AQA GCSE BIOLOGY (HIGHER) · 8461

BIOLOGY



EXAM QUESTION PACK

4.3.1 COMMUNICABLE DISEASES (PACK 4)

SCORE	PERCENTAGE
/328	%

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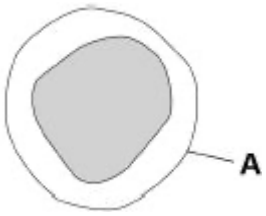
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Q1.

Figure 1 shows one type of white blood cell.

Figure 1



(a) What is structure **A**?

Tick **one** box.

- Cell membrane ☐
- Cell wall ☐
- Cytoplasm ☐
- Nucleus ☐

(1)

(b) White blood cells help to defend the body against pathogens.

How do the white blood cells do this?

Tick **three** boxes.

- Clone pathogens ☐
- Engulf pathogens ☐
- Produce antibiotics ☐
- Produce antibodies ☐
- Produce antitoxins ☐
- Produce toxins ☐

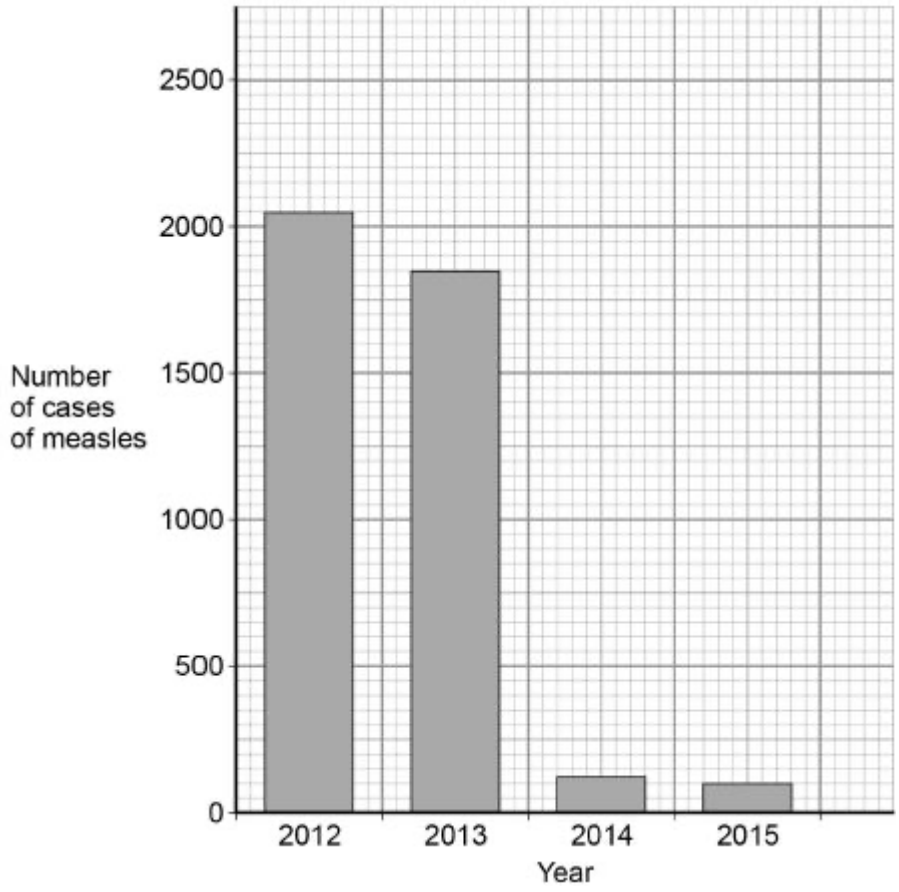
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(3)

Measles is a serious disease. A person can die from measles.

Figure 2 shows the number of cases of measles in England and Wales between 2012 and 2015

Figure 2



(c) Use **Figure 2** to calculate the decrease in the number of cases of measles between 2012 and 2015

_____

_____

Answer = _____ cases

(2)

(d) Suggest **one** reason for the decrease in the number of cases of measles between 2012 and 2015

_____

_____

(1)

(e) Antibiotics **cannot** be used to treat measles.

Suggest why.

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_____

_____

(1)

(f) Gonorrhoea is a disease caused by a bacterium.

Gonorrhoea **can** be treated with antibiotics.

Give **one** other way to control the spread of gonorrhoea.

_____

_____

(1)

A scientist investigated how effective different antibiotics were at killing gonorrhoea bacteria.

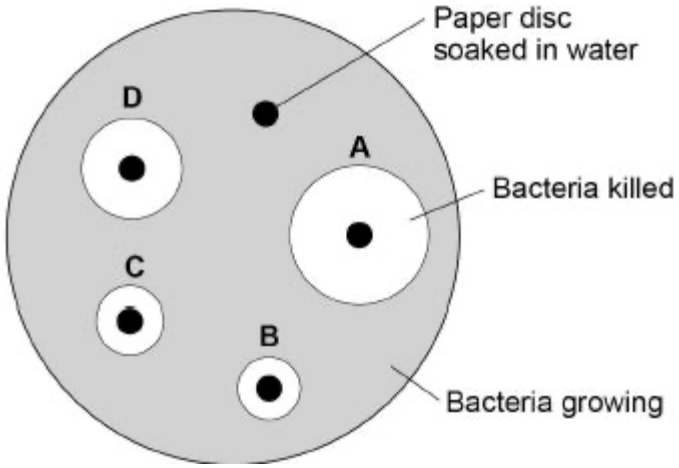
This is the method used.

1. Grow gonorrhoea bacteria on agar in a Petri dish.
2. Place one paper disc soaked in water onto the agar.
3. Place four other paper discs, each soaked in a different antibiotic, **A**, **B**, **C**, and **D**, onto the agar.
4. Use the same sized paper discs and the same concentration of each antibiotic.
5. Incubate the Petri dish for 3 days.

Figure 3 shows the scientist's results.

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

Figure 3



(g) Give **one** control variable the scientist used.

_____

_____

(1)

(h) Suggest why **one** disc was soaked in water.

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_____

_____

(1)

(i) Which antibiotic in **Figure 3** would be the best to treat gonorrhoea?

Give a reason for your answer.

Antibiotic _____

Reason _____

_____

(2)

(Total 13 marks)

Q2.

Coronary heart disease (CHD) is a non-communicable disease.

CHD is caused when fatty material builds up in the coronary arteries.

(a) Explain what a non-communicable disease is.

_____

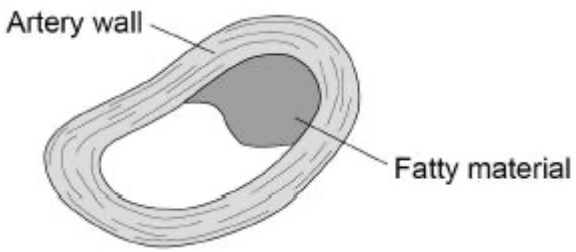
_____

_____

_____

(2)

The diagram below shows a coronary artery of someone with CHD.



(b) Explain how CHD can cause a heart attack.

_____

_____

_____

_____

_____

_____

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(3)

(c) Explain how lifestyle and medical risk factors increase the chance of developing CHD.

(6)

(Total 11 marks)

Q3.

Measles is a serious disease. A person can die from measles.

The table below shows the number of medically confirmed cases of measles in England and Wales between 2012 and 2015

Year	Number of medically confirmed cases of measles
2012	2030
2013	1843
2014	121
2015	91

(a) Suggest **one** reason why the actual number of cases of measles in England and Wales might be higher than is shown in the table above

(1)

(b) Calculate the percentage decrease in the number of medically confirmed cases of

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measles between 2012 and 2015

_____

_____

_____

_____

Percentage decrease = _____ %

(2)

(c) One reason for the decrease in the number of cases of measles is that more children were vaccinated against the disease.

Vaccinating a large proportion of the population reduces the spread of the measles virus.

Explain why.

_____

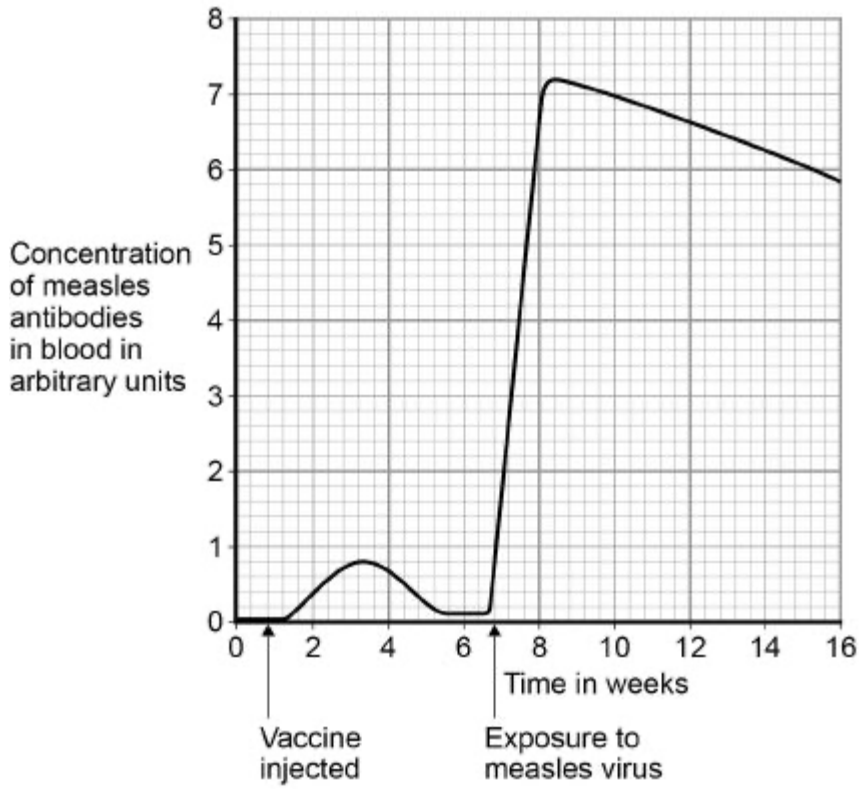
_____

_____

_____

(2)

(d) The graph below shows the concentration of measles antibodies in the blood of a boy.



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Explain the differences between antibody production after the vaccine injection and after exposure to the measles virus.

You should include data from the graph above

(6)
(Total 11 marks)

Q4.

Pseudomonas bacteria cause infections in hospital patients.

A new strain of *Pseudomonas* bacteria has evolved. This new strain can only be killed by one antibiotic called fluroquinolone.

Scientists want to prevent the new strain of *Pseudomonas* from spreading in the human population.

Explain the advice doctors should be given to prevent the spread of the new strain.

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_____

_____

_____

_____

(Total 6 marks)

Q5.

Gamma radiation is emitted from the nuclei of some atoms.

(a) What is a gamma ray?

Tick **one** box.

A helium nucleus ☐

A high speed electron ☐

A neutron ☐

A type of electromagnetic radiation ☐

(1)

(b) Which would be the best absorber of gamma radiation?

Tick **one** box.

