Infection and Response 8

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Name: _____

Class: _____

Date: _____

Time: **66 minutes**

Marks: **66 marks**

Comments:

Q1.

MRSA is a strain of bacterium that developed due to a mutation.

MRSA is difficult to treat so has led to high numbers of infections in hospital patients.

Explain why.

_____

_____

_____

_____

_____

_____

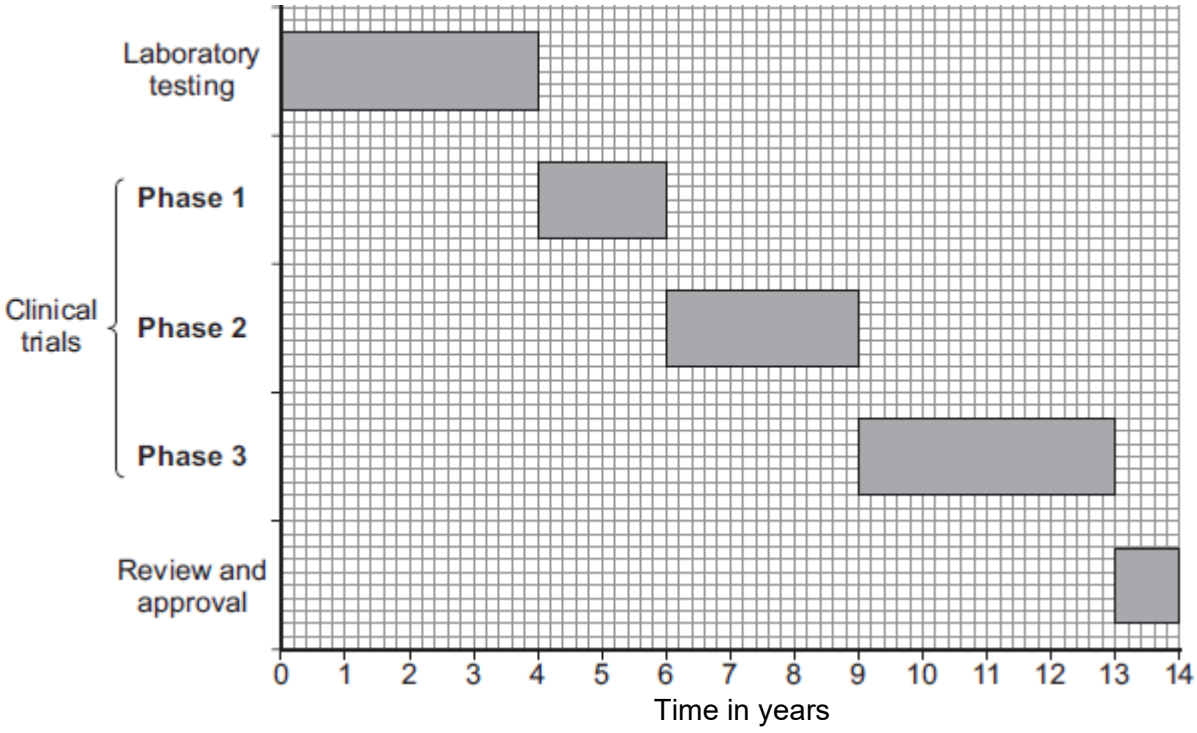
_____

(Total 4 marks)

Q2.

New drugs have to be tested before they can be sold.

The graph shows how much time the different stages of testing took for a new drug.



(a) (i) How much time did the laboratory testing of the drug take?

_____ years

(1)

(ii) Suggest what the drug was tested on during laboratory testing.

_____

(1)

(b) Clinical trials are carried out on human volunteers and patients.

(i) How much time did the clinical trials take for this drug?

_____

_____ years

(2)

(ii) During **Phase 1** clinical trials, the drug is tested on healthy volunteers using low doses.

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

The reason for **Phase 1** testing is to

find the best dose.
see if the drug works.
see if the drug has side effects.

(1)

(iii) During **Phase 2** and **Phase 3** clinical trials, half of the volunteers are given a fake drug called a placebo in a double blind trial.

In a double blind trial, who knows which volunteers are given the drug and which volunteers are given the placebo?

Tick (✓) **one** box.

