



## **B3 INFECTION AND RESPONSE**

Practice questions

Name: \_\_\_\_\_

Class: \_\_\_\_\_

Date: \_\_\_\_\_

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Time: **155 minutes**

Marks: **154 marks**

Comments: **HIGHER TIER**

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1

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.

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(1)

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

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(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.

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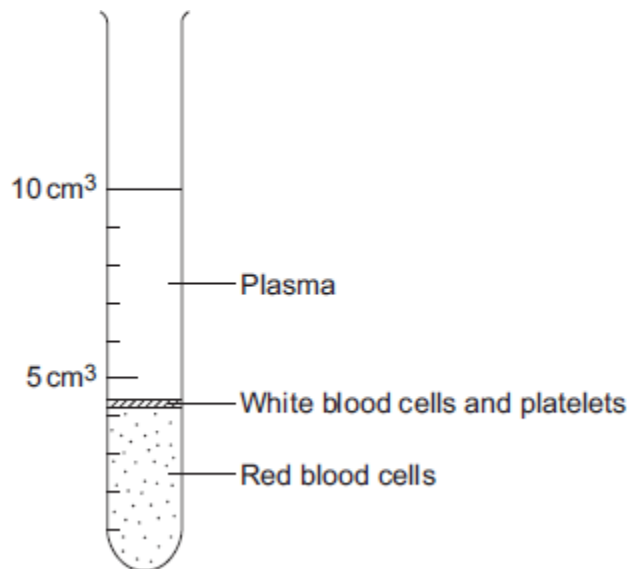
(1)

(Total 5 marks)

2

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<sup>3</sup> blood sample.



(a) Calculate the percentage of the blood that is made up of plasma.

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Answer = \_\_\_\_\_ %

(2)

(b) Name **three** chemical substances transported by the plasma.

1. \_\_\_\_\_

2. \_\_\_\_\_

3. \_\_\_\_\_

(3)



- (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?

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(1)

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

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(1)

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

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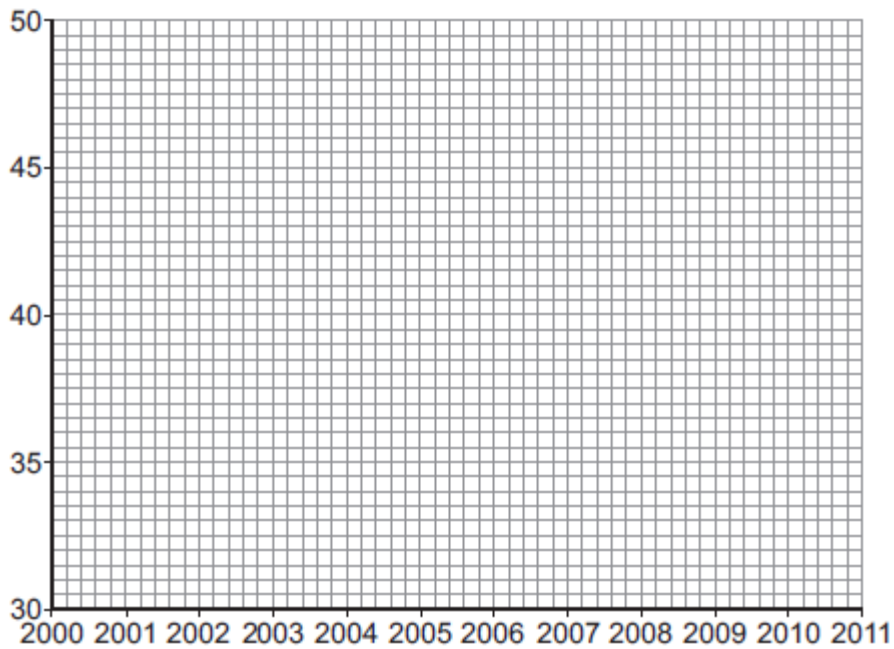
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(2)

(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.

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(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.

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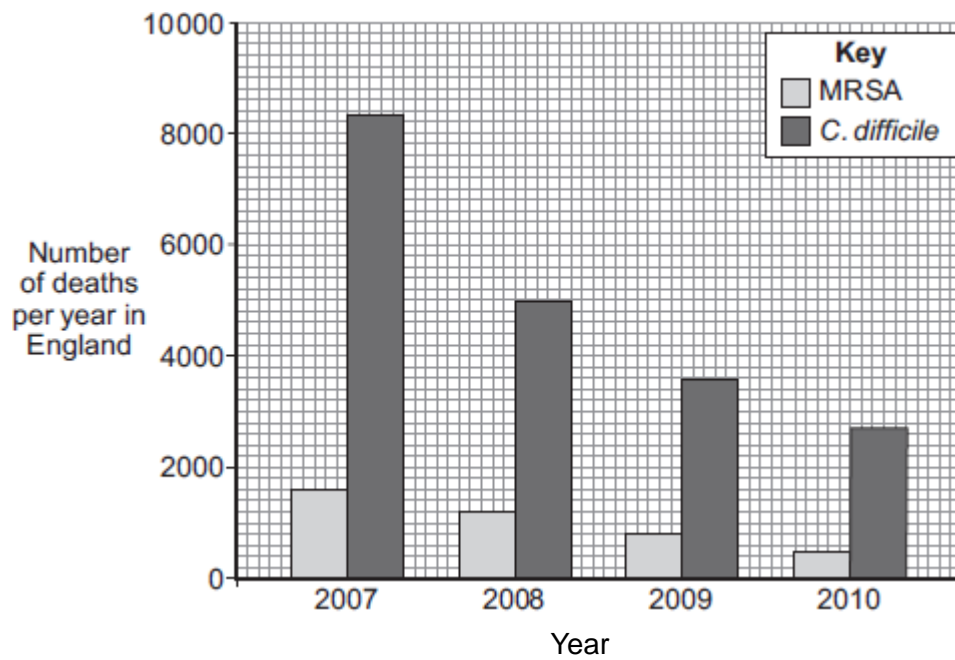
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(2)  
(Total 13 marks)

