogens / microbes (from hands)

ignore disease / infection / germs / childbed fever

or

reduced transfer of bacteria / viruses / pathogens / microbes (from hands)

1

Q9.

(a) lungs

for 1 mark

1

(b) microbes reproduce rapidly produce poisons

for 1 mark each

2

(c) viruses/fungi/protozoa

for 1 mark

1

(d) more likely to come into contact with infected people/more TB bacteria in air

for 1 mark

1

(e) white cells ingest bacteria
produce antibodies which destroy bacteria
produce antitoxins which counteract poisons produced by bacteria
Q10.
(a) **Quality of written communication**
*The answer to this question requires ideas in 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.*

idea of mutation or variation

*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*

(resistant cells) survive antibiotic 1 mark
(resistant cells) breed 1 mark

(b) **EITHER (yes)**

keep animals disease free (1) so grow faster (1 mark) or live longer

**OR (no)**

resistant bacteria may develop (1) risk to human or animal health (1) *allow bacteria become resistant / immune* 2 marks

Q11.
(a) microbes entered body, multiplied rapidly, made poisons *any 2 for 1 mark each* 2 marks

(b) contact with infected people *for 1 mark* 1 mark

(c) the body kills the microbes *for 1 mark* 1 mark

Q12.
(wbc) ingest / digest pathogens / bacteria / viruses

*allow eat germs*

*ignore swallow germs*

*ignore ingest the disease*
(wbc) produce antibodies

(wbc) produce antitoxins

any one from:

• (antibodies) destroy or kill pathogens / bacteria / viruses / germs

• (antitoxins) counteract / destroy / neutralise toxins / poisons

• reasonable reference to memory cells or rapid production of antibodies upon re-infection

Q13.

(i) 2 of:

- ingest microbes; )allow higher level answers
- produce antibodies; )allow cause and effect
- produce antitoxins )eg antitoxins neutralise poisons = 2

  each for 1 mark

(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

  each for 1 mark

Q14.

(a) use antibiotics; or named one to kill bacteria; (not microbes)

  each for 1 mark

(b) some ingest/digest bacteria (not microbes) OWTTE

  some produce antibodies;

  which destroy bacteria/viruses;

  some produce antitoxins;

  which counteract poisons released by bacteria

  each for 1 mark

Q15.

Quality of written communication
any two from:

mutation occurs in bacteria or change in DNA / gene occurs

cancel if mutation ‘caused by’ antibiotic

(resistant bacteria) survive or non-resistant bacteria are killed or reference to ‘natural selection’

resistant bacteria pass on the gene / allele

allow pass on the mutation
do not accept just ‘pass on resistance’

Q16.
(a) (i) decrease

rate of decrease slows

(ii) any one from:

• more use of disinfectant
  allow any reasonable increase in hygiene or sterilisation precautions
• more use of hand washing
• more careful / more often cleaning of patient facilities
• raised awareness / education about hygiene

Explanation:
stops / reduces the bacteria being transferred / spreading

(iii) \[
800 - 500 \div 800 \times 100 = 37.5 \%
\]
correct answer with or without working gains 2 marks

(iv) any one from:

• numbers quite low now so hard to reduce further
• was a big campaign / much publicity (in 2009) so more people already doing it
• hygiene / cleaning now good so hard to improve
• hospitals short of money so less staff to clean

(b) mutation occurred giving resistance (to methicillin)
do not accept overuse caused mutation
resistant bacteria not able to be treated / not killed

these bacteria multiplied / reproduced / spread quickly

Q17.
(a) (i) diagram shows extensions of intact cell membrane around viruses

(ii) antibodies
   allow enzymes re (ii)
   allow interferon
   ignore antitoxins / proteins

(b) virus is transferred
   (virus in) blood / body fluids – transfer (via needles)

Q18.
(i) kills / destroys bacteria or
    prevents growth of bacteria
    do not allow germs
    do not allow fights or gets rid of

(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

Q19.
(a) antibodies
   allow antitoxins / memory cells
   do not allow antigens

   immune
   ignore protection
allow resistant

(b) (i) fell

numerical qualification to zero / nothing / by 100%
allow stopped in 1995

(ii) (no)
ignore circle

% vaccination fell or when no vaccination
but autism numbers did not fall / stayed high / increased
or
‘(yes) might support it if time lag between vaccination and autism symptoms’ / ‘time lag for diagnosis’ (1)

6 year time lag quantified (1)

Q20.

(a) (i) viruses live inside cells

viruses inaccessible to antibiotic
allow drug / antibiotic (if used) would (have to) kill cell

(ii) mutation
ignore mutation caused by antibiotic

natural selection or no longer recognised by antibiotics
accept description of natural selection

(b) (stimulate) antibody production
ignore antitoxin

(by) white cells

rapidly produce antibody on re-infection
ignore antibodies remain in blood

Q21.

(a) any two from:

virus is neutral
• resistant to (most) antibiotics
• contagious or easily passed on or reference to open wounds
• patients ill therefore less able to combat disease

(b) (i) chloride of lime / hand washing killed bacteria (picked up from corpses)
   allow disease / germs / infection / disinfectants

(ii) people to wash hands after contact with patient

so bacteria / pathogen / MRSA not transferred to other patient

Q22.

(a) testing for toxicity / see if it is safe / see if it is dangerous / to see if it works
   ignore side effects unqualified

(b) (i) testing for side effects / testing for reactions (to drug)
   ignore to see if it works
   do not accept dosage

(ii) any one from
   ignore immune system
   • dose too low to help patient
   • higher risk for patient
   • might conflict with patient’s treatment / patient on other drug
   • effect might be masked by patient’s symptoms / side effects clearer

(c) to find optimum dose
   allow testing on larger sample or it makes results more reliable
   allow to find out if drug is effective / find out if drug works on ill people (not just if drug works)

(d) (i) (tablet / drug / injection) that does not contain drug
   allow control / fake / false
   allow tablet / injection that does not affect body
   do not accept drug that does not affect body

(ii) neither patients nor doctors
Q23.

