



**2**

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

(a) Explain, as fully as you can, how the MMR vaccine protects children from these diseases.

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**(3)**

(b) Read the passage.

Autism is a brain disorder that can result in behavioural problems. In 1998, Dr Andrew Wakefield published a report in a medical journal. Dr Wakefield and his colleagues had carried out tests on 12 autistic children.

Dr Wakefield and his colleagues claimed to have found a possible link between the MMR vaccine and autism.

Dr Wakefield wrote that the parents of eight of the twelve children blamed the MMR vaccine for autism. He said that symptoms of autism had started within days of vaccination.

Some newspapers used parts of the report in scare stories about the MMR vaccine. As a result, many parents refused to have their children vaccinated.

Dr Wakefield's research was being funded through solicitors for the twelve children. The lawyers wanted evidence to use against vaccine manufacturers.

Use information from the passage above to answer these questions.

(i) Was Dr Wakefield's report based on reliable scientific evidence?

Explain the reasons for your answer.

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**(2)**

(ii) Might Dr Wakefield's report have been biased?

Give the reason for your answer.

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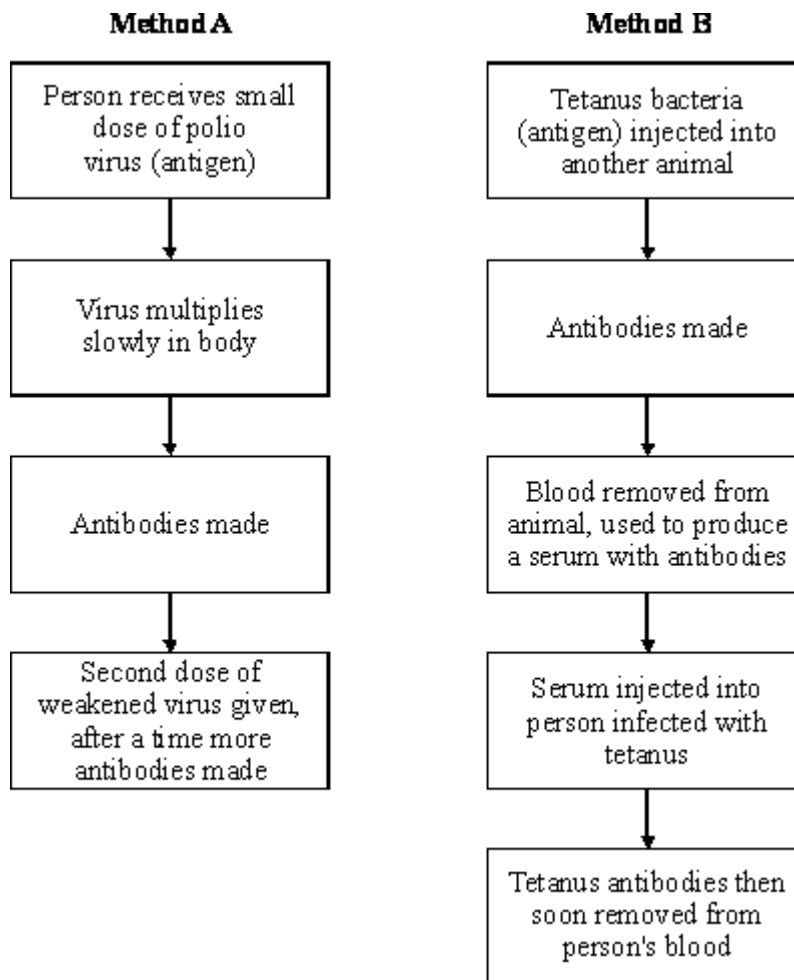
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(1)

(Total 6 marks)

3

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



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

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(1)

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

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(1)

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

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(1)

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

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(1)

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

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(2)

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

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(1)

(Total 7 marks)

