# exampro

## 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.

**Word about drug testing**                    **Definition**

| 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 |

**(2)**

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

Only then can the results be published by the drug company.

Suggest **one** reason why the results are studied by other scientists.

_____

_____

**(1)**
**(Total 5 marks)**

**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.

| hearsay. |
| a hypothesis. |
| a prediction. |

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

**(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.

_____

_____

_____

_____

_____

_____

**Q3.**

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

1 _____

2 _____

**(2)**

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

_____

_____

**(1)**

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

1. _____

_____

2. _____

_____

**(2)**

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

Name of disease: _____

How immunisation protects us: _____

_____

_____

_____

_____

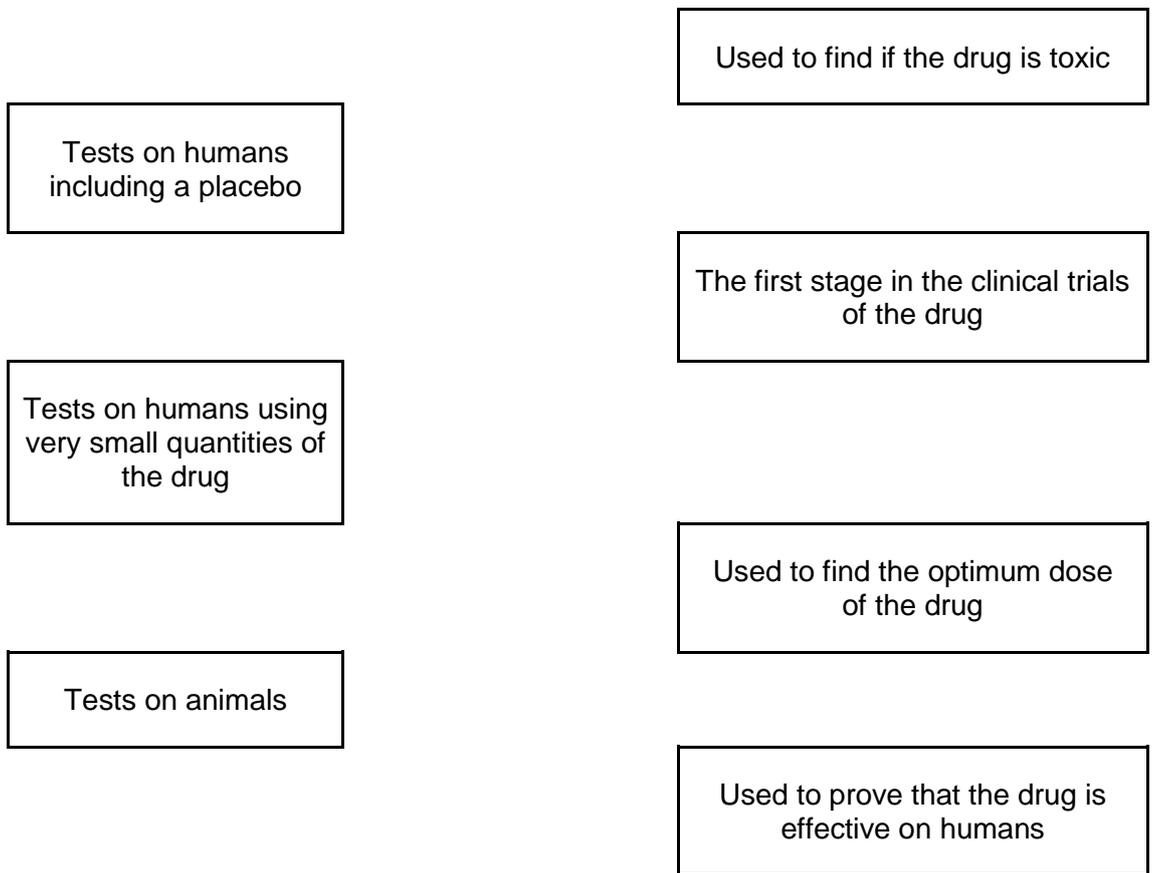**(3)**
**(Total 8 marks)**

**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

**(3)**

(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.

_____

_____

_____

_____

_____

_____

_____

_____

<div align="right">

**(3)**
**(Total 6 marks)**

</div>

## 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.

_____

_____

_____

_____

<div align="right">

**(Total 2 marks)**

</div>

## Q6.

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

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

_____

_____

_____

_____

<div align="right">

**(2)**

</div>

(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?

