Q1.

Viruses cause disease.

(a) What name is given to microorganisms that cause disease?

Tick (✓) one box.

Pathogens	☐
Predators	☐
Prokaryotes	☐

(1)

(b) How do viruses cause the symptoms of disease?

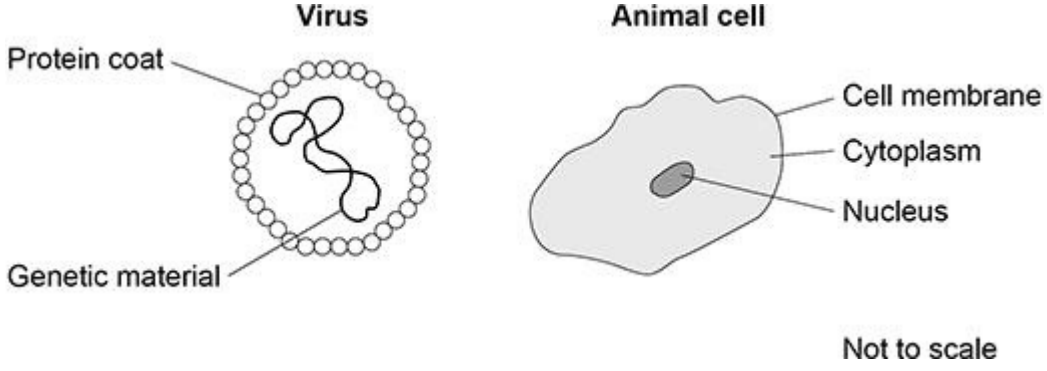
Tick (✓) one box.

Viruses engulf white blood cells, destroying them.	☐
Viruses produce antibodies that damage tissues.	☐
Viruses reproduce inside cells, damaging them.	☐

(1)

Figure 1 shows a virus and an animal cell.

Figure 1



(c) Suggest one reason why viruses are not classed as cells.

_____

_____

(1)

A vaccine can protect humans from a viral disease.

(d) What does the vaccine contain?

Tick (✓) one box.

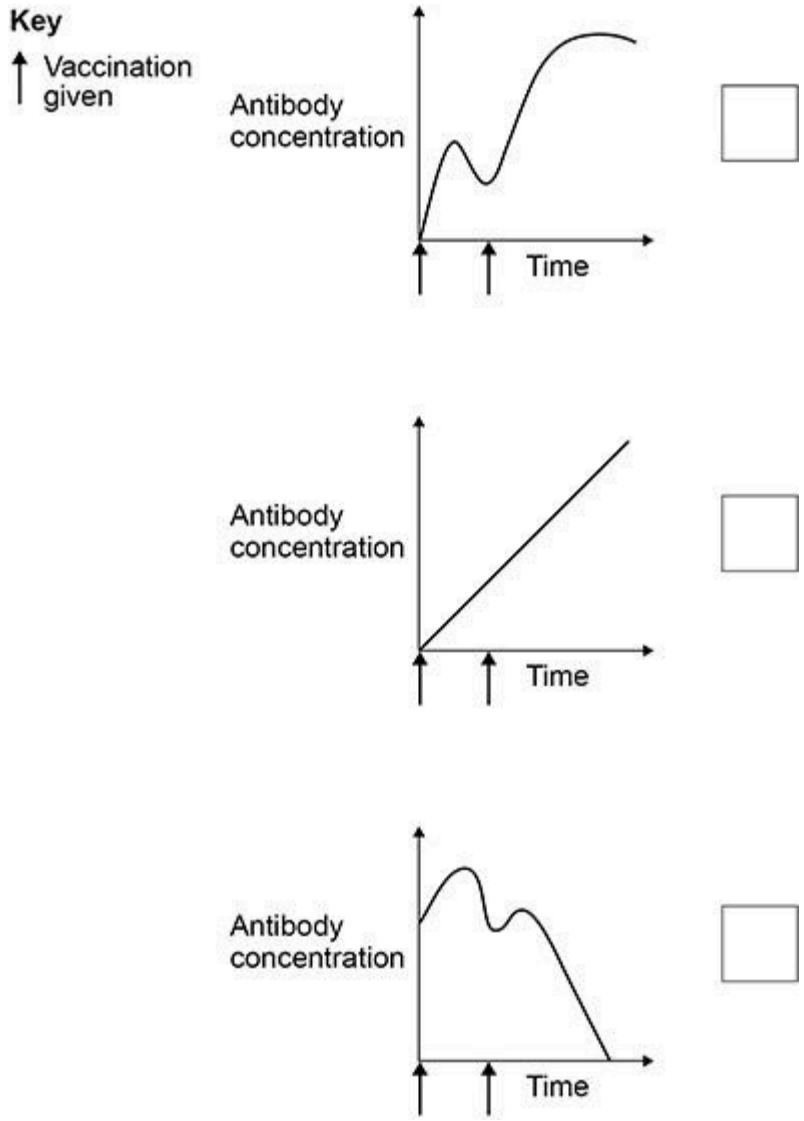
A toxic form of a virus	☐
A weakened form of a virus	☐
An active form of a virus	☐

(1)

In some cases, a first vaccination needs to be followed by a second vaccination sometime later.

(e) Which graph shows how the concentration of antibodies in a person's blood changes after the first and second vaccinations?

Tick (✓) one box.



(1)

Tobacco mosaic virus (TMV) causes disease in plants.

TMV affects the rate of photosynthesis in plants.

(f) Which part of a plant shows discolouration caused by TMV?

Tick (✓) one box.

