

Q1.

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)

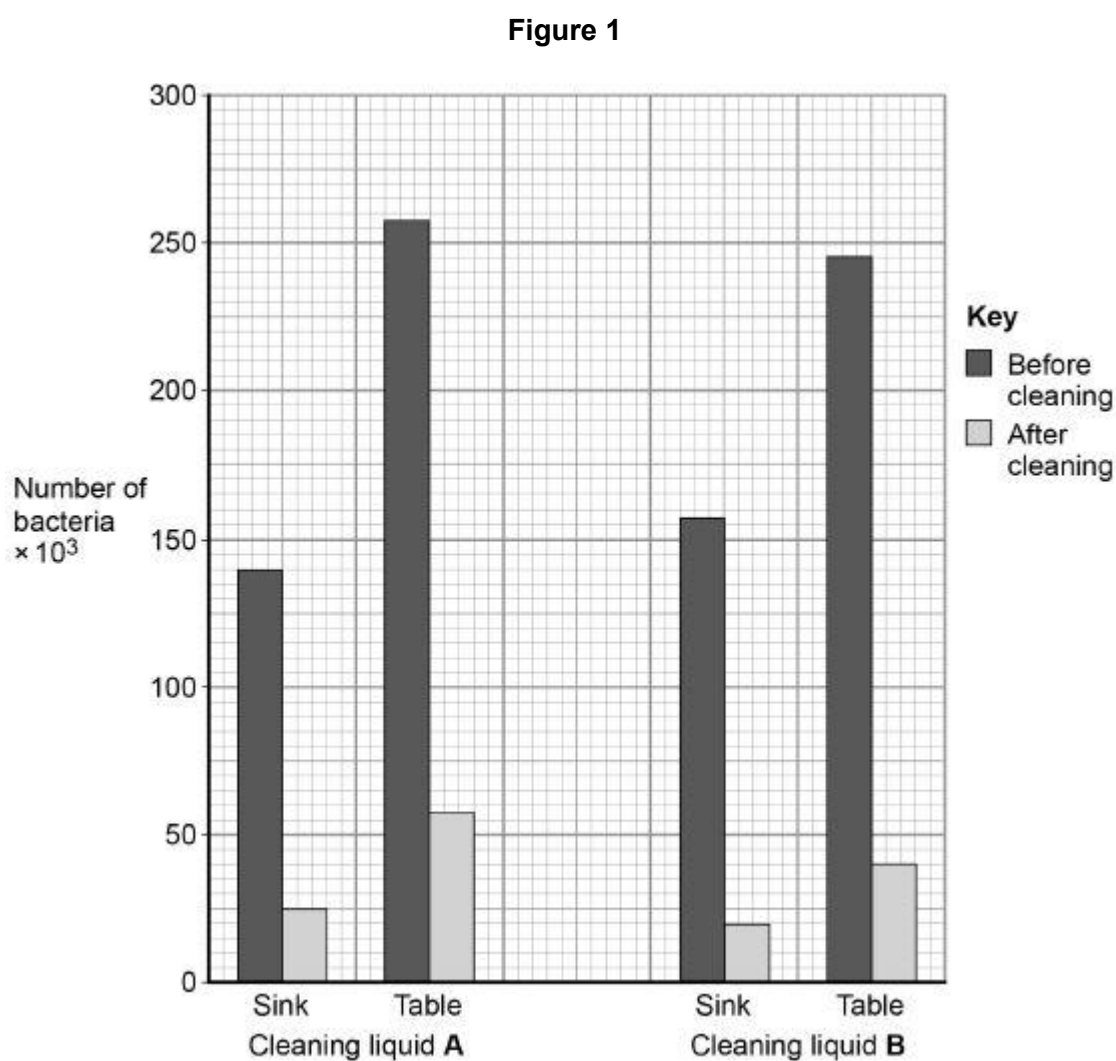
A restaurant owner employed a scientist to test the effectiveness of two kitchen cleaning liquids.

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**.



(f) Which cleaning liquid is the more effective?

Give a reason for your answer.