_____

_____

_____

_____

<div align="right">

**(2)**
**(Total 4 marks)**

</div>

## 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.

_____

_____

_____

_____

_____

_____

**(3)**

(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.
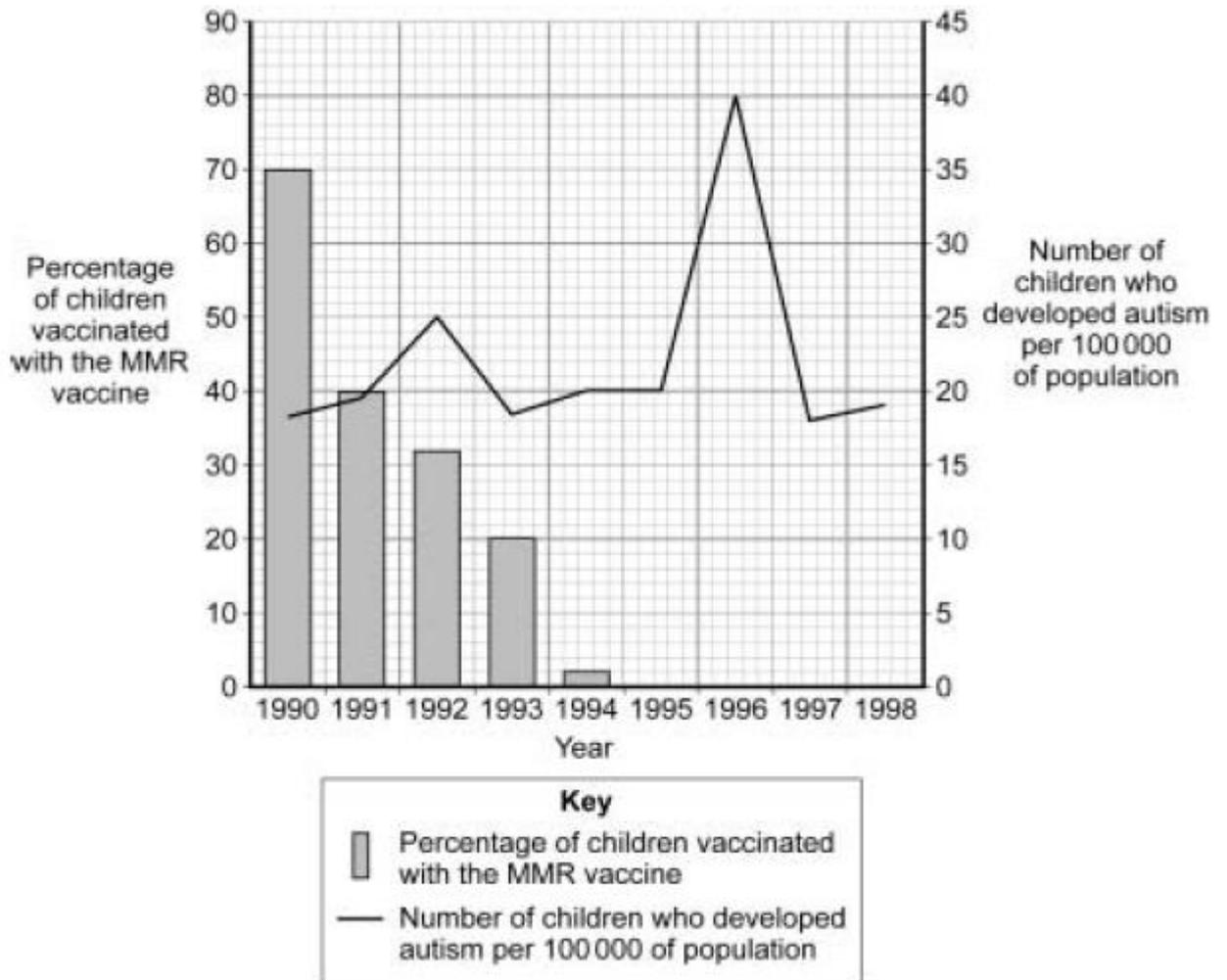


The data in the graph support the view that there is **no** link between MMR vaccination and autism.

Explain why.

_____

_____

_____

_____

_____

_____

_____

_____

_____

**(4)**

**(Total 7 marks)**

**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**.
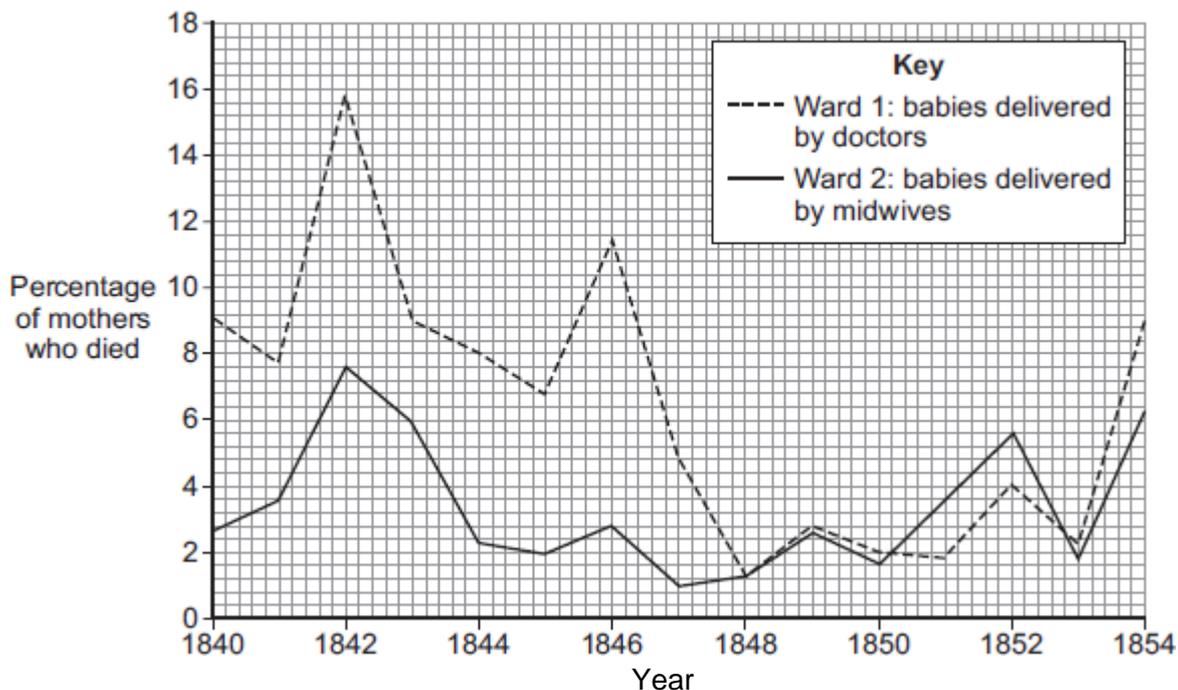


(a)  What conclusion can be made from the data between 1840 and 1846?