A few mm of air ☐

A thick sheet of cardboard ☐

A thick sheet of lead ☐

A thin sheet of paper ☐

(1)

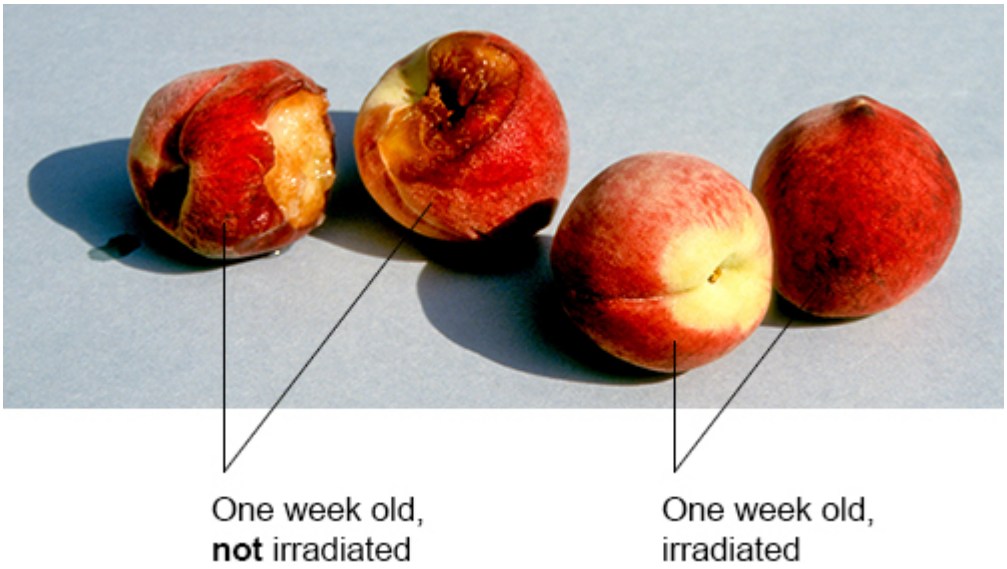
Food can be irradiated with gamma rays to kill bacteria.

Below is a photograph of peaches.

Two of the peaches were irradiated.

The photograph was taken one week after irradiation.

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(c) Why do food producers need to kill bacteria on food?

Tick **two** boxes.

- To change the colour of the food ☐
- To decrease the rate of decay of the food ☐
- To decrease the shelf life of the food ☐
- To prevent food poisoning ☐
- To remove dirt from food ☐

(2)

(d) How do gamma rays kill bacteria?

Tick **one** box.

- Gamma rays cause meiosis to occur ☐
- Gamma rays cause mutations ☐
- Gamma rays decrease the size of bacterial cells ☐
- Gamma rays destroy the food source for bacteria ☐

(1)

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(e) Food producers can irradiate food by passing it close to a radioactive source.

How can food producers increase the level of radiation that the food is exposed to?

Tick **two** boxes.

Boil the food before passing it close to the radioactive source	☐
Decrease the distance between the food and the radioactive source	☐
Increase the time for which the food is close to the radioactive source	☐
Put the radioactive source in a box	☐
Reduce the temperature of the radioactive source	☐

(2)

(f) A student said:

'The irradiated food would become radioactive.'

Give **one** reason why the student is **not** correct.

_____

_____

(1)

(Total 8 marks)

Q6.

There are several methods of contraception.

(a) Draw **one** line from each method of contraception to how the method works.

Method of contraception	How the method works
diaphragm	prevents embryo implanting
intrauterine device	prevents release of the egg
oral contraceptive	prevents sperm reaching the egg

(2)

(b) When a new oral contraceptive is tested on volunteers, the contraceptive is first given at a low dose. Later, the dose is increased.

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Why are new drugs given at low doses at first?

_____

_____

(1)

(c) The table below shows information about three methods of contraception.

	Condom	**Oral contraceptive**	**Hormone skin patch**
Percentage (%) effectiveness	98.0	99.7	99.8
How contraception is obtained	From shops or sexual health clinic	From doctor or sexual health clinic	
Possible side effects	No serious side effects	Headaches, nausea, high blood pressure	Headaches, nausea, blood clots

Evaluate the use of these contraceptive methods.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

(6)

(Total 9 marks)

Q7.

Alpha, beta and gamma are types of nuclear radiation.

(a) Explain why gamma emission does **not** change the atomic number of an element.

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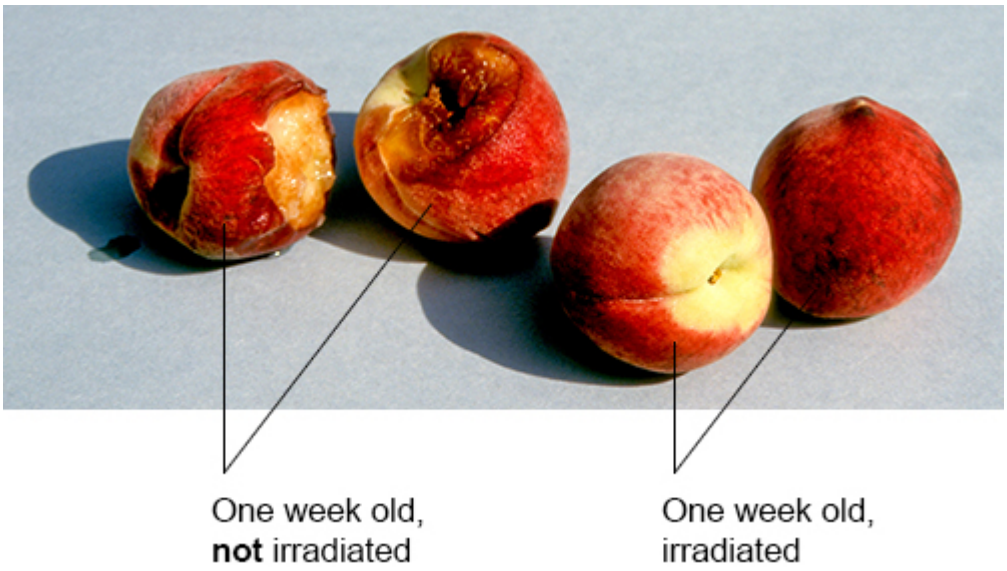
(2)

Food can be irradiated to make it safer to eat.

Below is a photograph of peaches.

Two of the peaches were irradiated.

The photograph was taken one week after irradiation.



(b) Explain why irradiating food makes it safer to eat.

(3)

(c) Food is packaged and then irradiated.

Explain why food is irradiated using gamma radiation rather than alpha or beta radiation.

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_____

_____

(2)

(d) Some people are concerned that irradiated food could be radioactive.

Describe how irradiated food is different from food that is radioactive.

_____

_____

_____

_____

(2)

(Total 9 marks)

Q8.

Chickenpox is a disease. Many children get chickenpox.

Most children recover quickly with no serious long term effects.

Chickenpox cannot be treated with antibiotics.

(a) What type of pathogen causes chickenpox?

_____

(1)

People can pay for their child to be vaccinated against chickenpox.

The vaccination stimulates the production of antibodies.

(b) Which part of the blood produces antibodies?

Tick **one** box.

Plasma ☐

Platelets ☐

Red blood cells ☐

White blood cells ☐

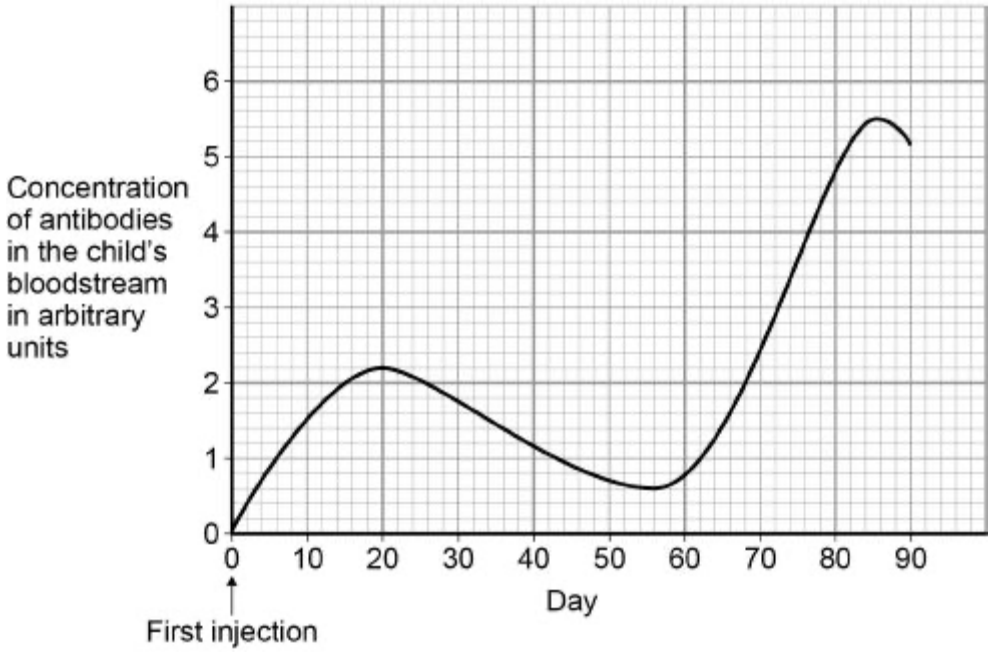
(1)

The vaccination involves two injections.

The graph below shows how the concentration of antibodies in a child's bloodstream

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changes.



(c) Suggest on what day the second injection was given.

Day = _____

(1)

(d) On which day is the child's ability to defend against chickenpox at its peak?

Day = _____

(1)

Children can only have the chickenpox vaccination if their parents pay for the vaccine.

Some people think the vaccination should be free to all children.

(e) If more people were vaccinated the number of children getting chickenpox would decrease.

What are **two** possible reasons for this decrease?

Tick **two** boxes.

Drugs to treat chickenpox are no longer effective ☐

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Children are less likely to come into contact with someone with the disease	☐
More people will have the correct antibodies	☐
People may catch the disease from the vaccination	☐
People may have a weakened immune system	☐

(2)

(f) The government needs to decide whether to make the chickenpox vaccination free to all children.

Suggest **two** factors the government should consider when making this decision.

1. _____

_____

2. _____

_____

(2)

(Total 8 marks)

Q9.

Dravet syndrome is caused by a genetic mutation.

Dravet syndrome causes epileptic seizures. An epileptic seizure is caused by unusual brain activity.

(a) Mutations often happen when cells divide.

Give **one** other cause of genetic mutations.

_____

_____

(1)

(b) Scientists have transferred the mutated gene for Dravet syndrome into zebrafish using genetic engineering.

This means the scientists could test a new drug to treat Dravet syndrome on the zebrafish.

Which **two** of the following are used during the process of genetic engineering?

Tick **two** boxes.

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Enzymes ☐

Placebos ☐

Vaccines ☐

Vectors ☐

White blood cells ☐

(2)

(c) Scientists used the genetically engineered zebrafish to test the new drug.

Describe the processes that then need to happen to test the new drug before it can be used to treat all children with Dravet syndrome.

(6)

(Total 9 marks)

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Q10.

Millions of people get salmonella food poisoning each year.

(a) A new vaccine has been developed to protect people against salmonella food poisoning.

Explain how the vaccine prevents people becoming ill with salmonella food poisoning.

(5)

(b) Salmonella food poisoning is caused by *Salmonella* bacteria.

Salmonella is treated with an antibiotic called nalidixic acid.

Nalidixic acid is no longer effective for some strains of *Salmonella* bacteria.

Explain how these bacteria have evolved by natural selection.

(3)

(Total 8 marks)

Q11.