	Tick (✓)
The doctors but not the volunteers	
The doctors and the volunteers	
The volunteers but not the doctors	
Neither the volunteers nor the doctors	

(1)

(Total 6 marks)

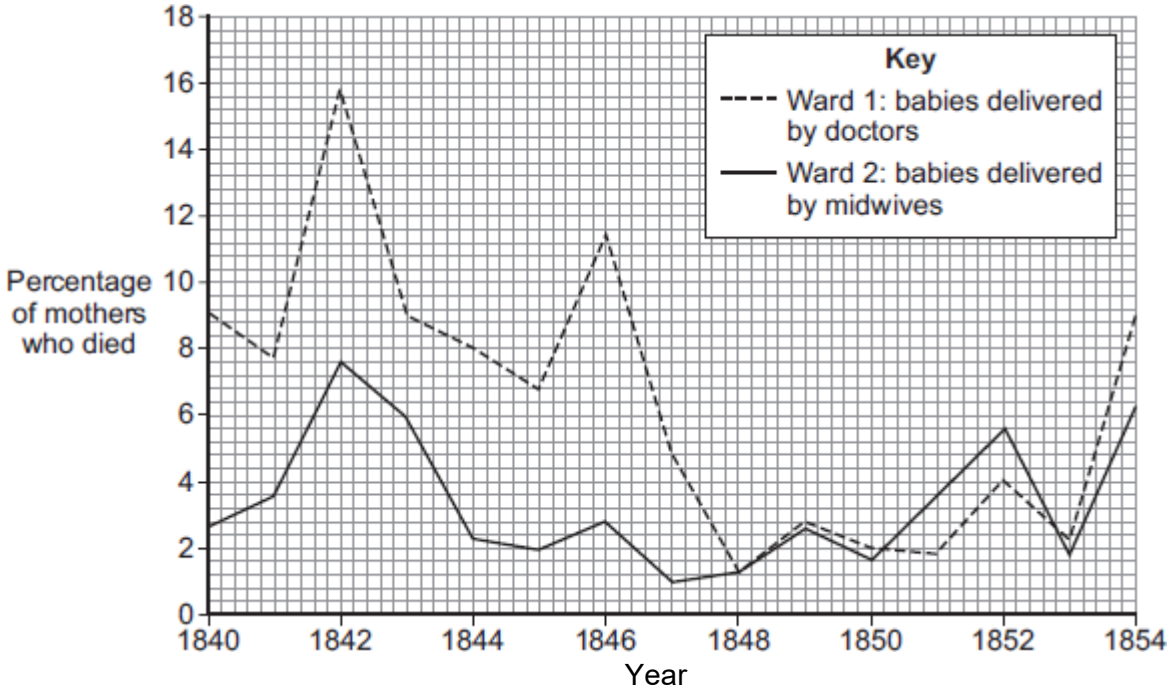
Q3.

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.

_____

_____

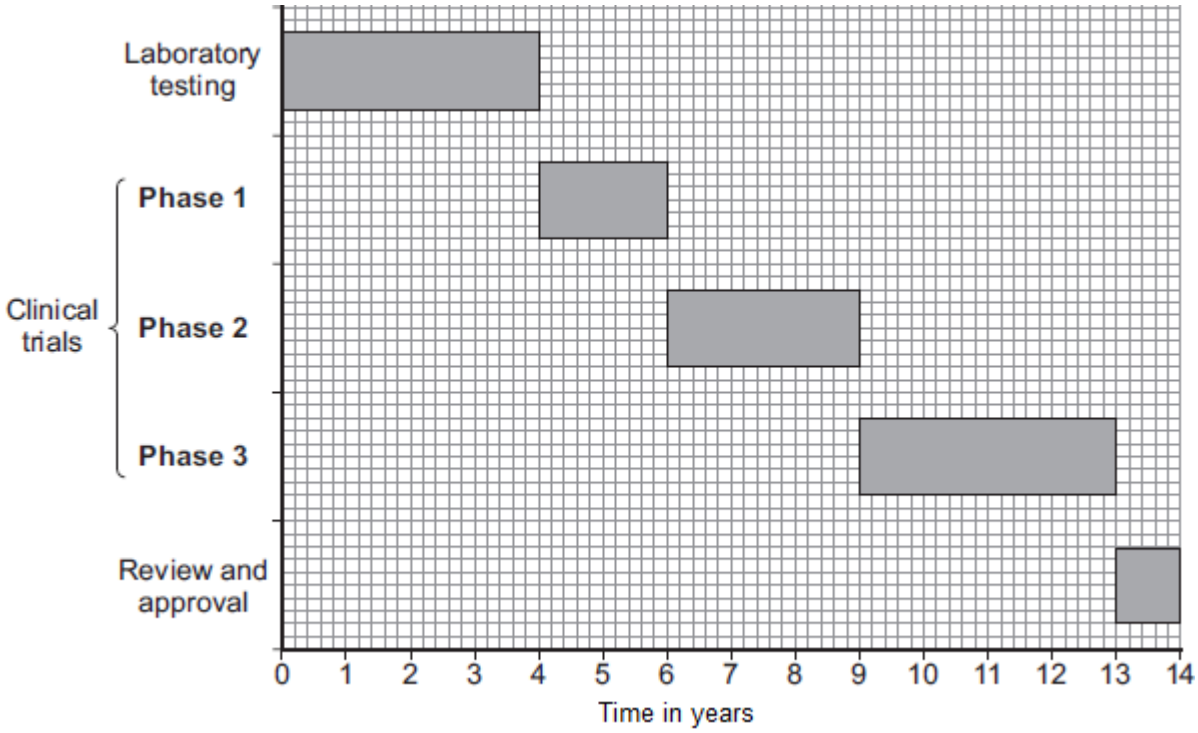
(1)