_____

_____

Suggest a reason for this.

_____

_____

**(2)**

(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?

_____

_____

_____

_____

**(2)**

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

_____

_____

**(1)**
**(Total 5 marks)**

## 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?

_____

**(1)**

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

_____

_____

**(2)**

(c)　Name **one other** group of microbes that often causes disease.

_____

**(1)**

(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.

_____

_____

_____

_____

_____

_____

**(3)**

(b)     Do you think that farmers should be allowed to put low doses of antibiotics in animal feed? Explain the reasons for your answer.

_____

_____

_____

_____

**(2)**

**(Total 5 marks)**

## 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.

_____

_____

_____

_____

**(2)**

(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?

_____

_____

_____

_____

**(1)**

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

_____

_____

## Q12.

The body's immune system protects us from diseases.

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

_____

_____

_____

_____

_____

_____

_____

_____

_____

**(Total 4 marks)**

## Q13.

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

1. _____

_____

2. _____

_____

**(2)**

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

_____

_____

_____

_____

_____

_____

**(3)**
**(Total 5 marks)**

## 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.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

**(5)**
**(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.*

_____

_____

_____

_____

_____

_____

**(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.
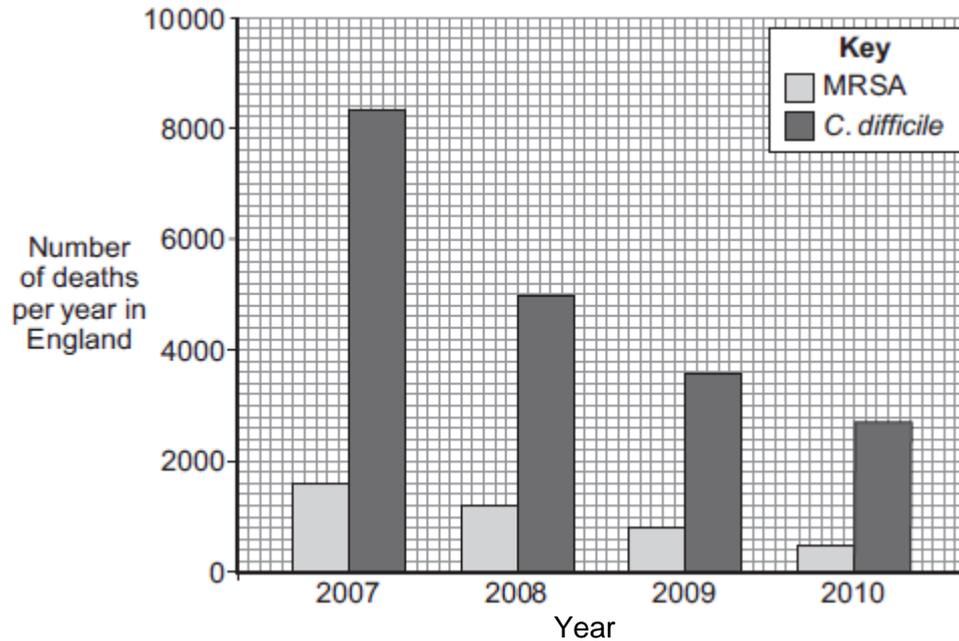


(a) (i) Describe the trend for deaths caused by *C.difficile*.

_____

_____

_____

_____

**(2)**

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

Explain your answer.

_____

_____

_____

_____

**(2)**

(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.

_____

_____

**(1)**

(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.

_____

_____

_____

_____

_____

_____

**(3)**
**(Total 10 marks)**

## 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.
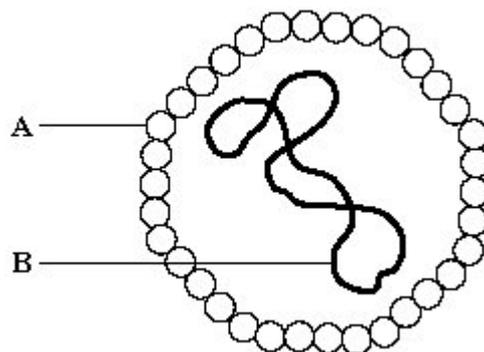


**Diagram 1**

(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.

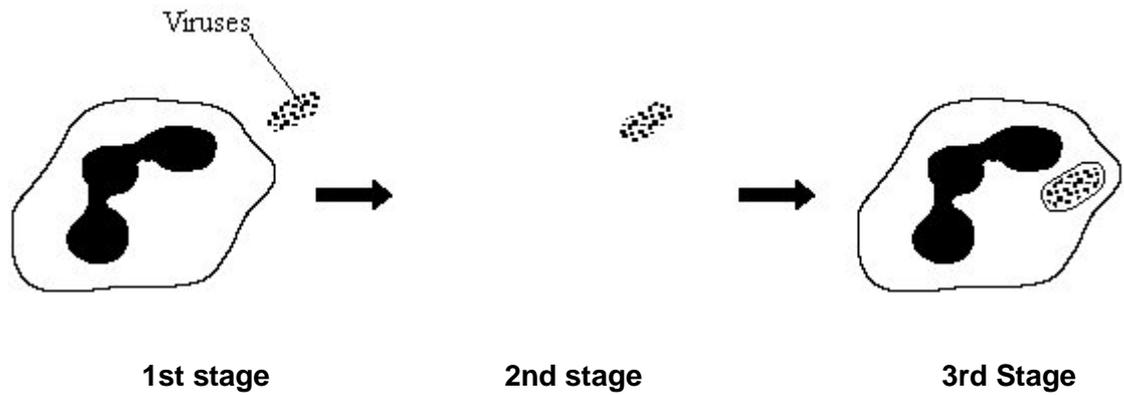Complete diagram **2** by drawing the 2nd stage.