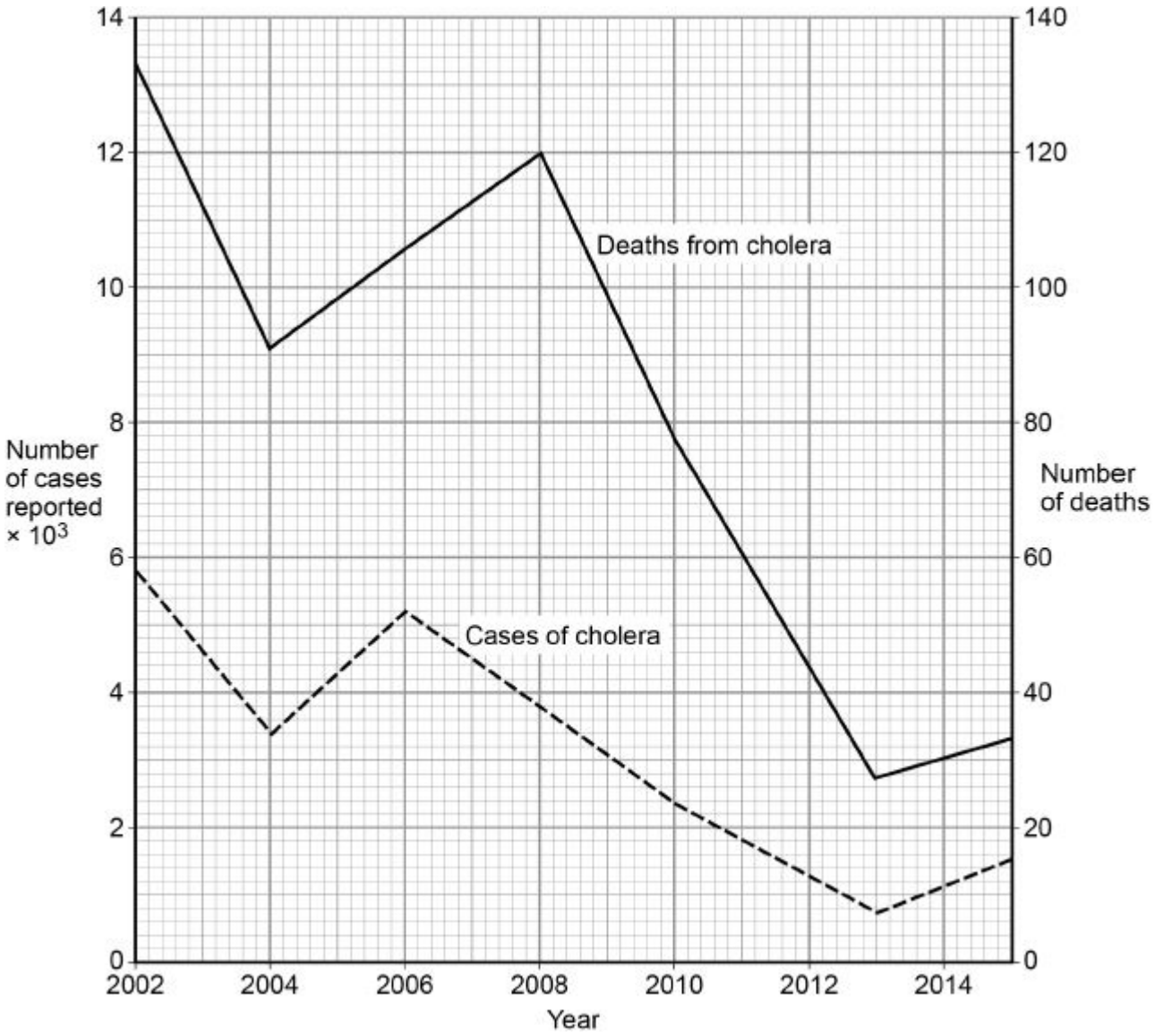
Getting safe drinking water is a problem for millions of people.

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Cholera is a waterborne disease.

Figure 1 shows data about cholera from one area of Africa.

Figure 1



(a) What percentage of cases of cholera reported in 2004 resulted in deaths in 2004?

Give your answer to 2 significant figures.

Percentage deaths = _____

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(4)

(b) A student concluded that a cholera epidemic occurred in 2008.

Give **one** reason for and **one** reason against the student's conclusion.

Use information from **Figure 1**.

_____

_____

_____

_____

(2)

(c) A different student concluded that a cholera epidemic had occurred in 2002.

Why can we **not** be sure of this from the data given in **Figure 1**?

_____

_____

(1)

(d) Suggest **two** possible ways in which cholera might spread in one area of Africa.

1. _____

_____

2. _____

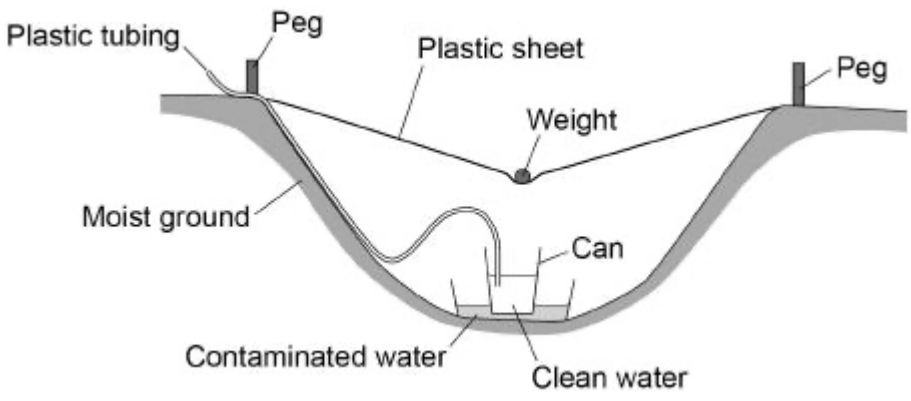
_____

(2)

(e) There are a number of ways to provide clean and safe water for people.

Figure 2 shows a simple method for collecting clean water. This method is called solar distillation.

Figure 2



Explain the processes that occur in the method shown in **Figure 2** to provide clean

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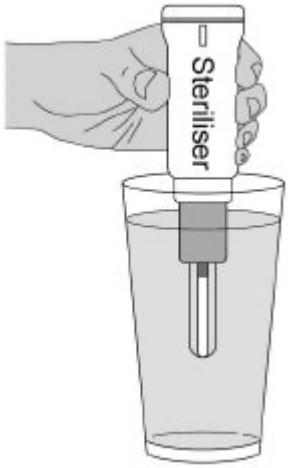
drinking water.

(5)

(f) Another method of making water safe to drink is to use a portable steriliser.

Figure 3 shows a portable steriliser.

Figure 3



The steriliser emits light.

Explain how the steriliser kills the bacteria in the water.

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_____

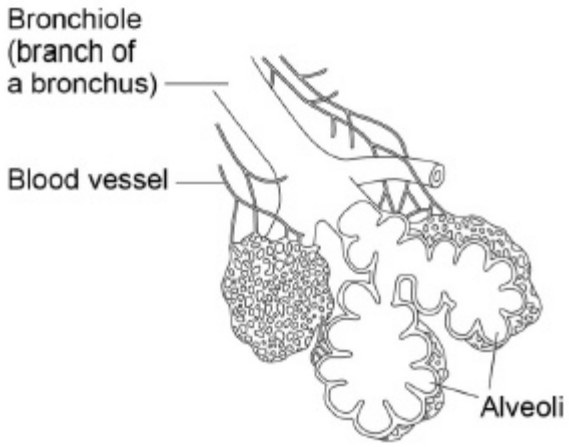
(3)

(Total 17 marks)

Q12.

Figure 1 shows part of the lungs.

Figure 1



(a) Give **two** ways the lungs are adapted for efficient exchange of gases.

Describe how each adaptation helps to maintain efficient gas exchange.

Adaptation 1 _____

_____

Description _____

_____

Adaptation 2 _____

_____

Description _____

_____

(4)

(b) There are 5.4 million people with asthma in the UK.

What type of disease is asthma?

Tick **one** box.

An allergy ☐

A bacterial infection ☐

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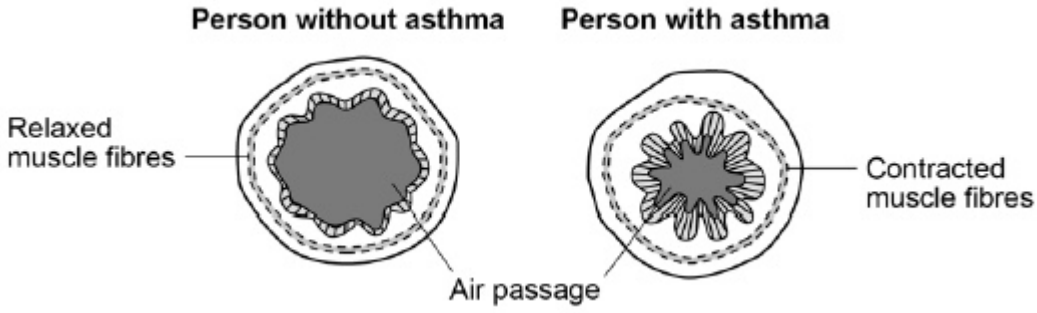
A cancer ☐

A viral infection ☐

(1)

(c) **Figure 2** shows cross-sections of bronchioles of two people.

Figure 2



Suggest why people with asthma often find it difficult to breathe.

_____

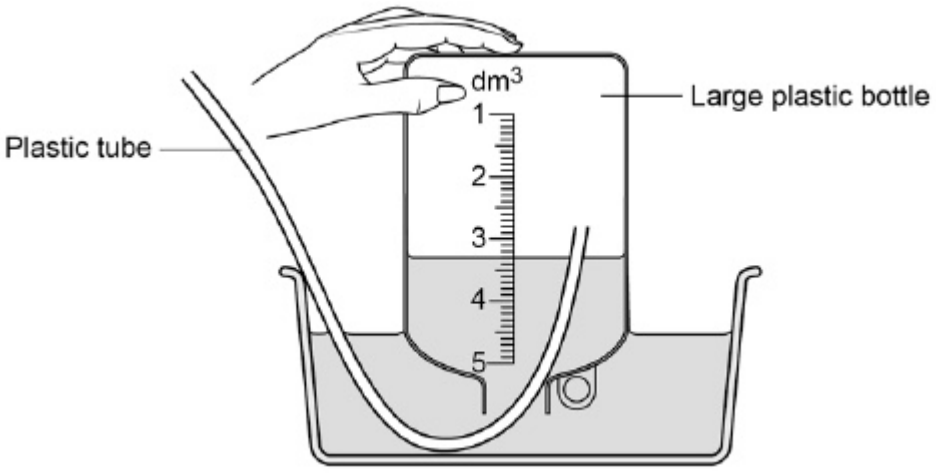
_____

(1)

(d) People with asthma often have a reduced lung volume.

Figure 3 shows the apparatus a student used to measure his lung volume.

Figure 3



This is the method used.

1 Fill the bottle with water.

2 Breathe out through the tube.

The volume of water pushed out of the bottle is equal to his lung volume.

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What is the student's lung volume?

Volume = _____ dm^3

(1)

Scientists tested a new drug to treat asthma.

The scientists measured the lung volume of:
- volunteers without asthma
- some volunteers during a mild asthma attack
- other volunteers during a severe asthma attack.

Half the people in each group were given a placebo.

The other half of the people in each group were given the new drug.

The tests were carried out as a double blind trial.

(e) What is a placebo?

_____

_____

(1)

(f) Who knows which volunteers in a double blind trial are given the drug and which volunteers are given the placebo?

Tick **one** box.

The scientists but not the volunteers	☐
The scientists and the volunteers	☐
The volunteers but not the scientists	☐
Neither the volunteers nor the scientists	☐

(1)

(g) Suggest why it is a good idea that double blind trials should be used in drug testing?

_____

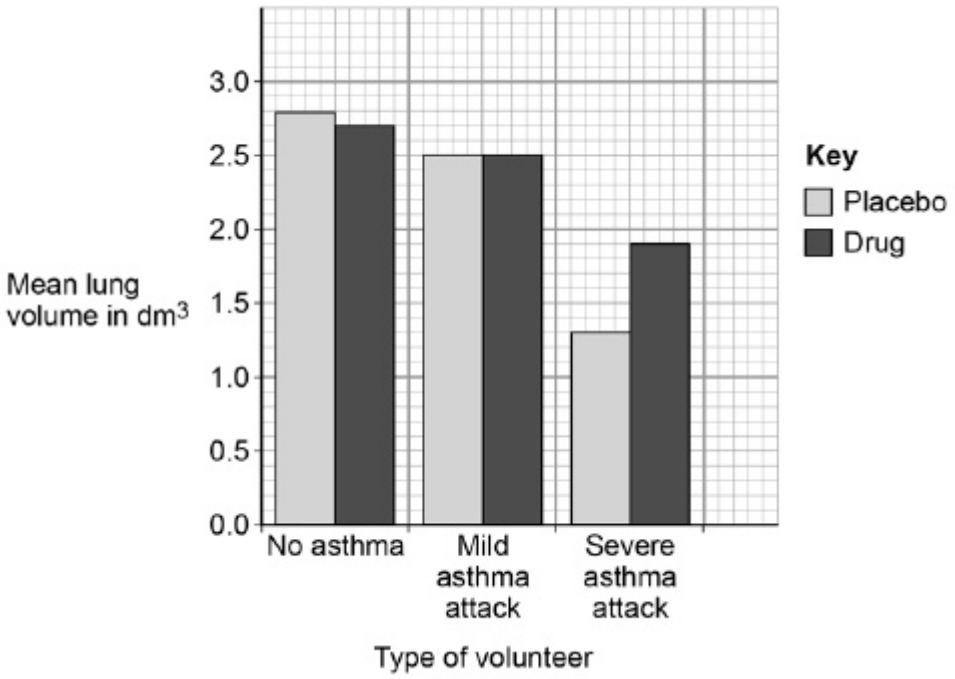
_____

(1)

(h) **Figure 4** shows the results of the drug tests.

