

Infection and Response 7

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Time: **73 minutes**

Marks: **73 marks**

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Q1.

(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)

Q2.

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)

Q3.

Read the following passage.

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

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

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

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

(3)

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

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

(3)

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

(2)

(Total 8 marks)

Q4.

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.

(1)

(Total 4 marks)

Q5.

Read the following passage.

‘The immune system is the body’s defence force. It protects against infections which might enter the body. The potential invaders include bacteria and viruses. The two basic defences are cells and chemicals. The best known action of defence cells is the ingesting and killing of microbes. The best known chemical defence is the antibody - a protein
5 specially made to match with the surface of an invading microbe. Once covered with antibody, the microbe becomes easier to destroy.
So how do the invaders ever win? Part of the answer is that the chemical defenders take some time to become effective. When the body is infected for the first time by a particular microbe, there is a race between the multiplying microbes and the multiplying
10 cells producing the antibody. Given time, the body usually wins; eventually enough antibodies are formed to overcome the invaders. But if the initial invasion force is large, or the immune system is weak, the battle may be lost.’

(a) (i) Which type of cells ingest and kill invading microbes? (lines 3 - 4)

(1)

(ii) Give **two** circumstances in which the initial invasion force might be very large (lines 11 - 12).

1. _____

2. _____

(2)

(iii) After being ingested, the microbes are digested in the cells. Briefly explain what happens to the proteins that the microbes contain.

(2)

(b) Explain how bacteria cause disease once they get into the body.

(2)

(c) Name a type of medicine that kills bacteria inside the body.

(1)

(d) People often risk first-time infection by a particular microbe while visiting other countries. People can be immunised against the disease that the microbe causes.

Explain, as fully as you can, how immunisation works.

(3)

(Total 11 marks)

Q6.

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.

(Total 2 marks)

Q7.

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)

Q8.

Flu is an infectious disease caused by a virus.

Many people in England become infected with the flu virus in winter.

- (a) Doctors do not prescribe antibiotics to patients with flu. Doctors do not prescribe antibiotics to patients with flu.

State why.

(1)

- (b) A flu vaccine is offered to people with a high risk of having a severe illness if they are infected by the flu virus.

What does a flu vaccine contain?

Tick (✓) **one** box.

Inactive antibodies

Inactive viruses

White blood cells

(1)

- (c) The table shows the percentage of people in high-risk groups who had been vaccinated against flu by November in 2013. The data is for England.

Group at risk of a severe illness	Percentage (%) of group vaccinated by November in 2013
2-year-old children	31.1
3-year-old children	27.9
People 65 years and older	64.4

Give **one** conclusion from the data in the table above.

Suggest a reason for this.

Conclusion: _____

Reason: _____

(2)

(Total 4 marks)

Q9.

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

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

(2)

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

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

(2)

(Total 4 marks)

Q10.

Bacteria and viruses can reproduce quickly inside the body and make people feel ill.

- (a) Use the correct answer from the box to complete the sentence.

antibodies	antitoxins	toxins
-------------------	-------------------	---------------

Bacteria and viruses make us feel ill because they produce _____ .

(1)

- (b) (i) Antibiotics can be used to treat some infections.

Use the correct answer from the box to complete the sentence.

bacteria	bacteria and viruses	viruses
-----------------	-----------------------------	----------------

Antibiotics are medicines that kill _____ .

(1)

- (ii) New strains of pathogens have developed which are resistant to antibiotics.

Use the correct answer from the box to complete the sentence.

are short of food	invade body cells	mutate
--------------------------	--------------------------	---------------

New strains are produced when pathogens _____ .

(1)

- (iii) What will scientists have to develop to kill these new resistant strains?

(1)

(Total 4 marks)

Q11.

Two common medicines are paracetamol and ibuprofen. These medicines help to reduce high body temperature.

- (a) Children who were ill with high body temperatures were identified at doctors' surgeries.

These children were put into two groups.

The children in each group were matched for age, gender and body mass.

Group 1: 50 children were given paracetamol.

Group 2: 50 children were given ibuprofen.

- (i) Give **one** control variable in this investigation.

(1)

- (ii) In some investigations when medicines are tested, a placebo is given to one group.

