

4-3 Infection and Response – Biology

1.1 Pathogens are disease causing microorganisms.

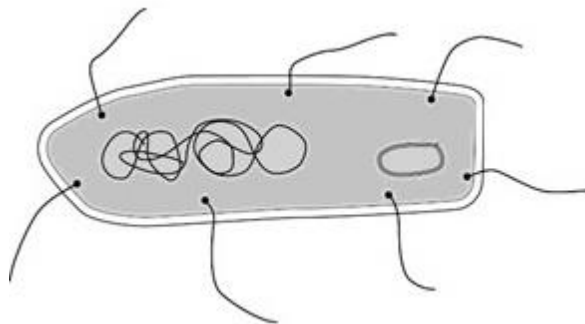
Draw **one** line from each disease to the correct disease-causing microorganism.

[3 marks]

Disease	Microorganism
Measles	Virus
Rose black spot	Bacterium
Salmonella	Fungi
	Protists

Figure 1 shows the image of a bacterial cell.

Figure 1



1.2 Measure the length of the image of the cell in mm.

[1 mark]

Length of image = _____ mm

1.3 The bacterial cell has been magnified 15 000 times.

Calculate the real length of the bacterial cell using your answer in 1.2.

[1 mark]

Real length of cell = _____ μm

1.4 Plants can be infected with pathogens.

Plants are also damaged by ion deficiencies.

Chlorosis (yellow leaves) is caused by an ion deficiency.

Lack of which ion causes chlorosis?

[1 mark]

Tick **one** box.

Chloride

Hydrogen

Magnesium

Nitrate

2.0 Drugs affect the human body.

New drugs must be tested and trialled before being used.

2.1 New drugs are tested in a laboratory before they are trialled on people.

In a laboratory, what are new drugs tested on?

[1 mark]

2.2 Why is it important that drugs are trialled before doctors give them to patients?

[2 marks]

Tick **two** boxes.

To check that the drug works

To check the cost of the drug

To find out if the drug is legal

To find the best dose to use

2.3 In a double blind drug trial, only some people know which patients have been given the drug.

Who knows which patients have been given the drug?

[1 mark]

Tick **one or more** boxes.

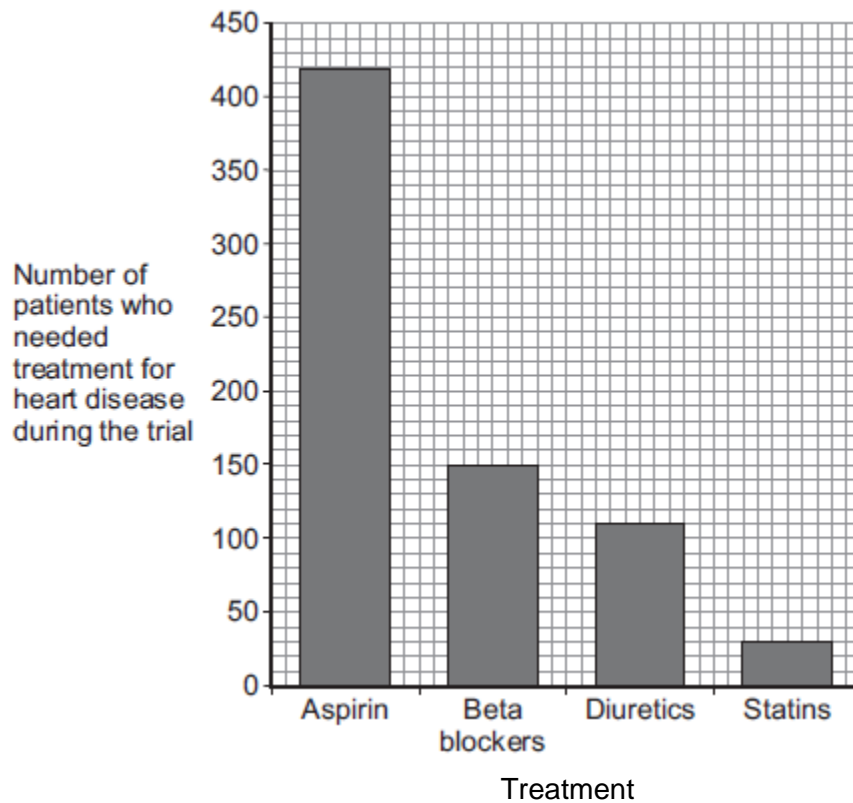
The patient

The doctor

The scientists at the drug company

Doctors trialled four different treatments for reducing the risk of heart disease. The patients did **not** have heart disease at the start of the trial. The **Figure 2** below shows the results.

Figure 2



Each treatment was trialed on the same number of patients for 5 years.