Flower ☐

Leaf ☐

Root ☐

(1)

The table below shows the rate of photosynthesis in four different tobacco plants.

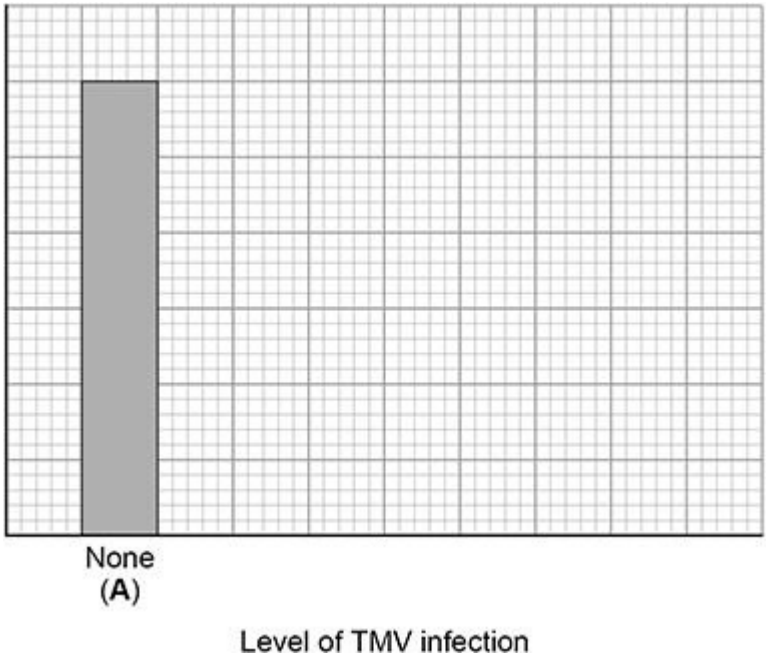
Tobacco plant	Level of TMV infection in plant	Rate of photosynthesis in arbitrary units
A	None	15
B	Mild	13
C	Medium	7
D	High	3

(g) Complete Figure 2.

You should:

- label the y-axis
- add the correct scale to the y-axis
- plot the data from the table above
- label each bar.

Figure 2



(5)

(h) What conclusion can be made from the data in the table above?

_____

_____

(1)

(i) Explain why a high level of TMV infection reduces growth in a plant.

_____

_____

_____

_____

(2)

(Total 14 marks)

Q2.

The human body can defend itself against microorganisms that cause disease.

Viruses are one type of microorganism that cause disease.

(a) Name one type of microorganism that causes disease in humans.

Do not refer to viruses in your answer.

_____

(1)

(b) Which two defence systems prevent microorganisms infecting the human body?

Tick (✓) two boxes.

Air is warmed as it is breathed into the lungs.	☐
Hairs on the skin trap microorganisms.	☐
Hydrochloric acid is produced by the stomach.	☐
Teeth in the mouth crush and kill microorganisms.	☐
The skin is a barrier covering the whole body.	☐

(2)

(c) If microorganisms enter the human body the immune system can destroy the microorganisms.

How does the immune system destroy microorganisms?

Tick (✓) one box.

Platelets kill the microorganisms. ☐

Red blood cells stick to the microorganisms. ☐

White blood cells engulf the microorganisms. ☐

(1)

(d) Vaccinations prevent people becoming ill with diseases such as measles.

Complete the sentences.

Choose answers from the box.

active	fast	resistant	slow	weakened

In a vaccine the measles virus is _____.

If the measles virus enters the body after vaccination the immune system reaction

will be _____.

(2)

(e) How is the measles virus spread from one person to another?

_____

_____

(1)

Doctors investigated the spread of the virus that causes chickenpox.

The first symptom of chickenpox after exposure to the virus is spots on the body.

23 children were playing together at a party.

On the day of the party one of the children developed chickenpox spots.

Every two days after the party, the doctors recorded when the other 22 children first showed chickenpox spots.
The table below shows the results.

Day when chickenpox spots first showed	Number of children
2	0
4	0

6	0
8	0
10	1
12	1
14	6
16	4
18	2
20	0
Total	14

(f) What was the range for the days on which children first showed chickenpox spots?

Use the table above.

From day _____ to day _____

(1)

(g) Incubation time is the usual time from exposure to a pathogen until the first symptoms appear.

Suggest the most likely incubation time for chickenpox.

Incubation time = _____ days

(1)

(h) Suggest one reason why some of the children did not develop chickenpox.

_____

_____

(1)

(i) One mother gave antibiotics to her child who had chickenpox.

Suggest why this child did not recover more quickly than the other children who had chickenpox.

_____

_____

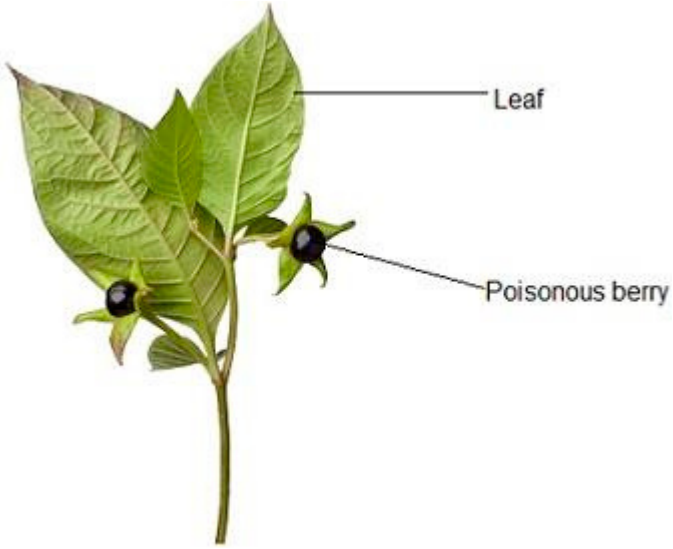
(1)

(Total 11 marks)

Q3.