(Total 5 marks)

Q4.

New drugs have to be tested before they can be sold.

The graph shows how much time the different stages of testing took for a new drug.



(a) (i) How much more time did the clinical trials take than the laboratory testing?

_____

_____ years

(1)

(ii) Apart from the time taken, what other difference is there between laboratory testing and clinical trials?

_____

_____

(1)

(b) (i) During **Phase 1** clinical trials, the drug is tested on healthy volunteers using low doses.

Suggest why **only** healthy volunteers and **only** low doses are used at this stage of drug testing.

_____

_____

_____

_____

(2)

(ii) In **Phase 2** and **Phase 3** clinical trials, a double blind trial is usually done.

Explain what a double blind trial is and why a double blind trial is good practice.

_____

_____

_____

_____

_____

_____

(3)

(Total 7 marks)

Q5.

The body defends itself against pathogens.

(a) Give **three** ways that white blood cells defend the body against pathogens.

Tick (✓) **three** boxes.

Ingest pathogens	☐
Produce antibiotics	☐
Produce antibodies	☐
Produce antibodies	☐
Produce antitoxins	☐
Produce vaccines	☐
Stop pathogens entering the body	☐

(3)

(b) Bacterial infections can be treated with antibiotics.

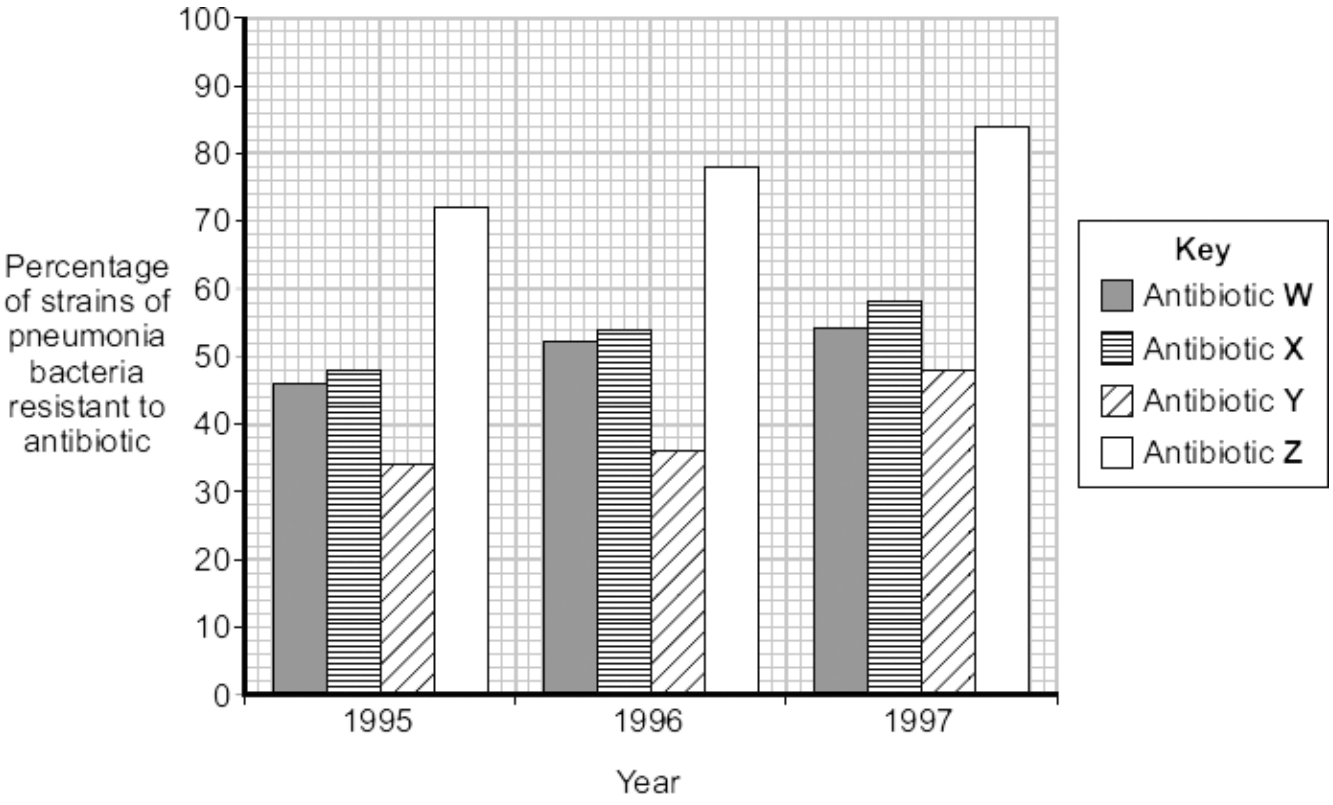
Sometimes bacteria are resistant to antibiotics.