4

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*.

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(2)

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

Explain your answer.

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**(2)**

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

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Percentage change in deaths caused by MRSA = \_\_\_\_\_ %

**(2)**

(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.

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**(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.

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**(3)**

**(Total 10 marks)**



5

Read the article.

Parents all over the world advise children to 'wrap up warm or you'll catch a cold'. Scientists at Cardiff University recruited 180 volunteers to take part in an investigation to find out if the advice was true. The investigation took place during the city's common cold season.

Half of the volunteers put their feet in bowls of ice cold water for 20 minutes. The other volunteers sat with their feet in empty bowls.

Over the next few days, almost a third of the volunteers who put their feet into cold water developed colds. Fewer than one in ten of the other volunteers developed colds.

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

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

- hearsay.
- a hypothesis.
- a prediction.

(1)

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

\_\_\_\_\_

(1)

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

Explain why.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

(3)

(Total 5 marks)

6

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.

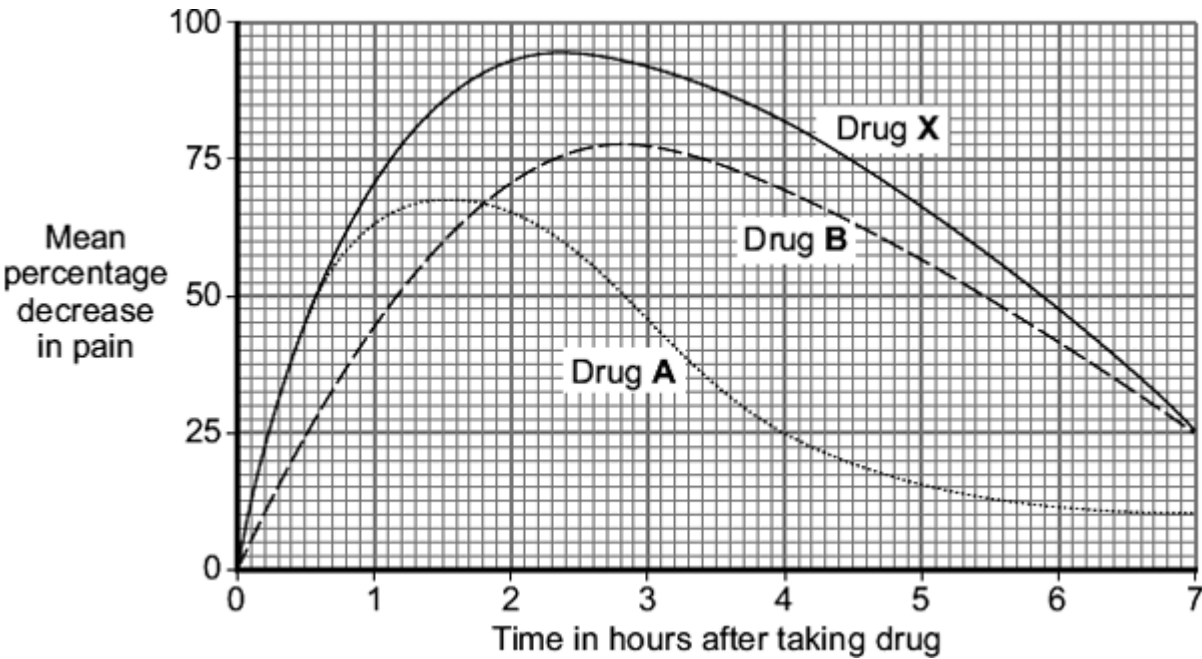
To get valid results the three groups of volunteers should be matched for as many factors as possible.

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**.

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(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)

7

(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.

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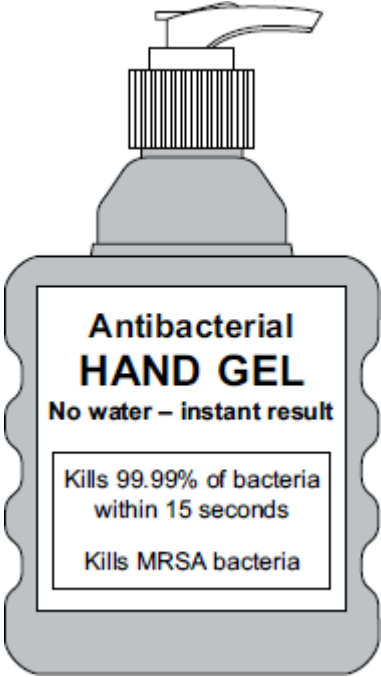
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**(3)**  
**(Total 6 marks)**