**1st stage**　　　　**2nd stage**　　　　**3rd Stage**

**Diagram 2**

**(1)**

(ii)　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.

_____

_____

_____

_____

**(2)**
**(Total 4 marks)**

## Q18.

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?

_____

**(1)**

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

_____

_____

_____

_____

**(2)**

**(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.

**(2)**

(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.

Key

**Percentage of children vaccinated with the MMR vaccine**

Number of children who developed autism per 100000 of population
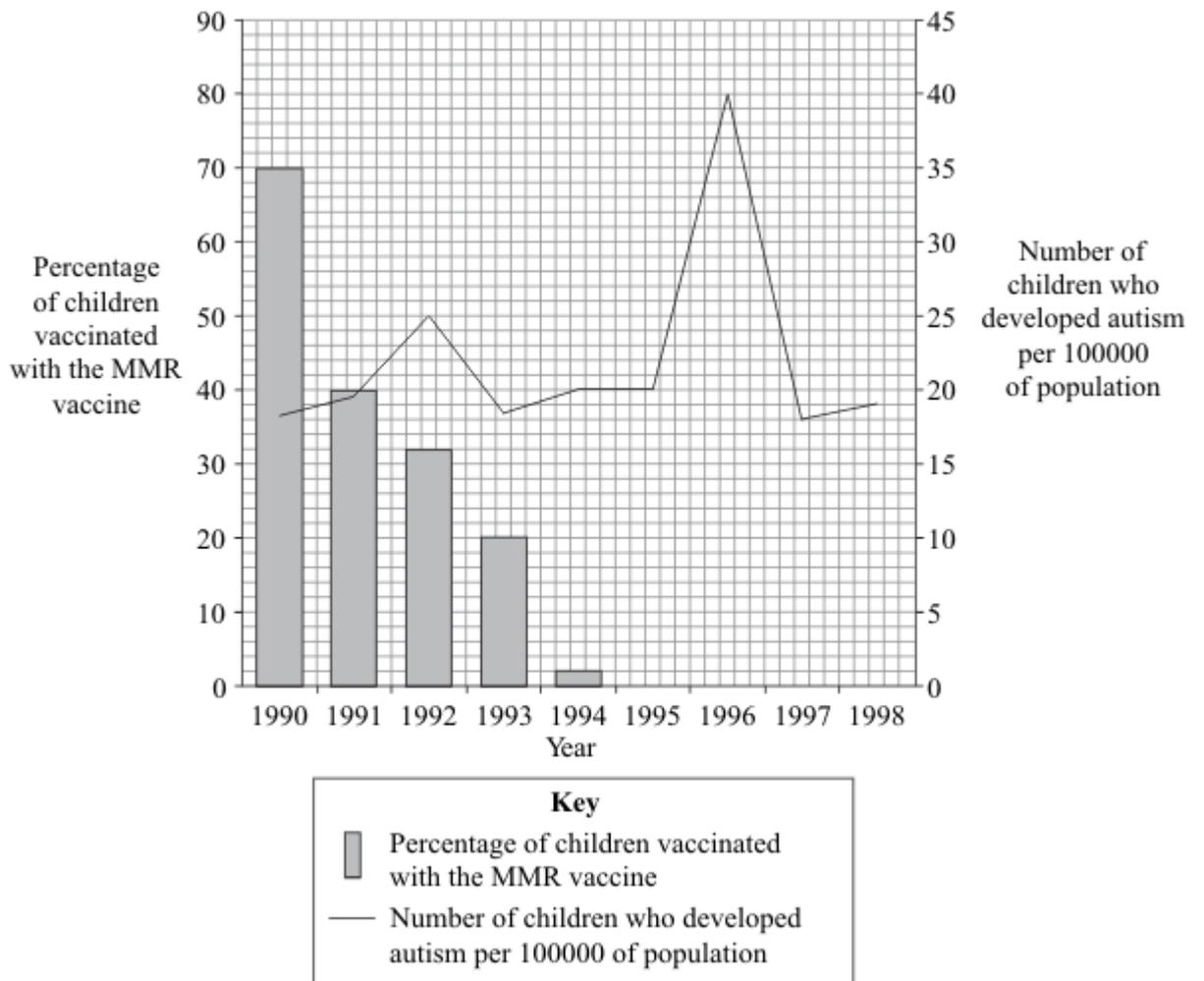
(i) Describe how the percentage of children vaccinated with the MMR vaccine changed between 1990 and 1995.

_____

_____

_____

_____

_____

**(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.

_____

_____

_____

_____

_____

**(2)**
**(Total 6 marks)**

## Q20.

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

_____

_____

_____

_____

**(2)**

(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.

_____

_____

_____

_____

**(2)**

(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.

_____

_____

_____

_____

_____

_____

**(3)**
**(Total 7 marks)**

## Q21.

Controlling infections in hospitals has become much more difficult in recent years.

(a)   Explain why MRSA is causing problems in many hospitals.

_____

_____

_____

_____

**(2)**

(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.