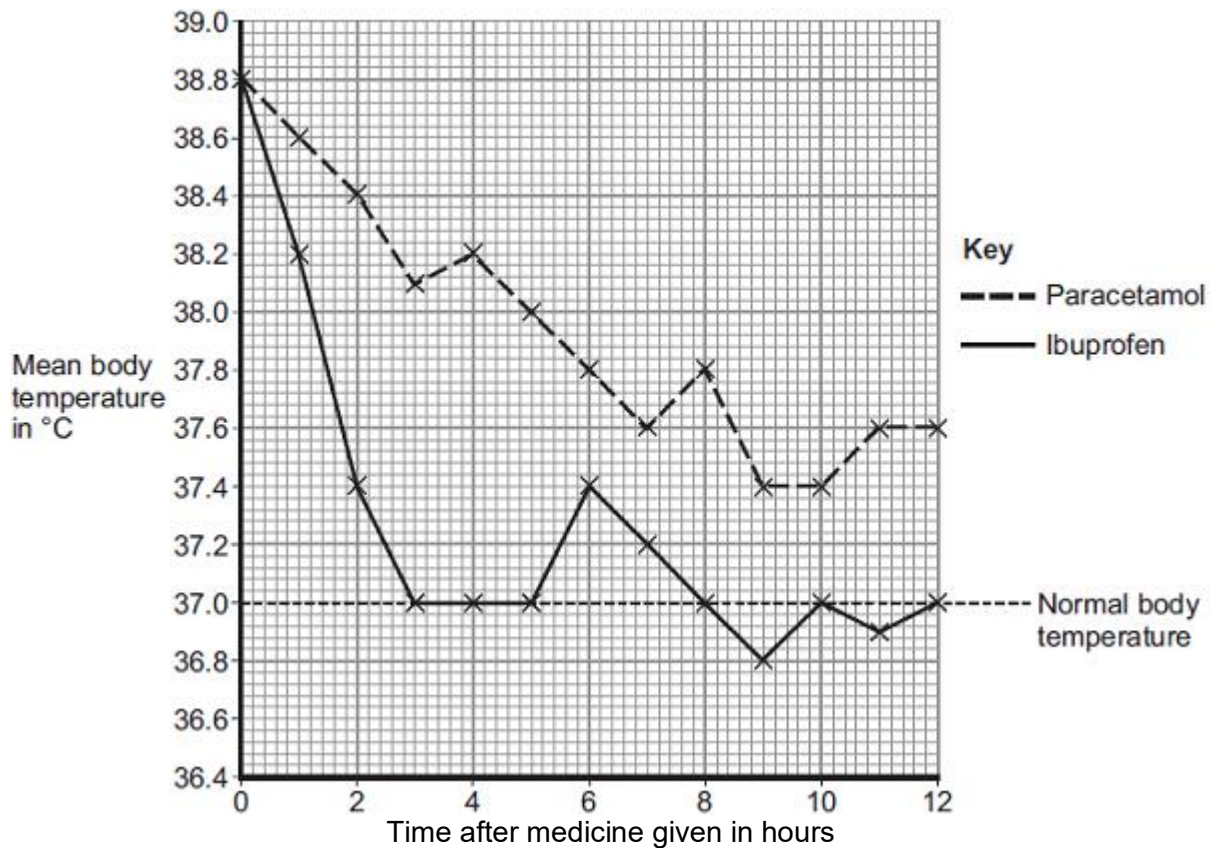
What is a placebo?

(1)

- (b) The children's body temperatures were measured before any medicine was given and every hour after treatment started.

Paracetamol was given every 4 hours. Ibuprofen was given every 6 hours.

The results for the two groups are shown in the figure below.



- (i) What was the mean body temperature 4 hours after paracetamol was given?

_____ °C

(1)

- (ii) Suggest which medicine a parent should give to their child to reduce a high body temperature to normal.

Use information from the graph.

Medicine: _____

Give **two** reasons for your answer.

(2)

(Total 5 marks)

Q12.

Bacteria and viruses can reproduce quickly inside the body and make us feel ill. These organisms may cause symptoms such as a high body temperature.

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

(1)

Two common medicines are paracetamol and ibuprofen. These medicines help to reduce high body temperature.

Data was collected to find out whether paracetamol, ibuprofen or a combination of these two medicines was the best to reduce high body temperature in children.

Children who were ill with high body temperatures were identified at doctors' surgeries.

These children were put into three treatment groups:

Group 1: given paracetamol only

Group 2: given ibuprofen only

Group 3: given a combination of paracetamol and ibuprofen

The children in each group were matched for age and gender.

There were 50 children in each group.

The table below shows how often the medicines were given to the children in each group. The doses were as directed by the manufacturers.