(a) any two from:

- arthritis
  
  *allow damaged joints*

- diabetes
  
  *accept high blood sugar*

- high blood pressure

- strokes
  
  *allow blocked blood vessels / thrombosis*

- allow breathing difficulties
  
  *ignore cancer*
  
  *ignore high cholesterol*

(b) (i) any two from:

  *to gain marks there must be a comparison*
  
  *ignore comparison at single age*

- lower number of women deaths up to age of 75-80

- higher number of women deaths after 80
  
  *ignore women die older or men die younger*

- men’s peak higher

- men’s peak at an earlier age

- men’s death start earlier than women

- more men than women die of heart disease

(ii) any two from:

- men smoke more (cigarettes)
  
  *ignore alcohol*

- more men smoke

- men under more stress

- men less active

- more men overweight / eat more / less diet conscious or different fat distribution
  
  *ignore reference to body size*

- genetic factors

- men might have lower metabolic rate
  
  *ignore references to hormones*

- men less likely to visit doctor even though they have symptoms
(c) points can be in any order

laboratory tests / tests on tissues
or
tests on animals
or
tests for toxicity

ignore computer simulations

tests for side effects on volunteers / healthy people / small numbers

widespread testing
or
testing for optimum dose
or
test on patients / sick people
or
test to see if it is effective

accept use of placebo

Q24.

(a) any two from:

• only one ‘chromosome’
  allow one strand of DNA
• circular
  allow loop
• may have plasmids
• not in a nucleus / no nucleus

(b) (i) any one from:

• London is much higher
  or converse
• more variable / wider range
  allow ‘on average it is 5 / 6 times greater’

(ii) increases

Included figures must be correct

(iii) overall slight increase

accept ‘doesn’t change much’

variable / goes up and down

(c) (i) both axes correctly labelled
x = Year

y = Number of cases

correct points
   all correct = 2 marks
   1-2 errors = 1 mark
   > 2 errors = 0 marks

suitable line of best fit
   accept straight line or smooth curve

(ii) doesn't fit the pattern / line of best fit

(d) provides immunity / protection (to TB)
   ignore 'stops people catching it'
   ignore ‘resistance’

prevents TB spreading
   accept ref to herd immunity

Q25.

(a) 55%  
   2 marks for correct answer alone
   accept 54 – 56
   5.5 / 10 × 100 alone gains 1 mark

(b) any three from:
   • amino acids
   • antibodies
   • antitoxins
   • carbon dioxide
   • cholesterol
   • enzymes
   • fatty acid
   • glucose
   • glycerol
   • hormones / named hormones
   • ions / named ions
   • proteins
   • urea
   • vitamins
   • water.
   ignore blood cells and platelets
   ignore oxygen
   max 1 named example of each for ions and hormones
   allow minerals
Marks awarded for this answer will be determined by the Quality of Communication (QC) 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 description of pathogens with errors or roles confused.

or
the immune response with errors or roles confused.

Level 2 (3 – 4 marks)
There is a description of pathogens and the immune response with some errors or confusion.

or
a clear description of either pathogens or the immune response with few errors or little confusion.

Level 3 (5 – 6 marks)
There is a good description of pathogens and the immune response with very few errors or omissions.

Examples of biology points made in the response:

- bacteria and viruses are pathogens
  credit any ref to bacteria and viruses
- they reproduce rapidly inside the body
- bacteria may produce poisons / toxins (that make us feel ill)
- viruses live (and reproduce) inside cells (causing damage).

White blood cells help to defend against pathogens by:

- ingesting pathogens / bacteria / (cells containing) viruses
  credit engulf / digest / phagocytosis
- to destroy (particular) pathogen / bacteria / viruses
- producing antibodies
- to destroy particular / specific pathogens
- producing antitoxins
- to counteract toxins (released by pathogens)
  credit memory cells / correct description
- this leads to immunity from that pathogen.

Q26.

(a) kills / destroys bacteria / MRSA
  do not allow germs

  prevents / reduces transfer
  allow stops MRSA entering ward

(b) mutation
  do not accept antibiotics causes mutation
Q27.

(a) don't kill pathogens / bacteria / viruses / microbes / microorganisms
   allow don't contain antibiotics
   ignore antibodies / attack / fight
   allow only treat symptoms / pain
   ignore kill disease / germs

(b) any **two** from:
   - age
   - gender
   - extent / severity of pain
     **or** how long had pain **before trial**
   - type of pain / illness / site of pain
     **accept 'the pain' for 1 mark, if neither extent or type given**
     ignore pain threshold
   - (body) mass / weight / height
     **allow body size / physique**
   - other medical issues / drugs taken / health / fitness
   - ethnicity

(c) (i) 75
   ignore calculations / %

(ii) faster pain relief / decrease
    **allow pain relief sooner**
    **or it works quicker**
    **or more pain relief at start / in first 1 / 1 \(\frac{3}{4}\) hours**

(iii) decrease of pain higher / more
    **ignore more effective unless qualified by time > 1 \(\frac{3}{4}\) hours**
    **allow effect lasts longer**
    decrease of pain is longer lasting
(d) any three from:

ignore yes or no

(Yes because)

• rapid pain relief (from A)
• long lasting pain relief (from B)
• and it costs less
• the sum of the pain relief (from A + B) is greater (than X)

(No because)

• drug X gives more pain relief
• (A + B / they ) might interact with each other
• could result in overdose
• could be more / new side effects
  
  if neither points gained
  allow (more) dangerous