_____

_____

**(1)**

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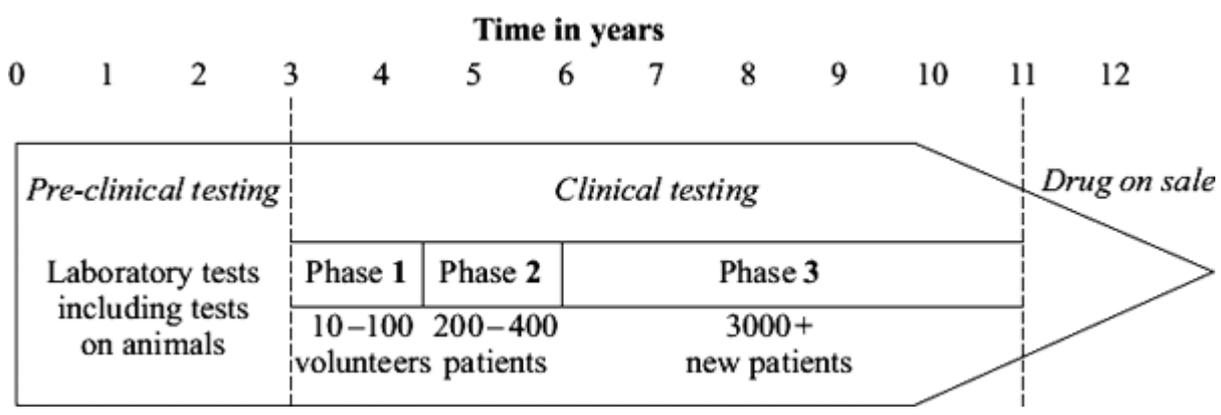
_____

_____

_____

_____

**(2)**

**(Total 5 marks)**

## 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.



(a)   What is the main purpose of *pre-clinical testing?*

_____

_____

**(1)**

(b)   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?

        _____

        _____

**(1)**

    (ii)    In Phase **1** testing, healthy volunteers are used rather than patients.

        Suggest **one** reason for this.

        _____

        _____

**(1)**

(c)   What is the main purpose of the Phase **2** and Phase **3** testing?

    _____

    _____

**(1)**

(d)   During Phase **3** testing, many of the patients are given a *placebo.*

    (i)    What is meant by a *placebo?*

        _____

        _____

**(1)**

    (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   ☐

**(1)**

**Q23.**

Diet and exercise affect health.

(a)    Many people are obese (very overweight).
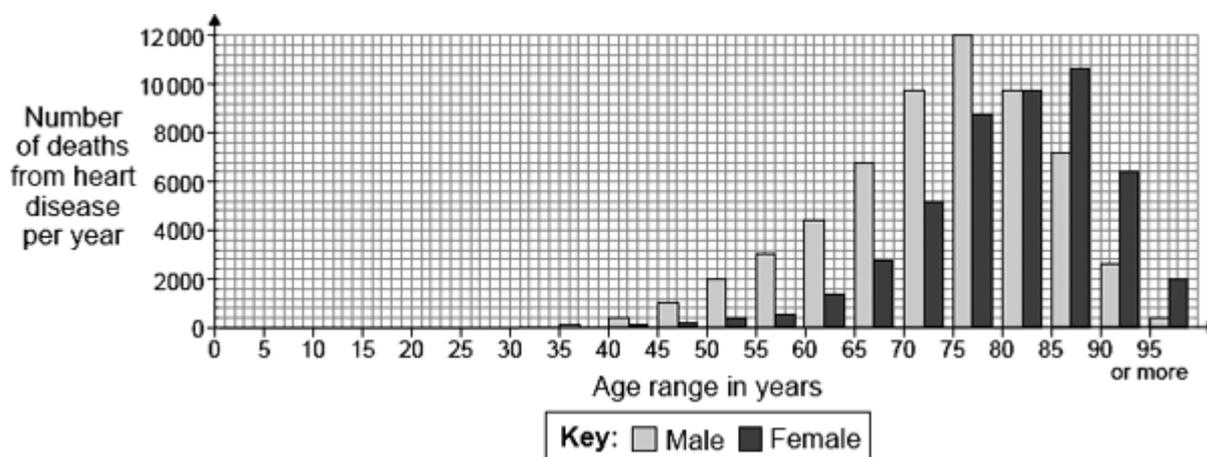
Obesity can lead to heart disease.

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

1. _____

2. _____

**(2)**

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



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. _____

_____

**(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. _____

_____

**(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. _____

_____

**(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.

**Number of cases of TB per 100 000 people**

| Year | London | South East | South West |
|------|--------|------------|------------|
| 2000 | 37 | 5 | 3 |
| 2001 | 36 | 6 | 4 |
| 2002 | 42 | 6 | 6 |
| 2003 | 42 | 7 | 4 |
| 2004 | 42 | 7 | 5 |
| 2005 | 49 | 8 | 5 |

| | | | |
|---|---|---|---|
| 2006 | 44 | 8 | 3 |
| 2007 | 43 | 8 | 5 |
| 2008 | 44 | 8 | 5 |
| 2009 | 44 | 9 | 6 |
| 2010 | 42 | 9 | 5 |
| 2011 | 45 | 10 | 5 |

(i) How does the number of cases of TB for London compare with the rest of southern England?