8

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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(2)

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

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(3)

(Total 5 marks)

9

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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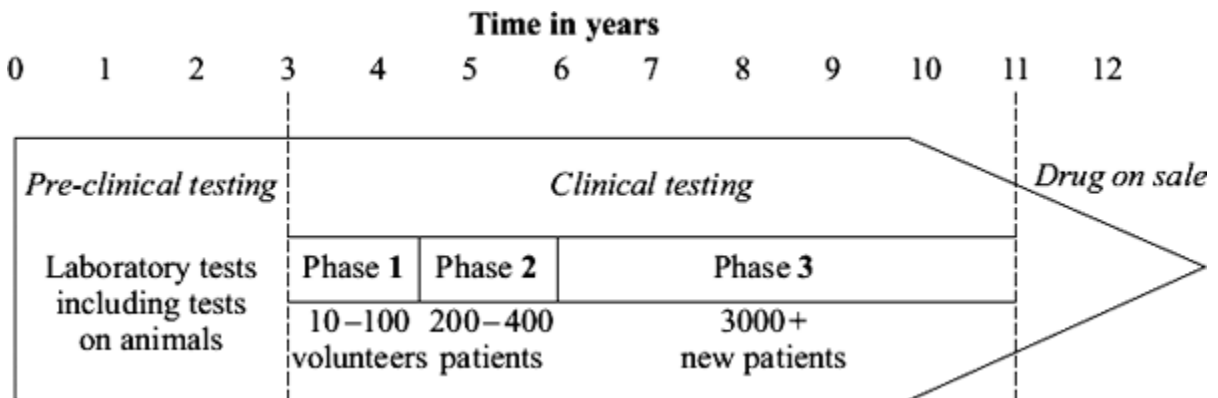
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(Total 4 marks)

10

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*?

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(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?

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(1)

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

Suggest **one** reason for this.

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(1)

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

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(1)

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

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

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(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)

(Total 6 marks)



11

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 9 850 deaths worldwide from EVD.

The number of deaths is an estimate.

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

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(1)

(b) Why were antibiotics **not** used to treat EVD?

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(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.

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(1)

(e) The number of deaths from EVD continued to increase.

The World Health Organization (WHO) decided it was ethical to use unlicensed drugs.

The WHO said unlicensed drugs could only be given to people who gave their permission.

Also, any results had to be shared with other researchers and drug companies.

Some vaccines had shown positive results in animal testing, but the vaccines had not been tested and trialled in humans.

The supplies of the vaccine were low.

At first the vaccines were only used for health workers.

How would the use of a vaccine **reduce the spread** of EVD?

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(2)

(f) Evaluate the use of unlicensed drugs and vaccines during the EVD outbreak.

Give a conclusion.

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(6)

(Total 13 marks)

12

White blood cells protect the body against pathogens such as bacteria and viruses.

(a) (i) Pathogens make us feel ill.

Give **one** reason why.

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(1)

(ii) White blood cells produce antibodies. This is one way white blood cells protect us against pathogens.

Give **two** other ways that white blood cells protect us against pathogens.

1. \_\_\_\_\_

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2. \_\_\_\_\_

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(2)

(b) Vaccination can protect us from the diseases pathogens cause.

(i) One type of virus causes measles.

A doctor vaccinates a child against measles.

What does the doctor inject into the child to make the child immune to measles?

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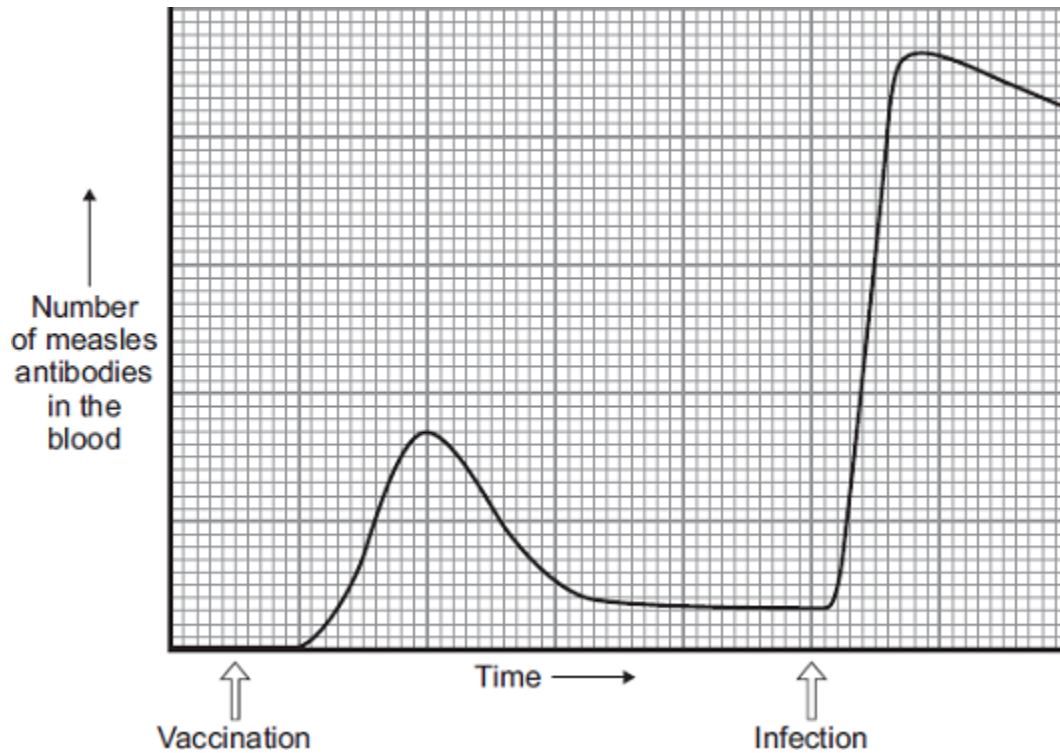
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**(2)**