**4**

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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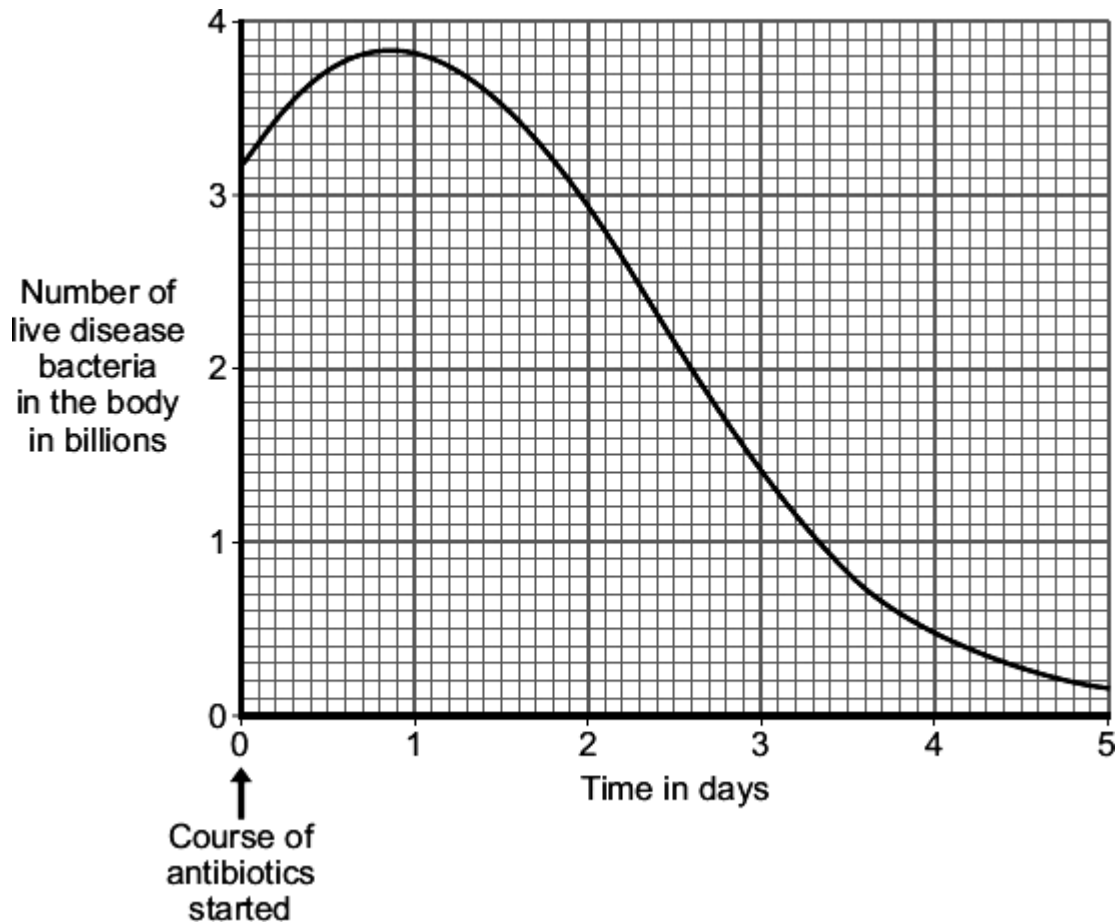
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(3)

- (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)

**5**

Pathogenic bacteria and viruses may make us feel ill if they enter our bodies.

- (a) Why do bacteria and viruses make us feel ill?

Bacteria \_\_\_\_\_

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Viruses \_\_\_\_\_

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(2)