	Time in hours						
	0	2	4	6	8	10	12
Group 1: Paracetamol only	P		P		P		P
Group 2: Ibuprofen only	I			I			I
Group 3:Paracetamol and ibuprofen	P&I		P	I	P		P&I

Key: P = paracetamol only

I = ibuprofen only

P&I = paracetamol and ibuprofen

(b) This investigation would have been improved if a fourth group of children had been included.

(i) The children in each group were matched for age and gender.

Suggest **one** other factor the children should have been matched for to make this investigation valid.

_____ (1)

(ii) What would the children in the fourth group have been given?

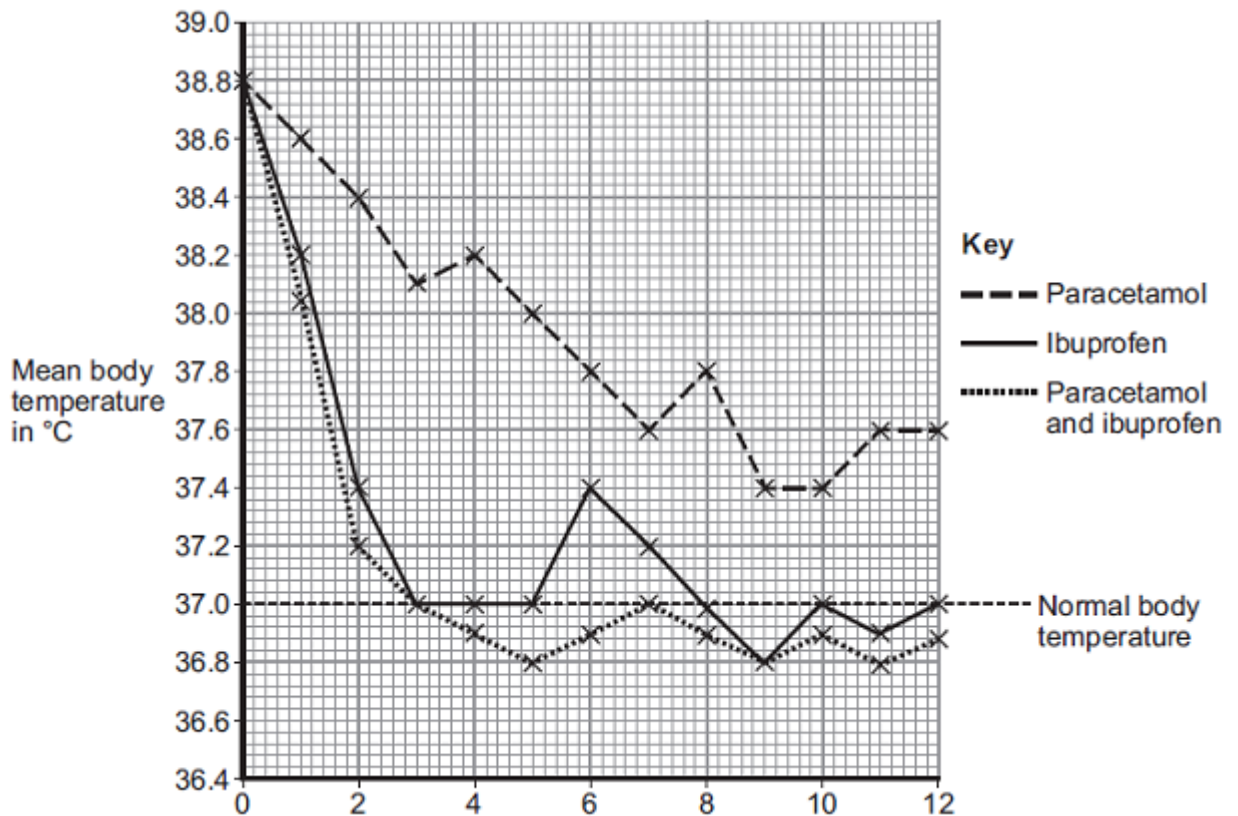
_____ (1)

(iii) Suggest why this would have improved the investigation.

_____ (1)

(c) The children's body temperatures were measured before any medicine was given and every hour after treatment started.

The mean body temperatures for each of the three groups are shown in the figure below.



Time in hours

- (i) What was the difference in mean body temperature after 4 hours between the group taking paracetamol only and the group taking ibuprofen only?

_____ °C

(1)

- (ii) How many more hours did the mean body temperature stay normal or below normal, when taking both paracetamol and ibuprofen compared to taking ibuprofen only?

_____ hours

(1)

- (d) Doctors and nurses usually advise parents to give ibuprofen to children with a high body temperature.

