AQA GCSE Biology | 8461

SPECIFICATION POINT 4.1.1.6

# Culturing microorganisms (biology only)

## Past-paper questions

| | |
|---|---|
| Tier | **Higher** |
| Question groups | **15** |
| Available paper years | **2008–2025** |

## Using this booklet

1. Answer the questions in order and show your working.
2. Original question numbers and marks are retained.
3. Print at actual size (100%) for measuring questions.
4. Use the companion answer booklet to check your work.

**Name:** _____ **Date:** _____

Whole questions are retained for context, so some parts assess other specification points. Current and legacy sources are labelled. Continue on extra paper if needed.

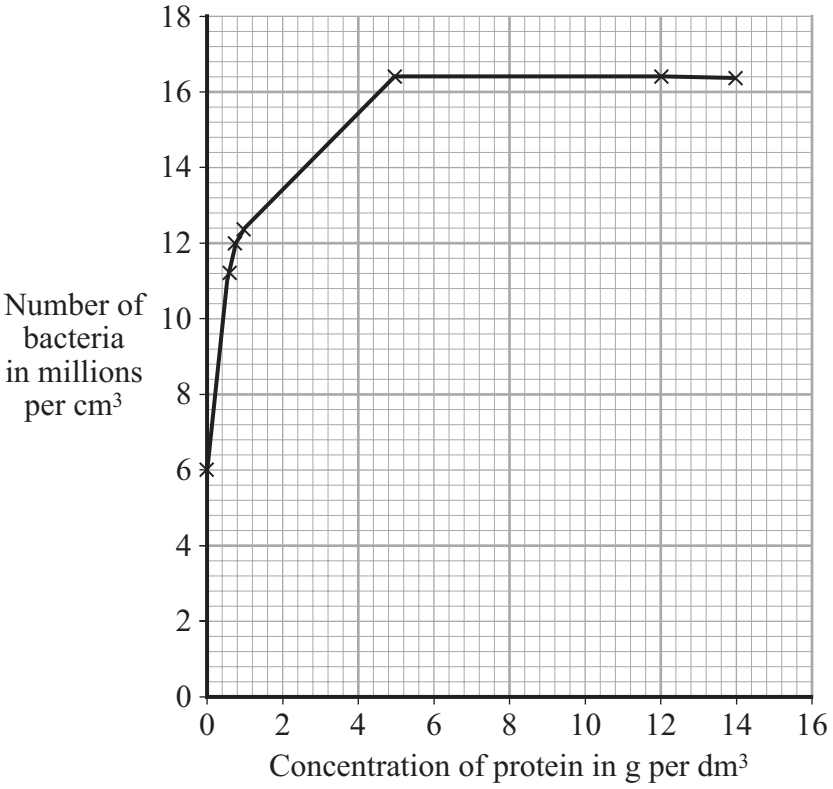
### 4.1.1.6 Culturing microorganisms (biology only)

**Question 01**

June 2008 | BLY3H | Original Q6 | Legacy

**6** Microorganisms are grown in industrial fermenters. Before this is done, laboratory investigations are carried out to find the optimum growing conditions.

**6** (a) The graph shows the effect of protein concentration on the growth of one species of bacterium after 12 hours in a broth culture.



**4.1.1.6 Culturing microorganisms (biology only)**

**Question 01 · continued**



*for mark*

**6** (a) Describe and explain, as fully as you can, the effect of protein concentration on the number of bacteria.

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*(5 marks)*

**6** (b) Bacteria of this species were grown in an industrial fermenter.

What concentration of protein would you recommend for use in the fermenter?

Explain the reasons for your answer.

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*(3 marks)*

**8**

**4.1.1.6 Culturing microorganisms (biology only)**

**Question 02**

January 2009 | BLY3H | Original Q4 | Legacy

**4** Some students investigated the effect of pH on the growth of one species of bacterium.

They transferred samples of bacteria from a culture of this species to each of eight flasks. Each flask contained a solution of nutrients but at a different pH.

After 24 hours, the students measured the amount of bacterial growth.

**4** (a) It was important that the flasks in which the bacteria grew were not contaminated with other microorganisms.

Describe **two** precautions the students should have taken to prevent this contamination.

1 .....

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2 .....

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*(2 marks)*

**4** (b) To see the effect of pH on the growth of the bacteria, other conditions should be kept constant.

Suggest **two** conditions which should have been kept constant for all eight flasks.

1 .....

2 .....

*(2 marks)*

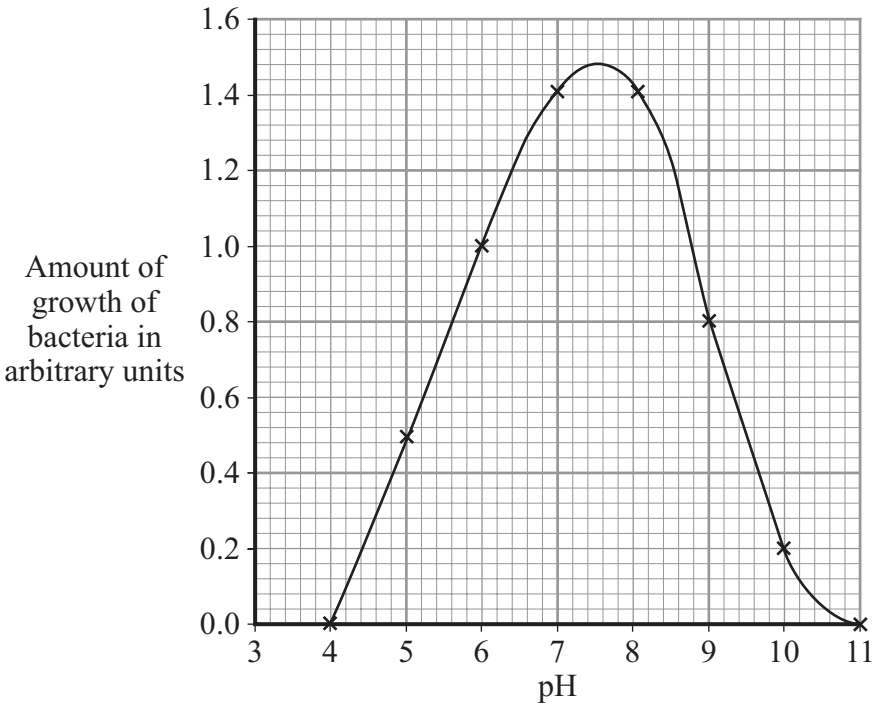
**4.1.1.6 Culturing microorganisms (biology only)**

**Question 02 · continued**



*for mark*

**4** (c) The graph shows the results of the investigation.




**4** (c) The students wanted to find the best pH for the growth of this species of bacterium.

**4** (c) (i) Use the graph to estimate the pH at which the bacteria would grow best.

pH .....

*(1 mark)*

**4** (c) (ii) What could the students do to find a more accurate value for the best pH for growth of the bacteria?

.....

.....

*(1 mark)*

**6**

4.1.1.6 Culturing microorganisms (biology only)

Question 03

June 2009 | BLY2H | Original Q4 | Legacy

**4** A manufacturer is trying to improve the quality of the biological detergent he produces.

Scientists at his company carried out the following experiments on enzymes:

- Samples of lipase were collected from five different types of bacterium, **A**, **B**, **C**, **D** and **E**.
- The samples were diluted to give the same concentration of lipase.
- Agar jelly containing a lipid was prepared in a dish. This forms a cloudy mixture which becomes clear when the lipid is digested.
- Five small holes were cut into the agar.
- Two drops of lipase solution from bacterium **A** was added to hole **A**.
- This process was repeated for each sample of lipase.

**Diagram 1** shows the appearance of the dish.

**Diagram 1**

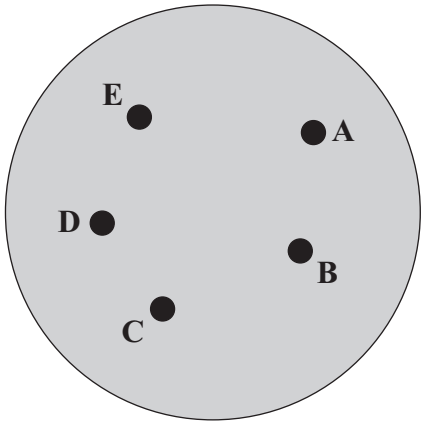
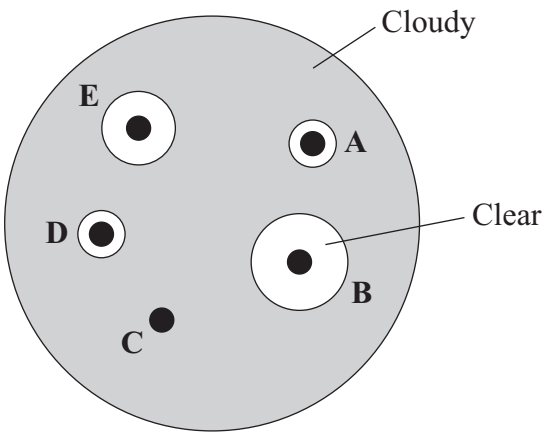



**Diagram 2** shows the appearance of the dish 24 hours later.

**Diagram 2**



**4.1.1.6 Culturing microorganisms (biology only)**

**Question 03 · continued**



*for mark*

**4** (a) (i) Which type of bacterium, **A**, **B**, **C**, **D** or **E**, produced the most effective lipase in this investigation?