Figure 4

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Give **two** conclusions that can be made about the usefulness of the drug.

1. _____

_____

2. _____

_____

(2)

(Total 12 marks)

Q13.

Antibiotics are used to kill some types of pathogen.

(a) Which illness could be treated with an antibiotic?

Tick **one** box.

AIDS	☐
Measles	☐
Salmonella	☐
Type 2 diabetes	☐

(1)

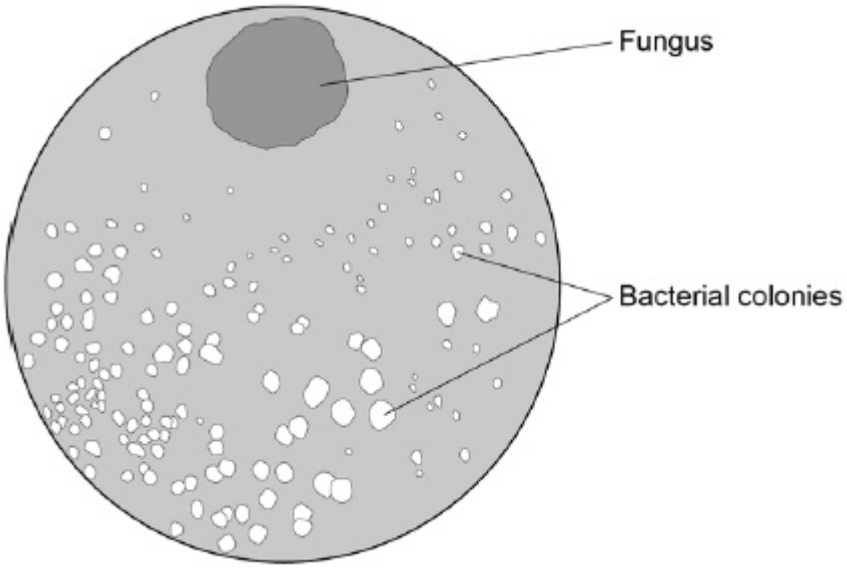
Alexander Fleming discovered the antibiotic penicillin.

He noticed that one of his Petri dishes containing bacteria had become contaminated with

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a fungus.

The diagram shows the Petri dish.



(b) Read the information about the discovery of penicillin.

Draw **one** line from each piece of information to its description.

Information	**Description**
	Conclusion
Fleming noticed that there were only a few bacterial colonies growing near the fungus.	
	Hypothesis
Fleming thought the fungus must have produced a chemical (penicillin) that killed the bacteria around it.	
	Investigation
He injected 8 mice with bacteria and gave 4 of these mice an injection of penicillin.	
	Observation
The 4 mice injected with penicillin survived. The 4 mice **not** given penicillin died.	
	Result

(4)

(c) Look at the diagram of the petri dish.

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The greater the distance from the fungus the more bacteria grew.

Suggest **one** reason for this.

_____

_____

(1)

(d) Give **two** reasons why Fleming's discovery was important.

1. _____

_____

2. _____

_____

(2)

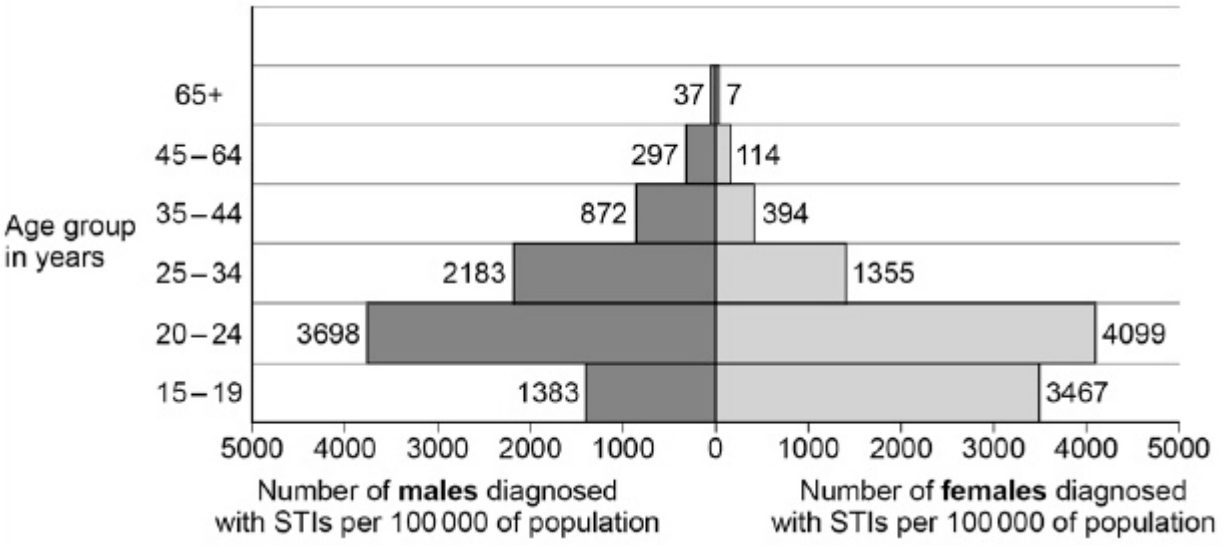
(Total 8 marks)

Q14.

This question is about sexually transmitted infections (STIs).

Figure 1 shows the number of STIs diagnosed in England in 2015.

Figure 1



(a) The total population of females aged 15–19 was 1 572 189

Calculate the number of females aged 15–19 who were diagnosed with an STI.

_____

_____

_____

_____

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Number of females = _____

(3)

(b) Suggest why the data is given per 100 000 of the population and **not** as the number of people.

_____

_____

(1)

(c) Gonorrhoea is an STI.

Describe the symptoms of gonorrhoea.

_____

and

_____

(1)

Gonorrhoea was treated using penicillin until resistant strains of Gonorrhoea bacteria appeared.

A new antibiotic is tested to treat gonorrhoea.

Scientists need to know the concentration of antibiotic that will be most effective and safe.

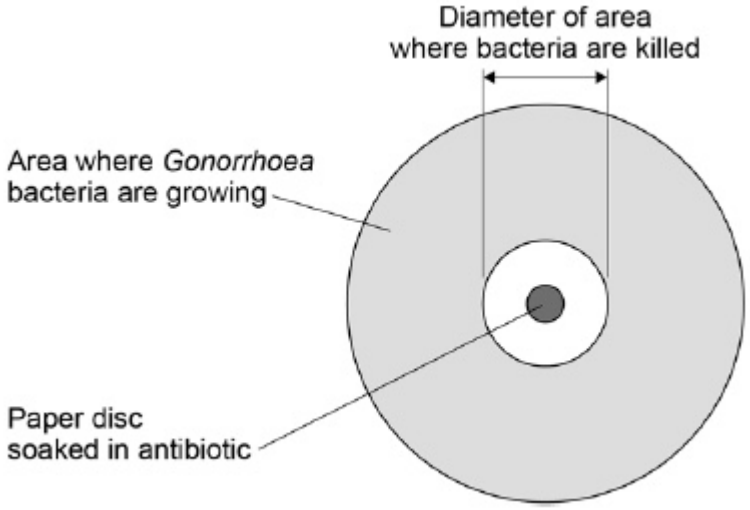
This is the method used.

1. Soak paper discs in different concentrations of antibiotic solution.
2. Place one disc in the centre of an agar plate where Gonorrhoea bacteria are growing.
3. Incubate the agar plate at 37 °C for 24 hours.
4. Measure the diameter of the clear area where the bacteria are killed.
5. Repeat steps 2–4 for each concentration of the antibiotic solution.

Figure 2 shows the results for one concentration of the antibiotic solution.

Figure 2

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The table shows the results.

Concentration of antibiotic in mg/dm^3	**Diameter of clear area in mm**
0	0
1	0
3	8
5	15
10	16
20	17

(d) What was the dependent variable in this investigation?

_____

_____

(1)

(e) Calculate the area where bacteria were killed when the antibiotic concentration was 20 mg/dm^3

Use the equation: area = πr^2

Use 3.14 as the value for π

r is the radius of the circle.

Give your answer to 3 significant figures.

_____

_____

_____

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Area = _____ mm^2

(2)

(f) The scientists recommended that the antibiotic should be used at a concentration of 5 mg/dm^3

Suggest **two** reasons why the scientists recommended this concentration.

1. _____

_____

_____

2. _____

_____

_____

(2)

(g) The antibiotic needs further testing before it can be licensed for human use.

The first stage is pre-clinical tests using live cells, tissues and animals.

Describe the other stages of drug testing.

Give reasons for each stage.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

(6)

(Total 16 marks)

Q15.

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Food poisoning can be caused by eating food that is contaminated with *Salmonella* bacteria.

(a) Give **one** difference between a bacterial cell and an animal cell.

_____

_____

(1)

The table shows the number of confirmed cases of salmonella food poisoning in the UK.

Year	**Confirmed cases per 100 000 population**
2006	23.82
2007	22.24
2008	18.82
2009	17.17
2010	15.39
2011	15.12
2012	14.00
2013	13.16
2014	12.63
2015	14.50

It is estimated that in the UK, for every confirmed case of salmonella poisoning there are another 3 unconfirmed cases.

(b) Estimate the total probability of suffering from salmonella food poisoning in 2015.

_____

_____

_____

_____

_____

_____

(3)

(c) Describe the trend in the number of confirmed cases of salmonella food poisoning between 2006 and 2014.

_____

_____

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(1)

(d) Suggest two reasons for the trend in the data between 2006 and 2014.

1. _____

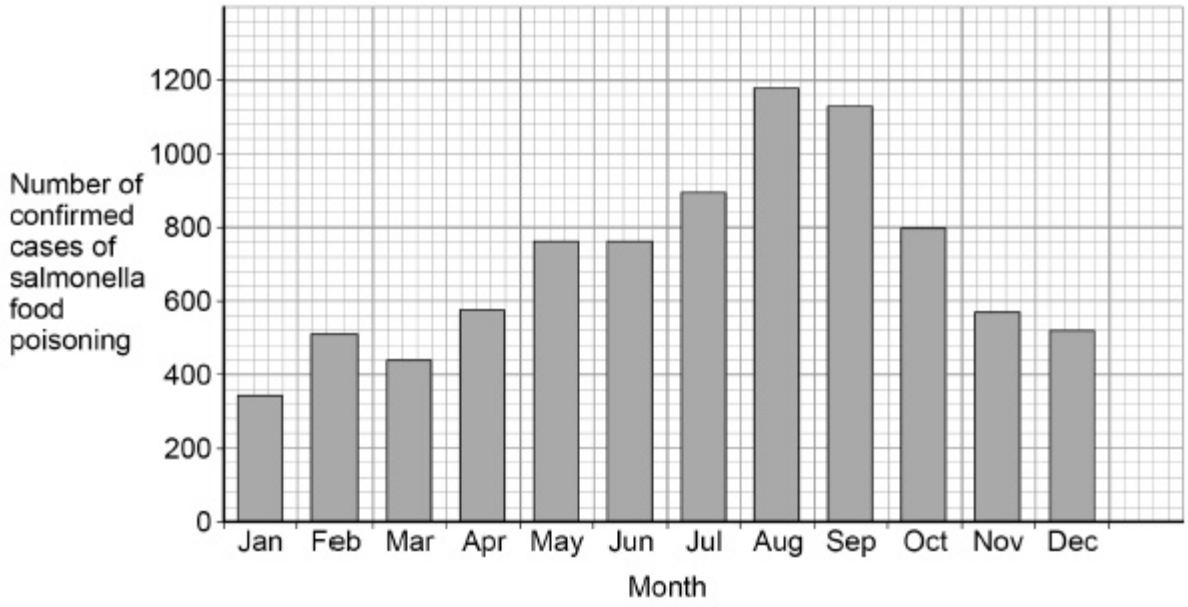
_____

2. _____

_____

(2)

(e) The graph shows the number of confirmed cases of salmonella food poisoning in the UK during one year.