Complete the sentences to suggest reasons why giving only ibuprofen might be better than giving only paracetamol or a combination of paracetamol and ibuprofen. You should use information from the table and the figure.

- (i) Giving ibuprofen might be better than giving paracetamol because

(2)

- (ii) Giving only ibuprofen might be better than giving a combination of paracetamol

and ibuprofen because _____

(2)

(Total 10 marks)

Mark schemes

Q1.

- (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]

Q2.

- (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]

Q3.

- (a) white cells ingest bacteria
produce antibodies which destroy bacteria
produce antitoxins which counteract poisons produced by bacteria
for 1 mark each 3

(b) dead/mild microbes
stimulate antibody production
white cells can quickly produce these again
for 1 mark each 3

(c) adds more bacteria (mild)
does not affect TB bacteria
for 1 mark each 2

[8]

Q4.

(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]

Q5.

(a) (i) white blood cells
for 1 mark 1

(ii) e.g. contact with infected person unhygienic conditions
for 1 mark each 2

(iii) broken down, by enzymes into amino acids
any 2 for 1 mark each 2

(b) reproduce rapidly produce toxins
for 1 mark each 2

(c) antibiotic or named
for 1 mark 1

(d) mild or deal microbes introduced white cells produce antibodies
which can destroy disease microbes
idea of memory cells
idea that injecting antibodies give immediate production
any 3 for 1 mark each

Q6.

bacteria reproduce rapidly / increase rapidly in numbers produce poisons / toxins
each for 1 mark

2

[2]

Q7.(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]

Q8.

(a) antibiotics do not kill viruses

allow antibiotics only kill bacteria

allow flu is not caused by a bacterium

or

antibiotics are not effective against viruses

allow antibiotics cannot reach viruses inside cells

1

(b) Inactive viruses

1

(c) Conclusion:

people 65 years and older had the highest percentage vaccinated.

Reason:
more worried about becoming ill
or
had more time to go to the doctor.
OR
Conclusion:
children aged 3-years had the lowest percentage vaccinated.

Reason:
parents didn't have time to take them to the doctor
or
they had been vaccinated when 2-years old.

1

[4]

Q9.

(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]

Q10.

(a) toxins

1

(b) (i) bacteria

1

(ii) mutate

1

(iii) new / different antibiotic
allow new / different drug
*do **not** allow vaccine*

1

[4]

Q11.

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

- age
- gender
- body mass
- number in group / 50
allow number of children
- high body temperature
allow starting temperature
allow dose / amount of drug given

1

(ii) any **one** from:

- tablet that does not contain a drug / anything
allow sugar pill
*do **not** allow a different drug*
- fake drug

1

(b) (i) 38.2 (°C)

1

(ii) ibuprofen

no mark for drug
no marks if wrong drug selected

any **two** from:

- reduced body temperature fast(er)
allow acts fast(er)
- maintained temperature in normal range / around 37 °C (longer / for several hours)
- paracetamol did not reduce temperature to normal / 37 °C
accept ibuprofen did reduce temperature to normal / 37 °C
- ibuprofen given less frequently
allow less drug needed
ignore cheaper unless qualified

2

[5]

Q12.

(a) (bacteria and viruses produce) toxins

allow poisons
allow damage body cells

1

(b) (i) body mass

allow weight
allow ethnicity
ignore height / size

1

- (ii) placebo / fake drug
allow sugar pill
allow no treatment 1
- (iii) any **one** from:
 - as a control group
 - for comparison
 - to see if the drugs worked
 - to take account of psychological effect*accept placebo effect*
allow to avoid bias 1
- (c) (i) 1.2 (°C) 1
- (ii) 3 (hours) 1
- (d) (i) (Paracetamol)
 any **two** from:
 - ibuprofen reduces body temperature faster
 - ibuprofen reduces temperature more
 - ibuprofen doesn't need to be taken as often
 - ibuprofen keeps body temperature lower / normal / 37 °C for longer*allow works faster* 2
- (ii) (Paracetamol + ibuprofen)
 any **two** from:
 - body temperature decreases at a similar rate
allow ibuprofen works (almost) as fast
 - ibuprofen maintained body temperature close to normal / 37 °C
allow ibuprofen maintained normal body temperature almost as long
allow doesn't make temperature drop below normal as long
 (better to) take fewer drugs
allow less chance of overdose / giving too much
allow (better to) take drugs less frequently
 - easier to administer
allow less chance of missing doses / taking at the wrong time 2

[10]