- (ii) A few weeks after the vaccination, the child becomes infected with measles viruses from another person.

The graph shows the number of measles antibodies in the child's blood from before the vaccination until after the infection.



More measles antibodies are produced after the infection than after the vaccination.

Describe other differences in antibody production after infection compared with after vaccination.

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(3)

- (iii) Vaccination against the measles virus will **not** protect the child against the rubella virus.

Why?

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(1)

(c) What is the advantage of vaccinating a large proportion of the population against measles?

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(1)

(Total 10 marks)

13

Some diseases can be cured by using antibiotics or prevented by vaccination.

(a) (i) Explain fully why antibiotics cannot be used to cure viral diseases.

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(2)

(ii) There has been a large increase in the populations of many antibiotic-resistant strains of bacteria in recent years.

Explain why.

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(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.

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(3)

(Total 7 marks)

14

Drugs must be trialled before the drugs can be used on patients.

- (a) (i) Before the clinical trials, drugs are tested in the laboratory. The laboratory trials are **not** trials on people.

What is the drug tested on in these laboratory trials?

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(1)

- (ii) Drugs must be trialled before the drugs can be used on patients.

Give **three** reasons why.

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(3)

- (b) Read the information about cholesterol and ways of treating high cholesterol levels.

Diet and inherited factors affect the level of cholesterol in a person's blood. Too much cholesterol may cause deposits of fat to build up in blood vessels and reduce the flow of blood. This may cause the person to have a heart attack. Some drugs can lower the amount of cholesterol in the blood.

The body needs cholesterol. Cells use cholesterol to make new cell membranes and some hormones. The liver makes cholesterol for the body.

Some drugs can help people with high cholesterol levels.

**Statins** block the enzyme in the liver that is used to produce cholesterol. People will normally have to take statins for the rest of their lives. Statins can lead to muscle damage and kidney problems. Using some statins for a long time has caused high numbers of deaths.

**Cholesterol blockers** reduce the absorption of cholesterol from the intestine into the blood.

Cholesterol blockers can sometimes cause problems if the person is using other drugs.







(b) Scientists are trialling a 'nicotine vaccine' that might help **wean smokers off** the drug nicotine.  
The trials so far have produced very mixed results.  
Nicotine molecules are very small and can get through the protective layers around the brain.

(i) How does nicotine cause a person to become addicted?

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(1)

(ii) The 'nicotine vaccine' is made by attaching proteins to nicotine molecules. After 'vaccination' the body reacts to the nicotine in the same way as it reacts to pathogens.

Suggest how the 'nicotine vaccine' might help wean a smoker off nicotine.

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(2)

(Total 7 marks)

17

People may be immunised against diseases using vaccines.

(a) (i) Which part of the vaccine stimulates the body's defence system?

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(2)

- (ii) A person has been vaccinated against measles. The person comes in contact with the measles pathogen. The person does **not** catch measles.

Explain why.