Figure 1 shows part of a deadly nightshade plant.

Figure 1



(a) How will the poisonous berries help the deadly nightshade plant to survive?

_____

_____

(1)

(b) Which type of defence mechanism are the berries?

Tick (✓) one box.

Chemical ☐

Mechanical ☐

Physical ☐

(1)

Figure 2 shows part of a gorse plant.

Figure 2

(c) Suggest how the gorse plant is adapted to defend itself.

_____

_____

(1)

(d) The green leaves of the gorse plant make glucose for the plant to use.

What are two uses of glucose in the gorse plant?

Tick (✓) two boxes.

- For defence ☐
- For respiration ☐
- To absorb water ☐
- To release minerals ☐
- To store as starch ☐

(2)

(e) A student wanted to show that the leaves of a gorse plant contain glucose.

The student crushed the leaves to extract the liquid from the cells.

Describe the method the student could use to test the liquid from the cells for glucose.
Include the result if glucose is present.

_____

_____

_____

_____

_____

_____

(3)

(f) The roots of the gorse plant have bacteria that turn nitrogen gas into nitrate ions.

Explain why nitrate ions are needed by the gorse plant.

_____

_____

_____

_____

(2)

(g) The roots of gorse plants can be infected by honey fungus.

The honey fungus produces tiny spores underground. Suggest how the honey fungus spores travel from the roots of an infected gorse plant to the roots of a healthy gorse plant.

_____

_____

(1)

A drug can be extracted from gorse seeds.

Doctors want to trial the drug from gorse seeds to see if it can treat diarrhoea.

(h) Which two factors must the doctors test the drug for in the trial?

Tick (✓) two boxes.

- Appearance ☐
- Dosage ☐
- Solubility ☐
- Taste ☐

Toxicity ☐

(2)

(i) In the trial some patients will take tablets made from gorse seeds and some patients will take tablets made from sugar.

What are the tablets made from sugar called?

Tick (✓) one box.

Antibiotics ☐

Antibodies ☐

Painkillers ☐

Placebos ☐

(1)

(Total 14 marks)

Q4.

Mosquitoes carry a pathogen that causes malaria.

(a) What type of pathogen causes malaria?

Tick (✓) one box.

A bacterium ☐

A fungus ☐

A protist ☐

A virus ☐

(1)

Mosquito nets can help prevent the spread of malaria.

Table 1 shows the results of a study in one area of Africa.

Table 1

Total number of people in the study	Number of people who use mosquito nets when sleeping	Percentage of people with malaria	
		Who use mosquito nets when sleeping	Who do NOT use mosquito nets when sleeping
476	426	1.2	40

A newspaper made the following statement:

> 'Study shows mosquito nets are scientifically proven to prevent malaria.'

(b) Give one piece of evidence that supports the statement.

_____

_____

(1)

(c) Suggest one reason why the statement may not be valid.

_____

_____

(1)

Table 2 shows information about the number of deaths from malaria in the same area of Africa.

Table 2

Year	Number of deaths from malaria per 100 000 people
2005	161
2007	136
2009	114
2011	97
2013	94
2015	92

(d) Predict the number of people per 100 000 who died from malaria in 2017 if the trend stayed the same.

_____

_____

Number of people per 100 000 =_____

(1)

(e) Use of mosquito nets has helped to reduce the number of deaths from malaria each year.

Suggest one other reason for the reduced number of deaths from malaria each year.

_____

_____

(1)

(f) Describe how the human body:

- prevents pathogens from entering
- defends itself against pathogens inside the body.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

(6)

(Total 11 marks)

Q5.

A man has the following symptoms:

- yellow discharge from his penis
- pain when urinating.

(a) The man has a bacterial infection.

What is the most likely cause of the man's symptoms?

Tick (✓) one box.

Gonorrhoea ☐

HIV ☐

Measles ☐

Salmonella poisoning ☐

(1)

(b) The man took a full course of antibiotics.

The man's symptoms did not improve.

Why did the antibiotics not cure the symptoms?

Tick (✓) one box.

The bacteria are immune to the antibiotics. ☐

The bacteria are resistant to the antibiotics. ☐

The man is immune to the antibiotics. ☐

The man is resistant to the antibiotics. ☐

(1)

(c) Using a condom can stop the bacteria being passed to another person during sexual intercourse.

Suggest a different way the man could avoid passing the bacteria on to someone else.

_____

_____

(1)

A scientist investigated the effect of three different antibiotics on three different types of bacteria, A, B and C.

This is the method used.

