Questions are for both separate science and combined science students unless indicated in the question

Q1.

Salmonella bacteria cause outbreaks of food poisoning in humans.

To prevent food poisoning in humans, farmers vaccinate their animals against *Salmonella* bacteria.

(a) How do *Salmonella* bacteria in food cause the symptoms of vomiting and diarrhoea?

_____

_____

(1)

During a food poisoning outbreak, scientists identified the farm where the food came from.

The farmer had **not** vaccinated the farm animals against *Salmonella* bacteria.

(b) The food poisoning outbreak could have been prevented if the farm animals had been vaccinated.

Explain how:

- the immune systems of animals respond to a vaccination
- the immune response in farm animals prevents an outbreak of food poisoning in humans.

_____

_____

_____

_____

_____

_____

_____

_____

_____

(4)

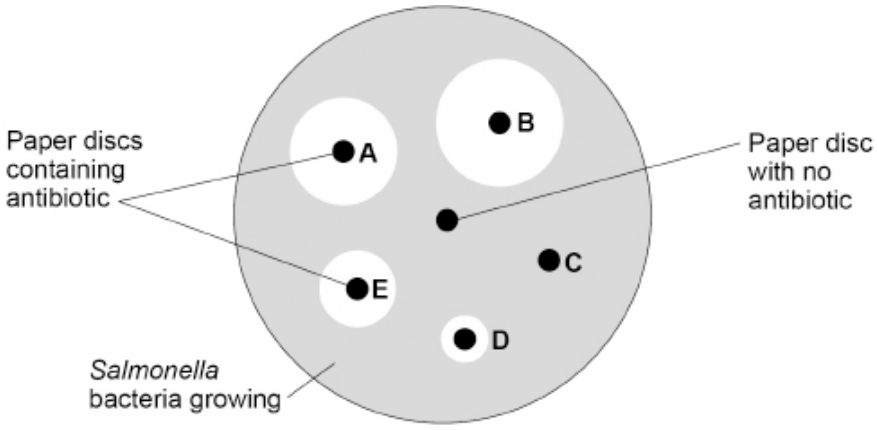
Most cases of food poisoning do **not** need to be treated with antibiotics.

However, some patients may need to take antibiotics to recover.

Scientists investigated the effectiveness of five different antibiotics on the *Salmonella* bacteria in the outbreak.

Antibiotics **A**, **B**, **C**, **D** and **E** were used in the investigation.

The figure below shows the results.



(c) Describe **two** aseptic techniques the scientists should have used in the investigation. **(biology only)**

1 _____

_____

2 _____

_____

(2)

(d) The scientists incubated the bacteria at 37 °C.
Students in school laboratories incubate bacteria at 25 °C.

Explain why scientists use 37 °C but students must use 25 °C to incubate bacteria. **(biology only)**

_____

_____

_____

_____

_____

_____

(3)

(e) What is the purpose of the paper disc with no antibiotic in the figure above? **(biology only)**

_____

_____

(1)

(f) The scientists concluded that either antibiotic **A** or antibiotic **B** should be prescribed to patients with food poisoning.

Why should antibiotic **A** or antibiotic **B** be prescribed? **(biology only)**

_____

_____

(1)

(g) The scientists wanted to be more certain about which antibiotic should be prescribed.

Describe how the results in the figure above could be used to obtain a **quantitative** comparison of antibiotics **A** and **B**. **(biology only)**

_____

_____

(1)

(h) One year later, there was another outbreak at the farm involving *Salmonella* bacteria.

Antibiotic **B** did **not** have an effect.

Suggest why antibiotic **B** no longer had an effect.

_____

_____

(1)

(i) Antibiotics treat food poisoning because they kill *Salmonella* bacteria inside the human body.

Some antibiotics work because they damage the bacterial cell wall.

The bacteria die because the cells burst.

Explain why the cells burst.

_____

_____

_____

_____

_____

_____

(3)

(Total 17 marks)

Q2.

A student prepared some onion cells.

The student viewed the onion cells using a light microscope.

This is the method used.

1. Cut an onion into pieces using a sharp knife.

2. Peel off a thin layer of onion epidermis from one piece of onion.

3. Place the onion epidermis onto a microscope slide in a single flat layer.

4. Add three drops of iodine solution.

5. Slowly lower a cover slip at an angle onto the onion epidermis.

6. Place the slide on the stage of the microscope.

(a) The table below shows a risk assessment for this experiment.

Complete the table.

Hazard	**Risk**	**Plan to minimise risk**
Iodine solution is an irritant	May cause allergic reaction or skin rash	
Sharp knife		

(2)

(b) Give a reason for each of the following steps in the method.

A **thin layer** of onion epidermis is used.

_____

_____

_____

Iodine solution is added to the onion epidermis.

_____

_____

_____

The cover slip is lowered onto the onion epidermis **at an angle**.

_____

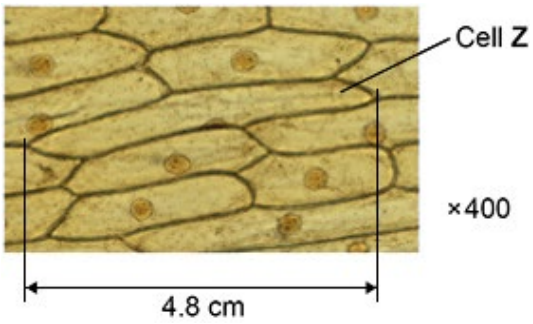
_____

_____

(3)

Figure 1 shows what the student saw under the microscope at a magnification of ×400.

Figure 1



(c) The length of cell **Z** in **Figure 1** is 4.8 cm.

Calculate the real length of cell **Z**.

Give your answer in micrometres (μm).

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

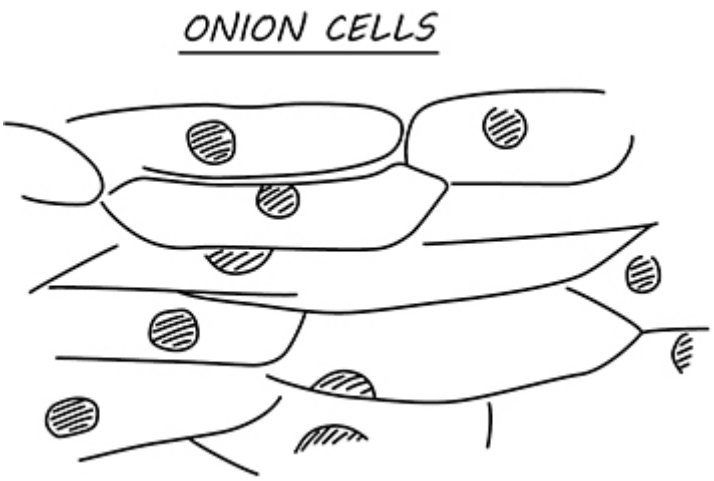
_____

Real length of cell **Z** = _____μm

(5)

Figure 2 shows the student's drawing of **Figure 1**.

Figure 2



(d) Give **two** ways the student could improve the drawing in **Figure 2**.

1 _____

_____

2 _____

_____

(2)

(e) Onion cells can be seen using an electron microscope.

Give **two** ways onion cells would look different when seen using an electron microscope.

1 _____

_____

2 _____

_____

(2)

(Total 14 marks)