_____

_____

_____

**(1)**

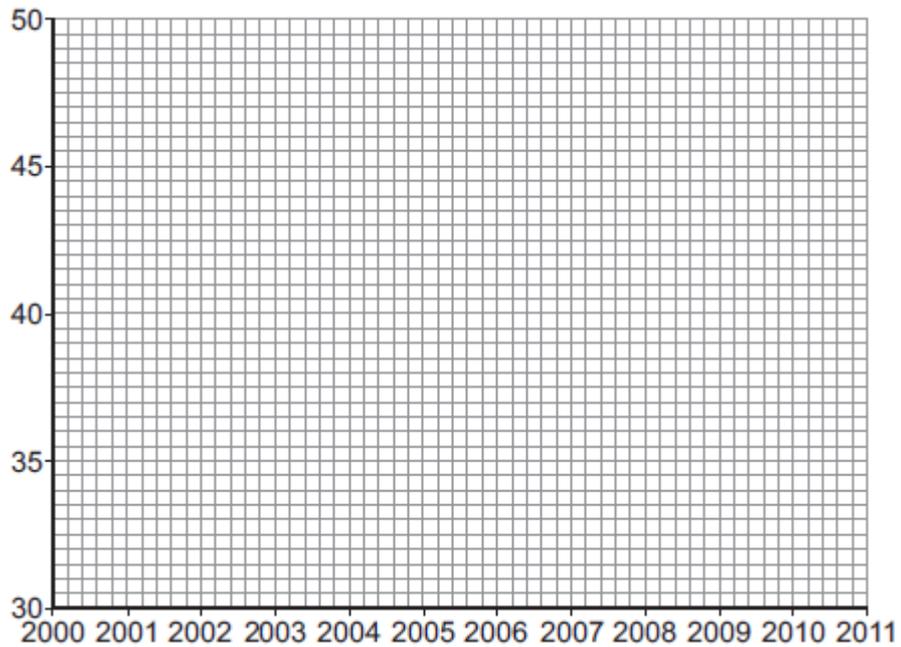(ii) Describe the pattern in the data for cases of TB in the South East.

_____

_____

**(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.

**(4)**

(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.

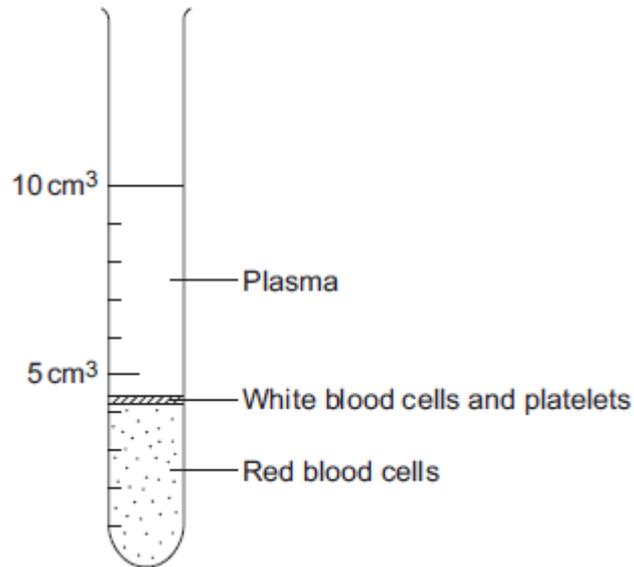Details of how a vaccine works are **not** required.

_____

_____

_____

_____

**(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.

_____

_____

_____

_____

_____

_____

_____

_____

## 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.

_____

_____

_____

_____

**(2)**

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

_____

_____

_____

_____

_____

_____

**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**
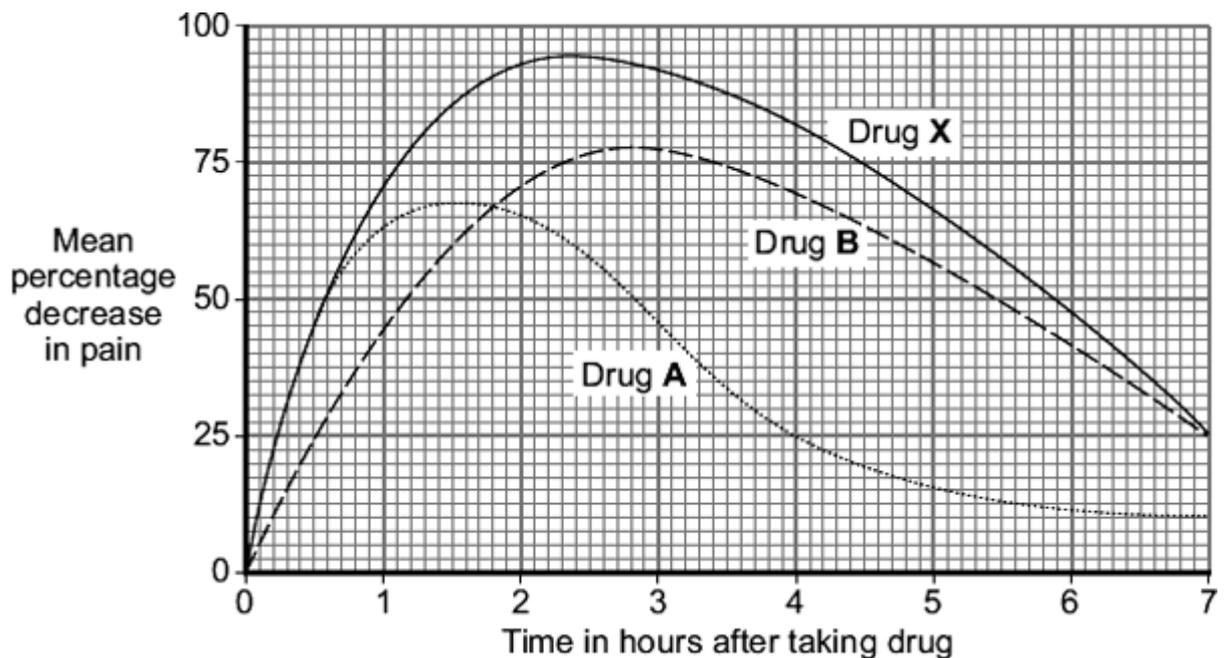   •  gave 200 of the volunteers a standard dose of drug **X**.