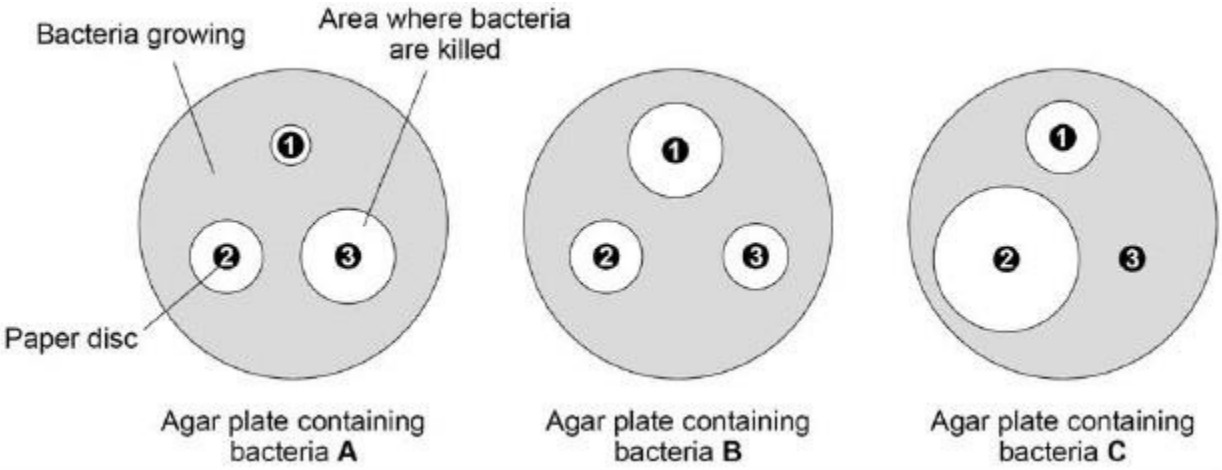
1. Grow bacteria A on an agar plate.

2. Put three separate paper discs each containing one of the antibiotics (1, 2 and 3) onto the agar plate
3. Put the agar plate into an incubator for 48 hours.

4. Repeat steps 1-3 for bacteria B and for bacteria C.

Figure 1 shows the scientist's results.

Figure 1



(d) Compare the effectiveness of the three antibiotics at killing the different types of bacteria.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

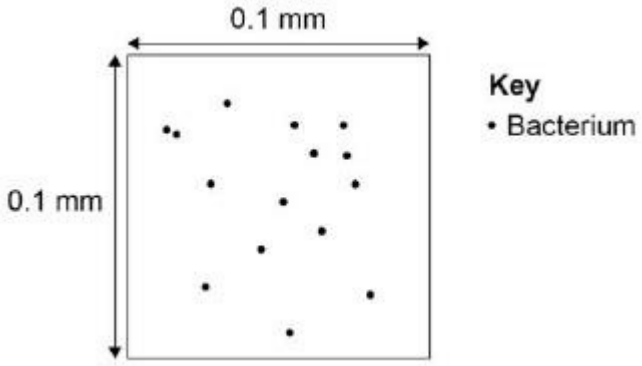
_____

(6)

Milk contains bacteria.

A small volume of raw milk was placed in a counting chamber in a special type of microscope slide.
Figure 2 shows what the counting chamber looked like when viewed using a microscope.

Figure 2



A scientist counted the number of bacteria in four samples of raw milk.

Table 1 shows the results.

Table 1

Milk sample	Number of bacteria in counting chamber
E	15
F	12
G	13
H	16

(e) Which milk sample is shown in Figure 2 ?

Tick (✓) one box.

Sample E ☐

Sample F ☐

Sample G ☐

Sample H ☐

(1)

(f) Calculate the mean number of bacteria in the four samples in Table 1.

_____

_____

_____

Mean number of bacteria = _____

(2)

(g) Calculate the mean number of bacteria per mm3 of milk in the samples.

Complete the following steps. Calculate the total area of the counting chamber in Figure 2.

_____

_____

Total area of counting chamber = _____ mm2

The depth of the counting chamber is 0.01 mm

Calculate the volume of the counting chamber in Figure 2.

Use the equation:

volume = area × depth

_____

Volume of counting chamber = _____ mm3

Calculate the mean number of bacteria per mm3 of milk in the samples.

Use the equation:

$$\text{mean number of bacteria per mm}^3\text{ of milk} = \frac{\text{mean number of bacteria from part (f)}}{\text{volume of counting chamber}}$$

_____

_____

Mean number of bacteria per mm3 of milk = _____

Milk is heated to reduce the number of bacteria it contains before it is sold for humans to drink.

Milk with more than 20 000 bacteria per cm3 cannot be sold for humans to drink.

Table 2 shows the number of bacteria per cm3 in four different samples of milk.

Table 2

Milk sample	Number of bacteria per cm3 of milk
P	1.8 × 104
Q	2.2 × 104
R	2.2 × 10−5
S	1.8 × 103

(3)

(h) Which of the milk samples could not be sold for humans to drink?

Tick (✓) one box.

P ☐ Q ☐ R ☐ S ☐

(1)

(i) Why should milk sold for humans to drink not contain large numbers of bacteria?

_____

_____

(1)

(Total 17 marks)

Q6.

Eating food containing *Salmonella* bacteria can cause illness.

(a) Two symptoms of infection by *Salmonella* are vomiting and diarrhoea. What causes these symptoms?

_____

_____

(1)

(b) Give two ways a person with a mild infection of *Salmonella* can help prevent the spread of the bacteria to other people.

1.

_____

_____

2.

_____

_____

(2)

(c) In very serious infections of *Salmonella*, a doctor can prescribe drugs to kill the bacteria.

What type of drug can the doctor prescribe to kill the bacteria?

_____

_____

(1)

(d) A person with AIDS may take longer than a healthy person to recover from a *Salmonella* infection.

Explain why.

_____

_____

_____

_____

(2)

(e) *Salmonella* bacteria can be transmitted from chickens to humans. Chickens can be vaccinated to prevent the transmission of *Salmonella* bacteria to humans.

Suggest one other way farmers could prevent the transmission of *Salmonella* from chickens to humans.