Write your answer, **A**, **B**, **C, D** or **E**, in the box.

*(1 mark)*

**4** (a) (ii) Explain your answer.

.....

.....

*(1 mark)*

**4** (b) The manufacturer plans to add the most effective lipase to the washing powders he produces.

Suggest **two** other factors he should investigate before deciding which lipase is the most effective.

1.....

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2.....

.....

*(2 marks)*

**4** (c) Many biological detergents cannot be used at high temperatures.

Explain why.

.....

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*(1 mark)*

5

### 4.1.1.6 Culturing microorganisms (biology only)

**Question 04**

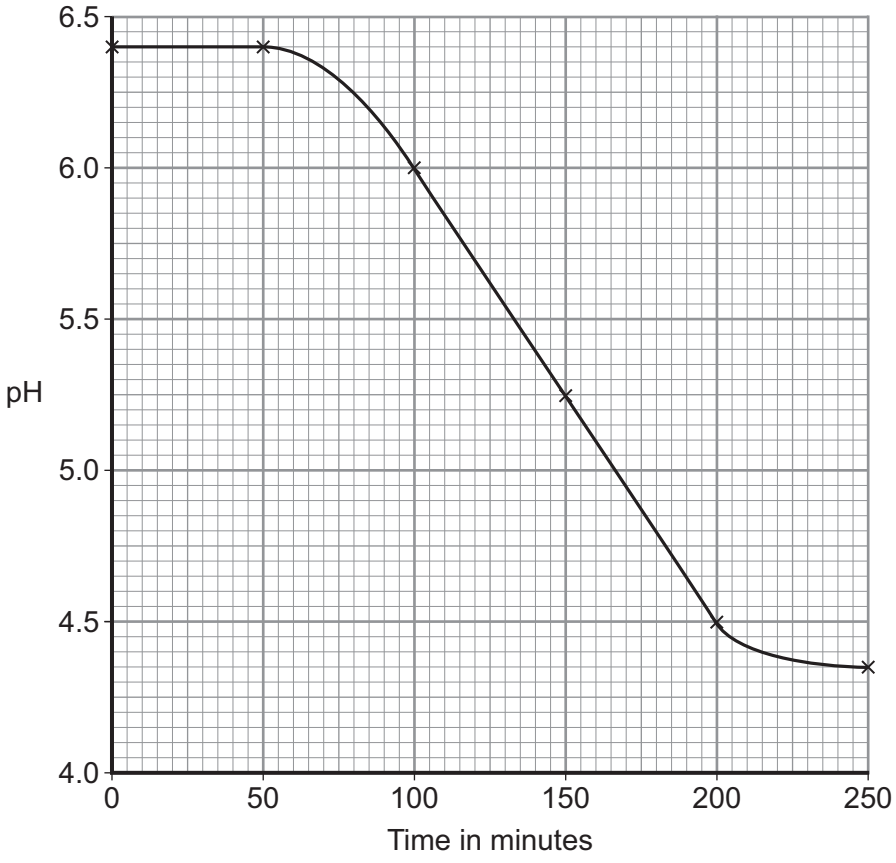


**2** A student investigated the production of yoghurt.

The student:

- boiled 200 $cm^3$ of milk in a flask for 10 minutes
- let the milk cool to room temperature
- then added 20 $cm^3$ of 'yoghurt starter culture' (plain yoghurt which contains living bacteria)
- put the flask in a water bath at room temperature
- measured the pH of the yoghurt every 50 minutes.

The results are shown in the graph.




**2 (a)** The milk was boiled for 10 minutes before it was used.

Explain why this was necessary.

.....

.....

*(1 mark)*

4.1.1.6 Culturing microorganisms (biology only)

Question 04 · continued



**2 (b) (i)** Use information from the graph to calculate the rate of fall in pH between 100 and 200 minutes.

Show clearly how you work out your answer.

.....

.....

.....

Answer = ..... pH units per minute
*(2 marks)*

**2 (b) (ii)** Suggest **one** reason why the rate of fall in pH slowed down after 200 minutes.

.....

.....
*(1 mark)*

**2 (c)** What substance causes the yoghurt to thicken after 200 minutes?

.....

.....
*(2 marks)*

**2 (d)** The yoghurt would have been produced more quickly at 35 °C.

**2 (d) (i)** What is the maximum temperature at which bacteria should be grown in a school laboratory?

..... °C
*(1 mark)*

**2 (d) (ii)** It is **not** safe to grow bacteria at 35 °C in a school laboratory.

Explain why.

.....

.....
*(1 mark)*

8

### 4.1.1.6 Culturing microorganisms (biology only)

**Question 05**

June 2011 | BLY3H | Original Q6 | Legacy

**6 (a)** In industry, microorganisms are grown in fermenters to make useful products.

Name **one** useful product that can be made using microorganisms grown in a fermenter.

.....

*(1 mark)*

**6 (b)** Scientists grew one species of bacterium in a fermenter.
The scientists added glucose and other nutrients to the culture medium in the fermenter.

To study the growth of the bacteria, the scientists removed a 1 $cm^3$ sample of the culture medium from the fermenter once every 5 hours. They added a measured volume of water to dilute the sample by a known amount.

The scientists used two different methods to find the number of bacteria in each sample.

**Method A**

The scientists:

- added 0.1 $cm^3$ of the diluted culture to a Petri dish
- poured molten agar into the Petri dish and swirled the dish to mix the contents
- placed the Petri dish in an incubator at 35 °C for 24 hours
- counted the number of colonies of bacteria that had grown in the Petri dish.

**Method B**

The scientists:

- put some of the diluted sample into a special counting chamber on a microscope
- counted the number of bacteria found in a small volume of the diluted culture.

**6 (b) (i)** In each method, the scientists diluted the samples that they removed from the fermenter.

Why did they need to do this?

.....

.....

*(1 mark)*

Question 05 · continued



**6 (b) (ii)** In **Method A**, the scientists counted colonies of bacteria that had grown in a Petri dish. Explain how counting colonies helped the scientists to find the number of bacteria in a sample.

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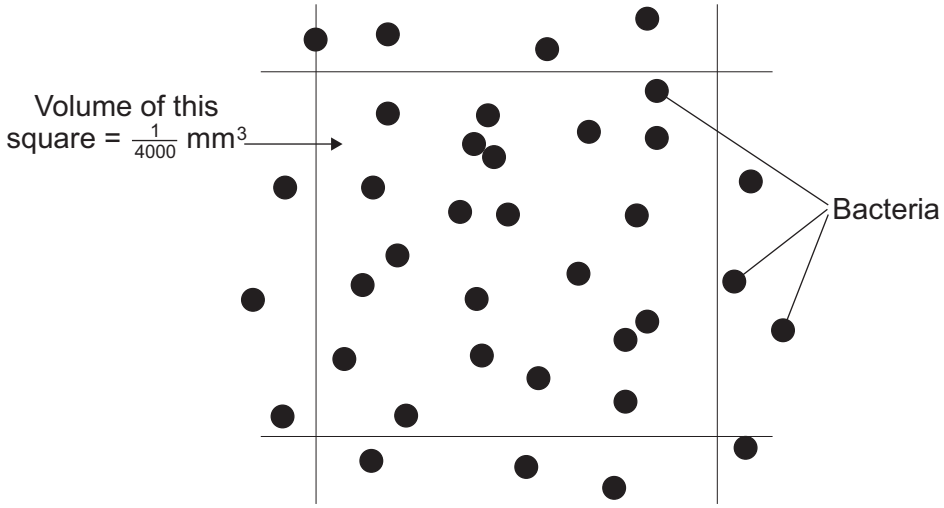
*(2 marks)*

**6 (c)** The scientists wanted to find the number of bacteria in a sample of culture medium by using **Method B**.

The sample of culture medium was diluted to $\frac{1}{100}$ of its original concentration.

The diluted sample was then placed in the counting chamber.

The diagram shows part of the counting chamber as seen under a microscope.




Complete the following calculations to find how many bacteria there were in 1 $mm^3$ of the undiluted sample of culture medium.

Use information from the diagram.

Number of bacteria in $\frac{1}{4000}$ $mm^3$ of **diluted** culture medium = .....

Number of bacteria in 1 $mm^3$ of **diluted** culture medium = .....

Number of bacteria in 1 $mm^3$ of **undiluted** culture medium = .....