2.4 How many patients who took aspirin needed treatment for heart disease during the trial?

[1 mark]

Number of patients = _____

2.5 Based **only** on the evidence in the graph, which would be the best treatment to reduce the risk of developing heart disease?

[1 mark]

2.6 Suggest **one** other factor that a doctor might consider before deciding which treatment to use for a patient.

[1 mark]

3.0 Some forms of the Human Papilloma Virus (HPV) have been shown to cause cervical cancer.

Girls aged 11 to 14 now receive a vaccine for HPV.

Explain how the HPV vaccine could reduce the incidence of cancer.

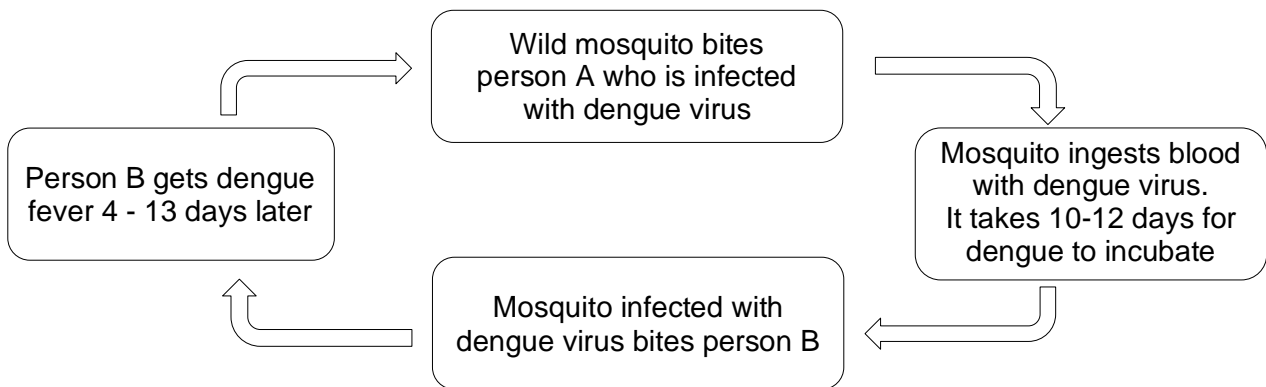
Include in your answer:

- How the immune system responds to vaccines
- How giving girls the vaccine could reduce the number who get cervical cancer.

[6 marks]

4.0 Dengue fever is a viral disease that affects up to 100 million people each year.
The lifecycle of the dengue virus can be summarised as:

Figure 3



4.1 The mosquito passes the virus from person to person.
What type of organism is the mosquito in this case?

[1 mark]

Tick **one** box.

- Fungus
- Parasite
- Protist
- Vector

4.2 Brazil is a country with high levels of the dengue virus in the population.

Give **two** ways in which people in Brazil can help prevent infection with dengue virus.

[2 marks]

4.3 What is the minimum incubation time from person **A** being bitten to person **B** getting dengue fever?

Use information in **Figure 3**

[1 mark]

5.0 Pneumonia is a condition that causes severe breathing difficulties and can lead to death. It is usually caused by a viral or bacterial infection.

The incidence of pneumonia in people with HIV has been five to ten times higher than in people without HIV.

5.1 Suggest why the incidence of pneumonia is higher in people with HIV.

[2 marks]

5.2 Atazanavir is a drug used to treat people with HIV.

Suggest what type of drug Atazanavir is.

[1 mark]

5.3 Scientists are trying to make a vaccine against HIV.

A vaccine to protect against HIV could be made using only a small part of the virus rather than a weakened form of the whole virus.

There would be **no** whole virus in the vaccine.

Suggest **two** advantages of using this type of vaccine.

[2 marks]

5.4 Tobacco Mosaic Virus affects plants.

Plants infected with Tobacco Mosaic Virus are often smaller than healthy plants.

Explain why.

[4 marks]