_____

_____

(1)

A restaurant owner employed a scientist to test the effectiveness of two kitchen cleaning liquids.

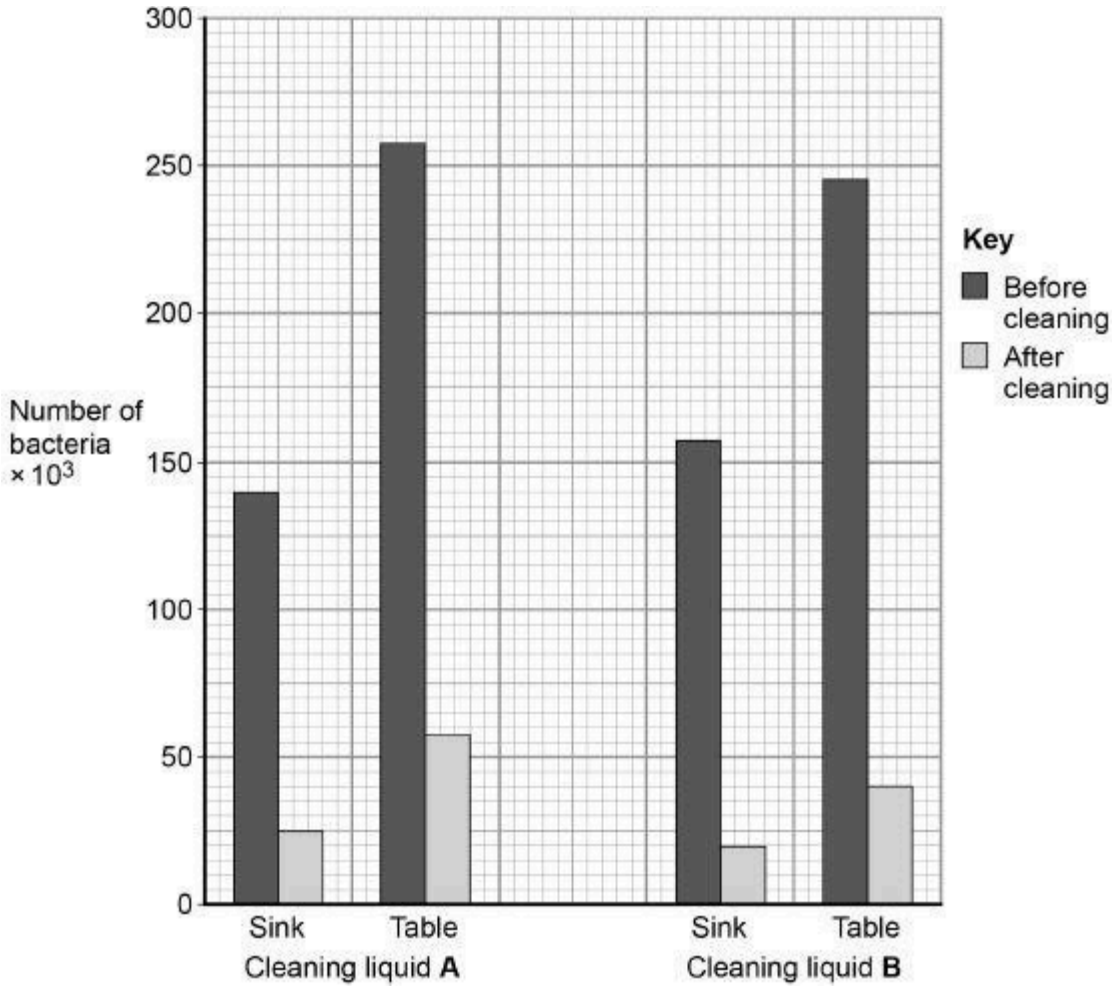
The scientist took samples from two work surfaces:

- before the surfaces had been cleaned with the cleaning liquids
- after the surfaces had been cleaned with the cleaning liquids.

The samples were then analysed for the number of bacteria they contained.

The results are shown in Figure 1 .

Figure 1



(f) Which cleaning liquid is the more effective?

Give a reason for your answer. Cleaning liquid _____ Reason

_____

_____

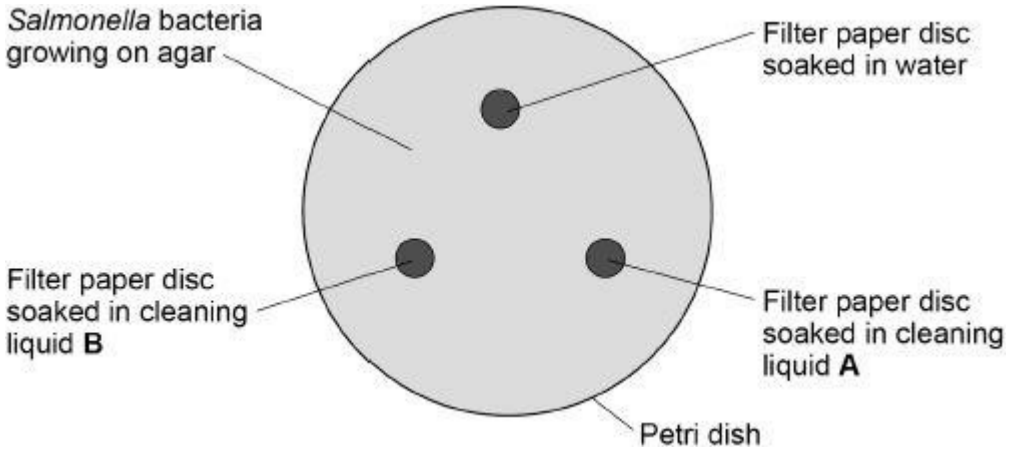
_____

(1)

The scientist investigated the effect of cleaning liquid A and cleaning liquid B on *Salmonella* bacteria grown in a laboratory.