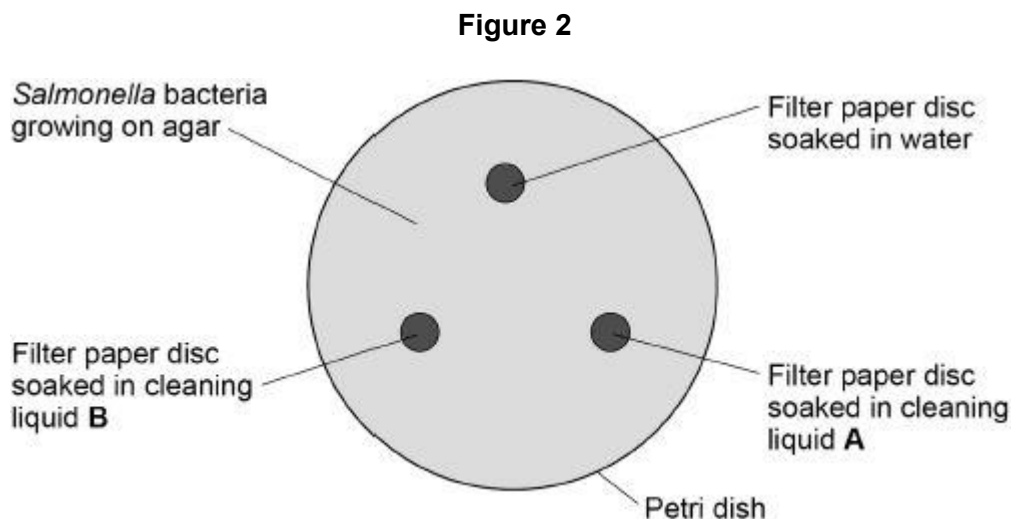
Cleaning liquid _____

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.



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 cm ²
Water	0
Cleaning liquid A	11
Cleaning 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 dm^3 .

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

(1)

(Total 11 marks)

Q2.

Mosquitoes carry a pathogen that causes malaria.

- (a) What type of pathogen causes malaria?

Tick (✓) **one** box.

A bacterium	<input type="checkbox"/>
A fungus	<input type="checkbox"/>
A protist	<input type="checkbox"/>
A virus	<input type="checkbox"/>

(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)

Q3.

Figure 1 shows an animal cell viewed using a microscope.

Figure 1



- (a) The cell contains a nucleus.

What is the function of the nucleus?

(1)

- (b) Name **one** type of cell that does **not** contain a nucleus.

(1)

- (c) Draw a simple diagram of the cell in **Figure 1**.

Label **two** parts of the cell.

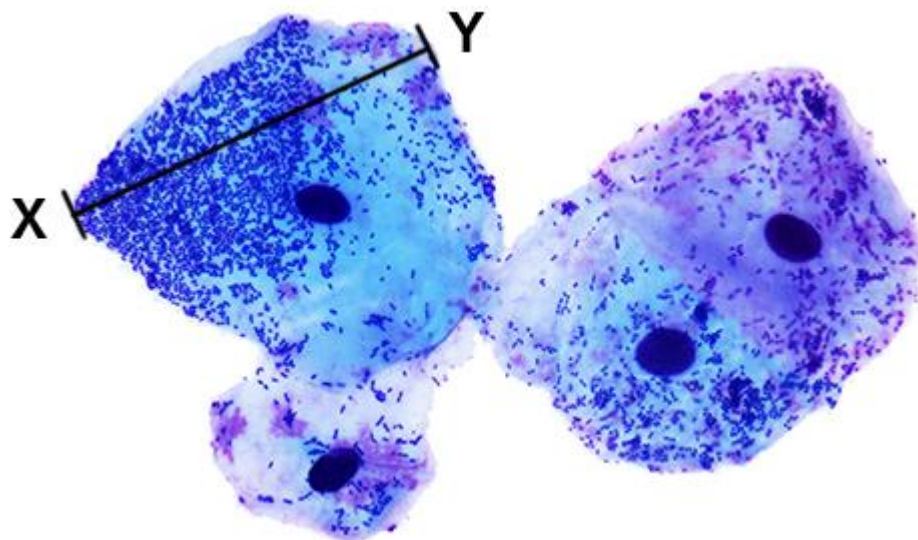
(2)

- (d) Name **one** structure found in a plant cell but **not** found in an animal cell.

(1)

Figure 2 shows some different cells.

Figure 2



- (e) The real length from point X to point Y is 0.06 mm

Calculate the magnification.