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.



(i)     How much pain did the volunteers still feel, four hours after taking drug **A**?

_____ percent

**(1)**

(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**.

_____

_____

_____

_____

**(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.

_____

_____

_____

_____

_____

_____

_____

**(3)**
**(Total 10 marks)**

Mark schemes

## Q1.

(a) any **one** from:

- not all deaths recorded
- not all causes of deaths recorded

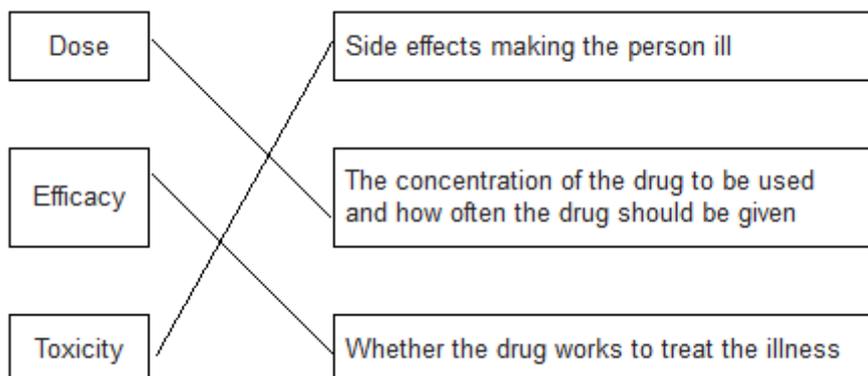    *allow cause may not be known*

1

(b) antibiotics do not kill viruses

    *allow antibiotics <u>only</u> kill bacteria*

1

(c)



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

2

(d) any **one** from:

- to prevent false claims
- to make sure the conclusions are correct / valid
- to avoid bias

1

[5]

## Q2.

(a) hearsay

1

(b) (volunteers with feet in) <u>empty</u> 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]**


## Q3.

(a)    virus
       bacteria (allow fungi, protozoa)

**2**

(b)    reference to poisons/toxins produced by microbes

**1**

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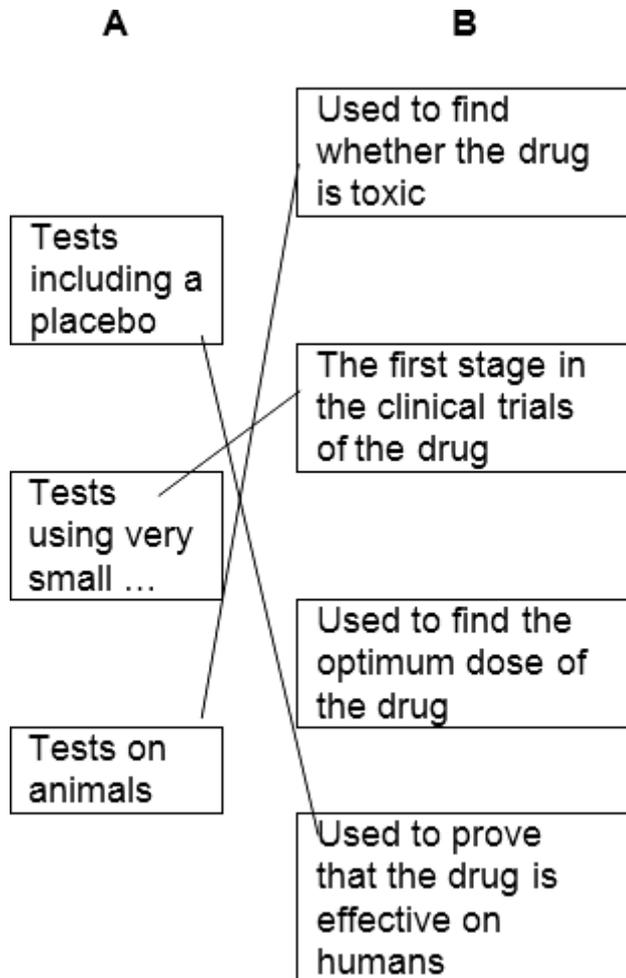       produce antitoxins

**2**

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

**3**

**[8]**


## Q4.

(a)

| A | B |
|---|---|
| | Used to find whether the drug is toxic |
| Tests including a placebo | |
| | The first stage in the clinical trials of the drug |
| Tests using very small ... | |
| | Used to find the optimum dose of the drug |
| Tests on animals | |
| | 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*

3

(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 <u>not</u> 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*

3

## Q5.

bacteria reproduce <u>rapidly</u> / increase <u>rapidly</u> in numbers produce poisons / toxins
*each for 1 mark*

2

## Q6.

(a)   viruses live / reproduce inside cells

1

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

1

(b)   develop new antibiotics

1

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*

1

[4]

## Q7.

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

1

white blood cells stimulated to produce antibodies

1

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

1

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

1

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

1

number of children developing autism peaked after MMR
vaccination had ceased

1

which suggests that something other than MMR vaccination
was causing autism

1

[7]