Figure 2 shows the way the investigation was set up.

Figure 2



The Petri dish was placed in an incubator at 25 °C for 48 hours.

After 48 hours, the scientist calculated the area around each paper disc where no bacteria were growing.
The results are shown in the table below.

Filter paper disc	Area around disc with no bacteria growing in cm2
Water Cleaning	0
liquid A Cleaning	11
liquid B	13

(g) What measurement would the scientist need to take to calculate the area where no bacteria were growing?

_____

_____

(1)

(h) Give one change to the investigation that would allow the scientist to check if the results are repeatable.

_____

_____

(1)

(i) The scientist showed the results to the restaurant owner.

Both cleaning liquids cost the same per dm3.

Suggest one other factor the restaurant owner should consider when choosing which cleaning liquid to use.

_____

_____

(1)

(Total 11 marks)

Q7.

Many diseases can be treated using drugs.

(a) Which type of pathogen can be killed by antibiotics?

Tick one box.

Bacteria ☐

Fungi ☐

Protists ☐

Viruses ☐

(1)

(b) Some drugs were originally extracted from living organisms.

Draw one line from each drug to the organism it was originally extracted from.

Drug	Organism the drug was originally extracted from
Aspirin	A mould
Digitalis	A virus
	Foxglove
	Rose
	Willow Tree

(2)

(c) New drugs must be tested before they can be used. Give one reason why drugs should be tested.

_____

_____

(1)

(d) Doctors have developed a new drug.
The new drug has been tested on live animals.

What is the next stage in testing the new drug?

Tick one box.

Testing on animal tissues in a laboratory	☐
Testing on healthy volunteers	☐
Testing on patients with the disease	☐
Testing on the whole human population	☐

(1)

(e) Vaccination can be used to prevent an illness in a person. Explain how a vaccination can prevent an illness.

_____

_____

_____

_____

_____

_____

_____

_____

(4)

(Total 9 marks)

Q8.

Rose black spot is a disease of roses.

(a) What type of microorganism causes rose black spot?

Tick one box.

A bacterium ☐

A fungus ☐

A protist ☐

A virus ☐

(1)

(b) Explain how different types of organism defend themselves against microorganisms.

_____

_____

_____

_____

_____

_____

_____

_____

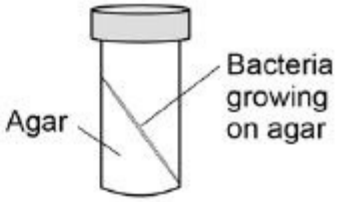
(6)

(c) A student tried to grow some bacteria in the laboratory.

The diagram shows some of the apparatus used.

Inoculating loop

Petri dish containing agar



Bottle containing the bacteria

This is the method used.

1. Remove the lid of the Petri dish.
2. Remove the lid of the bottle containing the bacteria.
3. Use the inoculating loop to remove some of the bacteria from the bottle.
4. Spread the bacteria over the agar using the inoculating loop.
5. Put the lid back on the Petri dish.
6. Put the Petri dish into an incubator at 25 °C for 24 hours.

Steps 1–5 could cause the sample of the bacteria on the petri dish to be contaminated.
Give three improvements to the method to prevent contamination.

1.
_____
_____

2.
_____
_____

3.
_____
_____

(3)

(d) Why did the student grow the bacteria at 25 °C rather than at 40 °C?

Tick one box.

So the bacteria grew more quickly ☐

So the bacteria grew more slowly ☐

To prevent the growth of a harmful pathogen ☐

To save money ☐

(1)

(Total 11 marks)

Q9.

A virus called RSV causes severe respiratory disease.

(a) Suggest two precautions that a person with RSV could take to reduce the spread of the virus to other people.

1.

_____

_____

2.

_____

_____

(2)

(b) One treatment for RSV uses monoclonal antibodies which can be injected into the patient.

Scientists can produce monoclonal antibodies using mice.

The first step is to inject the virus into a mouse.

Describe the remaining steps in the procedure to produce monoclonal antibodies.

_____

_____

_____

_____

_____

_____

_____

_____

(3)

(c) Describe how injecting a monoclonal antibody for RSV helps to treat a patient suffering with the disease.

_____

_____

_____

_____

(2)

A trial was carried out to assess the effectiveness of using monoclonal antibodies to treat patients with RSV.

Some patients were given a placebo.

(d) Why were some patients given a placebo?

_____

_____

(1)

A number of patients had to be admitted to hospital as they became so ill with RSV.

The results are shown in the table below.

Treatment received by patient	% of patients within each group admitted to hospital with RSV
Group A: Monoclonal antibody for RSV	4.8
Group B: Placebo	10.4

The trial involved 1 500 patients.

- Half of the patients (group A) were given the monoclonal antibodies.
- Half of the patients (group B) were given the placebo.

(e) Calculate the total number of patients admitted to hospital with RSV during the trial.

_____

_____

_____

_____

Total number of patients admitted to hospital = _____

(2)

(f) Evaluate how well the data in the table above supports the conclusion:

'monoclonal antibodies are more effective at treating RSV than a placebo'.

_____

_____

_____

_____

(2)

(Total 12 marks)

Q10.

Microorganisms can cause disease.