Use the equation:

$$\text{magnification} = \frac{\text{size of image}}{\text{real size of object}}$$

Magnification = × _____

(3)

- (f) The cells shown in **Figure 2** were viewed using a light microscope.

Give **two** advantages of using an electron microscope instead of a light microscope.

1 _____

2 _____

(2)

(Total 10 marks)

Q4.

The circulatory system is composed of the blood, blood vessels and the heart.

- (a) Urea is transported in the blood plasma.

Name **two** other substances transported in the blood plasma.

1. _____

2. _____

(2)

- (b) Some athletes train at high altitude.

Training at high altitude increases the number of red blood cells per cm³ of blood.

Explain why having more red blood cells per cm³ of blood is an advantage to an athlete.

(3)

(c) Which **two** blood vessels carry deoxygenated blood?

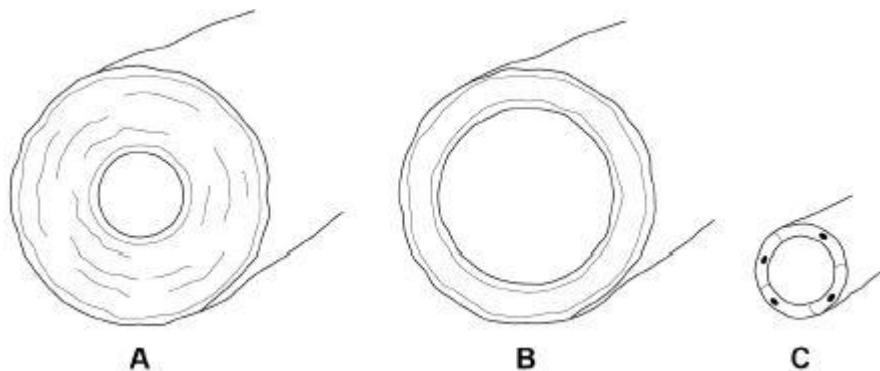
Tick **two** boxes.

Aorta	<input type="checkbox"/>
Coronary artery	<input type="checkbox"/>
Pulmonary artery	<input type="checkbox"/>
Pulmonary vein	<input type="checkbox"/>
Vena cava	<input type="checkbox"/>

(2)

Figure 1 shows the three types of blood vessel.

Figure 1



(d) Which type of blood vessel carries blood into the right atrium?

Tick **one** box.

A		B		C	
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(1)

(e) Compare the structure of an artery with the structure of a vein.

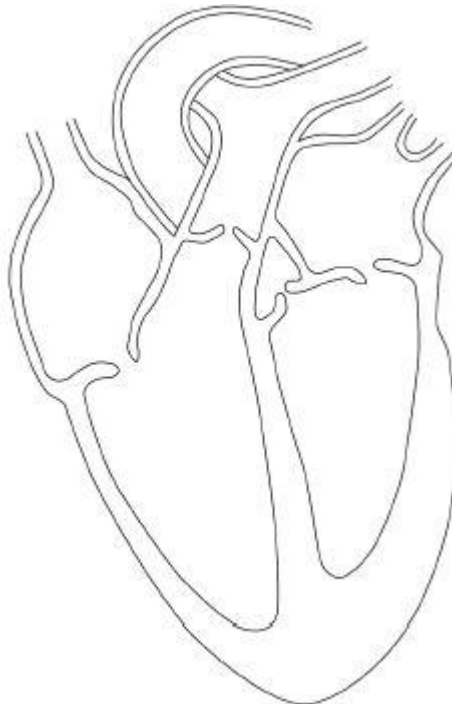
(3)

(f) Heart rate is controlled by a group of cells. This group of cells act as a pacemaker.

Figure 2 shows a section through the heart.

Draw an **X** on **Figure 2** to show the position of the pacemaker.

Figure 2



(1)

(g) A patient may be fitted with an artificial pacemaker.

What condition may be treated using an artificial pacemaker?

(1)
(Total 13 marks)

Q5.

A student carried out an investigation using chicken eggs.

This is the method used.

1. Place 5 eggs in acid for 24 hours to dissolve the egg shell.
2. Measure and record the mass of each egg.
3. Place each egg into a separate beaker containing 200 cm³ of distilled water.
4. After 20 minutes, remove the eggs from the beakers and dry them gently with a paper towel.
5. Measure and record the mass of each egg.

Table 1 shows the results.