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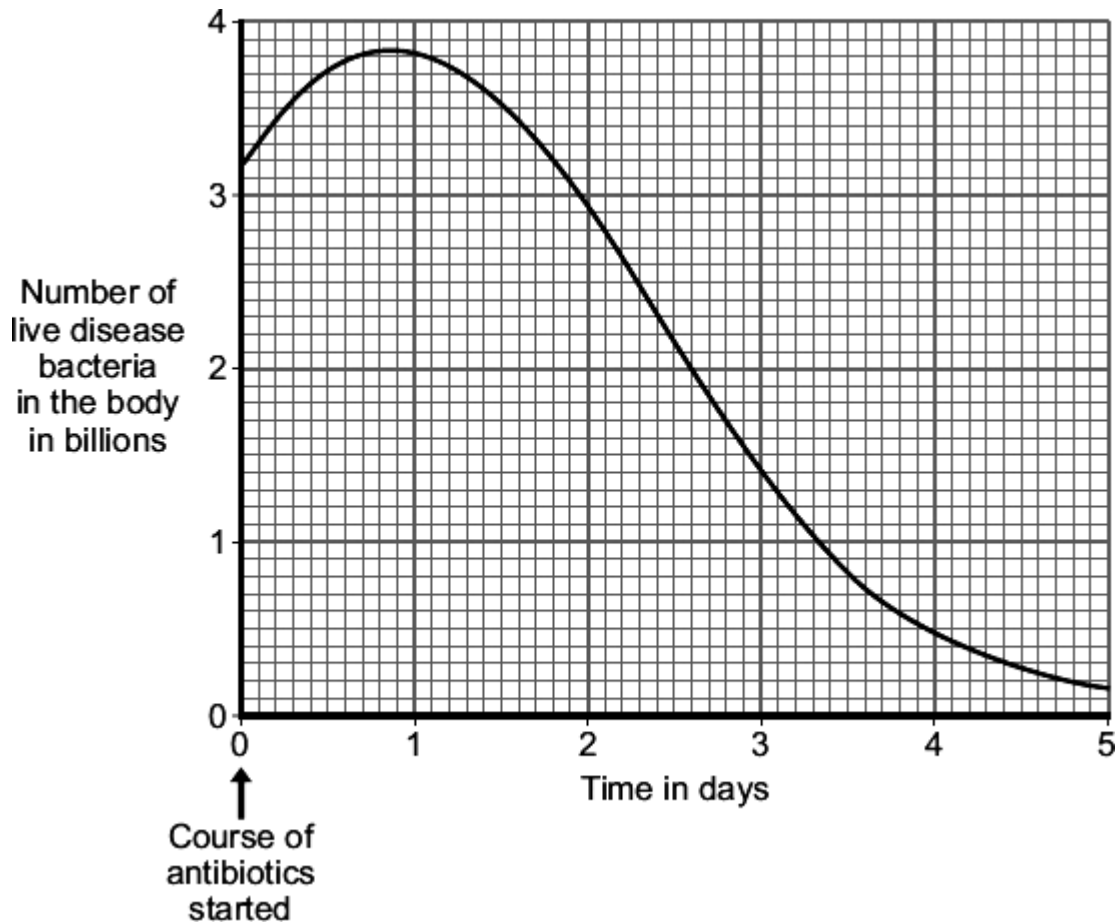
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(3)

- (b) A man catches a disease. The man has **not** been immunised against this disease. A doctor gives the man a course of antibiotics.

The graph shows how the number of live disease bacteria in the body changes when the man is taking the antibiotics.



- (i) Four days after starting the course of antibiotics the man feels well again. It is important that the man does **not** stop taking the antibiotics.

Explain why.

Use information from the graph.

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(2)

- (ii) Occasionally a new, resistant strain of a pathogen appears.

The new strain may spread rapidly.

Explain why.

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(3)

(Total 10 marks)

**18**

Many strains of bacteria have developed resistance to antibiotics.

The table shows the number of people infected with a resistant strain of one species of bacterium in the UK.

Year	2004	2005	2006	2007	2008
Number of people infected with the resistant strain	3499	3553	3767	3809	4131

- (a) Calculate the percentage increase in the number of people infected with the resistant strain between 2004 and 2008.

Show clearly how you work out your answer.

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Percentage increase = \_\_\_\_\_

**(2)**

- (b) Explain, in terms of natural selection, why the number of people infected with the resistant strain of the bacterium is increasing.

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**(3)**

**(Total 5 marks)**

**19**

Influenza is caused by a virus.

- (a) How do viruses cause illness?

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**(1)**

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

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

Suggest an explanation for this.

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**(3)**

**(Total 4 marks)**

**20**

Influenza is a disease caused by a virus.

- (a) Explain why it is difficult to treat diseases caused by viruses.

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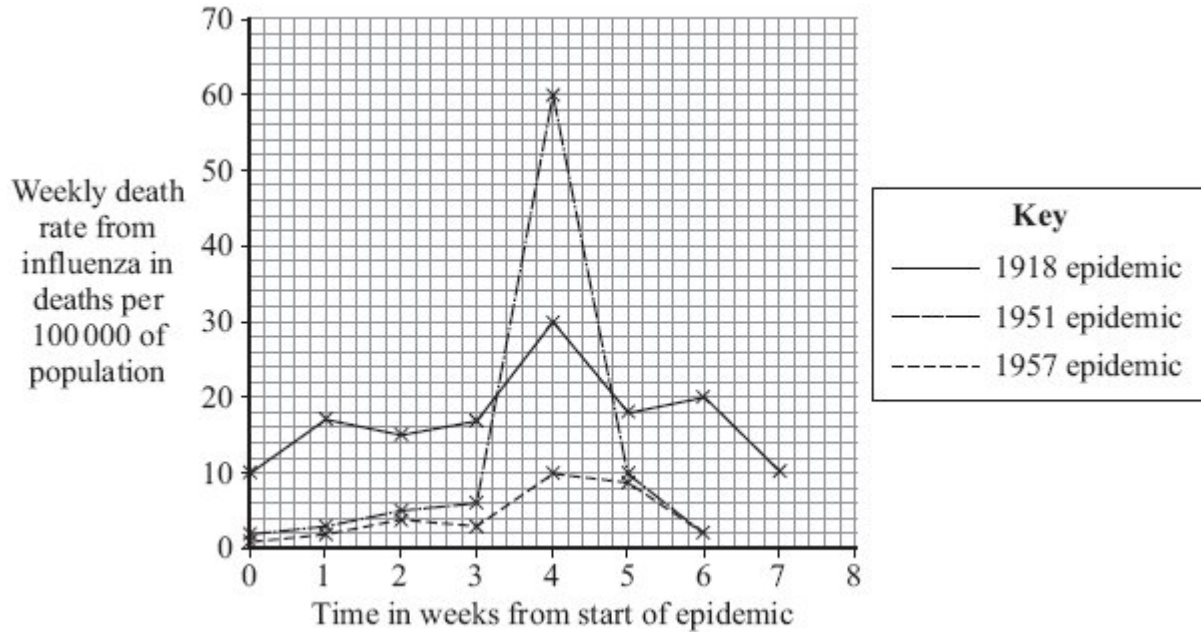
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**(2)**

(b) In some years there are influenza epidemics.