6.0 A student is given a tube containing a liquid nutrient medium.
The medium contains *E. coli* bacteria.

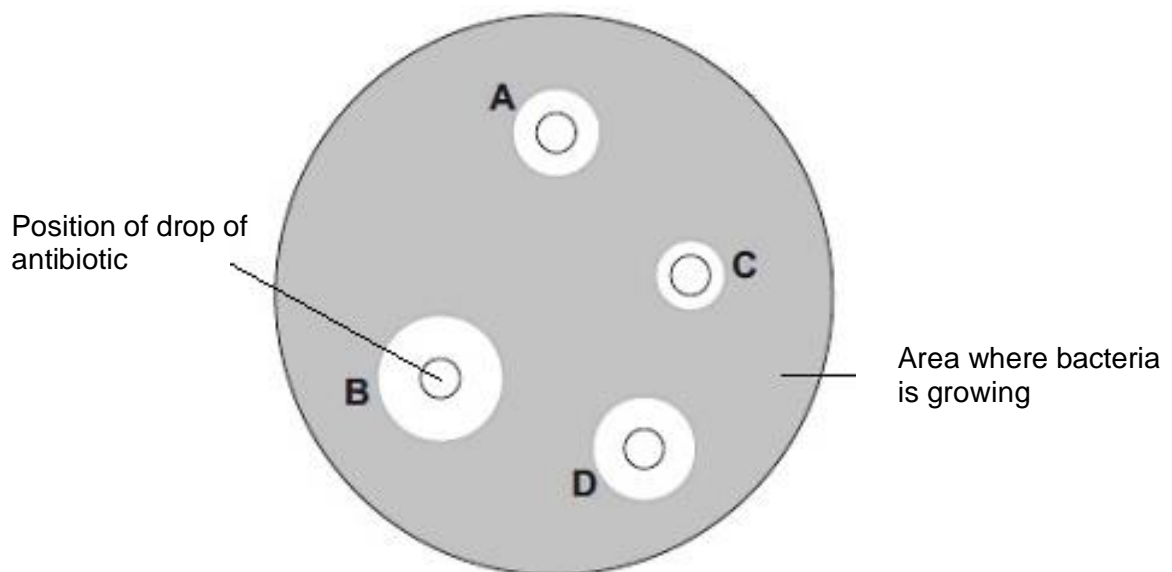
6.1 The student is told to grow some of the *E. coli* on agar jelly in a Petri dish.
Describe how the student should prepare an uncontaminated culture of *E.coli* in the Petri dish.
You should explain the reasons for each of the steps you describe.

[4 marks]

After the culture had been prepared, the student added one drop of each of five antibiotics, **A**, **B**, **C**, and **D**, onto the culture.

Figure 4 shows the appearance of the petri dish 3 days later.

Figure 3



6.2 Which was the most effective antibiotic?

For this antibiotic, calculate the area in which bacteria did not grow.
Show your working.

[2 marks]

Most effective disc_____

Area_____mm²

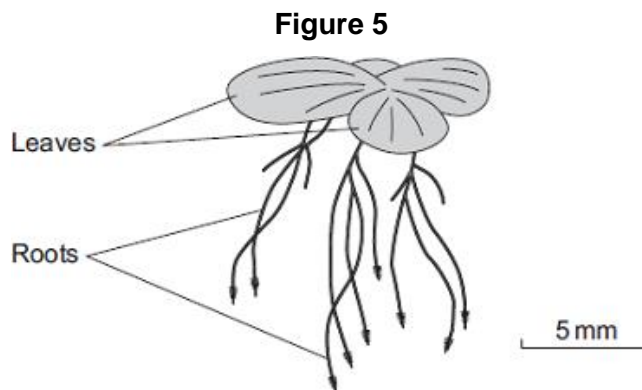
6.3 Explain whether the antibiotic use identified in **6.3** will be the best one to use for gonorrhoea infections.

[2 marks]

7.0 Duckweed is a plant that grows in ponds.

The leaves of duckweed float on the surface of the water and its roots hang down in the water

Figure 5 shows a duckweed plant.



7.1 Duckweed roots absorb nitrate ions from the water.

What do duckweed plants make with the nitrate ions?

[1 mark]

Some students grew duckweed plants in three different solutions of mineral ions, **A**, **B** and **C**, and in distilled water (**D**).

Table 1 shows the concentrations of mineral ions in each of **A**, **B**, **C** and **D** at the start of the investigation.

Table 1

Mineral ion	Concentration of mineral ions in mg per dm ³ at the start of the investigation			
	A	B	C	D
Nitrate	1000	4	4	0
Phosphate	300	0	0	0
Magnesium	200	84	24	0

The students counted the number of duckweed leaves in **A**, **B**, **C** and **D** at the start of the investigation and after 28 days.

Table 2 shows their results.

Table 2

	A	B	C	D
Number of leaves at start	4	4	4	4
Number of leaves after 28 days	50	27	14	6

7.2 Describe the effect of magnesium ions on the growth of duckweed.
Use **Table 1** and **Table 2**.

[1 mark]

7.3 Solution **A** contained the highest concentration of nitrate ions.
One student concluded, 'The results show that nitrate ions are needed for the growth of duckweed.'
What evidence in **Table 2** supports the student's conclusion?

[1 mark]

7.4 The students measured the growth of the duckweed by counting the number of leaves.
Suggest a better method of measuring the growth of the duckweed.

[1 mark]

7.5 Explain why your method is better than the students' method.

[1 mark]