Table 1

Egg	Mass of egg without shell in grams	Mass of egg after 20 minutes in grams
1	73.5	77.0
2	70.3	73.9
3	72.4	75.7
4	71.6	73.1
5	70.5	73.8

- (a) Another student suggested that the result for egg 4 was anomalous.

Do you agree with the student?

Give a reason for your answer.

(1)

- (b) Calculate the percentage change in mass of egg 3.

Percentage change in mass = _____

(2)

(c) Explain why the masses of the eggs increased.

(3)

(d) Explain how the student could modify the investigation to determine the concentration of the solution inside each egg.

(3)

Chicken egg shells contain calcium. Calcium ions are moved from the shell into the cytoplasm of the egg.

Table 2 shows information about the concentration of calcium ions.

Table 2

Location	Concentration of calcium ions in arbitrary units
Egg shell	0.6
Egg cytoplasm	2.1

(e) Explain how calcium ions are moved from the shell into the cytoplasm of the egg.

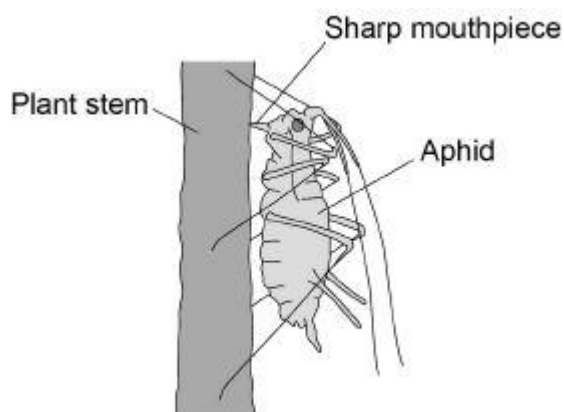
(3)
(Total 12 marks)

Q6.

Plants can be infected by fungi, viruses and insects.

Aphids are small insects that carry pathogens.

The diagram below shows an aphid feeding from a plant stem.



(a) An aphid feeds by inserting its sharp mouthpiece into the stem of a plant.

Give the reason why the mouthpiece of an aphid contains a high concentration of dissolved sugars after feeding.

(1)

(b) Plants infected with aphids may show symptoms of magnesium deficiency.

Magnesium deficiency symptoms include:

- yellow leaves
- stunted growth.

Explain how a deficiency of magnesium could cause these symptoms.

(5)

(c) A farmer thinks a potato crop is infected with potato virus Y (PVY).

The farmer obtains a monoclonal antibody test kit for PVY.

To make the monoclonal antibodies a scientist first isolates the PVY protein from the virus.

Describe how the scientist would use the protein to produce the PVY monoclonal antibody.

(4)
(Total 10 marks)

Q7.

Table 1 shows information about some food components in cow's milk.

Table 1

	Value per 500 cm ³	Recommended Daily Allowance (RDA) for a typical adult
Energy in kJ	1046	8700
Fat in g	8.4	70.0
Salt in g	0.5	6.0
Calcium in mg	605	1000
Vitamin B-12 in µg	4.5	2.4

- (a) How much **more** milk would a typical adult have to drink to get their RDA for calcium compared with the amount of milk needed to get their RDA for vitamin B-12?

Volume of milk = _____ cm³

(3)

- (b) Describe how a student could test cow's milk to show whether it contains protein and different types of carbohydrate.

(6)

A scientist investigated the effect of bile on the breakdown of fat in a sample of milk.

The scientist used an indicator that is colourless in solutions with a pH lower than 10, and pink in solutions with a pH above 10.

This is the method used.

1. Add 1 drop of bile to a test tube and one drop of water to a second test tube.
2. Add the following to each test tube:
 - 5 cm³ of milk
 - 7 cm³ of sodium carbonate solution (to make the solution above pH 10)
 - 5 drops of the indicator
 - 1 cm³ of lipase.
3. Time how long it takes for the indicator in the solutions to become colourless.

The results are shown in **Table 2**.

Table 2

	Time taken for the indicator to become colourless in seconds
Solution with bile	65
Solution without bile	143

- (c) Explain why the indicator in both tubes became colourless.

(3)

- (d) Give the reason why the measurement of the time taken for the indicator to become colourless might be inaccurate.

(1)

- (e) Explain the difference in the results for the two test tubes in **Table 2**.

(3)

(Total 16 marks)