(a) Draw one line from each disease to the correct description.

HIV	Can be spread by not washing hands thoroughly.
	Can increase the chance of infection such as pneumonia.
Malaria	Part of the life cycle includes an insect.
	spread by cough and sneezes.
Salmonella	Treated with stem cell.
	Treated with fungicides.

(3)

(b) Gonorrhoea is a sexually transmitted disease.

A bacterium causes gonorrhoea.

What are the symptoms of gonorrhoea?

Tick two boxes.

Headache ☐

Pain when urinating ☐

Rash ☐

Vomiting ☐

Yellow discharge ☐

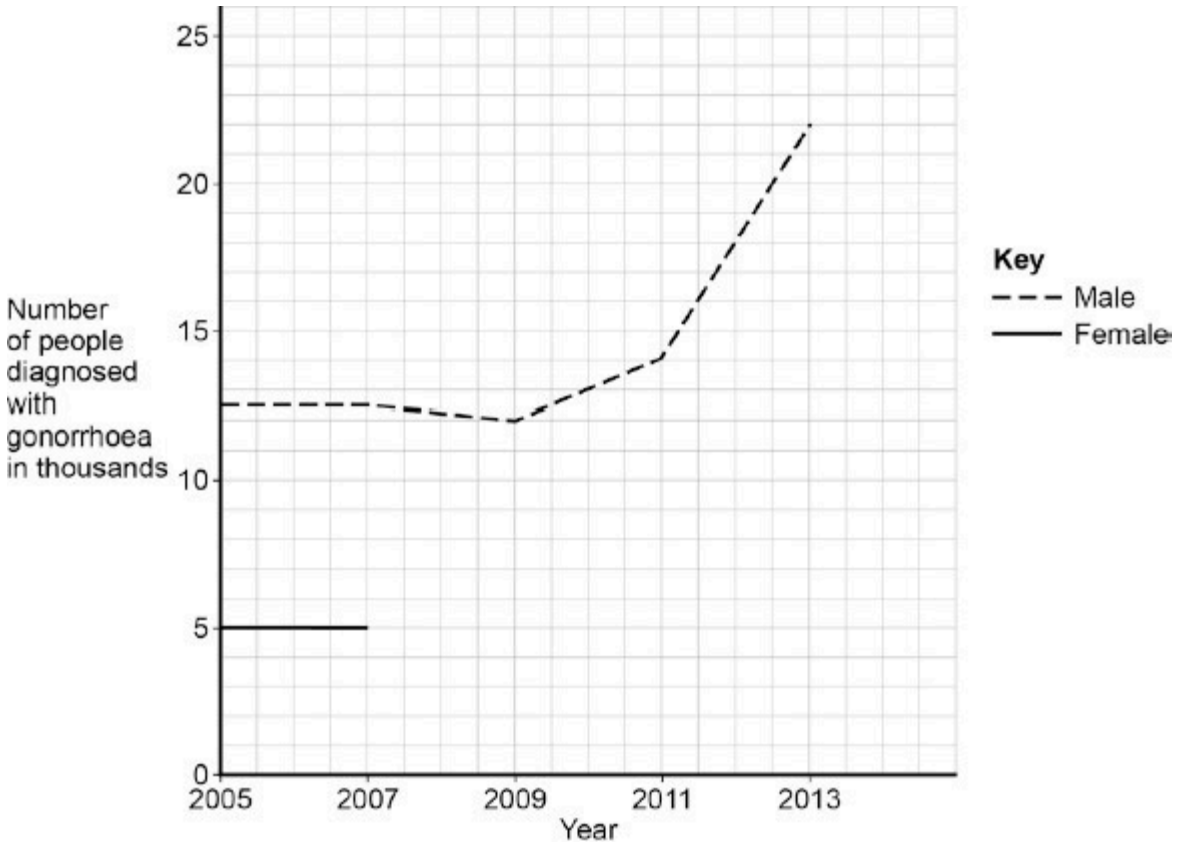
(2)

(c) The table below shows the number of people in the UK diagnosed with gonorrhoea in different years.

	Number of people diagnosed with gonorrhoea in thousands	
Year	Female	Male
2005	5.0	12.5
2007	5.0	12.5
2009	5.5	12.0
2011	6.0	14.0
2013	7.5	22.0

Use the data in the table to complete the graph below.

- The numbers for males have already been plotted.
- Only some of the numbers for females have been plotted.



(3)

(d) Describe the patterns in the numbers of males and females with gonorrhoea from 2005 to 2013.

Use the data in the graph.

_____

_____

_____

_____

_____

(3)

(e) Gonorrhoea is treated with an antibiotic. HIV is another sexually transmitted disease. Explain why prescribing an antibiotic will not cure HIV.

_____

_____

_____

_____

(2)

(Total 13 marks)

Q11.

Microorganisms cause infections.

The human body has many ways of defending itself against microorganisms.

(a) Describe two ways the body prevents the entry of microorganisms. 1.

_____

_____

2.