*(2 marks)*

**Question 6 continues on the next page**

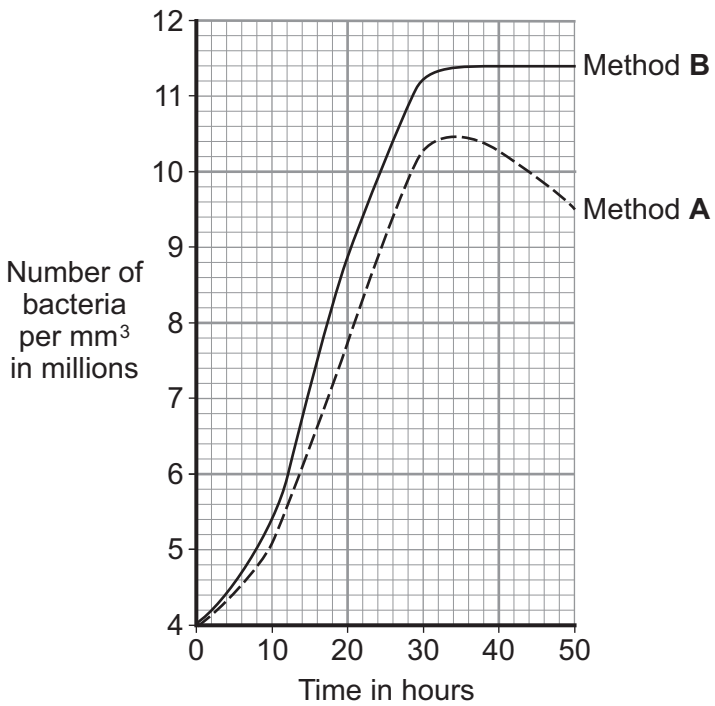
4.1.1.6 Culturing microorganisms (biology only)

Question 05 · continued



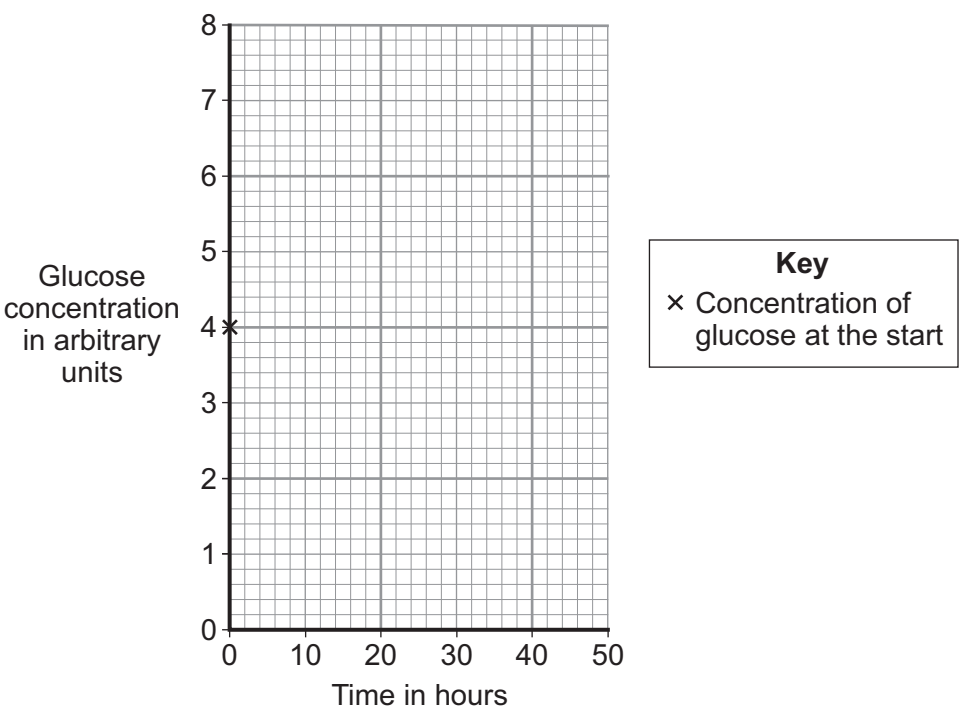
**6 (d)** The scientists grew the bacteria for 50 hours.
**Graph 1** shows the scientists' results.

**Graph 1**




**Graph 2** is not complete.
The concentration of glucose in the fermenter at the start of the investigation was 4 units.

**Graph 2**



4.1.1.6 Culturing microorganisms (biology only)

Question 05 · continued



**6 (d) (i)** **On Graph 2**, draw a line to show how the glucose concentration would change over the 50 hours of the investigation.

*(2 marks)*

**6 (d) (ii)** Explain the shape of the growth curve that was obtained using **Method A**.

Use information from your answer to part (d)(i).

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.....

.....

*(3 marks)*

**6 (d) (iii)** Why did **Method B** give higher values for the number of bacteria than **Method A**?

.....

.....

*(1 mark)*

12

### 4.1.1.6 Culturing microorganisms (biology only)

**Question 06**



**3** A student is given a tube containing a liquid nutrient medium. The medium contains one type of bacterium.

**3 (a)** *In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.*

The student is told to grow some of the bacteria on agar jelly in a Petri dish.

Describe how the student should prepare an uncontaminated culture of the bacterium in the Petri dish.

You should explain the reasons for each of the steps you describe.

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*(6 marks)*

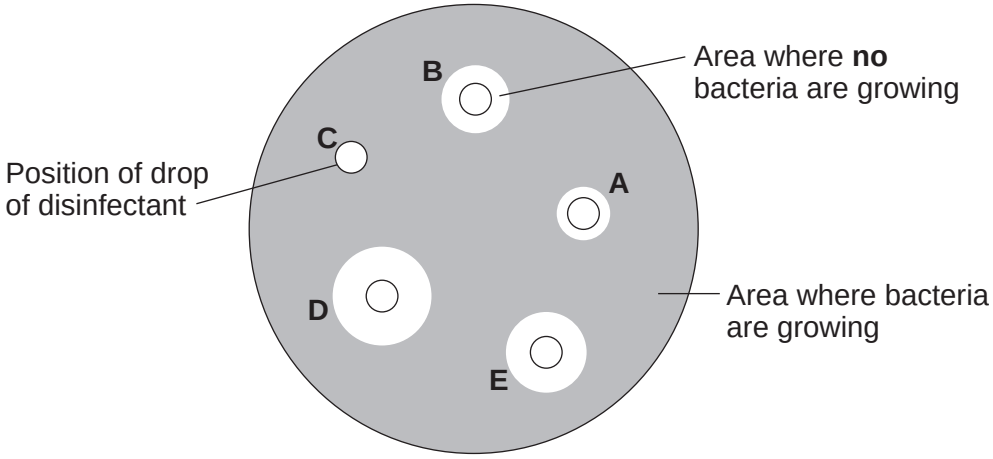
4.1.1.6 Culturing microorganisms (biology only)

Question 06 · continued



**3 (b)** After the culture had been prepared, the student added one drop of each of five disinfectants, **A**, **B**, **C**, **D** and **E**, onto the culture.

The diagram shows the appearance of the Petri dish 3 days later.




**3 (b) (i)** There are areas on the agar jelly where **no** bacteria are growing.

Why?

.....

.....

*(1 mark)*

**3 (b) (ii)** The student concluded that disinfectant **D** would be the best for using around the home.

Give **one** reason why the student might be correct.

.....

.....

.....

Give **one** reason why the student might **not** be correct.

.....

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.....

*(2 marks)*

9

### 4.1.1.6 Culturing microorganisms (biology only)

**Question 07**

June 2013 | BL1HP | Original Q5 | Legacy

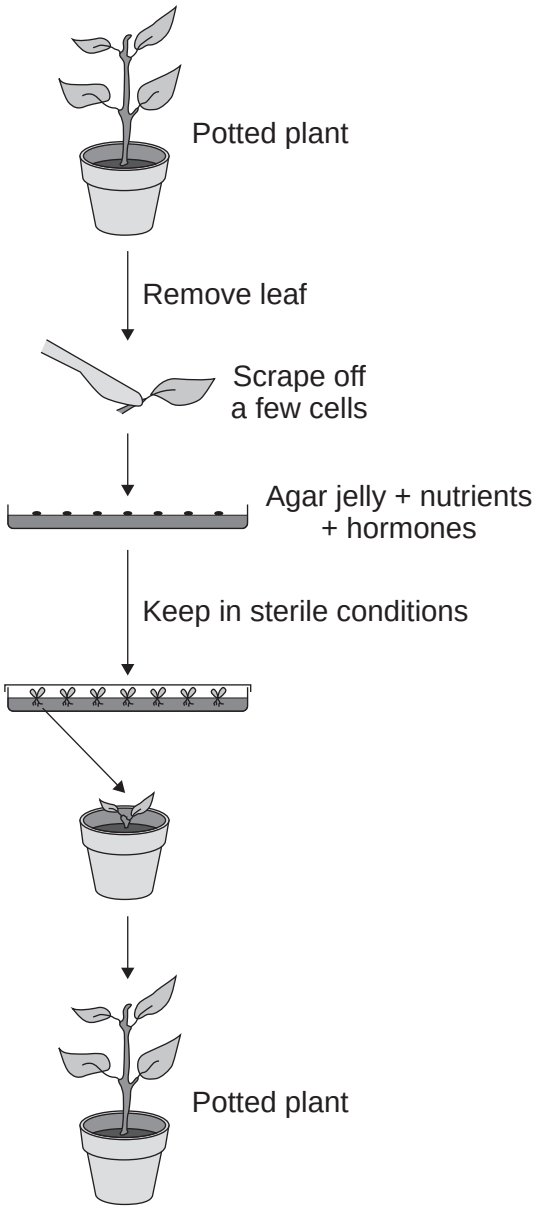
**5** Plant hormones are used in horticulture.

**5 (a)** Name **one** plant hormone.

.....