What does *resistant to antibiotics* mean?

_____

(1)

(c) The bar chart shows how the percentage of strains of pneumonia bacteria that are resistant to four different antibiotics changed between 1995 and 1997.



(i) Which would have been the best antibiotic to use against pneumonia bacteria in 1995?

Write the correct answer in the box. Antibiotic ☐

(1)

(ii) Calculate the change in the percentage of strains of pneumonia bacteria resistant to antibiotic **W** between 1995 and 1997.

Show clearly how you work out your answer.

_____

_____

Answer = _____ %

(2)

(iii) Suggest **two** possible reasons for this change in the number of strains of pneumonia bacteria resistant to antibiotic **W**.

1. _____

2. _____

(2)

(Total 9 marks)

Q6.

People can be immunised against a pathogen by injecting them with a vaccine.

(a) What does a vaccine contain?

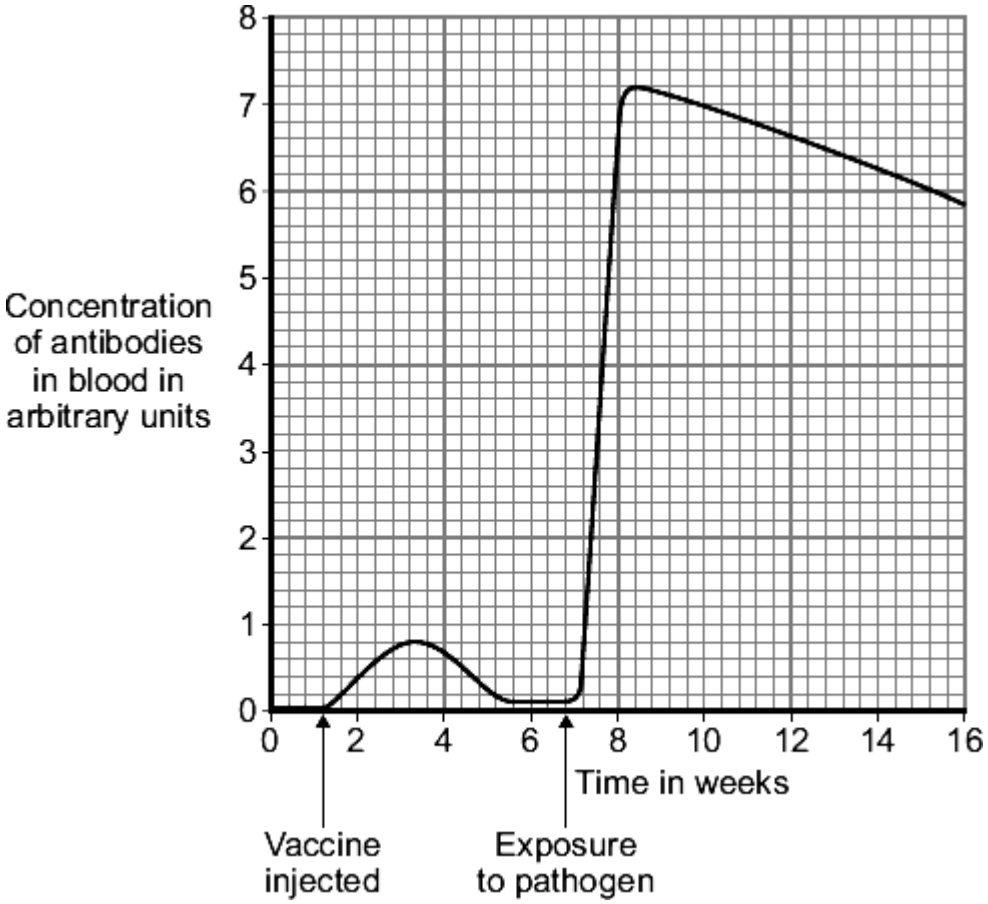
_____

_____

(1)