## Q8.

(a)   <u>more</u> (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

1

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

**[5]**

## 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

*for 1 mark each*

3

**[8]**

## 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*

1

(resistant cells) survive antibiotic

1

(resistant cells) breed

1

(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

**[5]**

## Q11.

(a) microbes entered body,
multiplied rapidly,
made poisons

*any 2 for 1 mark each*

2

(b) contact with infected people

*for 1 mark*

1

(c) the body kills the microbes

*for 1 mark*

1

**[4]**

## Q12.

(wbc) ingest / digest pathogens / bacteria / viruses

*allow eat germs*
*ignore swallow germs*
*ignore ingest 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]**

## 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*

**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
    *each for 1 mark*

**3**

**[5]**

## Q14.

(a)   use antibiotics; or named one to kill bacteria; (not microbes)
    *each for 1 mark*

**2**

(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*

**5**

**[7]**

## Q15.
**Quality of written communication**

*for correct use of at least **two** scientific terms eg mutation, resistant (**not** just 'antibiotic-resistant', **not** 'immune') / selection / natural selection / survival / reproduction / gene / allele / DNA*

**1**

any **two** from:

mutation occurs in bacteria or change in DNA / gene occurs
*cancel if mutation 'caused by' antibiotic*

(when antibiotic used) only 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'*

**2**

**[3]**

## Q16.

(a)  (i)  decrease

**1**

rate of decrease slows

**1**

(ii)  any **one** from:
  •  <u>more</u> use of disinfectant
    *allow any reasonable increase in hygiene or sterilisation precautions*
  •  <u>more</u> use of hand washing
  •  <u>more</u> careful / <u>more</u> often cleaning of patient facilities
  •  raised awareness / education about hygiene

**1**

Explanation:
stops / reduces the bacteria being transferred / spreading

**1**

(iii)  800 – 500 / 800 × 100 =

**1**

37.5 (%)
  *correct answer with or without working gains **2** marks*

**1**

(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

**1**

(b)  mutation occurred giving resistance (to methicillin)
    *do **not** accept overuse caused mutation*

**1**

resistant bacteria not able to be treated / not killed

**1**

these bacteria multiplied / reproduced / spread quickly

**1**

**[10]**

## Q17.

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

**1**

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

**1**

(b)　<u>virus</u> is transferred

**1**

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

**1**

**[4]**

## Q18.

(i)　kills / destroys <u>bacteria</u> **or**
prevents growth of <u>bacteria</u>
> *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]**

## Q19.

(a)　antibodies
> *allow antitoxins / memory cells*
> *do **not** allow antigens*

**1**

　immune
> *ignore protection*

*allow resistant*

**1**

(b)  (i)  fell

**1**

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

**1**

(ii)  (no)
*ignore circle*

**1**

% 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)

**1**

**[6]**

## Q20.

(a)  (i)  viruses live inside cells

**1**

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

**1**

(ii)  mutation
*ignore mutation caused by antibiotic*

**1**

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

**1**

(b)  (stimulate) antibody production
*ignore antitoxin*

**1**

(by) white cells

**1**

<u>rapidly</u> produce antibody on re-infection
*ignore antibodies remain in blood*

**1**

**[7]**

## 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

**2**

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

**1**

(ii) people to wash hands after contact with patient

**1**

so <u>bacteria</u> / <u>pathogen</u> / <u>MRSA</u> not transferred to other patient

**1**

**[5]**


# Q22.

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

**1**

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

**1**

(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

**1**

(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)*

**1**

(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*

**1**

(ii) neither patients nor doctors

**1**

**[6]**

**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*

                      **2**

    (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

                      **2**

        (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*

1

tests for <u>side effects</u> on volunteers / healthy people / small numbers

1

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*

1

**[9]**


## 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

2

(b)     (i)     any **one** from:

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

1

(ii)    increases
                *Included figures must be correct*

1

(iii)   overall slight increase
                *accept 'doesn't change much'*

1

variable / goes up and down

1

(c)     (i)     both axes correctly labelled

x = Year

y = Number of cases

**1**

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

**2**

suitable line of best fit
*accept straight line or smooth curve*

**1**

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

**1**

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

**1**

prevents TB <u>spreading</u>
*accept ref to herd immunity*

**1**

**[13]**


## Q25.

(a)   55%

*2 marks for correct answer alone*
*accept 54 − 56*
*5.5 / 10 × 100 alone gains **1** mark*

**2**

(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*

**3**

(c)    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.

**6**

**[11]**


# Q26.
(a)    <u>kills</u> / destroys bacteria / MRSA
         *do **not** allow germs*

**1**

prevents / reduces transfer
         *allow stops MRSA entering ward*

**1**

(b)    mutation
         *do **not** accept antibiotics causes mutation*

**1**

(causes) resistance

> *allow not effective*
> *ignore immunity*

1

to <u>antibiotics</u>

1

**[5]**

# Q27.

(a)   don't kill pathogens / bacteria / viruses / microbes / microorganisms

> *allow don't contain antibiotics*
> *ignore antibodies / attack / fight*
> *allow <u>only</u> treat symptoms / pain*
> *ignore kill disease / germs*

1

(b)   any **two** from:

- age

- gender

- extent / severity of pain
  **or** how long had pain <u>before trial</u>

- 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

2

(c)   (i)    75

> *ignore calculations / %*

1

(ii)   fast<u>er</u> pain relief / decrease

> *allow pain relief soon<u>er</u>*
> **or** *it works quick<u>er</u>*
>
> **or** *more pain relief at start / in first 1 / $1\frac{3}{4}$ hours*

1

(iii)  decrease of pain higher / more

> *ignore more effective unless qualified by time > $1\frac{3}{4}$ hours*
> *allow effect lasts longer*

1

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*

**3**

**[10]**