*(1 mark)*

**5 (b)** The diagram shows how new plants are produced using tissue culture.



4.1.1.6 Culturing microorganisms (biology only)

Question 07 · continued



**5 (b) (i)** Tissue culture is a type of *asexual reproduction*.

Give the main features of *asexual reproduction*.

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*(3 marks)*

**5 (b) (ii)** Another method of producing new plants is by taking cuttings.

Suggest **one** advantage of using tissue culture and **not** using cuttings to produce plants.

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*(1 mark)*

5

### 4.1.1.6 Culturing microorganisms (biology only)

**Question 08**

June 2018 | 8461/1H | Original Q1

**0 1** Eating food containing *Salmonella* bacteria can cause illness.

**0 1 . 1** Two symptoms of infection by *Salmonella* are vomiting and diarrhoea.

What causes these symptoms?

**[1 mark]**

**0 1 . 2** Give **two** ways a person with a mild infection of *Salmonella* can help prevent the spread of the bacteria to other people.

**[2 marks]**

1

2

**0 1 . 3** 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 mark]**

**0 1 . 4** A person with AIDS may take longer than a healthy person to recover from a *Salmonella* infection.

Explain why.

**[2 marks]**

**0 1 . 5** *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 mark]**

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

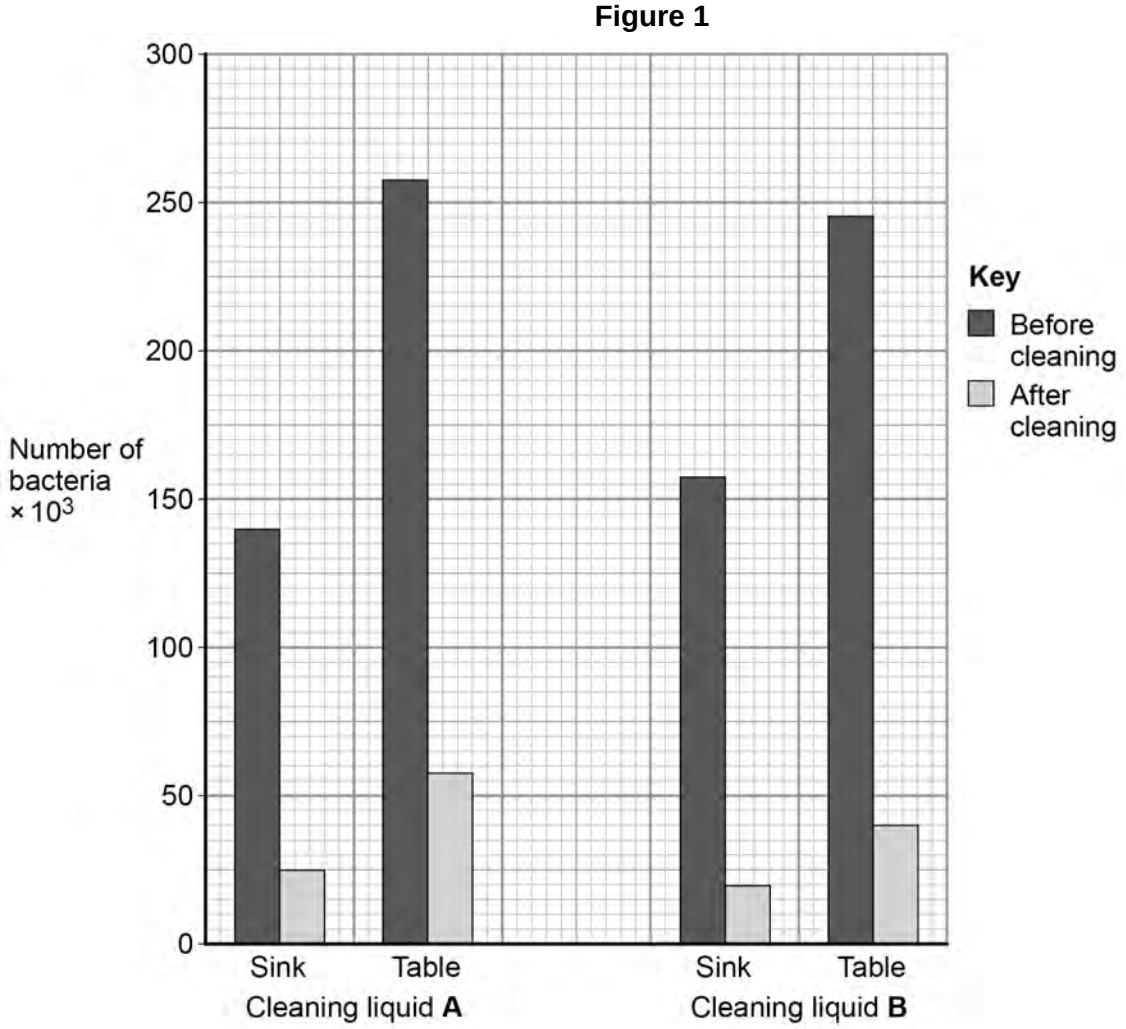
The scientist took samples from two work surfaces:

- 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**



4.1.1.6 Culturing microorganisms (biology only)

Question 08 · continued



**0 1 . 6** Which cleaning liquid is the more effective?

Give a reason for your answer.

**[1 mark]**

Cleaning Liquid _____

Reason _____

_____

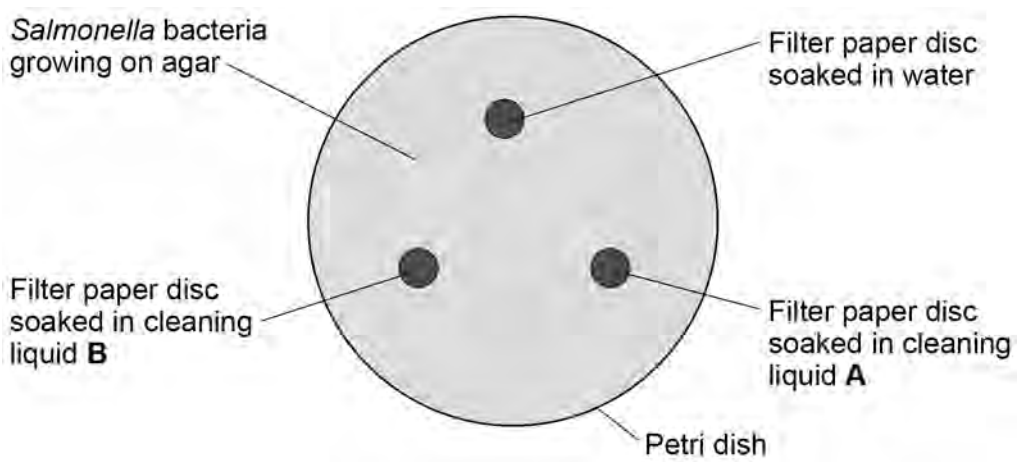
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**Question 1 continues on the next page**

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 **Table 1**.

**Table 1**

| Filter paper disc | Area around disc with no bacteria growing in $cm^2$ |
|---|---|
| Water | 0 |
| Cleaning liquid **A** | 11 |
| Cleaning liquid **B** | 13 |

**0 1 . 7** What measurement would the scientist need to take to calculate the area where no bacteria were growing?

**[1 mark]**

4.1.1.6 Culturing microorganisms (biology only)

Question 08 · continued



**0 1 . 8** Give **one** change to the investigation that would allow the scientist to check if the results are repeatable.

**[1 mark]**

**0 1 . 9** 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 mark]**

**11**

4.1.1.6 Culturing microorganisms (biology only)

Question 09



**0 5** **Table 2** gives the classification of four plant species.

**Table 2**

| Group | Species 1 | Species 2 | Species 3 | Species 4 |
|---|---|---|---|---|
| **Kingdom** | *Plantae* | *Plantae* | *Plantae* | *Plantae* |
| **Phylum** | *Spermatophyta* | *Spermatophyta* | *Spermatophyta* | *Spermatophyta* |
| **Class** | *Monocotyledonae* | *Dicotyledonae* | *Monocotyledonae* | *Dicotyledonae* |
| **Order** | *Poales* | *Fabales* | *Poales* | *Scrophulariales* |
| **Family** | *Cyperaceae* | *Fabaceae* | *Poaceae* | *Scrophulariaceae* |
| **Genus** | *Eriophorum* | *Pisum* | *Poa* | *Antirrhinum* |
| **Species** | *angustifolium* | *sativum* | *annua* | *majus* |

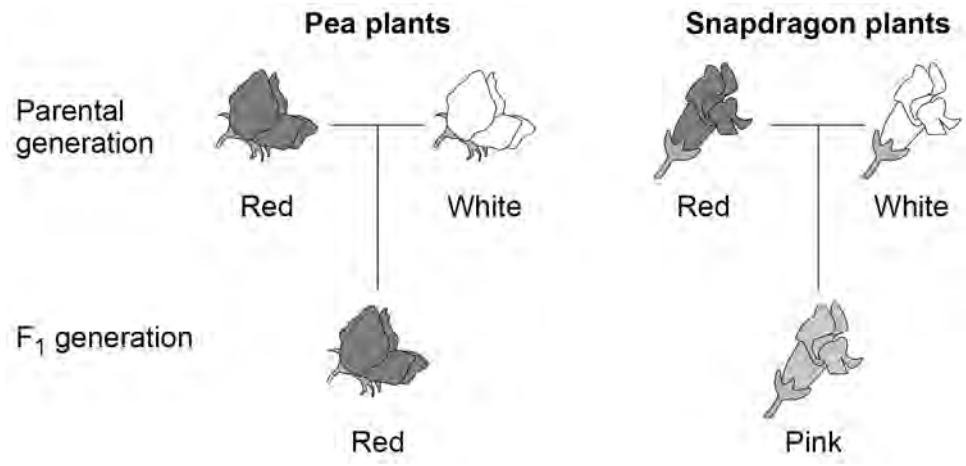
**0 5 . 1** Species **1** and **3** are the most closely related.