Suggest **one** reason for the high number of cases of salmonella food poisoning in the summer.

_____

_____

(1)

(Total 8 marks)

Q16.

Tobacco mosaic virus (TMV) can infect many species of plant.

TMV spreads throughout the whole plant, causing discolouration of the leaves.

(a) Suggest how TMV spreads within the plant from one part to another.

_____

_____

(1)

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(b) Describe how TMV can pass from one plant to another.

_____

_____

(1)

Plants can be genetically modified (GM) to be resistant to TMV.

(c) What **two** ways is the process of genetic modification different from selective breeding?

Tick **two** boxes.

GM is faster.	☐
GM is less dependent on chance at fertilisation.	☐
GM is less likely to give the desired characteristics in the offspring.	☐
GM is only used in plants, not animals.	☐
GM requires less specialist equipment.	☐

(2)

(d) Describe the process of genetic modification that is used to produce a plant that is resistant to a disease.

_____

_____

_____

_____

_____

_____

_____

_____

(4)

(e) Fields planted with genetically modified (GM) crops may have lower biodiversity than fields planted with non-GM crops.

Why is a reduction in biodiversity more likely to result in the extinction of a species?

_____

_____

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_____

_____

(2)

(f) Maintaining hedgerows around fields helps improve biodiversity.

Suggest **one** other reason why farmers maintain hedgerows around fields of crops.

_____

_____

(1)

(Total 11 marks)

Q17.

Some animals have a single circulatory system.

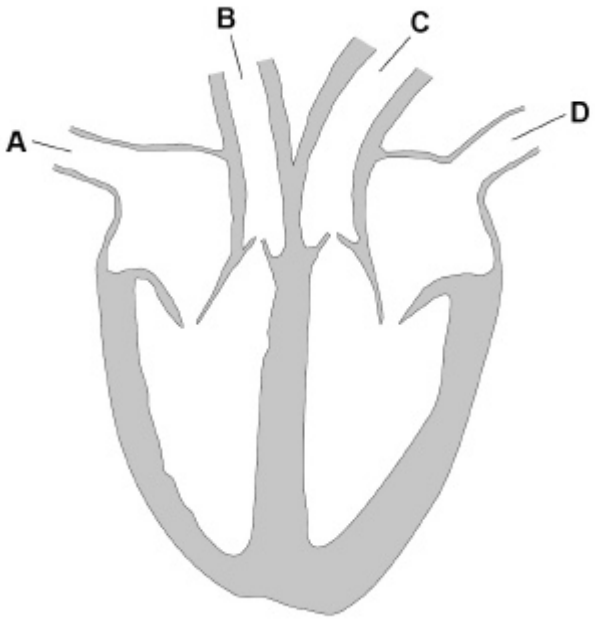
(a) Why is the human heart referred to as part of a dual circulatory system?

_____

_____

(1)

Below is a diagram of a human heart.



(b) Which label shows the pulmonary vein?

Tick **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

(1)

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(c) Which blood vessel takes oxygenated blood away from the heart?

Tick **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

(1)

(d) Name the blood vessels that deliver oxygen to the capillaries in heart muscle.

_____

(1)

(e) Pacemaker cells are a group of cells that control heart rate.

Where in the heart are the pacemaker cells located?

_____

(1)

(f) What type of signal is sent from the pacemaker cells to the heart muscle?

_____

_____

(1)

In a scientific investigation over 44 000 men were monitored for 12 years.

The men were divided into four groups based on their number of hours of physical activity they did per week.

The results are shown in the table.

Group	**W**	**X**	**Y**	**Z**
Mean number of hours of physical activity per week	1	5	12	24
Percentage who are smokers	14	11	9	7
Percentage with high cholesterol	11	10	11	11
Percentage with family history of heart disease	12	12	12	12
Mean percentage of fat in diet	34	33	32	30
Number of cases of heart disease	423	370	336	294

(g) Give **two** other factors which may affect the risk of heart disease.

You should **not** refer to the factors shown in the table.

1. _____

_____

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2. _____

_____

(2)

(h) Evaluate whether the data shows that increased hours of physical activity reduces the risk of heart disease.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

(6)

(Total 14 marks)

Q18.

Some diseases are communicable.

(a) What does communicable disease mean?

Tick **one** box.

A disease that can be spread from one person to another.	☐
A disease that cannot be treated with antibiotics.	☐
A disease that is not spread from animals to humans.	☐
A disease that is passed on through genes.	☐

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(1)

(b) A woman becomes ill and has the following symptoms:

- pain when urinating
- thick yellow discharge from vagina.

Which communicable disease does the woman have?

Tick **one** box.

Gonorrhoea	☐
HIV	☐
Measles	☐
Salmonella	☐

(1)

Tuberculosis is a bacterial infection that affects the lungs.

Tuberculosis causes severe discomfort.

(c) What type of medicine should be used to kill the tuberculosis bacteria?

_____

(1)

(d) What type of medicine should be used to treat the symptoms of TB?

_____

(1)

(e) Describe the ways in which the human body defends itself against the tuberculosis bacterium.

_____

_____

_____

_____

_____

_____

_____

_____

(4)

(Total 8 marks)

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Q19.

In 2012 scientists genetically modified goats to produce a specific protein in their milk.

The protein is found in the malarial parasite and can be used as a vaccine against malaria.

In the process:

- cells of goats are modified to produce the malarial protein
- the goats are milked
- the protein is removed from the milk
- the protein is purified.

(a) Describe how goat cells are modified so that they can produce the malarial protein.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

(4)

(b) The scientists have only modified female goat cells.

Suggest **one** reason why.

_____

_____

(1)

(c) Scientists can clone the genetically modified goats.

Suggest **two** reasons why the scientists clone the goats instead of producing offspring by sexual reproduction.

1. _____

_____

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2. _____

_____

(2)

(d) The protein in the milk has to be extracted and purified before it can be used as a vaccine.

Scientists are improving the process so the protein will work as a vaccine **without** needing to be extracted and purified.

Give **two** possible advantages of producing goat's milk that contains an effective malaria vaccine.

1. _____

_____

2. _____

_____

(2)

(e) Malaria affects many people across the world.

Describe how the white blood cells might respond to an infection of the malaria pathogen.

_____

_____

_____

_____

_____

_____

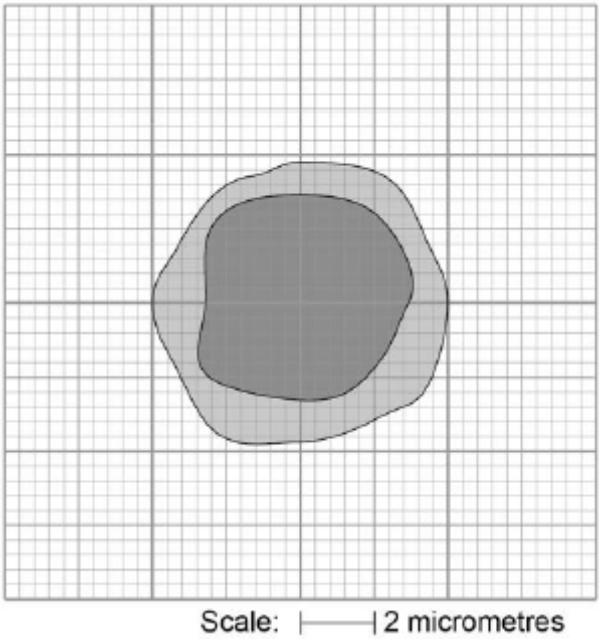
(3)

(Total 12 marks)

Q20.

The figure below shows a scale drawing of one type of cell in blood.

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(a) Use the scale to determine the width of the cell.

Give your answer to the nearest micrometre.

_____

_____

Width of cell = _____ micrometres

(1)

(b) Complete the table below.

Part of the blood	Function
	Carries oxygen around the body
	Protects the body against infection
Plasma	

(3)

(c) Platelets are fragments of cells.

Platelets help the blood to clot.

Suggest what might happen if the blood did **not** clot.

_____

_____

(1)

(Total 5 marks)

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Q21.

Pathogens cause infectious diseases in animals and plants.

(a) Draw **one** line from each disease to the type of pathogen that causes the disease.

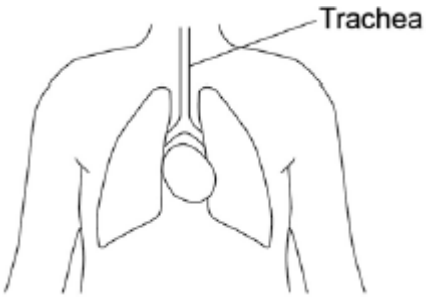
Disease	Type of pathogen
Gonorrhoea	Bacterium
Malaria	Fungus
Measles	Protist
	Virus

(3)

(b) Some parts of the human body have adaptations to reduce the entry of live pathogens.

Look at **Figure 1**.

Figure 1



Explain how the trachea is adapted to reduce the entry of live pathogens.

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(4)

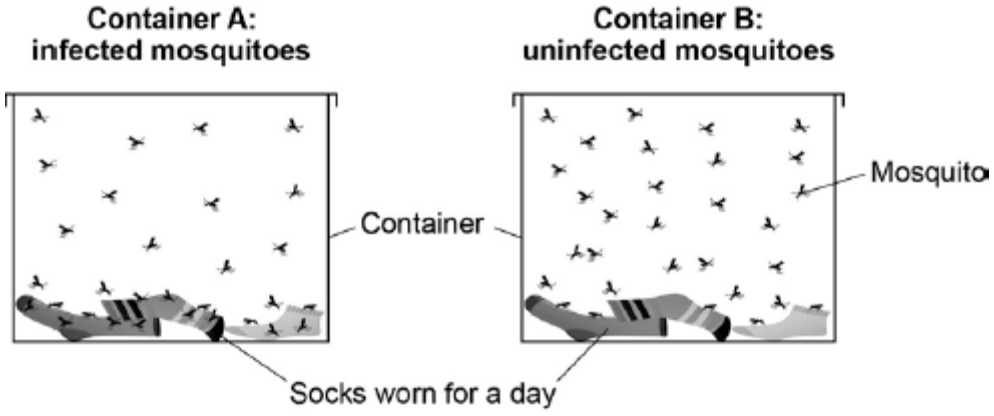
(c) Malaria is a serious disease that can be fatal.

Malaria is spread to humans by infected mosquitoes.

Scientists investigated the behaviour of mosquitoes to understand how the spread of malaria could be controlled.

Figure 2 shows the equipment the scientists used.

Figure 2



This is the method used.

1. 30 mosquitoes **infected with malaria** were placed in Container **A**.

2. 30 **uninfected** mosquitoes were placed in Container **B**.

3. The total number of times the mosquitoes landed on the socks was recorded.

Name the dependent variable and suggest **one** control variable in this investigation.