The graph shows the death rate in Liverpool during three influenza epidemics.



(i) The population of Liverpool in 1951 was approximately 700 000.

Calculate the approximate number of deaths from influenza in week 4 of the 1951 epidemic.

Show clearly how you work out your answer.

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Number of deaths \_\_\_\_\_

(2)

(ii) In most years, the number of deaths from influenza in Liverpool is very low.

Explain, in terms of the influenza virus and the body's immune system, why there were large numbers of deaths in years such as 1918 and 1951.

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(3)

(Total 7 marks)

## Mark schemes

1

(a) any **one** from:

- not all deaths recorded
  - not all causes of deaths recorded
- allow cause may not be known*

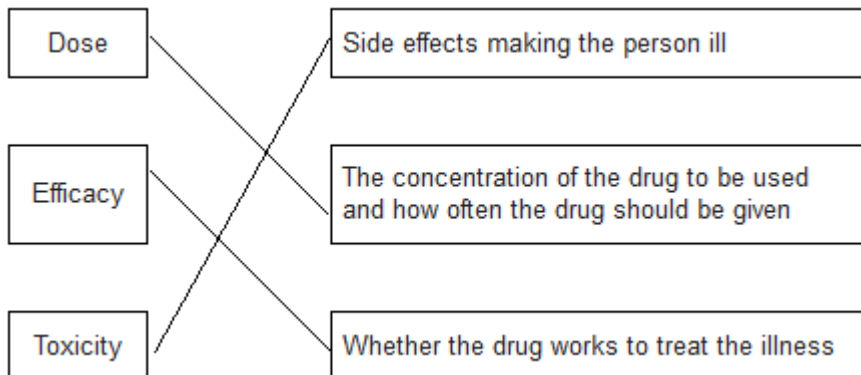
1

(b) antibiotics do not kill viruses

*allow antibiotics only 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]

2

(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]

3

(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 spreading

*accept ref to herd immunity*

1

[13]

4

(a) (i) decrease

1

rate of decrease slows

1

(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

1

Explanation:

stops / reduces the bacteria being transferred / spreading

1

(iii)  $800 - 500 / 800 \times 100 =$

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]

5

(a) hearsay

1

(b) (volunteers with feet in) empty bowls

*accept bowl with no (iced) water*

*do **not** accept mention of bowl with iced water*

1

(c) any **three** from:

*ignore control variables, eg age, gender*

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

3

[5]

6

(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*

1

(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

2

(c) (i) 75

*ignore calculations / %*

1

(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*

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

1

(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)**

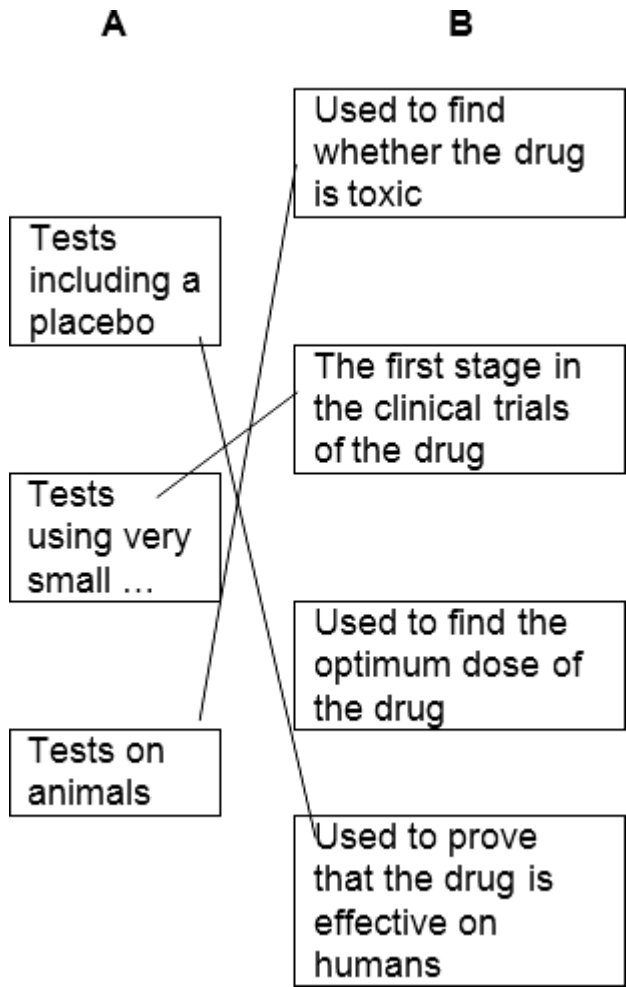
- drug X gives more pain relief
- (A + B / they ) might interact with each other
- could result in overdose
- could be more / new side effects