What information in **Table 2** gives evidence for this?

**[1 mark]**

**Figure 6** shows the inheritance of flower colour in two species of plant.

**Figure 6**




- In pea plants and in snapdragon plants, flower colour is controlled by one pair of alleles.
- In **Figure 6** the parental generation plants are homozygous for flower colour.
- In heterozygous **pea** plants, the allele for red flower colour is dominant.
- In heterozygous **snapdragon** plants, the alleles for flower colour are both expressed.

Question 09 · continued



Use the following symbols for alleles in your answers to Questions **05.2** to **05.4**:

| **Pea plants** | **Snapdragon plants** |
|---|---|
| **R** = allele for red flowers | $C^R$ = allele for red flowers |
| **r** = allele for white flowers | $C^W$ = allele for white flowers |

**0 5 . 2** What is the genotype of the red-flowered pea plants in the $F_1$ generation?

**[1 mark]**

_____

**0 5 . 3** What is the genotype of a white-flowered snapdragon plant?

**[1 mark]**

_____

A gardener crossed two pink-flowered snapdragon plants.

**0 5 . 4** Draw a Punnett square diagram to show why only some of the next generation plants had pink flowers.

Identify the phenotypes of all the offspring plants.

**[3 marks]**

**0 5 . 5** What percentage of the offspring would you expect to have pink flowers?

**[1 mark]**

Percentage = _____ %

4.1.1.6 Culturing microorganisms (biology only)

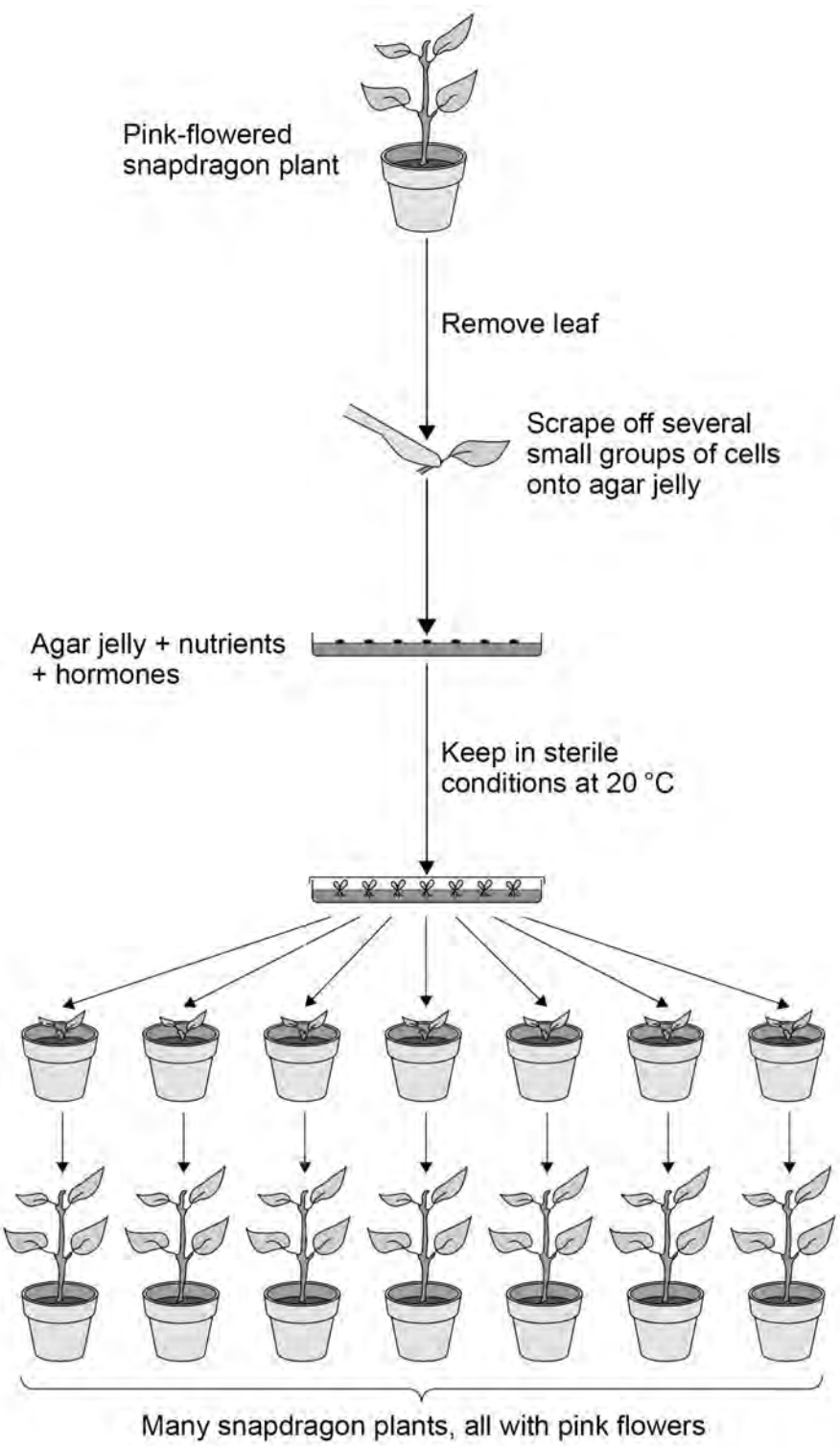
Question 09 · continued



Commercially, hundreds of pink-flowered snapdragon plants can be produced from one pink-flowered plant.

**Figure 7** shows a tissue culture technique used for producing many plants from one plant.

**Figure 7**



4.1.1.6 Culturing microorganisms (biology only)

Question 09 · continued



**0 5 . 6** Give a reason for each of the following steps shown in **Figure 7**.

**[5 marks]**

**Several** groups of cells are scraped off the leaf: _____

**Nutrients** are added to the agar jelly: _____

**Hormones** are added to the agar jelly: _____

The plant cells are kept in **sterile** conditions: _____

The plant cells are kept at **20 °C**: _____

**0 5 . 7** Explain why the method shown in **Figure 7** produces **only** pink-flowered plants.

**[2 marks]**

14

### 4.1.1.6 Culturing microorganisms (biology only)

**Question 10**

June 2019 | 8461/2H | Original Q7

**0 7** Ragwort is a weed that grows on farmland.

Ragwort is poisonous to horses.

**0 7 . 1** Plan an investigation to estimate the size of a population of ragwort growing in a rectangular field on a farm.

**[4 marks]**

**Question 7 continues on the next page**

Question 10 · continued

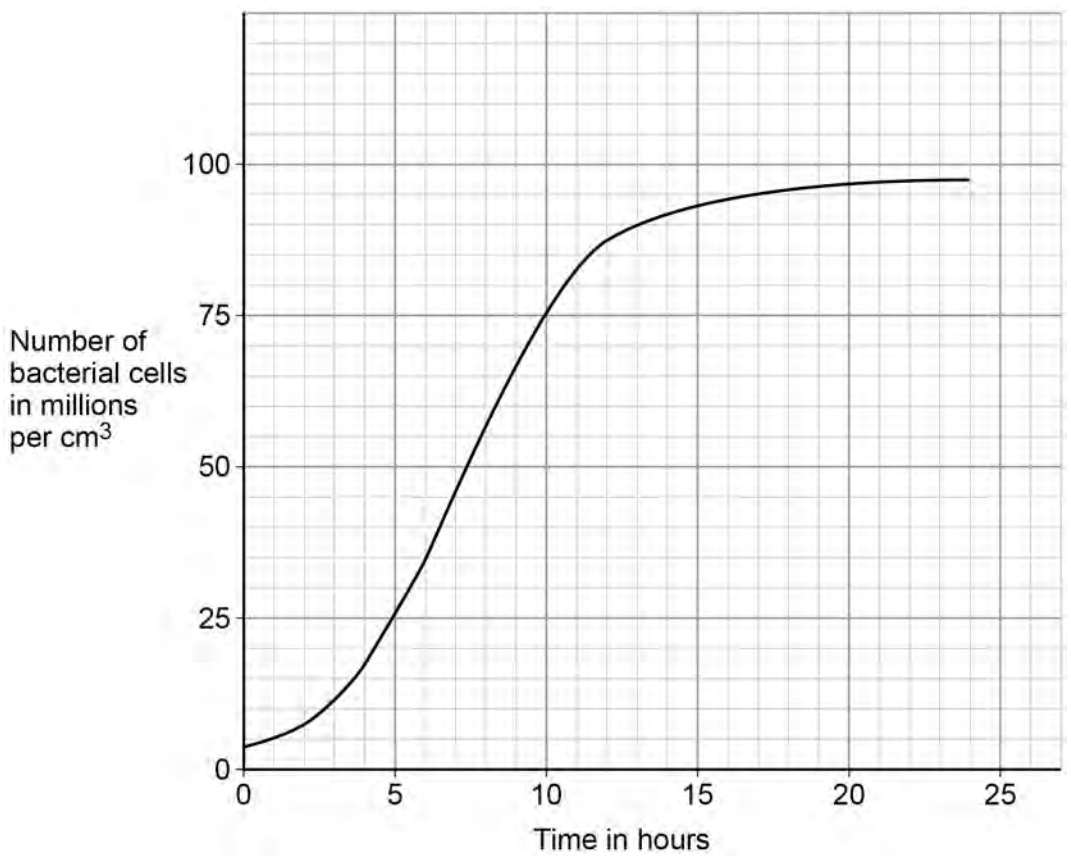


The herbicide glyphosate will kill ragwort and other weeds.