Dependent variable _____

_____

Control variable _____

_____

(2)

(d) Infected mosquitoes landed on the socks three times more often than uninfected mosquitoes.

Explain how this information can be used to reduce the spread of malaria.

_____

_____

_____

_____

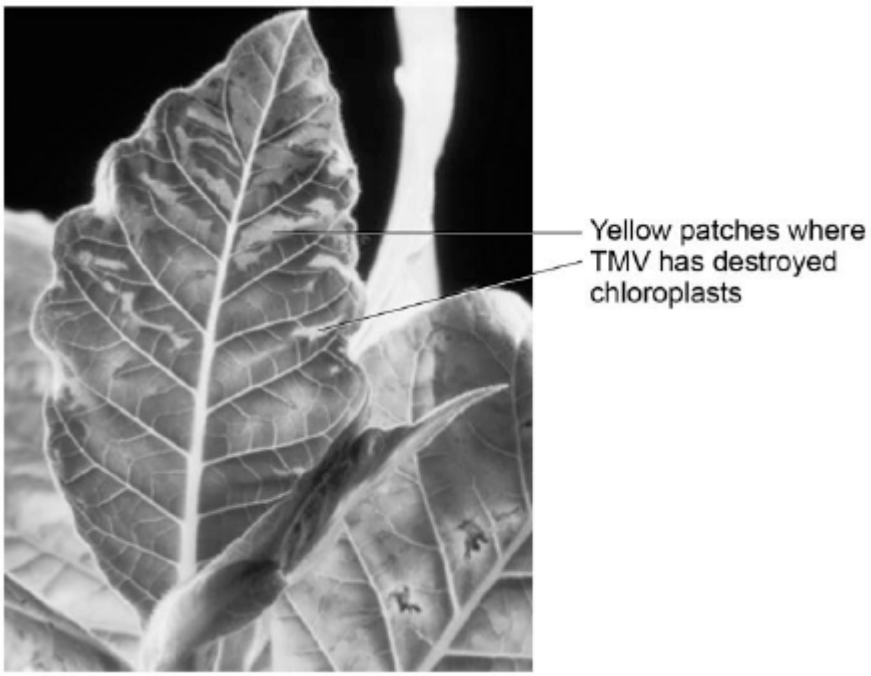
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(2)

(e) Tobacco mosaic virus (TMV) affects many species of plant.

Figure 3 shows a leaf infected with TMV.

Figure 3



© Nigel Cattlin/Getty Images

TMV destroys chloroplasts in the leaf.

Explain how this could affect the growth of the plant.

_____

_____

_____

_____

_____

_____

(3)

(Total 14 marks)

Q22.

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

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- no vaccines to prevent infection.

(a) By March 2015 there were an estimated 9850 deaths worldwide from EVD.

The number of deaths is an estimate.

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

_____

_____

(1)

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

_____

_____

_____

(1)

(c) After the outbreak began, drug companies started to develop drugs and vaccines for EVD.

A drug has to be thoroughly tested and trialled before it is licensed for use.

Testing, trialling and licensing new drugs usually takes several years.

Draw **one** line from each word about drug testing to the definition of the word.

Word about drug testing	**Definition**
Dose	Side effects making the person ill
Efficacy	The concentration of the drug to be used and how often the drug should be given
Toxicity	Whether the drug works to treat the illness

(2)

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

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

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

_____

_____

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(1)
(Total 5 marks)

Q23.

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.

_____

_____

(1)

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

_____

_____

_____

(1)

(c) After the outbreak began, drug companies started to develop drugs and vaccines for EVD.

A drug has to be thoroughly tested and trialled before it is licensed for use.

Testing, trialling and licensing new drugs usually takes several years.

Draw **one** line from each word about drug testing to the definition of the word.

Word about drug testing	**Definition**
Dose	Side effects making the person ill
Efficacy	The concentration of the drug to be used and how often the drug should be given
Toxicity	Whether the drug works to treat the illness

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(2)

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

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

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

_____

_____

(1)

(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?

_____

_____

_____

_____

(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)

Q24.

Pathogens are microorganisms that cause infectious disease.

(a) Draw **one** line from each disease to the way the disease is spread.

Disease	Way the disease is spread
	Animals that draw blood
Cholera	Drinking contaminated water
Cold	Droplets in the air when people cough or sneeze
Malaria	Eating food that is contaminated
	Breathing air polluted with carbon dioxide

(3)

(b) One way the human body protects itself against the entry of pathogens is by producing antimicrobial chemicals.

Antimicrobial chemicals kill pathogens.

Give **two** other ways the human body protects itself against the **entry** of pathogens.

1. _____

_____

2. _____

_____

(2)

(c) Measles is a childhood disease caused by a microorganism.

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Measles is **not** treated by antibiotics.

Give the reason why.

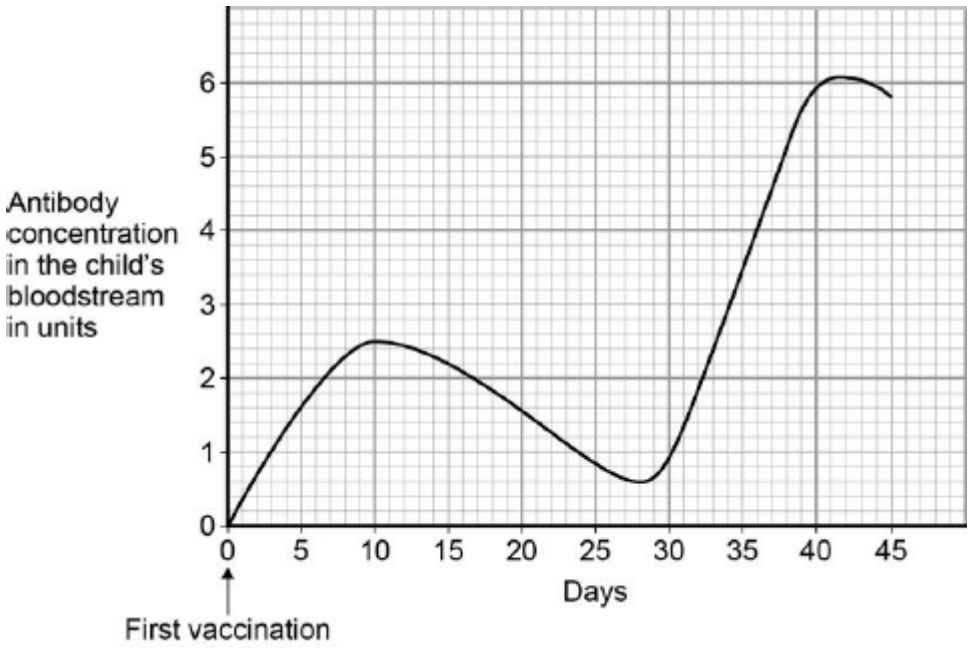
_____

(1)

(d) Vaccinations help people become immune to infections.

In 2013, 92% of children in the UK had two vaccination injections against measles.

The figure below shows how the concentration of antibodies in the blood changes after each measles vaccination.



Suggest what day the second vaccination was given.

_____

(1)

(e) What is the highest concentration of antibodies produced by the first vaccination?

_____

(1)

(f) How will the number of children getting measles change as more children are vaccinated against measles?

Give a reason for your answer.

Change _____

_

Reason _____

_____

(2)

(Total 10 marks)

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Q79.

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: _____

_____

_____

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Reason: _____

_____

_____

(2)

(Total 4 marks)

Q80.

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)

Q81.

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.

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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)

Q82.

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)

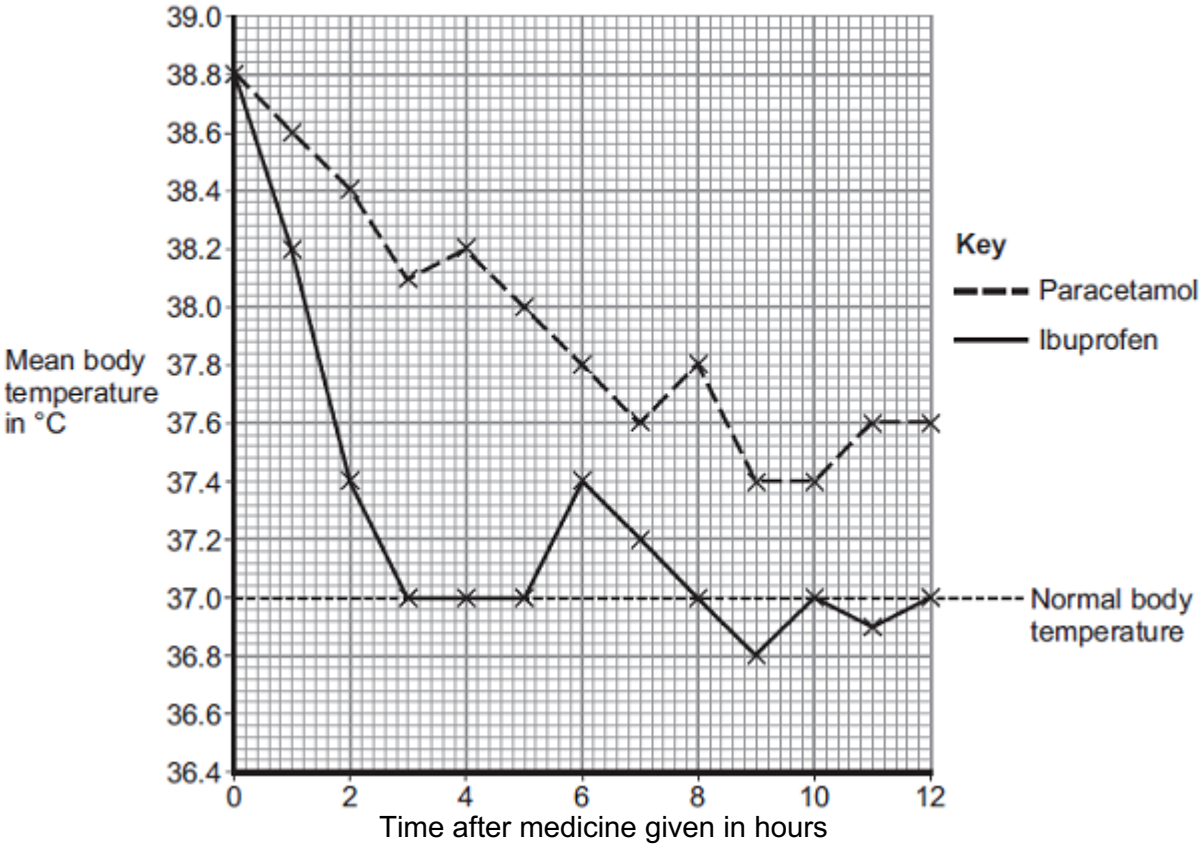
(b) The children's body temperatures were measured before any medicine was given

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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)

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Q83.

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.