*if neither points gained  
allow (more) dangerous*

3

[10]

7 (a)



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 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*

3

[6]

8

(a) kills / 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 antibiotics

1

[5]

9

(wbc) ingest / digest pathogens / bacteria / viruses

*allow eat germs*

*ignore swallow germs*

*ignore ingest the disease*

*ignore attack / kill the disease*

1



(wbc) produce antibodies 1

(wbc) produce antitoxins 1

any **one** from:

- (antibodies) destroy or kill pathogens / bacteria / viruses / germs  
*ignore destroy / kill disease*  
*ignore attack / fight pathogens*
- (antitoxins) counteract / destroy / neutralise toxins / poisons  
*ignore attack / killing toxins*
- reasonable reference to memory cells **or** rapid production of antibodies upon re-infection 1

[4]

10

(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]

11

(a) any **one** from:

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

*allow cause may not be known*

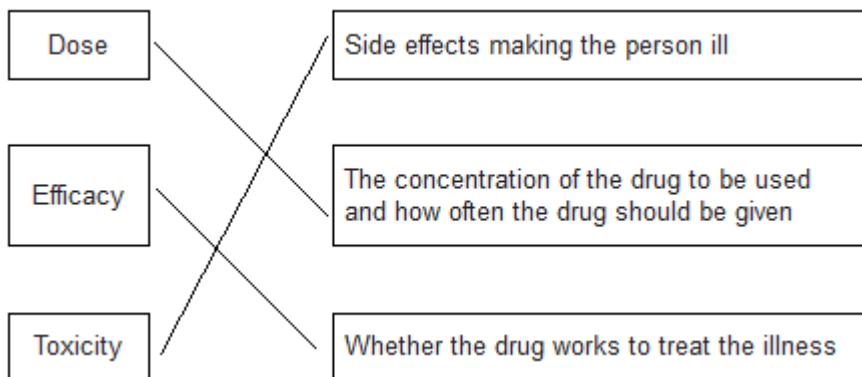
1

(b) antibiotics do not kill viruses

*allow antibiotics only 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

(e) some people would be immune to EVD

*allow those vaccinated would not contract the disease*

1

if less people (in a population) have EVD less chance of it being passed on

1

(f) **Level 3 (5–6 marks):**

A detailed and coherent evaluation is provided which considers a range of arguments for and against the use of unlicensed drugs and comes to a conclusion consistent with the reasoning.

**Level 2 (3–4 marks):**

An attempt to give arguments for and against the use of unlicensed drugs is made. The logic may be inconsistent at times but builds towards a coherent argument.

**Level 1 (1–2 marks):**

Discrete relevant points made. The logic may be unclear and the conclusion, if present, may not be consistent with the reasoning.

**0 marks:**

No relevant content

**Indicative content**

**pros**

- might save some lives
- vaccine could reduce chance of future outbreaks
- patient made aware of risk and agreed to use of drug
- sharing of results could speed up development of effective vaccines / drugs
- used mainly for health workers who were risking their lives to help

**cons**

- could be dangerous
- or**
- vaccine could harm a healthy person
  - goes against legislation / laws governing drug development
  - might set a precedent for other drugs not to be fully tested
  - unfair as not available to the African people

a justified conclusion

6

[13]

12

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

- (produce) toxins / poisons
- (cause) damage to cells  
*kill / destroy cells*  
*allow kills white blood cells*

1

(ii) produce antitoxins

1

engulf / ingest / digest pathogens / viruses / bacteria / microorganisms

*accept phagocytosis or description*

*ignore eat / consume / absorb for engulf*

*ignore references to memory cells*

1

(b) (i) dead / inactive / weakened

*accept idea of antigen / protein*

1

(measles) pathogen / virus

*ignore bacteria*

1

(ii) (after infection)

*accept converse if clearly referring to before vaccination*

1

rise begins sooner / less lag time

steeper / faster rise (in number)

1

longer lasting **or** doesn't drop so quickly

*idea of staying high for longer*

*ignore reference to higher starting point*

1

(iii) antibodies are specific or needs different antibodies

*accept antigens are different **or** white blood cells do not recognise virus*

1

(c) reduces spread of infection / less likely to get an epidemic

*accept idea of eradicating measles*

1

[10]

13

(a) (i) viruses live inside cells

1

viruses inaccessible to antibiotic

*allow drug / antibiotic (if used)*

*would (have to) kill cell*

1

(ii) any **two** from eg

- non-resistant strains killed (by antibiotics)
- so less competition
- overuse of antibiotics / antibiotics prescribed for mild infections  
*if no marks gained allow one mark for 'people do not finish course of antibiotics'*

2

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

1

(by) white cells

1

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

1

[7]

14

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

- cells
- tissues
- (live) animals / named  
*allow mammals*

1

(ii) any **three** from:

(to test for)

- toxicity / check not poisonous / not harmful  
*allow side-effect*  
*allow converse*
- interaction with other drugs
- efficacy **or** to see if they work **or** check if they treat the disease  
*allow converse*
- dosage **or** how much is needed

3

(b) **argued evaluation**

*comparison can be written anywhere in evaluation allow use of 'only' for implied comparison for each point eg **only** statins damage muscles / kidneys / organs*

any **six** from:

- statin can damage / muscles / kidneys / organs but cholesterol blockers don't  
*ignore liver*  
*if neither of the first 2 points are given accept for 1 mark*
- statins can cause death but cholesterol blockers don't  
*statins are more dangerous than cholesterol blockers **or** statins have more side effects*
- cholesterol blockers can interfere with action of other drugs but statins don't
- statins are for a life time but cholesterol blockers are not
- statins (might) reduce cholesterol to zero but cholesterol blockers only reduce it **or** statins reduce cholesterol more  
*allow statins (might) stop membrane / hormone production but cholesterol blockers don't*
- statins better for people with inherited high cholesterol
- cholesterol blockers better for people with dietary cholesterol problems
- taking/using statins/cholesterol blockers is better than dying from heart attack or build up of fat in blood vessels or reduced blood flow

6

[10]

15

(a) (i) kills / gets rid of / reduces methane bacteria

*allow kills / gets rid of / reduces bad bacteria*  
*ignore acts like antibiotic*

1

(ii) less food converted to methane

*allow can keep more cattle without further environmental damage*  
*ignore energy*

1

more growth / meat / muscle / milk produced / more profit / fatter animals  
*ignore references to bacteria and disease*

1

(b) absorbs energy / heat radiated by Earth

*allow absorbs / traps energy / heat / from Earth*  
*do **not** allow absorbs energy / heat from Sun*

1

some energy / heat reradiated

*ignore reflected*

*do **not** allow reradiates energy / heat from Sun*

1

leading to global warming / enhanced greenhouse effect

*accept effects of global warming eg melting ice caps*

*accept methane is a greenhouse gas*

*ignore references to ozone*

1

[6]

16

- (a) dead or inactive or weak form of pathogen / bacterium / virus / microorganism introduced

*ignore disease / germ*

1

(stimulates) white cells / lymphocytes / leucocytes

*accept B and T cells*

*ignore phagocytes*

1

to produce antibodies

*ignore antitoxins / antigens*

1

antibodies made quickly on re-infection / idea of memory cells

*ignore already has antibodies*

*ignore 'body remembers'*

1

- (b) (i) alters / causes chemical processes / body chemistry

*ignore craving / withdrawal symptoms*

1

(ii) any **two** from:

- combined molecule / vaccine stimulates antibody production

- if nicotine taken, antibodies bind to nicotine molecules

*ignore destroys nicotine*

- making them too large to get to brain / making them ineffective

*allow prevents nicotine entering brain*

2

[7]

17

- (a) (i) dead / inactive / weakened

*allow antigen / protein*

*ignore ref to other components*

*ignore small amount*

1

pathogen / bacterium / virus / microorganism

*ignore germs / disease*

1

(ii) *antigen / antibiotic instead of antibody = max 2*

white blood cells produce / release antibodies

*accept lymphocytes / leucocytes / memory cells produce antibodies*

*do **not** accept phagocytes*

1

antibodies produced quickly

1

(these) antibodies destroy the pathogen

*allow kill*

*do **not** accept antibodies engulf pathogens*

1

(b) (i) (live) bacteria still in body

*ignore numbers*

1

would reproduce

*ignore mutation / growth*

1

(ii) antibiotics / treatment ineffective **or** resistant pathogens survive

*accept resistant out compete non-resistant*

1

these reproduce

1

population of resistant pathogens increases

*allow (resistant pathogens reproduce) rapidly*

1

[10]

18

(a) 18.06 / 18 / 18.1

*correct answer gains 2 marks*

*if answer incorrect evidence of*

*$(4131 - 3499) \div 3499 \times 100$*

***or**  $632 \div 3499 \times 100$*

***or**  $((4131 \div 3499) \times 100) - 100$*

***or** 0.18*

*gains 1 mark*

2



(b) antibiotics kill non-resistant strain  
**or** resistant strain bacteria survive  
*accept resistant strain the successful competitor*  
*do **not** accept intentional adaptation*  
*ignore strongest / fittest survive*  
*ignore mutation*  
*ignore people do not finish antibiotic course*

1

resistant strain bacteria reproduce  
**or** resistant strain bacteria pass on genes

1

population of resistant strain increases **or** proportion of resistant bacteria increases  
*allow high numbers of resistant bacteria*

**or**  
people more likely to be infected by resistant strain (than non-resistant strain)

1

[5]

19

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

1

(b) any **three** from:

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

3

[4]

20

(a) any **two** from

- live inside / infect body cells
- difficult for drugs to enter (body) cells / drug would kill (body) cell
- antibiotics ineffective against viruses
- viruses mutate **frequently**

2

(b) (i) 420

*correct answer with **or** without working*

*if answer incorrect evidence of 'number of deaths' x 7 **or** 60 seen gains 1 mark*

*ignore 6 000 000*

2

(ii) any **three** from:

- virus / flu mutates
- people no longer / not immune  
*ignore resistance*
- white blood cells / memory cells / immune system do not recognise virus
- relevant reference to antibodies / antigens
- current vaccine ineffective **or** no vaccine available then **or** takes time to develop new vaccine  
*allow no tamiflu / anti-viral drugs*
- conditions less hygienic / lack of hygiene
- people in poor health (following world wars)  
*allow people had 'weak' immune system*

3

[7]