Scientists use bacteria for the genetic engineering of crop plants to make the crops resistant to glyphosate.

**Figure 8** shows the growth of a culture of the bacteria in a solution of nutrients at 25 °C

**Figure 8**




**0 7 . 2** Why did the rate of reproduction increase between 2 hours and 7 hours?

**[1 mark]**

4.1.1.6 Culturing microorganisms (biology only)

Question 10 · continued



**0 7 . 3** After 12 hours, the rate of reproduction decreased.

Suggest **three** ways the scientists could maintain a high rate of reproduction in the bacterial culture.

**[3 marks]**

1 _____

_____

2 _____

_____

3 _____

_____

**0 7 . 4** The rate of reproduction of the bacteria is fastest at 7 hours.

How many times faster is the rate of reproduction at 7 hours than the rate at 12 hours?

**[4 marks]**

_____

_____

_____

_____

_____

_____

_____

_____

Rate at 7 hours is _____ times faster.

**Question 7 continues on the next page**

4.1.1.6 Culturing microorganisms (biology only)

Question 10 · continued



**0 7 . 5** Scientists transferred a gene for resistance to the herbicide glyphosate into the bacteria.

The genetically-modified (GM) bacteria can then transfer the glyphosate-resistance gene to a crop plant.

Explain the advantage of making crop plants resistant to glyphosate.

**[3 marks]**

15

4.1.1.6 Culturing microorganisms (biology only)

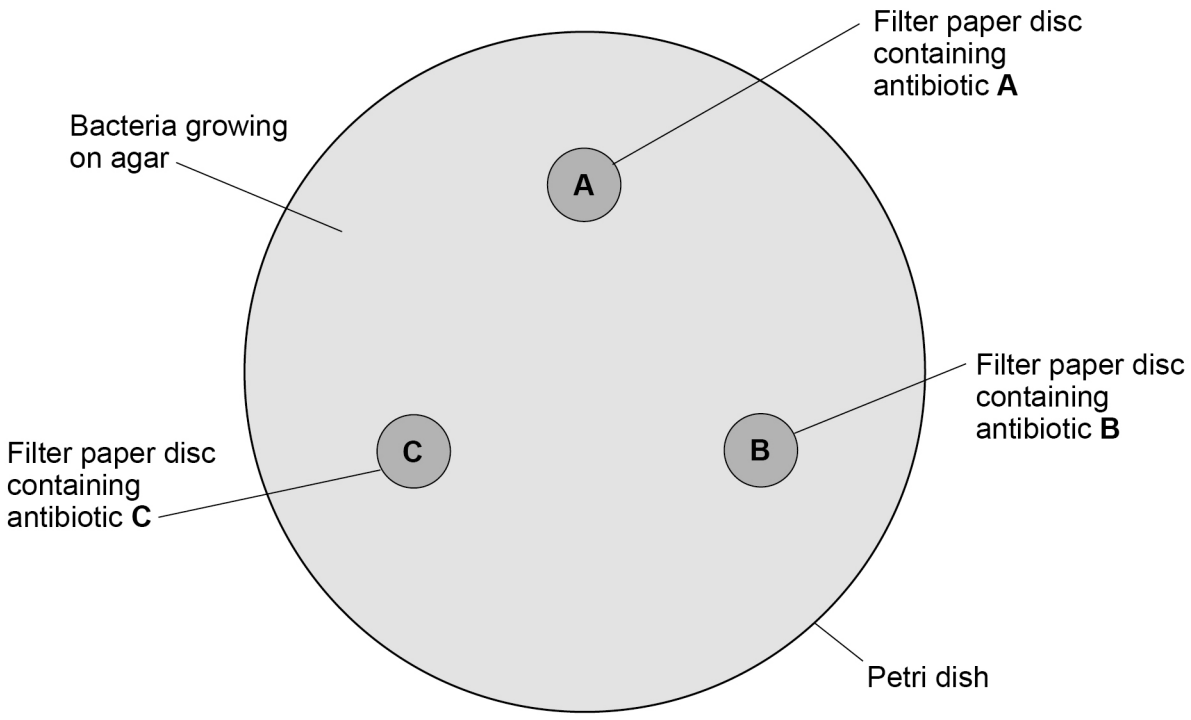
Question 11

November 2021 | 8461/1H | Original Q2

**0 2** A student investigated the effectiveness of three different antibiotics.

**Figure 3** shows how the student set up an agar plate.

**Figure 3**




The student used aseptic techniques to make sure that only one type of bacterium was growing on the agar.

**0 2 . 1** Describe **two** aseptic techniques the student should have used.

**[2 marks]**

1 _____

_____

_____

2 _____

_____

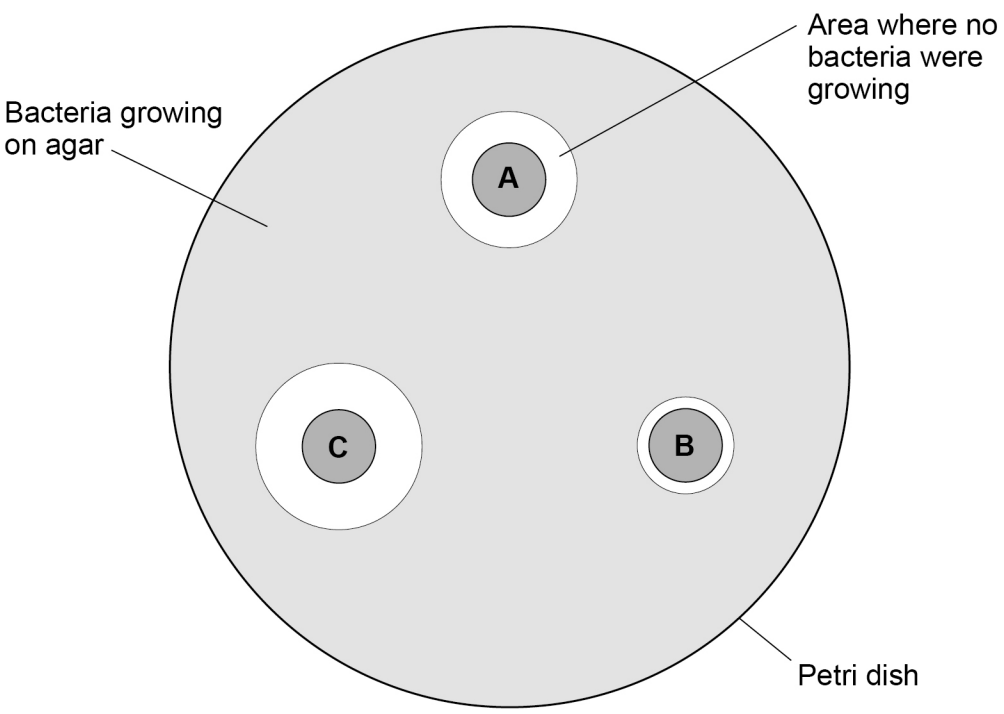
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**Question 2 continues on the next page**

The student placed the agar plate in an incubator at 25 °C for 48 hours.

**Figure 4** shows the agar plate after 48 hours.

**Figure 4**




**0 2 . 2** Which antibiotic is the **least** effective?

Give a reason for your answer.

**[1 mark]**

Least effective antibiotic _____

Reason _____

_____

_____

4.1.1.6 Culturing microorganisms (biology only)

Question 11 · continued



**0 2 . 3** Calculate the area where no bacteria were growing for antibiotic **C**.

Use $\pi = 3.14$

Give the unit.