(b) A person was injected with a vaccine. A few weeks later the person was exposed to the pathogen they had been immunised against.

The graph shows how the concentration of antibodies in the blood changed after injection of the vaccine and after exposure to the pathogen.



(i) Describe in detail the differences between antibody production after the injection of the vaccine **and** after the person was exposed to the pathogen.

(3)

(ii) Suggest an explanation for the differences you have described in part (b)(i).

(3)

(Total 7 marks)

Q7.

Drugs affect our body chemistry.

(a) **List A** gives the names of some drugs.
List B gives the uses of some drugs.

Draw **one** line from each drug in **List A** to the use of the drug in **List B**.

List A **Drug**	**List B** **Use**
Anabolic steroid	To increase fertility in women
Statin	To treat leprosy
Thalidomide	To stimulate muscle growth
	To reduce the risk of heart and circulatory diseases

(3)

(b) A new drug was trialled on 80 healthy volunteers.
The volunteers were asked to report any side effects.

The results of the trial are shown in the table.

Reported effects	Number of volunteers
No side effects	20
Severe sickness	42
Itchy skin	18

Based on the results of this trial, what should the drug company do next?

Tick (✓) **one** box.

Test on a small group of patients to find the optimum dose ☐

Test on a large group of patients to see if the drug works on ill people ☐

Stop the trial ☐

Give a reason for your answer.

_____

_____

(2)

(Total 5 marks)

Q8.

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.