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_____

(1)

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

_____

_____

(1)

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

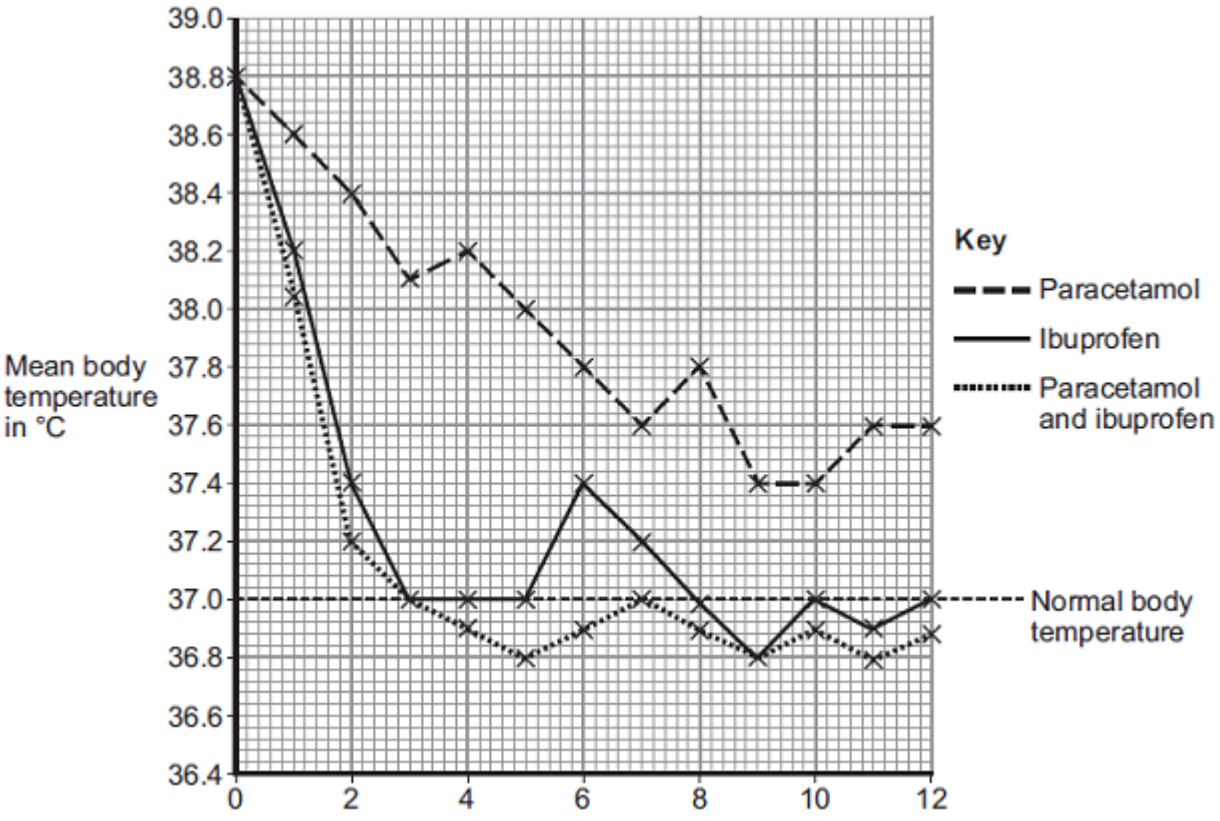
_____

_____

(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)

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(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)

Q84.

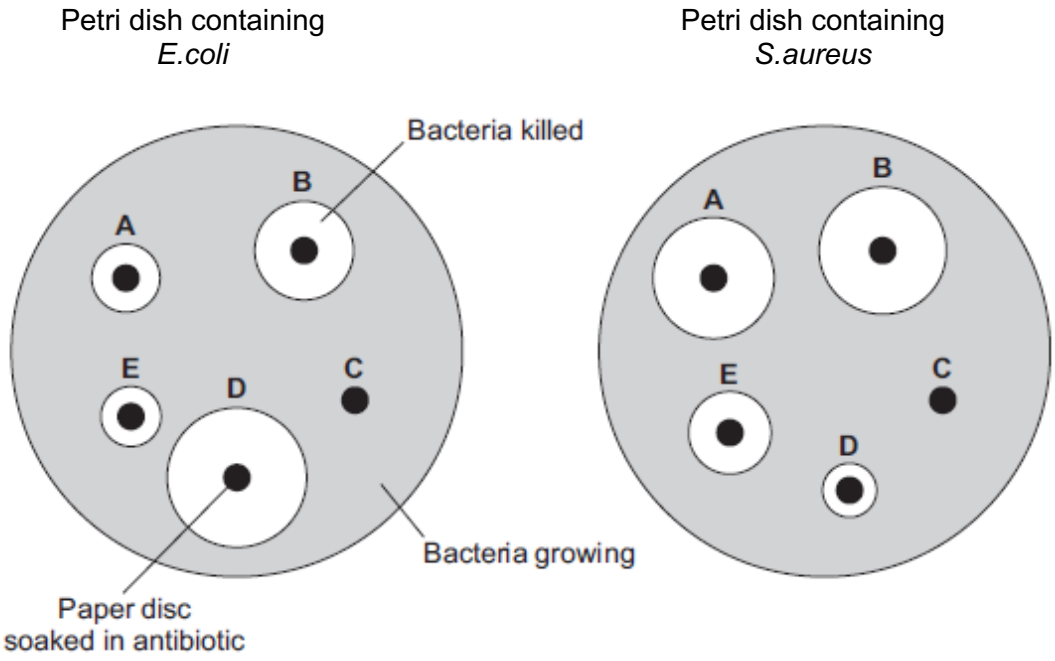
A scientist investigated how effective 5 different antibiotics were at killing two types of bacteria, *E.coli* and *S.aureus*.

- 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.

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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.

_____

_____

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_____

(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)

Q85.

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.

_____

_____

_____

_____

_____

_____

_____

_____

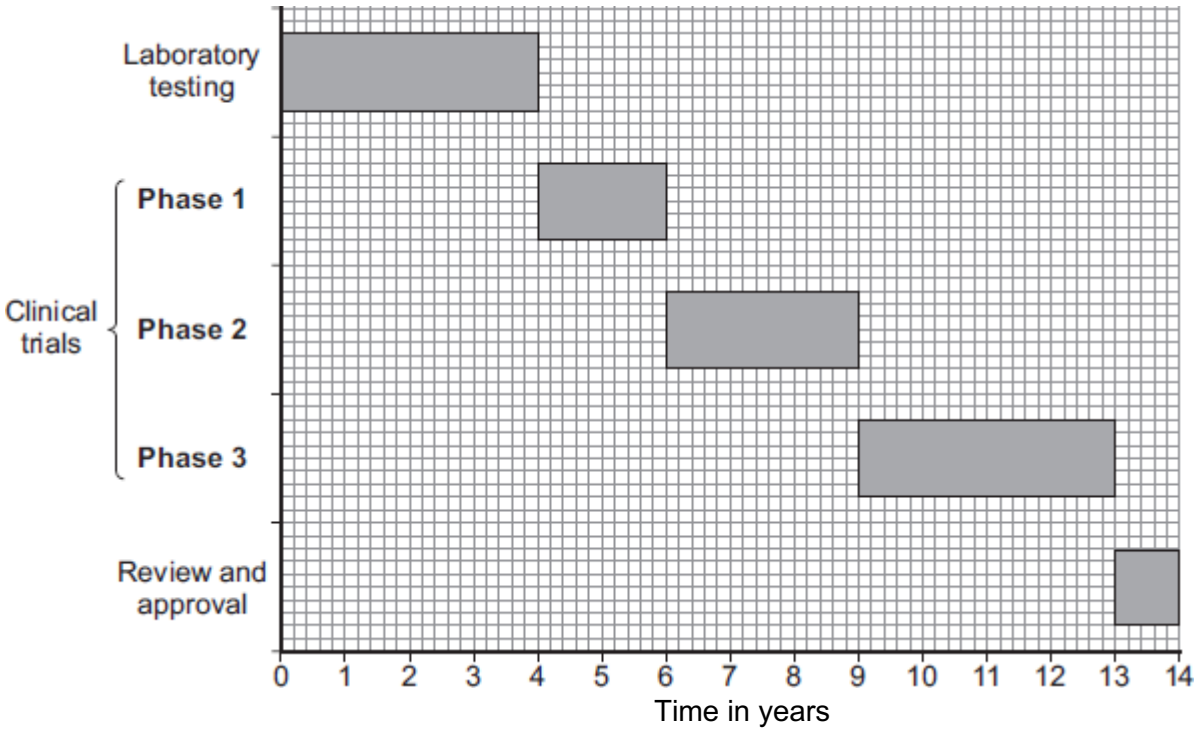
(Total 4 marks)

Q86.

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.

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(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.

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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)

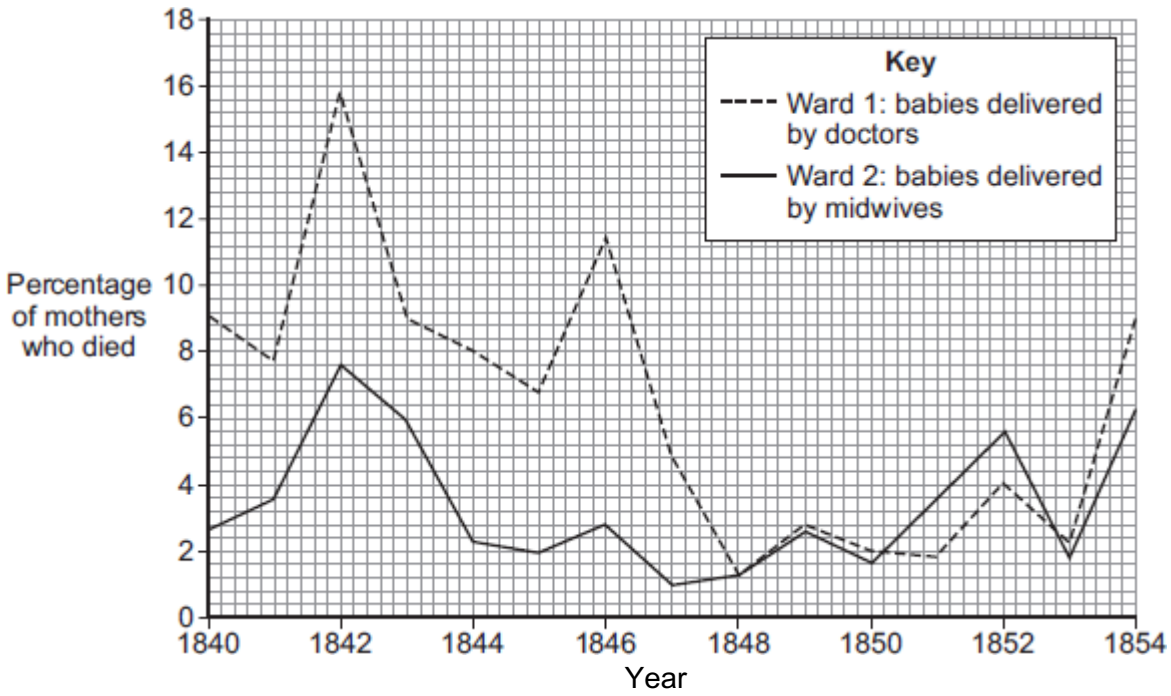
Q87.

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?

_____

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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)

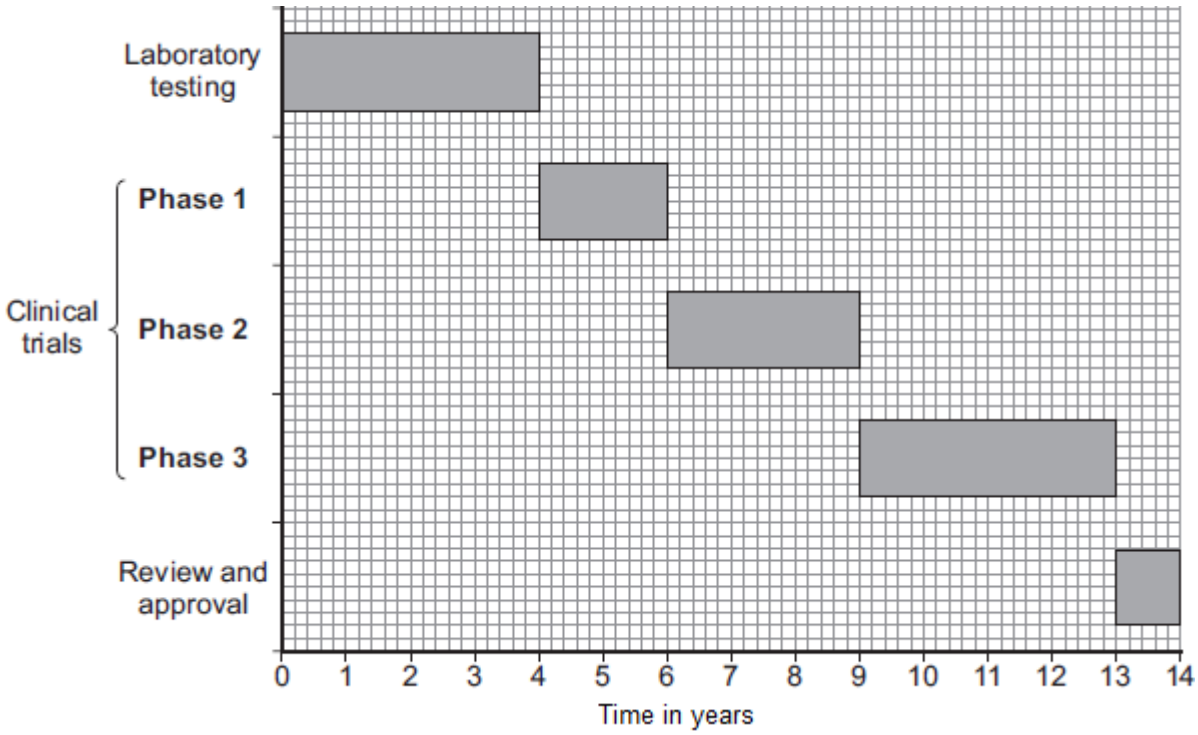
(Total 5 marks)

Q88.