**[5 marks]**

Area = _____ Unit _____

**0 2 . 4** Suggest **one** way the student could improve the investigation.

**[1 mark]**

_____

_____

9

4.1.1.6 Culturing microorganisms (biology only)

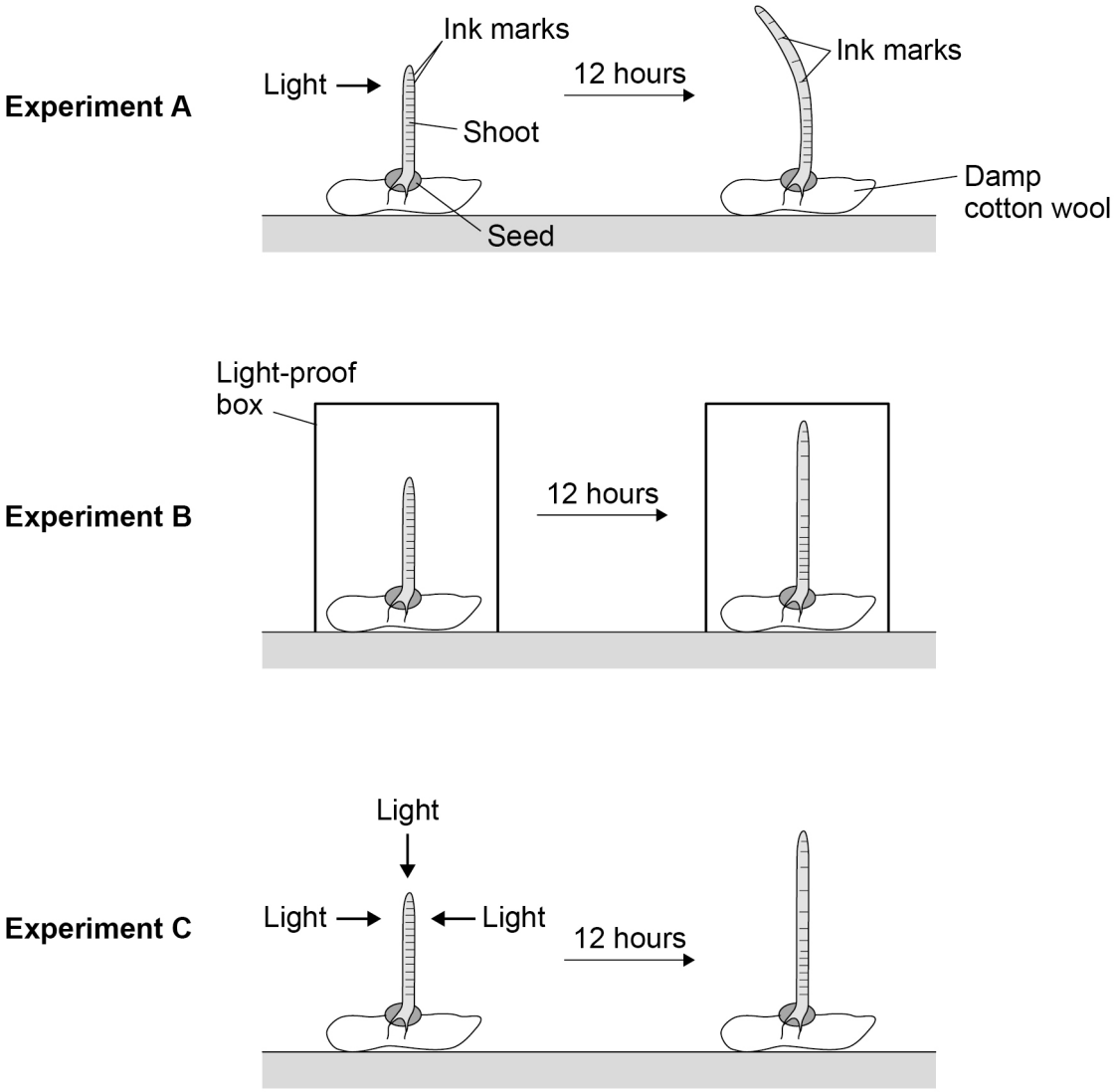
Question 12

June 2022 | 8461/2H | Original Q9

**0 9** Students investigated the response of plant shoots to one-sided light.

**Figure 13** shows how the students set up three experiments.

**Figure 13**



4.1.1.6 Culturing microorganisms (biology only)

Question 12 · continued

June 2022 | 8461/2H | Original Q9

**0 9 . 1** Suggest **two** control variables the students should have used in their investigation.

**[2 marks]**

1 _____

_____

2 _____

_____

**0 9 . 2** Describe how experiment **B** and experiment **C** acted as controls for the investigation.

**[2 marks]**

Experiment **B** _____

_____

Experiment **C** _____

_____

**0 9 . 3** Give **two** conclusions that the students could make from the **ink marks** on the shoot in experiment **A**.

**[2 marks]**

1 _____

_____

2 _____

_____

**0 9 . 4** Name the type of response shown by the seedling in experiment **A**.

**[1 mark]**

_____

**Question 9 continues on the next page**

**Question 12 · continued**



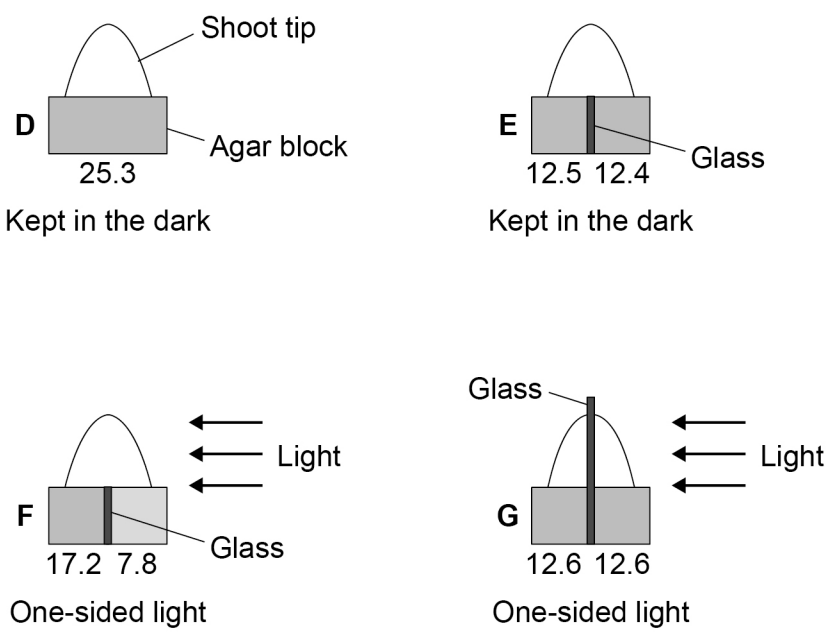
Auxin is a plant hormone. Auxin is made in the shoot tip.

Scientists investigated the role of auxin in the response of shoot tips to light.

This is the method used.

1. Grow four seedlings in the dark for a few days.
2. Cut the tip off the shoot of each seedling.
3. Place each shoot tip on a small block of agar jelly.
4. Place the shoot tips and agar in different conditions as shown in **Figure 14**.
5. After 24 hours, measure the mass of auxin in the agar blocks.

**Figure 14**




The numbers under each block show the mass of auxin that diffused into the blocks from the shoot tips.

The mass of auxin is given in arbitrary units.

4.1.1.6 Culturing microorganisms (biology only)

Question 12 · continued



**0 9 . 5** A scientist made a hypothesis:

'Light causes auxin to move from the side of the shoot nearest to the light to the side furthest from the light.'

Describe the evidence from **Figure 14** which supports the hypothesis.

**[3 marks]**

**0 9 . 6** Another scientist made a different hypothesis:

'Light causes the breakdown of auxin.'

Give the evidence from **Figure 14** that shows that auxin is **not** broken down by light.

**[1 mark]**

11

### 4.1.1.6 Culturing microorganisms (biology only)

**Question 13**

June 2023 | 8461/1H | Original Q3

**0 3** *Salmonella* bacteria cause outbreaks of food poisoning in humans.

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

**0 3 . 1** How do *Salmonella* bacteria in food cause the symptoms of vomiting and diarrhoea?

**[1 mark]**

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.

**0 3 . 2** 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 marks]**

**Question 3 continues on the next page**

Question 13 · continued



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

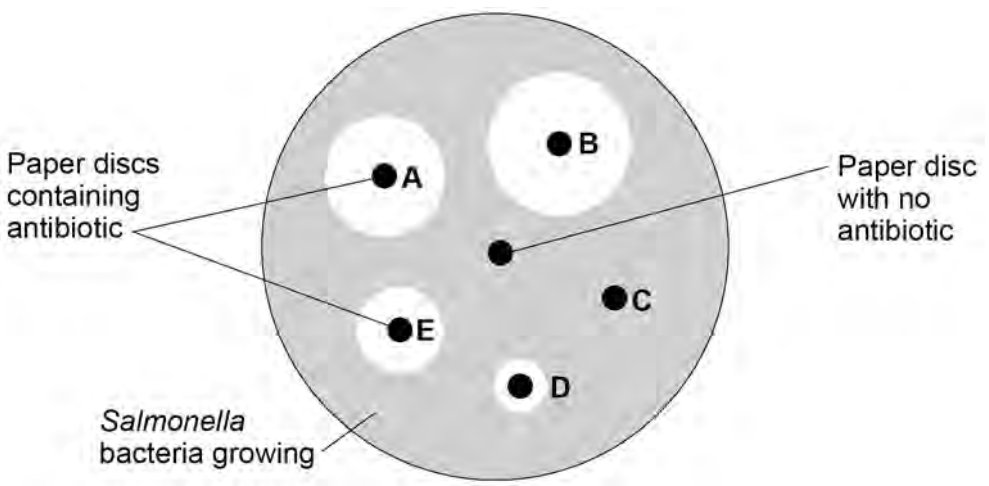
However, some patients may need to take antibiotics to recover.