_____

_____

_____

_____

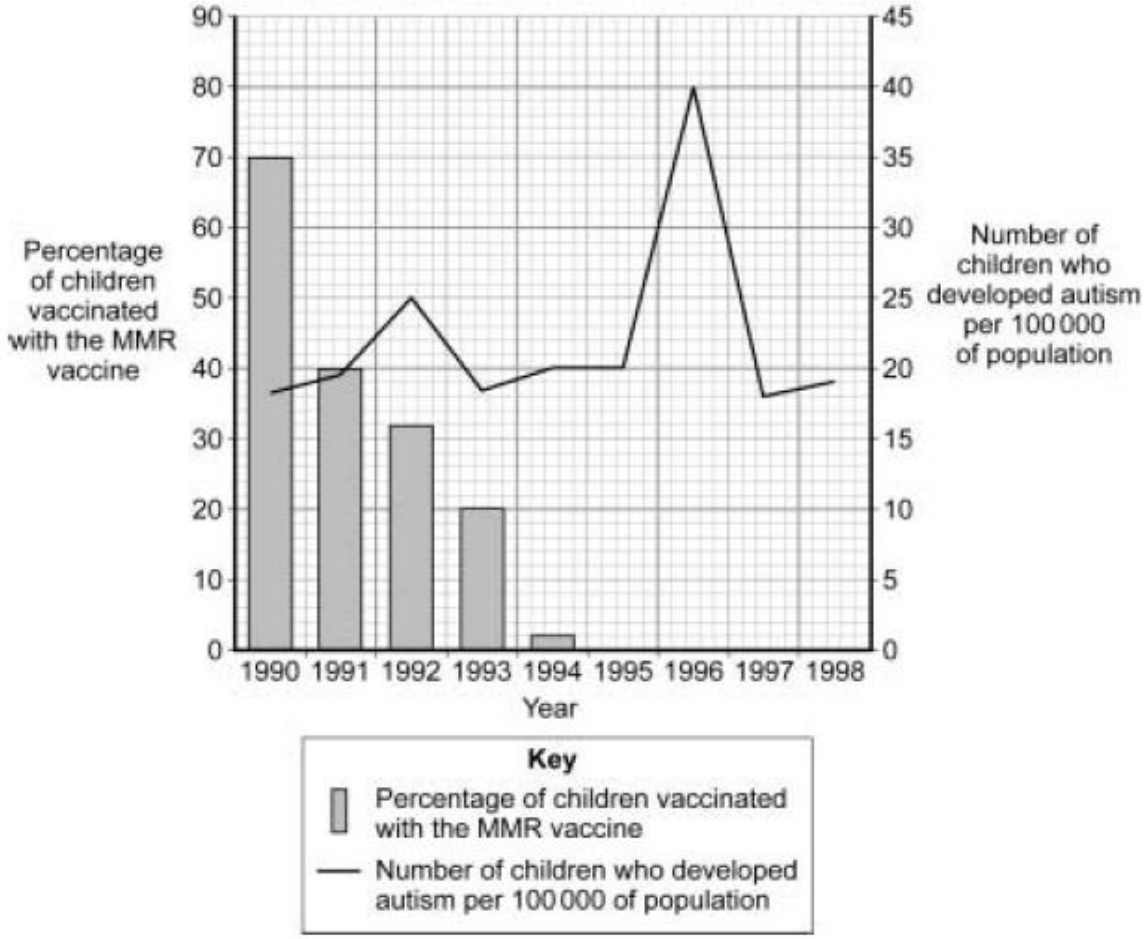
_____

_____

(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)

Q9.

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.

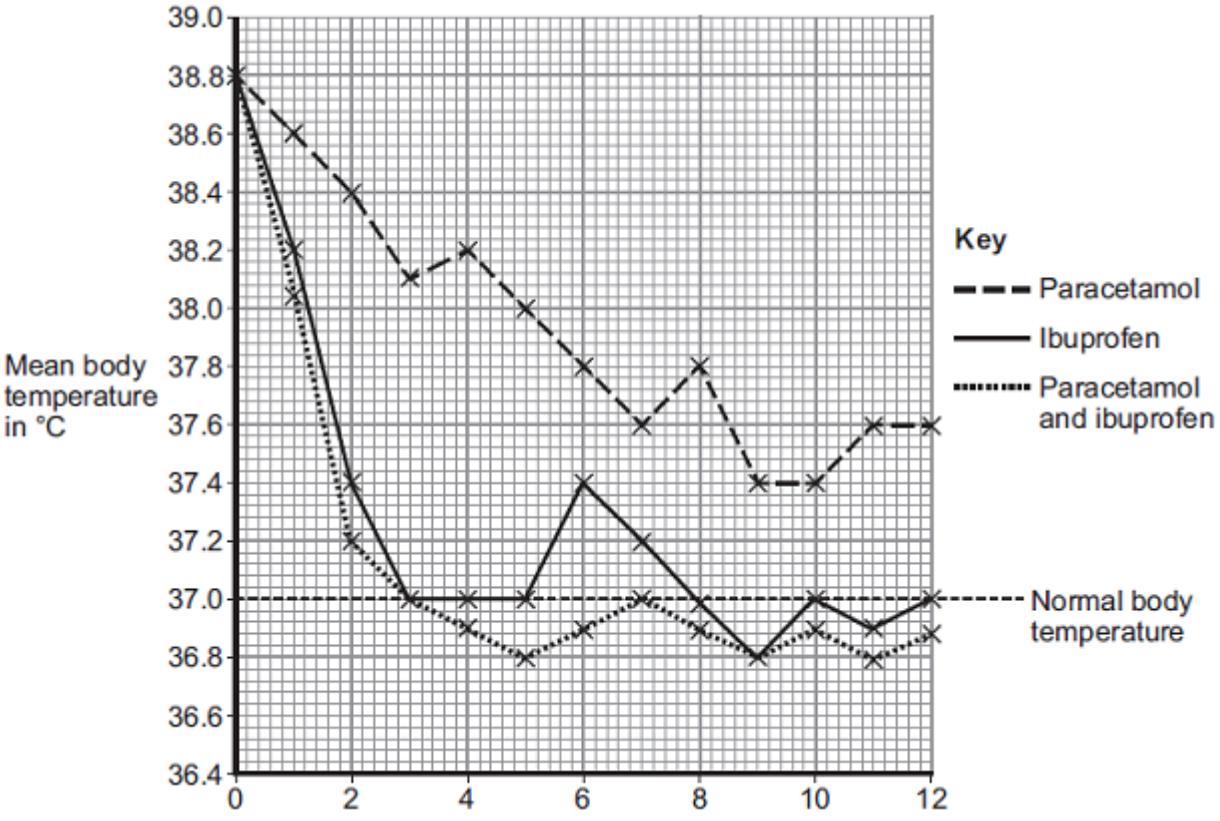
_____

_____

(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.