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.

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(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

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practice.

_____

_____

_____

_____

_____

_____

(3)

(Total 7 marks)

Q89.

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?

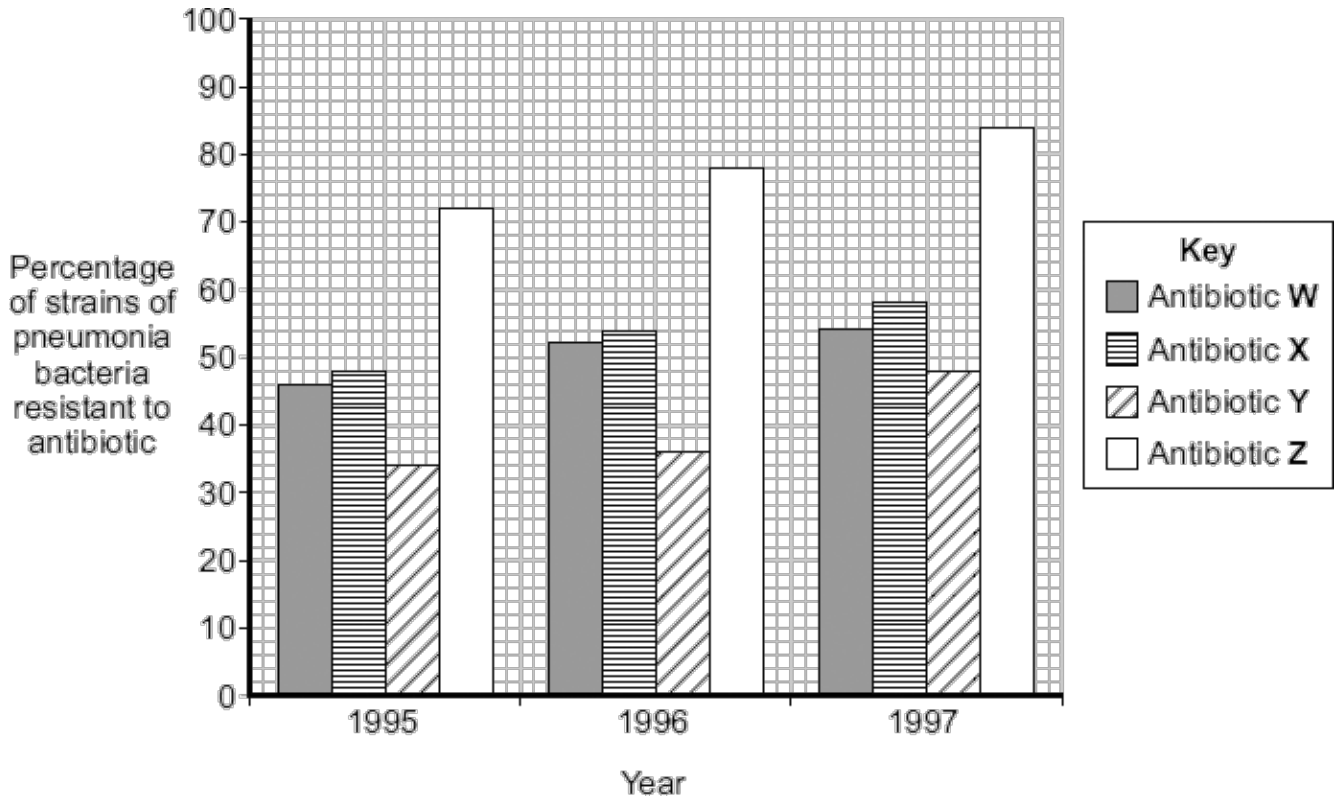
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_____

(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. _____

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2. _____

(2)

(Total 9 marks)

Q90.

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

(a) What does a vaccine contain?

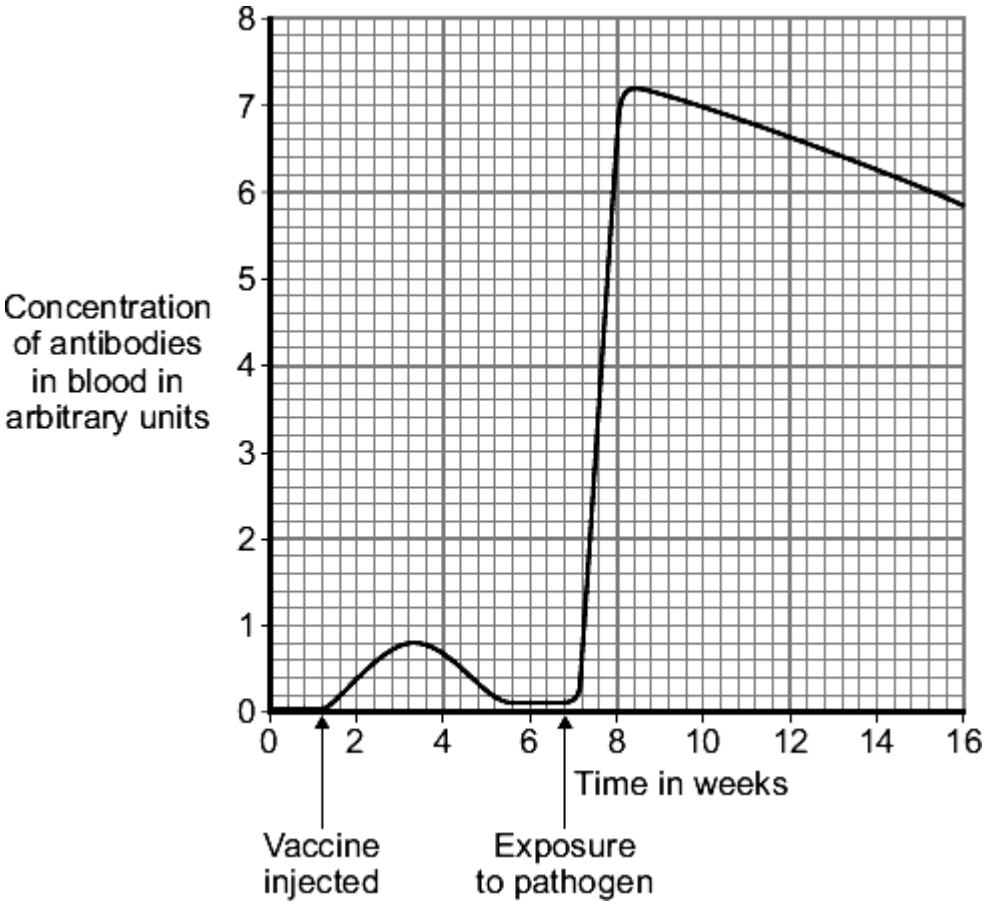
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_____

(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.

_____

_____

_____

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(3)

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

(3)

(Total 7 marks)

Q91.

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

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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)

Q92.

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.

_____

_____

_____

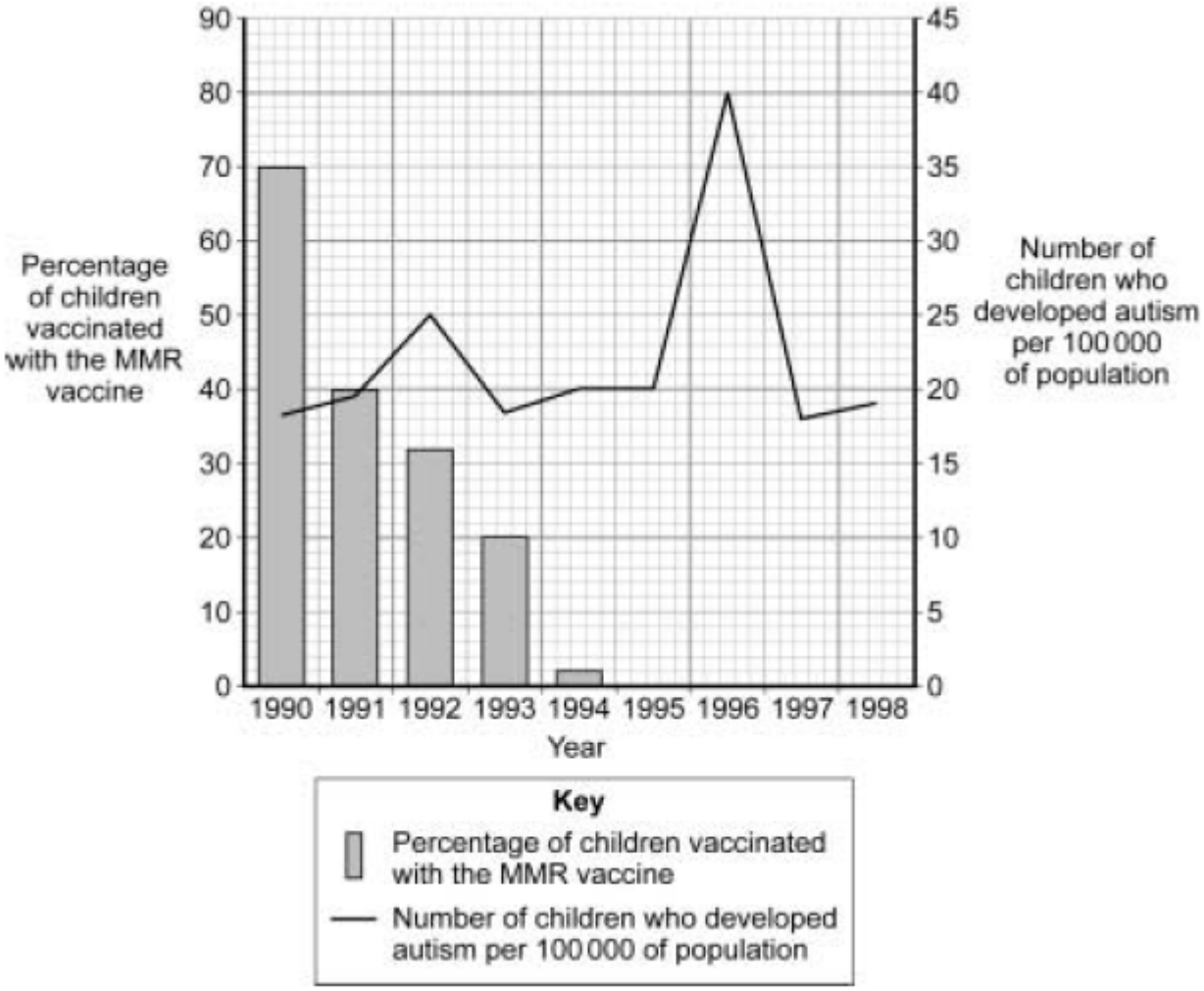
_____

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(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.

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_____

_____

_____

_____

(4)

(Total 7 marks)

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