_____

_____

(2)

(b) In 2014 the Ebola virus killed almost 8000 people in Africa. Drug companies have developed a new drug to treat Ebola. Explain what testing must be done before this new drug can be used to treat people.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

(6)

(Total 8 marks)

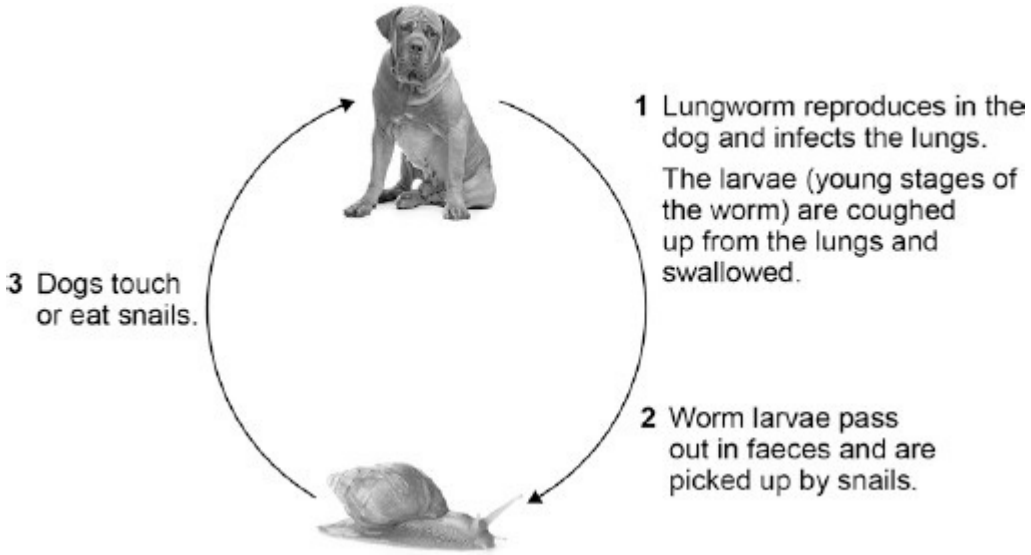
Q12.

Lungworm is an infection.

Lungworm can kill dogs.

It is caused by a small worm.

The diagram below shows the lifecycle of the lungworm.



Dog © Eriklam/iStock/Thinkstock, snail © Karandaev/iStock/Thinkstock

(a) What type of organism is represented by the snail in the lifecycle of the lungworm?

Tick one box.

Fungus ☐

Parasite ☐

Protist ☐

Vector ☐

(1)

(b) Suggest how the spread of the lungworm disease can be prevented.

_____

_____

_____

_____

_____

_____

(3)

(c) Malaria is a disease spread by mosquitoes. Describe two ways to control the spread of malaria. 1.

_____

_____

2.

_____

_____

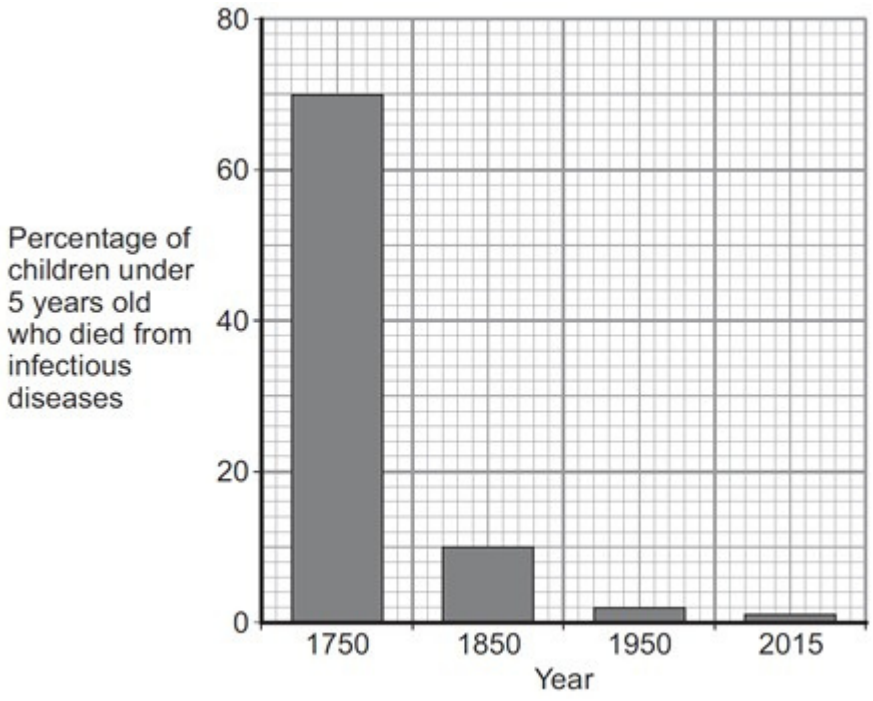
(2)

(Total 6 marks)

Q13.

Pathogens are microorganisms that cause infectious diseases.

(a) The graph shows the percentage of children under 5 years old who died from infectious diseases, in the UK, in four different years.



(i) Between 1750 and 1850 vaccinations were also developed.

What is in a vaccine?

Tick (✓) one box.

large amounts of dead pathogens ☐

large amounts of live pathogens ☐

small amounts of dead pathogens ☐

(1)

(ii) The advances in medicine had an effect on death rate.

Describe the effect these advances had between 1750 and 1850.

To gain full marks you should include data from the graph above.

_____

_____

_____

_____

(2)

(b) Antibiotics were developed in the 1940s. Antibiotics kill bacteria.

(i) Which one of the following is an antibiotic?

Draw a ring around the correct answer.

cholesterol penicillin thalidomide

(1)

(ii) The use of antibiotics has not reduced the death rate due to all diseases to zero.

Suggest two reasons why.

1.

_____

_____

2.

_____

_____

(2)

(c) In school laboratories, bacteria should be grown at a maximum temperature of 25 °C.

Give one reason why companies testing new antibiotics grow bacteria at 37 °C.

_____

_____

(1)

(Total 7 marks)