(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)

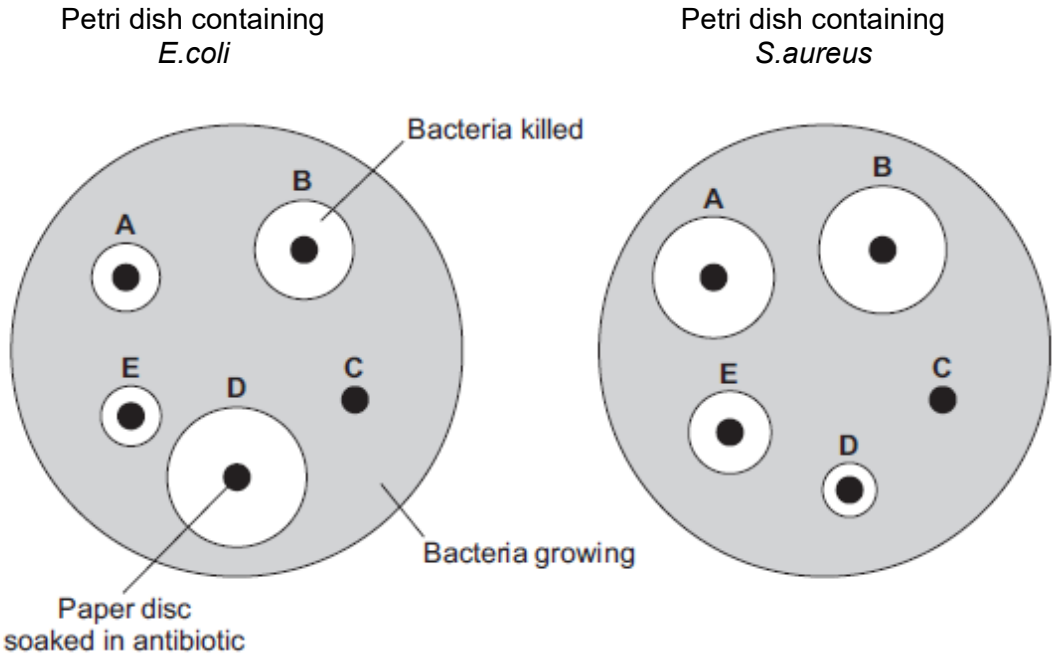
Q10.

A scientist investigated how effective 5 different antibiotics were at killing two types of bacteria, *E.coli* and *S.aureus*.

- The scientist grew the bacteria on agar in two different Petri dishes.
- He placed paper discs soaked in the 5 different antibiotic solutions, **A**, **B**, **C**, **D** and **E**, onto the agar.
- He used the same concentration of each antibiotic and the same sized paperdiscs.
- The Petri dishes were incubated at 25°C for 3 days.

A clear area around the paper disc means that the antibiotic has killed the bacteria there.

The results are shown in the diagram.



(a) Give **one** variable the scientist controlled.

_____

(1)

(b) Use the results shown in the diagram to help you to answer the following questions.

(i) Which antibiotic, **A**, **B**, **C**, **D** or **E**, was the most effective at killing *E.coli*?

Write the correct answer in the box. ☐

(1)

(ii) Which antibiotic, **A**, **B**, **C**, **D** or **E**, did not kill either *E.coli* or *S.aureus*?

Write the correct answer in the box. ☐

(1)

(iii) Which antibiotic, **A**, **B**, **C**, **D** or **E**, would be the best to use to kill both *E.coli* **and** *S.aureus*?

Antibiotic: _____

Give a reason for your answer.

_____

_____

_____

(2)

(c) MRSA is a strain of *S.aureus*. MRSA cannot be killed by most antibiotics.

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

Bacteria that cannot be killed by antibiotics are

immune.
powerful.
resistant.

(1)

(Total 6 marks)

Q1.

(MRSA is) resistant to / not killed by antibiotics

ignore references to viruses
ignore immune
ignore not treated by antibiotics

1

(as is a) new / different strain / type of bacterium

ignore has mutated
ignore new species

1

(therefore) people are not immune to it

accept can't produce the correct antibodies
ignore resistant

1

(many) patients more susceptible to infection / weaker immune system

ignore references to hygiene

1

[4]

Q2.

(a) (i) 4 / four (years)

1

(ii) any **one** from:

- animals

allow suitable examples eg rats
*do **not** allow humans / plants*

- (living) cells

allow human cells
*do **not** allow plant cells*

- (living) tissues

allow human tissues
*do **not** allow plant tissues*

1

(b) (i) 9 (years)

*allow **1** mark for 13 – 4*
or
2 + 3 + 4

2

(ii) see if the drug has side effects

1

(iii) neither the volunteers nor the doctors

1

[6]

Q3.