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.

**Figure 4** shows the results.

**Figure 4**




**0 3 . 3** Describe **two** aseptic techniques the scientists should have used in the investigation.

**[2 marks]**

1 _____

_____

2 _____

_____

4.1.1.6 Culturing microorganisms (biology only)

Question 13 · continued



**0 3 . 4** 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.

**[3 marks]**

**0 3 . 5** What is the purpose of the paper disc with no antibiotic in **Figure 4**?

**[1 mark]**

**0 3 . 6** 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?

**[1 mark]**

**0 3 . 7** The scientists wanted to be more certain about which antibiotic should be prescribed.

Describe how the results in **Figure 4** could be used to obtain a **quantitative** comparison of antibiotics **A** and **B**.

**[1 mark]**

4.1.1.6 Culturing microorganisms (biology only)

Question 13 · continued



**0 3 . 8** 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 mark]**

**0 3 . 9** 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 marks]**

**17**

4.1.1.6 Culturing microorganisms (biology only)

Question 14



**0 6** This question is about pathogens.

A scientist investigated antibiotic resistance in bacteria.

**0 6 . 1** Name **one** antibiotic.

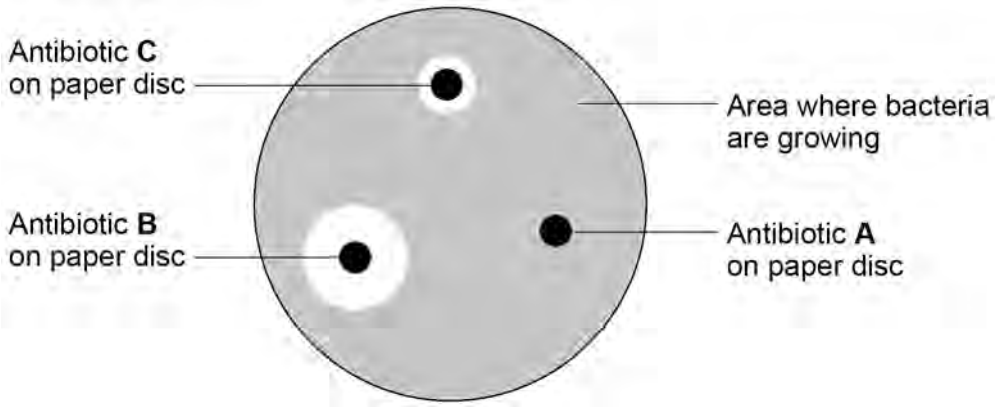
**[1 mark]**

The scientist grew one type of bacterium on agar in a Petri dish.

The scientist placed paper discs each containing a different antibiotic on the agar.

**Figure 5** shows the appearance of the Petri dish after 2 days.

**Figure 5**



4.1.1.6 Culturing microorganisms (biology only)

Question 14 · continued



**0 6 . 2** A student said:

'The bacterium is resistant to antibiotic **C**.'

Explain how the results in **Figure 5** show that the student is **not** correct.

**[2 marks]**

**0 6 . 3** Suggest why doctors are concerned about antibiotic resistance.

**[2 marks]**

**Question 6 continues on the next page**

4.1.1.6 Culturing microorganisms (biology only)

Question 14 · continued



Diseases caused by viruses **cannot** be treated using antibiotics.

**0 6 . 4** Suggest why viruses **cannot** be grown on agar.

**[1 mark]**

**0 6 . 5** Why is it difficult for scientists to develop drugs to destroy viruses?

**[1 mark]**

**0 6 . 6** Which disease is caused by a virus that damages white blood cells?

**[1 mark]**

Tick (✓) **one** box.

- AIDS ☐
- Gonorrhoea ☐
- Measles ☐
- Salmonella ☐

8

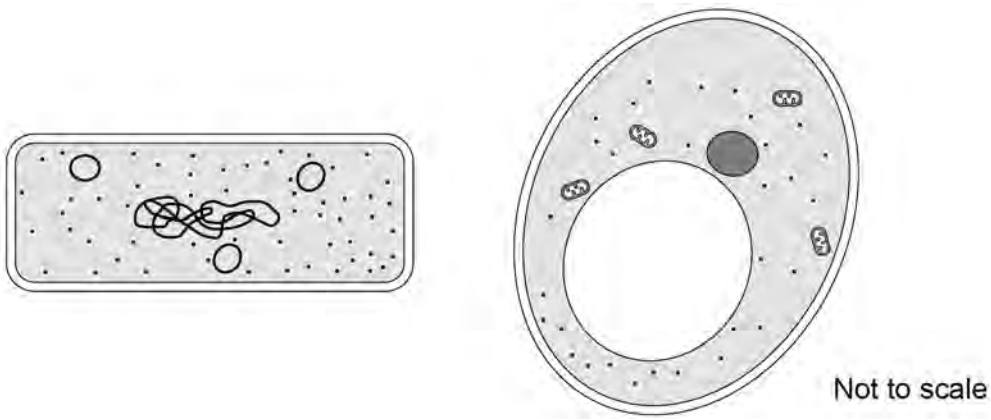
4.1.1.6 Culturing microorganisms (biology only)

Question 15



**0 8** **Figure 10** shows a bacterial cell and a yeast cell.

**Figure 10**




**0 8 . 1** Which statement about bacterial cells and yeast cells is correct?

**[1 mark]**

Tick (✓) **one** box.

- Bacterial cells and yeast cells are eukaryotic. ☐
- Bacterial cells and yeast cells are prokaryotic. ☐
- Bacterial cells are eukaryotic and yeast cells are prokaryotic. ☐
- Bacterial cells are prokaryotic and yeast cells are eukaryotic. ☐

**0 8 . 2** Give **two** features of a yeast cell that are **not** found in a bacterial cell.

Use **Figure 10**.

**[2 marks]**

1 _____

_____

2 _____

_____

**Question 15 · continued**



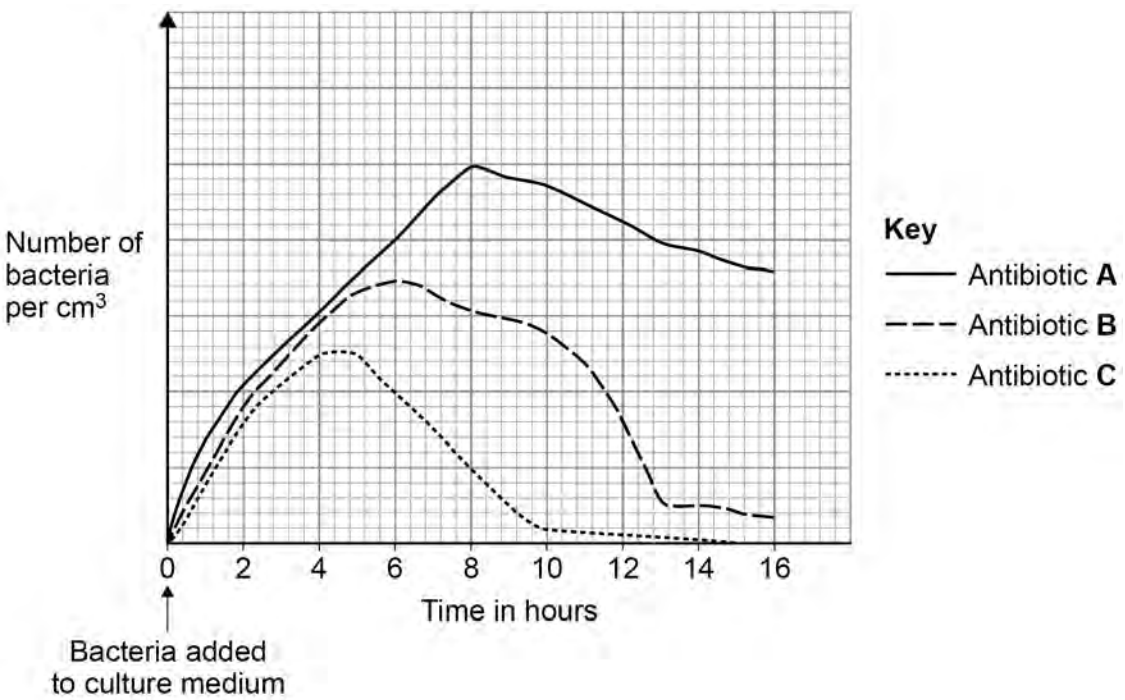
A scientist investigated the effect of different antibiotics on one type of bacterium.

The scientist:

- used three samples of culture medium
- added a different antibiotic to each sample
- added equal numbers of bacteria to each sample.

**Figure 11** shows the results.

**Figure 11**



4.1.1.6 Culturing microorganisms (biology only)

Question 15 · continued



**0 8 . 3** Compare the effectiveness of the antibiotics shown in **Figure 11**.

**[4 marks]**

**0 8 . 4** It was **not** possible for the scientist to count the total number of bacteria per $cm^3$ of culture medium.

The cells were too close together to be counted accurately.

The scientist took 10 samples from the culture medium.
Each sample had a volume of 0.02 $cm^3$.

Describe how the scientist could use the samples to estimate the number of bacteria in 1 $cm^3$ of culture medium.

**[2 marks]**

9