**6**

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)**



7 Influenza is a disease caused by a virus.

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

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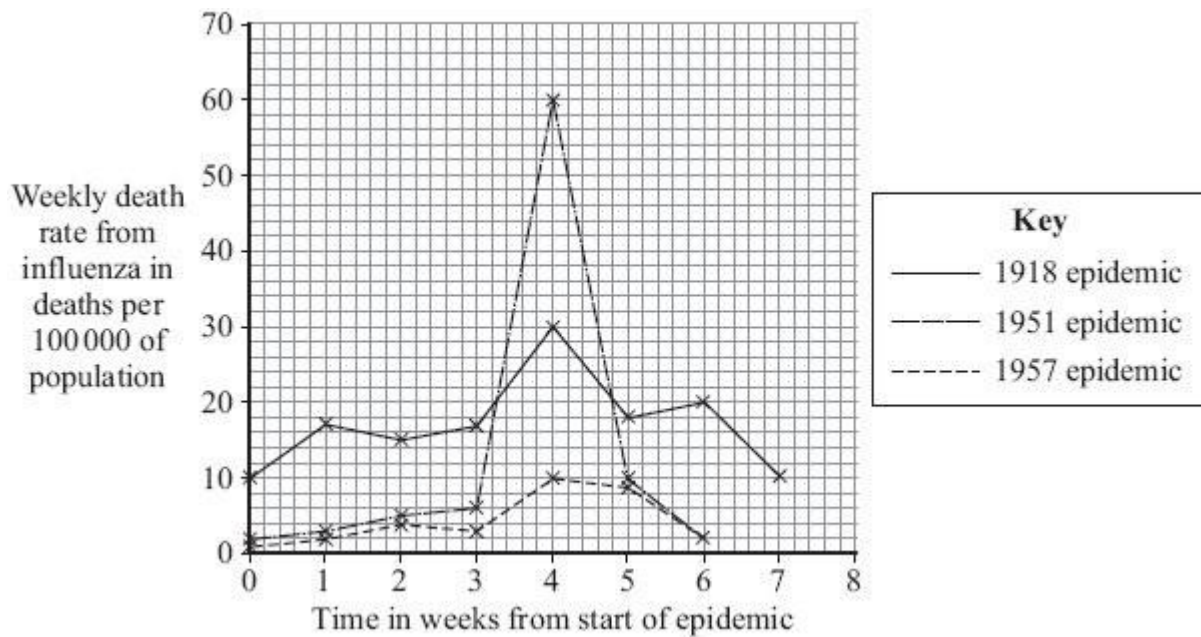
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(2)

(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)

**8** 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)

## Mark schemes

- 1 (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]

- 2** (a) any **three** from:
- vaccine is inactive / dead form of (pathogen)  
*allow antigens*
  - stimulates antibody production
  - stimulates antitoxin production
  - by white cells
  - antibodies kill (pathogen)
  - antitoxins neutralise poisons
  - antibodies quickly produced on reinfection  
*ignore antibodies remain in blood*
  - reference to ingestion by white cells
- 3

- (b) (i) (no)
- any **two** from
- sample size small / only 12
  - conclusion based on hearsay from parents
  - only 8 parents linked autism to MMR
  - no control used
- 2
- (ii) (yes)
- being paid by parents / lawyers
- 1

**[6]**

- 3** (a) antibodies;
- if incorrect term used then penalise in (a) then regard as continuous error for rest of question*
- 1

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

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

1

- (c) antibodies removed (from blood);

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

1

- (d) so more antibodies made;

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

1

- (e) any **two** from

already has tetanus bacteria in body;

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

would take too long **or**

a long time for antibodies to be made;

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

disease would have effect before  
antibodies made;

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

2 max

- (f) injection of ready made antibodies;

*accept does not have to wait for antibody formation **or** has large  
amount of antibodies quickly  
**or** has enough antibodies quickly  
**or** antibodies start working straight away*

1

[7]

- 4 (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
- 5 (a) (bacteria) produce toxins / poisons 1
- (viruses) damage / kills cells **or** toxins released from cell 1

[10]

(b) any **two** from:

- viruses live inside cells
- viruses inaccessible to drug
- drug would damage body cells / tissue

2

(c) any **four** from:

- overuse of antibiotics
- bacteria mutate  
*do not allow antibiotic causes mutation*
- antibiotics kill non-resistant strains **or** idea of selection
- reduced competition
- resistant bacteria reproduce

4

[8]

6

(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]

7

(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' × 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]

8

(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]