(a) more (mothers) died if doctors delivered their babies (rather than midwives)

answer must be comparative

allow more deaths on Ward 1

ignore descriptions of trends

1

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

allow disease / infection childbed fever

ignore germs

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

1

(b) (i) hand-washing

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]

Q4.

(a) (i) 5 (years)

1

(ii) lab tests on cells / tissues / animals **and** clinical trials in humans

*allow 1 block of lab tests **and** 3 blocks of clinical trials*

or

number of phases

1

(b) (i) (healthy volunteers)

any **one** from:

- too great a risk for ill person / patient
- patient might be taking another drug
- side effects easier to see

ignore references to the immune system

1

(low dose)

any **one** from:

- to reduce any risk
- to look for side effects

allow to avoid harm

1

(ii) placebo and drug tested

allow fake drugs / sugar pills

1

neither patients nor doctors know (who has taken placebo or drug)

*this full statement would gain **2** marks*

1

(so) avoids bias

or

(therefore) controls for psychological effects

or

(so) can tell if drug works rather than placebo effect

1

[7]

Q5.

(a) ingest pathogens

1

produce antibodies

1

produce antitoxins

1

*deduct **1** mark for each extra box ticked*

(b) are not killed / affected (by antibiotic)

allow antibiotic does not work / does not cure

allow bacteria immune (to antibiotic)

allow infection not killed
ignore bacteria mutated

1

(c) (i) (antibiotic) Y

1

(ii) 8
*allow 54 − 46 for **1** mark*

2

(iii) any **two** from:

- overuse / widespread use/ over prescription
  OWTTE
- inappropriate use / use for eg sore throats / viral infections
- mutation / change to DNA (in bacteria)
- natural selection /description
  ignore people not finishing course of antibiotics
  ignore wrong antibiotic given

2

[9]

Q6.

(a) dead / inactive form of pathogen / microorganism / bacterium / virus
ignore disease (for organism)
ignore toxins / antibodies

1

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

(after exposure):

- greater number of antibodies produced / higher concentration
- antibodies stay (in higher concentration) for longer
- antibodies produced quicker
- quantitative, eg 9 times higher / 0.8 to 7.2
  *scores **2** marks for increased to 9 times higher / from 0.8 to 7.2*

3

(ii) white cells
allow lymphocytes / leucocytes
*do **not** accept phagocytes / macrophage*

1

have had previous exposure to pathogen / recognise pathogen on re-entry / familiar with pathogen / reference to memory cells
ignore knows how to kill pathogen

ignore live pathogen introduced on exposure

1

<u>therefore</u> antibodies produced (more) rapidly

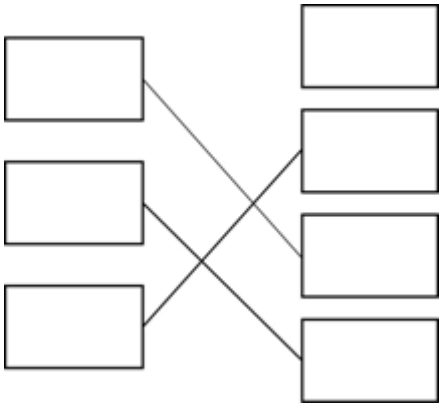
this marking point dependent on previous marking point

1

[7]

Q7.

(a)



one mark for each correct line

extra line from drug negates mark

3

(b) stop the trial

1

second mark scores only if first mark correct

side effects too severe

allow people might die / get ill / harmed

or

(too) many people had side effects

allow use of numbers from table

ignore itchy skin

1

[5]

Q8.

(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]

Q9.

(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]

Q10.

(a) any **one** from:

- <u>amount / concentration</u> of antibiotic
  *do **not** allow type of antibiotic ignore number of antibiotics*
  allow type of paper
- size of discs
  ignore number / position of discs
- (incubation) temperature
- incubated for same time / 3 days
  allow left / kept for same time
- type of agar
  ignore references to bacteria or petri dishes

1

(b) (i) D

1

(ii) C

1

(iii) B
no marks if wrong antibiotic

1

<u>both</u> had a large clear area around the disc
allow a description of this, eg B had the 2nd largest clear area with E.coli and the largest clear area on S.aureus

or

killed a lot of <u>both</u> bacteria

1

(c) resistant

1

[6]